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Social and intercultural dynamics in  
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technology from publicly-funded research  
laboratories

Ronald W. Murnain  
University of Wollongong

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SOCIAL AND INTERCULTURAL DYNAMICS  
IN INDUSTRY'S COMMERCIALISATION OF TECHNOLOGY  
FROM PUBLICLY-FUNDED RESEARCH LABORATORIES

A thesis submitted in fulfilment of  
the requirements for the award of the degree

DOCTOR OF PHILOSOPHY

from

UNIVERSITY OF WOLLONGONG

by

RONALD W. MURNAIN, B.Sc.(hons)



CENTRE FOR RESEARCH POLICY


1996



### CERTIFICATE OF ORIGINALITY

I hereby declare that this thesis is the result of my own research and that it contains no material, in whole or in part, that has been submitted for an award including a higher degree, to any other university or institution.

I also declare that this thesis contains no material previously written or published by another person, except where due reference is made in the text of the work.



Ronald W. Murnain

Donald Horne (Why Our Luck Changed, Sydney Morning Herald,  
13 January 1996) has described a task for  
his hypothetical "Royal Commission into the Business Culture":

*Even when [industrial] successes come ..., has  
it been from hard economics or from cultural  
change in the wider views of the world (and of  
what Australia can do in it)? ... The Com-  
mission conducts a nationwide search for at  
least one writer in Australia who reports,  
comprehensively, regularly and widely on busi-  
ness as an activity that involves people as  
well as balance sheets, that involves imagin-  
ation as well as interest rates.*

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## ABSTRACT

The *commercialisation* process through which industry uses technology from publicly-funded research laboratories, involves a laboratory and one or more companies establishing a *commercialisation interface*. This brings together the sometimes conflicting research and business cultures.

Although commercialisation is ultimately a social process, studies of commercialisation interfaces have often focused more on the contractual, administrative or economic structures set up to manage them, than on the social and intercultural dynamics that create and sustain them. So previous research has largely left unanswered the questions that drive this thesis:

- \* How does the social structure of the laboratory-company interface emerge and endure?
- \* What behaviour contributes to the interface's social effectiveness?

The study draws on theories on intergroup contact, trust, conflict, power, ethnic adaptation, organisational adaptation and symbolic representation, to identify *dimensions of social behaviour* likely to influence the status of the commercialisation interface. These dimensions provide an analytical framework for investigating what makes commercialisation interfaces effective. The framework is applied to analyse commercialisation case studies and to formulate a theoretical model which helps explain the social/intercultural basis of commercialisation.

The analysis reveals that different dimensions of behaviour influence the social effectiveness of interfaces not only to different degrees, but also in fundamentally different ways.

The impact on interface effectiveness of several influential dimensions of social behaviour was encouraged or reinforced by *the contexts* of the interfaces in the case studies: their historical, cultural context and/or their contemporary, structural context. Other influential dimensions were largely unaffected by the interfaces' contexts. Behaviour's *source of influence* on interface effectiveness is therefore important.

The dimensions of social behaviour were found also to have different *modes of influence* on interface effectiveness. Some dimensions affected the way participants approached their forthcoming involvement in the interface (an '*individual*' mode of influence). Other dimensions had a '*collective*' mode of influence; here the behaviour was tightly bound up with the collective activity of both partners and their representatives within the interface itself, as that small group set about its tasks.

The importance of these channels through which behaviour actually gains its influence on interface effectiveness suggests that the interpretation and management of social behaviour in commercialisation must focus on the interplay between behaviour's mode and source of influence. The thesis argues that this interaction is crucial in generating the interface's social/intercultural dynamics. The interface is very much the product of social adaptation: adaptation of individuals to social forces generated in the interface itself and elsewhere, and adaptation of the interface as a small group to cultural and other forces. The thesis shows that these processes of adaptation can readily be understood in terms of the interplay of behaviour's mode and source of influence.

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Of all the support, understanding and co-operation I received during the period I was working on the thesis, the most important came from my family. My wife, Jill, supported me (in all ways) over this period, while our sons Jeremy and Tim were tolerant and co-operative.

My supervisors, Professor Stephen Hill and Associate Professor Tim Turpin, freely gave their advice and guidance. I appreciated very much their agreement that much of the preparation of the thesis could be done away from the University, as well as their re-arranging their schedules to enable many of our meetings to take place in Canberra. I would not have relished too many more trips down the Macquarie Pass!

Working away from the University meant that I relied on library resources in my home town, Canberra: in particular the libraries of the Australian National University. Access to these resources was important.

Of course key inputs were made by the CSIRO, SIROTECH, company and other people I interviewed. These people were free with both their time and their personal thoughts on the various commercialisation ventures: often at some potential inconvenience, embarrassment or risk.

I received particular assistance and encouragement from the contacts on the respective case studies in CSIRO, who arranged use of the ventures, the interviews, and access to written - sometimes sensitive - file material.

Assistance from all these people made identifying, setting up and investigating the case studies simpler than I had expected.

An important part of the knowledge-base upon which the thesis built came from my professional experience over the 1970s, 80s and early 90s: mainly in CSIRO. Over this period, far too many people to name gave me guidance, ideas and stimulation. They are hereby thanked.

CSIRO provided financial support for part of the project in the form of a postgraduate studentship. I am grateful to CSIRO for this support.

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## PREAMBLE

The relationship between the publicly-funded research laboratories and industry has long been important for Australia's effective application of technology in the development of new and improved products and processes.

Traditional forms of interaction are important in this relationship. Publicly-funded laboratories consult individual companies and industry bodies about national technology needs, for instance, while laboratories undertake paid work on industry's technological problems through arm's-length arrangements like consultancies and research contracts.

Over the past several years, however, the research-business relationship has come to feature fundamentally new forms of interaction. Arrangements embodying a much higher degree of interdependence have come to be increasingly important (Martin, 1991; National Board of Employment, Education and Training, 1993; Gupta, Raj and Wilemon, 1987). These arrangements include collaborative research arrangements and various types of joint ventures. Institution-owned commercial entities are also becoming more common.

This change seems to have resulted from a combination of

- \* *Government policy initiatives* encouraging more, and perhaps closer and more interdependent, research-business contact: like introduction and reinforcement of the Australian government's 30% external funding target for most public sector laboratories, and the Co-operative Research Centres program.

- \* *Community expectations*, clearly framed in various policy reviews. For example, an independent review of aspects of interaction with industry by the Commonwealth Scientific and Industrial Research Organisation (CSIRO), Australia's largest and probably most influential research agency,<sup>1</sup> recommended more frequent formation of joint venture companies (Review of CSIRO's Commercial Activities, 1983, pp.36 and 37). Likewise a more general review of CSIRO advocated that that Organisation enter more "collaborative research contracts and, particularly, joint ventures" (Australian Science and Technology Council, 1985, p.36).
- \* *Philosophies of research agencies and their management*. CSIRO's Chief Executive in the late 1980s/early 1990s, for instance, repeatedly emphasised the interdependence (the "seamlessness") of CSIRO-company relationships (Stocker, 1993).

Laboratories' and companies' objectives and priorities often needed to change to accommodate these new forms of interaction, as did the social and management basis of research-industry relations. Traditional roles and responsibilities were often being broken down or reassigned, while new abilities, skills and perspectives were becoming more important. Researchers and research managers can now be expected, for example, to manage (and be managed) across organisational boundaries, and to see things clearly from commercial perspectives.

These changes often demanded that companies be more open in their thinking, and share commercial knowledge and perspectives with laboratories. Researchers, for their part, were often expected to reveal more of their work and their thinking to people they had previously

mostly dealt with at arm's length, and to have a closer, longer term association with products based on their technology. Laboratories are now often expected to share risks traditionally borne by the commercial partner, as well as the real price of failure of ventures. It is notable that CSIRO is in the process of developing a risk-assessment and risk-management strategy for handling its interactive work with companies: a course of action largely precipitated by CSIRO's unfamiliarity and discomfort with the new modes of interaction (personal communication from E.N. Cain, Secretary to CSIRO Board, 4 May 1995).

These new forms of research-business interaction come prominently into play in the important process of a company's *commercialisation* of technology, under a formal commercial arrangement with a laboratory. The social and intercultural basis of this process is the subject of this study, which focuses on technology generated by CSIRO.

CSIRO has responded positively to pressure from government and the community to develop the capacity to assist industry address national economic development needs. As long ago as the early 1980s CSIRO saw that further harnessing the Organisation's resources to this end would depend on the beliefs, thinking and behaviour of CSIRO managers and staff becoming more conducive to effective commercial interaction with industry.

Bringing about this major cultural change has not been easy. CSIRO's retention of many of the traditional values, priorities and behaviours of public sector research has often seemed to constrain the Organisation's ability to provide Australian industry with the technology, services and know-how needed. A recent discussion/options paper from

the CSIRO Board's evaluation committee highlights a number of things CSIRO must do to overcome culture-based barriers to effective CSIRO-business interaction. CSIRO must (inter alia) "be more businesslike in commercial dealings and recognise that an adequate solution may be preferred to scientific perfection", and "recognise that customers find [CSIRO's] contract process overly legalistic and time consuming" (evaluation committee of the CSIRO Board, 1995, p.10).

CSIRO's work on building a more suitable platform for effective interaction with companies has given much attention to improving awareness of commercial perspectives and expectations, the capability to behave in commercially sound ways, the strategic positioning of the Organisation's research, and access to commercially sound advice. At the same time, the Organisation's 'hard' commercialisation dealings with companies have been markedly upgraded. All this makes CSIRO's practices and approaches a potentially rich source of insights into the commercial use of technology from publicly-funded research laboratories.

Improving interactive procedures, awareness and commitment was catalysed over the mid-1980s by an increasing self-criticism by CSIRO's top management. The Organisation's commercialisation ventures, and reasons for their success or failure, were subjected to systematic critical examination. The Organisation's Chief Executive and one of its Deputy Chief Executives started taking a closer personal interest in these ventures; one or the other (at different times) started sitting on the Board of CSIRO's commercial company, SIROTECH Ltd. From that position they were able to scrutinise CSIRO's developing commercialisation activity.



In parallel with this arrangement, from 1982 to 1989, the author of this thesis was responsible, as Senior Adviser (Commercial) in CSIRO's Corporate Centre, for critically monitoring and analysing the Organisation's commercialisation ventures and how they were being handled. There were three specific aims for this activity: correcting and anticipating problems in existing arrangements and those then under development; increasing the Organisation's ability to construct effective commercialisation vehicles in the future; and 'fine-tuning' SIROTECH's commercialisation operations on behalf of CSIRO, during and following the company's establishment in 1984.

I had come into this role from a 13-year background in CSIRO in personnel policy-development/personnel management consulting. A main focus of that work had been assessing the performance level of staff: including in their increasing collaborative work with industry. This earlier experience with CSIRO-business interaction from a personnel management perspective provided a useful foundation for my involvement over the 1980s, when I brought to bear instead a research policy/commercialisation policy perspective.

This experience with CSIRO's commercialisation activities provided the context within which my approach to, and thinking on, this study developed. Describing this approach and context at the outset will help explain why the various dynamics examined in the thesis came to be looked at as likely significant forces on the commercialisation process.

Monitoring and analysis of CSIRO's commercialisation performance over most of the 1980s relied especially on data collected in connection

with the SIROTECH Board's consideration of detailed, highly structured recommendations and periodic progress reports on the establishment, development and operation of each major venture. These reports were prepared by SIROTECH's project directors and Managing Director, with inputs from CSIRO managers. The data available included detailed minutes of Board discussion/decisions.

I was centrally involved in analysing and articulating this information in two ways. First, I articulated and analysed particular problems and issues, with SIROTECH managers and CSIRO managers at a range of levels. Second, I prepared reports on all significant issues for CSIRO's corporate-level managers. Often this analysis and discussion of a particular venture stretched over years, as it went through its formation, development, implementation and operation stages, and through half a dozen or more recommendations/reports to the SIROTECH Board. My involvement (with SIROTECH and other CSIRO managers) in critically examining and developing CSIRO's commercialisation arrangements amounted to reasonably close participant observation of those arrangements as the Organisation's approach to the commercialisation task unfolded.

This observation provided an especially valuable foundation for the present study's analysis of the emerging culture of the research-business interface: more so because this was such an instructive period in the history of CSIRO's work with the world of commerce. In the 1980s, CSIRO's day-to-day *commercial* work with industry was developing rapidly, following an earlier period during which the Organisation's *strategic interactions* with industry had been rapidly developed. These were times of much change and strain, with CSIRO people often working in

modes that were quite foreign to them, so perspectives developed during this period on the thinking and behaviour of publicly-funded researchers (and their counterparts in companies) as the parties came together are likely to be especially salient.

Over nearly six years from the establishment of SIROTECH early in 1984 until my departure from the area in late 1989, well over one hundred commercialisation ventures were systematically monitored and analysed in the fashion described. While this participant observation of ventures facilitated improvements to commercialisation policies and procedures, more importantly for the present study it highlighted to me aspects of commercialisation being concentrated on in the attempts to upgrade commercialisation capability, as well as other aspects that were being largely ignored.

In particular, I perceived that potentially important *social and intercultural* barriers to effective commercialisation often were not being addressed at a fundamental level. Often issues embodying these barriers were being identified. But solutions to the issues were seldom finding their way into the management strategy for establishing and developing a particular venture, or into CSIRO's corporate memory, where they could be called on by those responsible for 'building' commercialisation ventures in the future.

Instead, important social/intercultural issues and conflicts identified in recommendations and reports to the SIROTECH Board (like differences of opinion and commitment between different levels of management in the company or in CSIRO, or differences between the parties on key goals or ways of operating) were invariably being translated into

the terms of the contractual basis of the venture. The concentration was almost exclusively on the flow of money, how much each party was to invest, when investments were to be made, nominated management arrangements, legal provisions, and similar 'hard' variables. It was being tacitly assumed by SIROTECH and CSIRO management that the conflicts, uncertainties, doubts, trust and other fundamental social/intercultural processes underlying these issues would necessarily be addressed by adjusting the contractual arrangement.

This tendency to attribute fundamental intergroup difficulties to incompatible technical, strategic or business interests is identified by Taylor and Moghaddam (1987), who observe that it is often assumed that

the social psychological aspects of intergroup behavior are not determinants of - but rather, are mainly determined by - the compatibility or incompatibility of group interests [and that] the negative attitudes, stereotypes and attributions that members of one group have regarding members of an out-group ... stem from [their] incompatible interests [p.34].

Generally, it was only when arrangements came 'off the rails' that attention was turning substantively (and it seemed to me often only momentarily) to interpersonal, intergroup and intercultural relationships and issues. While realigning the formal legal-administrative arrangement could perhaps ultimately improve the social/intercultural dynamics, it seemed to me that this could not be guaranteed. Repeated airing of the same social/management and intercultural issues in the same project, sometimes over a period of years, perhaps suggests that this "realigning" may in some cases even have been counterproductive for the underlying social/intercultural dynamics.

These observations in the 1980s first led me to conjecture whether a

better understanding and greater management awareness of the social/intercultural dynamics of the commercialisation process might help us construct and operate more effective commercialisation arrangements. There were many prima facie indications of how important social/intercultural factors might be for the success or failure of commercialisation ventures.

On the one hand, certain social/intercultural problems or difficulties often seemed to be associated with a CSIRO-company venture's eventual breakdown. Looking back through the venture's history, it was often possible to point to these potential problem areas early in the venture's lifetime. Frequently it seemed to be possible, for instance, to identify in ventures that eventually broke down, early problems or issues based on the following sorts of influences and characteristics:

- \* Researchers' exceptionally strong feeling of 'strangeness', uncertainty, isolation and incompatibility in the world of commercial product-development.
- \* Reluctance by one or both parties to change their ways or to take on a more adventurous role in the venture. Restriction of one party to a narrow, discrete role, evidently preventing its skills and views from penetrating the other party's activities and thinking.
- \* Marked differences in the parties' power in the venture, their motivation for entering it, and what they stood to gain or lose from it.

- \* Reluctance of one or both parties to participate in defining clear, unambiguous goals for the venture, and to take up those goals as a driving force for their involvement.
- \* One or both parties' lack of trust in the other party: perhaps trust to handle sensitive information, for instance.
- \* The research laboratory's scepticism about how necessary a tight, fully commercial agreement was, and about whether such an agreement could possibly reflect the "real" needs in commercialisation.
- \* Variable support for the venture either from different levels of management in one party or from management of the different parties.
- \* Significant conflict, sometimes resulting in extreme actions by one party (like legal action, collusion and exercising of political influence). A reluctance on the part of senior managers to take definite steps to control conflict.

On the other hand, it often seemed possible to associate certain social/intercultural *strengths* discernible very early in a venture's lifetime, with eventual relative success. These included:

- \* One party's obvious respect for the other party's basic values and ways of doing things.
- \* A conscious effort by at least one party to view the task in a

fundamentally new light, having realised that their existing perspectives and outlooks would not meet the venture's needs.

- \* At least one party's performance 'above and beyond the call of duty', through doing more than was demanded under the formal arrangement.
- \* Both parties contributing significantly to all facets of the venture's operations, and coping well with the often strange atmosphere of commercialisation interaction.
- \* Leadership of the research team by someone with an adventurous and open outlook on working with industry.
- \* Thorough definition of management and operating arrangements.
- \* A willingness to tie down or limit points of conflict. Notwithstanding frequent management indifference to conflict-management, some of the most notable revivals of seemingly doomed ventures appeared to have started with managers setting about translating points of conflict into 'hard' issues.

It seemed to me at the time that this prima facie relationship between social or intercultural strengths/weaknesses and a commercialisation venture's success/failure was unlikely to be coincidental, and that the observation since made by Martin (1991) was likely to be correct: success in commercialisation is often greatly influenced by factors like commitment, and control of conflict. It seemed to me that, while study from economics-based perspectives had shed some light onto some

aspects of commercialisation, these approaches told only part of the story. It became clear to me over the latter part of the 1980s, that an analytical framework synthesising social and cultural perspectives would be likely both to improve our understanding of the commercialisation process at a fundamental level and to encourage managers of commercialisation to take the (probably important) social and intercultural dynamics into account in their day-to-day activities.

Using my observations made over the 1980s as guidance for this study demanded that those observations be consolidated in some way. The collation for the SIROTECH Board of strategic analyses of all major CSIRO commercialisation ventures over a substantial period in effect provided this consolidation. All of these recommendations/reports on about 100 separate commercialisation projects over the period 1984 to 1989<sup>2</sup> were reviewed at the commencement of the study, to identify potential social/intercultural contributors to commercialisation effectiveness. This provided invaluable guidance for the study's identification of theoretical perspectives in the literature, for identification of specific areas of analysis suggested by those theoretical perspectives, and for selection of types of commercialisation ventures most likely to cast light onto important social/intercultural dynamics.

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#### Notes to the Preamble:

1. CSIRO, which has been in existence for 70 years, employs some 7000 people in more than 30 research divisions on more than 100 sites across the country, and has an annual budget of some \$A700 million. The diversity of the Organisation's research is



reflected in the names of the six institutes into which the divisions, until a recent re-organisation, were arranged: Animal Production and Processing; Plant Production and Processing; Minerals, Energy and Construction; Industrial Technologies; Information Science and Engineering; and Natural Resources and Environment.

CSIRO has long been a national icon in Australia, respected for its scientific excellence, its independence and authority, and its achievements: especially in facilitating development of agricultural and other resource-based industries (see Schedvin, 1987). However the Organisation's contribution to economic development, especially in the manufacturing and service industries, has increasingly come under question, particularly from the early 1980s, from politicians and some parts of the scientific/technological community.

2. It did not prove possible to gain access to the comparable documents covering the period from 1989 to SIROTECH's disbandment in 1993.

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# **CHAPTER 1**

## **SOCIAL/INTERCULTURAL DYNAMICS IN THE COMMERCIALISATION INTERFACE**

## CHAPTER 1

# SOCIAL/INTERCULTURAL DYNAMICS IN THE COMMERCIALISATION INTERFACE

### A. INTRODUCTION

Effective acquisition of appropriate technology is important for Australian industry's rapid development. Quality technology is especially important for assisting Australia through the process of rapid internationalisation and for negotiating Australian companies' positions in the new loosely-bounded internationalised commercial world (see, for instance, chapter 4 in Scott-Kemmis, Darling and Johnston, 1988; Martin, 1991; Carnegie et al, 1993). At the same time, top-quality technology can help industry move towards the more sophisticated, higher value-added products that are important to wealth-generation and national well-being (see, for instance, McKinsey & Co., 1992),<sup>1</sup> and can enable more efficient production of those products, to higher quality standards.

Technology can be obtained from a variety of sources, including parent companies, affiliates or third parties. Such sources will continue to be important, notwithstanding restricted, unattractive terms sometimes attached to their use (Ford, 1991, pp.70 and 71; Grant, 1984). Companies' own generation of technology has become increasingly important in recent years.<sup>2</sup>

Technology generated *through the national publicly-funded research effort* has been an important basis for innovation in Australian industry. Most of this research is performed in CSIRO, other government laboratories, and the universities.

Effective use of this source of technology is especially important for Australia's economic development, because of the size of these laboratories' contribution to the national R&D effort. Well over half of all R&D activity still takes place in publicly-funded laboratories (Australian Science and Technology Council, 1991, chapter 2). This compares with around 40% for most other OECD countries (Science and Technology Budget Statement, 1991-92). The balance of the national research effort underlines the importance of creative, sustainable interfaces between research laboratories and industry.

Effective use of technology from the publicly-funded laboratories is important also because of government and community expectations. A lot of policy attention has been given to better tuning laboratories' operating arrangements and the context in which the laboratories work, to meet industry's technology needs. Policy initiatives (one embodying a 30% external funding requirement for government laboratories, for example), and interactive mechanisms for government laboratories (like the Co-operative Research Centres program) are now well established: see, for instance, Co-Operative Research Centres Program Evaluation, 1995.

An often effective channel through which a company can access a publicly-funded laboratory's technology is a formal commercial arrangement between the two parties. Use of this channel is referred to hereafter as "*commercialisation*", or "*the commercialisation process*".

Laboratories seem to have increasingly realised that much additional funding and a better concentration of resources can result from creative commercialisation relationships (Grose, 1993; Clack, 1992; Owen,

1992). Some laboratories have shown startling growth in commercial income (Juddery, 1994). Quite apart from being financially attractive to laboratories, effective commercialisation arrangements are widely seen as important also for the well-being of the national research system. Leading figures in laboratories and industry have attested to this (see Stocker, 1993).

Most publicly-funded laboratories, encouraged by the 30% external funding policy, have developed their commercialisation interests and capabilities, and many have accumulated a deal of skill and experience in the subject. The participant observation and analysis of CSIRO's commercialisation ventures between 1982 and 1989 described in the preamble showed that steps to this end in CSIRO have concentrated on *contract-based* aspects of commercialisation. The aim has mostly been to improve definition of the legal responsibilities and financial obligations of each party to a commercialisation venture, and to fine-tune other business-oriented parameters.

But the literature on commercialisation, and on the broader process of innovation (using technology from various sources), supported by the participant observation of many CSIRO commercialisation ventures, identifies important *social and cultural events and processes* occurring at the research-production interface. This thesis argues that relying on contractual/regulatory mechanisms to improve our understanding of commercialisation and our ability to construct effective commercialisation arrangements, is unlikely to be successful. Instead, it is necessary to take into account both the formal contractual dynamics and the less formal (but pervasive) social/cultural dynamics that drive the adaptation of research and business (as unique areas of

organisational activity) to the research-business interface.

Both the analytical framework and the theoretical model developed in the thesis seek to develop a deep understanding of the informal, tacit dimensions of interaction in the commercialisation process.

#### **B. HUMAN FACTORS IN THE STUDY OF COMMERCIALISATION AND INNOVATION<sup>3</sup>**

Using technology to develop and produce new industrial products and processes normally involves the interaction of individuals or groups with different perspectives on science/technology and industry, and on the relationship between the two areas. These differences have come about in large part because of researchers' and company executives' different collective experiences, and resulting cultural differences (see, for instance, Roberts, 1988, and Lundvall, 1988).

Often these intercultural interactions stretch over relatively long periods. The literature documents important ongoing interactions between pairs of culturally different participants in many innovation ventures. These pairings include production managers/operators and researchers/technology specialists; business-development/marketing specialists and technical people; and people with a long-term perspective (often measured in years) and people with a short-term perspective (measured in weeks or months).

Roberts (1988); Smith, McKeon, Hoy, Boysen, Schechter and Roberts (1984); and Dubinskas (1985) highlight the need for people occupying critical innovation roles to reconcile any intercultural differences and to work effectively together. Only then, these authors argue, is innovation likely to be successful.

Some of the literature points to potentially divisive social and management issues often encountered in innovation ventures, which can activate or amplify intercultural differences. These issues include imposed unilateral cultural change, unclear power relationships, unclear or unaccepted goals, conflict between the parties, "mismatches" between innovation channels and the broad economic framework, and weak management support. Implications of these issues in various combinations are discussed by Mitchell, 1991; Lundvall, 1988; Gupta, Raj and Wilemon, 1987; Roberts, 1988; Dubinskas, 1985; Shanklin and Ryans, 1984; Frosch, 1984; Wolff, 1985; and Smith, McKeon, Hoy, Boysen, Schechter and Roberts, 1984.

When the innovation activity is *interorganisational* (as with commercialisation), any differences in interests, perspectives and cultures can be accentuated. The often severe impact of interorganisational differences on the outcome of innovation ventures is identified by Martin, 1991; Geisler and Rubenstein, 1989; Goldhor and Lund, 1983; Frosch, 1984; van Dierdonck, de Backere and Engelen, 1990; and Osborne, 1989.

With some commercialisation arrangements, intercultural differences can be further amplified by the substantial stakes involved. Financially, the stakes can easily run to seven figures; sometimes this can more than double the laboratory's operating budget. This was the case, for example, with two of the four commercialisation ventures to be studied in this investigation.

The stakes can also be high in other terms; one party's or both parties' reputation and/or future existence might hang on the venture.



Instances of this were clearly identifiable among CSIRO's commercialisation ventures monitored and analysed over the 1980s. Again, this was the case with three of the four commercialisation ventures to be studied in the present investigation.

Under these circumstances, unless management and operating arrangements accommodate intercultural differences, it might be expected that any of a number of suggested culture-based incompatibilities between research and business could be activated or amplified. These can include Dubinskas's differing timeframes (Dubinskas, 1985), Frosch's incompatible conceptions of "tidiness" (Frosch, 1984), and Goldhor and Lund's expertise incompatibilities (Goldhor and Lund, 1983). Participant observation of many CSIRO commercialisation ventures in the 1980s suggested that these intercultural incompatibilities are widespread; they are discussed later in this chapter.

If it is important for commercialisation and innovation arrangements to accommodate issues originating in cultural differences, it might be expected that the commercialisation/innovation literature will encompass much research on the management of those differences (see Newby, 1992, p.13; Australian Science and Technology Council, 1993, pp.ix and 13; and Scott-Kemmis, Darling and Johnston, 1988, p.28). Review of that literature does identify studies addressing various human factors, and often these human factors incorporate or at least reflect intercultural issues. Dodgson, 1993(a) and (b); Edosomwan, 1989; a number of British government studies (like Lilley, 1991; and House of Lords Select Committee on Science and Technology, 1991); Lundvall, 1988; Roberts, 1988; Dosi, 1988; Gupta, Raj and Wilemon, 1987; Roessner and Bean, 1990; Russo and Herrenkohl, 1990; van Dierdonck, de

Backere and Engelen, 1990; Miller, 1995; Edelheit, 1995; Hull, 1990; Renner, 1992; Leonard, Wismer and Bosserman, 1994; Hausler, Hohn and Lutz, 1994; Smith, Dickson and Smith, 1991; and the National Board of Employment, Education and Training, 1993, all canvass ideas on human factors.

But few of these works get far with illuminating the effects on the tacit, informal basis of interaction, of the intercultural, interorganisational and intergroup differences identified above. Often, the process of cultural adaptation at the research-business interface is raised but not articulated and investigated. The literature tends to encompass human factors within primarily economic/contractual perspectives. While these latter perspectives are undoubtedly important, their prominence has evidently militated against deep and comprehensive investigation of social and intercultural dimensions of commercialisation/innovation.

Thus, many of the studies cited above take only a first step towards explaining the role of intercultural, interorganisational and intergroup differences. The National Board of Employment, Education and Training (although discussing research-business interaction generally, rather than interaction specifically to commercialise technology) observes that differences in understanding between university and business people are often misleadingly lumped together as "cultural difference", pointing to a vague need for "cultural change" (National Board of Employment, Education and Training, 1993, executive summary, p.9). This generality and vagueness obscures the key task of bridging intercultural boundaries:

It is an unclear understanding of the difference between the sectors rather than the difference itself that creates the problem [executive summary, p.9].

Therefore, according to the National Board of Employment, Education and Training, it is important to gain a better understanding of what the difference means, rather than simply to identify, or even to describe, the difference. In fact, this is the very thing research on commercialisation/innovation tends not to do. Across much of the literature these differences remain hidden or at least glossed over.

For example, Roessner and Bean (1990) bury away among detailed discussion of the mechanisms of company/federal laboratory interaction in the USA, a list of "factors accounting for success and failure of interactions". Some of these factors clearly have intercultural/inter-organisational elements; they include person-to-person contact, flexibility in approach, support of company middle management, support of laboratory middle management, and support of laboratory top management (Roessner and Bean, 1990). But identification of these factors is at the same time both the start and virtually the finish of Roessner and Bean's discussion of the human dimension of collaborative interaction.

The Russo and Herrenkohl (1990), van Dierdonck, de Backere and Engelen (1990), Leonard, Wismer and Bosserman (1994), Hull (1990) and Osborne (1989) papers cited above also deal with the human factors mainly descriptively, and arguably in a somewhat truncated way, with each author often concentrating on just one aspect of research-business interaction. This aspect can be communication (in the case of Russo and Herrenkohl, the (largely undefined) importance of close one-to-one relationships (van Dierdonck et al), networks (Leonard et al), or

structural/administrative action (Hull, and Osborne).

Other studies pursue human factors' role in the commercialisation or innovation processes more comprehensively, but arguably not in sufficient depth to assist much in coming to close grips with the underlying social and intercultural dynamics.

Even organisational learning,<sup>4</sup> for instance, which has contributed in a systematic, consolidated way to the innovation literature, tends to deal in a conceptualisation of 'learning' that involves no more than people in companies 'picking up' knowledge through "experience-based learning", learning through "interaction through suppliers and users", and "learning what is feasible and profitable" (Scott-Kemmis, Darling and Johnston, 1988, pp.13 & 16). Indeed, Scott-Kemmis et al identify one form of organisational learning - "market learning" - that involves no more than companies "swap[ping] notes regarding those national or niche markets in which they are not competitors" (p.63). Dodgson acknowledges organisational learning's limited potential to help improve our understanding of the dynamics of commercialisation/innovation:

[M]ost economists' contribution to our understanding of organizational learning is limited to descriptive analyses of the outcomes of cumulative experience [Dodgson, 1993(a), p.379].

Organisational learning is typical of many areas of innovation research that have dealt with the human factors at considerable length, in that those factors are often pursued as subsidiaries to traditional economics-based approaches to innovation. The real focus remains on contractual arrangements between the parties (see, for example,

Georghiou, Metcalfe, Gibbons, Ray and Evans, 1986), and on economics-based measures of performance.

Reviews of the innovation literature reflect a marked concentration on such perspectives. For example, very few (of the order of one to two percent) of the more than one thousand works cited in reviews by Scott-Kemmis, Darling and Johnston (1988) and Organisation for Economic Co-Operation and Development (1991) evidently incorporate a significant 'human factors' approach among their various approaches to analysing innovation.

The balance of the most widely cited works in the innovation literature confirms that the centre of gravity of innovation studies lies distinctly in economics-based research. The work of many of the leading figures in innovation studies, like Abernathy and Clark (1985), Utterbeck (1986), Porter (1983), Pavitt (1986), Georghiou et al (1986), Sahal (1983 (a) and (b)), and Chesnais (1986), focuses on economic, structural and policy perspectives, and for the most part gives little attention to the human factors.

A similar limited attention to social/intercultural aspects is also evident in the body of studies seeking to identify comprehensively *barriers to sound commercialisation/innovation performance*. The main barriers identified stem from inappropriate administrative/structural actions by governments (see, for instance, Piatier, 1984); inadequate financing arrangements (see Piatier, 1984; House of Lords Select Committee on Science and Technology, 1991; Pappas Carter Evans and Coop, 1990); unsuitable national policies (see Organisation for Economic Co-operation and Development, 1991; House of Lords Select Committee on

Science and Technology, 1991; Doherty, 1989; Prime Minister's Science Council, 1991(a) and 1991(b)); and, in particular, unsuitable or inadequate structural arrangements (see Lundvall, 1988; Dosi, 1988; Senate Standing Committee on Science and the Environment, 1979; Doherty, 1989; Bureau of Industry Economics, 1991 (a), (b), (c) and (d); and 1992; Schriesheim, 1990-91; Feller, 1990; Supapol, 1990; Berman, 1990; Mitchell, 1991; Roessner and Bean, 1990, 1991 and 1993; Bloch, 1991; Schimank, 1990; Carr, 1992 (a) and (b); many of the chapters in Link and Tasse, 1989; Bertha, 1990; Smith, McKeon, Hoy, Boysen, Schechter and Roberts, 1984; Rosenberg and Nelson, 1994; Souder, Nashar, Padmanabnan, 1990; Senker and Faulkner, 1992; Miller, 1995; and Smith, Dickson and Smith, 1991).

A number of studies of barriers to effective commercialisation/innovation combine more than one of the administrative, financial, structural and policy perspectives identified above: see Brown, Berry and Goel, 1991; Goldhor and Lund, 1983; Geisler and Rubenstein, 1989; Radosevich and Lombana, 1993; Australian Science and Technology Council, 1985; and Department of Science and Technology, 1984.

The final two of these wider ranging studies clearly illustrate opportunities for drawing on the social/intercultural basis of the commercialisation process, that have been foregone.

The Australian Science and Technology Council's report on its review of CSIRO (Australian Science and Technology Council, 1985) contains a chapter called "Interactions" and sections within that chapter called "Interactions with industry" and "Interactions in the application of research results". But these do not mention, even in passing, a single

social or intercultural basis of CSIRO's interactions. Rather, they are restricted to the structural, funding, contractual and planning bases of linkages.

Likewise with the fundamental examination of Australia's commercialisation of technology from publicly-funded research that took place at the 1983 national technology conference (Department of Science and Technology, 1984). That conference's syndicate discussions on "research/industry interaction" identified several classes of communication barriers between technology-creators in publicly-funded research laboratories and technology-users in industry, residing in (inter alia) lack of 'market pull' for guiding publicly-funded research, barriers to information-flow, and some laboratories' lack of sensitivity to industry advice (Department of Science and Technology, 1984).

However the examination did not take the extra step of asking why such barriers had come into being, why some of them were so serious, and how they relate to interaction's social or intercultural basis.

It is not that economics- or contract-based factors are not important. In fact, studies from these perspectives answer many key questions about innovation/commercialisation. The point is that this emphasis has tended to obscure the importance of the informal and human factors in constituting and maintaining the interface between science and business. It seems that at present, theoretical insights into the social/intercultural basis of commercialisation must largely be sought between the lines of the primarily economics/contract-oriented commercialisation/innovation literature, and/or through adapting

theory from the well-founded but much more general literature of sociology, social psychology, anthropology, management studies and related disciplines.

### C. HUMAN FACTORS IN COMMERCIALISATION POLICIES AND PRIORITIES

Review of the policies and approaches of those shaping and overseeing the commercialisation process in Australia in recent years reflects the same emphasis on improving the 'hard' legal-administrative arrangements, evident in research on commercialisation/innovation.<sup>5</sup>

The 1983 review of CSIRO's commercialisation activities,<sup>6</sup> for instance, identified more than 60 ways in which those activities could be improved. But these focused almost exclusively on three areas of policy and practice: commercialisation policy, structural management arrangements within CSIRO, and mechanisms for CSIRO-industry contact (report on Review of CSIRO's Commercial Activities, 1983). The review made no reference to the social/intercultural basis of these mainly contract-based and structure-based processes.

Likewise, a series of internal CSIRO discussion papers and policy papers culminating in establishment of SIROTECH in 1984 focused on structural and administrative aspects of commercialisation. The thrust of these papers was clearly towards tightening up CSIRO's commercial practices and reducing commercial risk, reaping more income for CSIRO, and effecting improvements to the structural and contract-based aspects of CSIRO-company contact.

This emphasis on the 'hard' legal and structural aspects of commercialisation came about despite CSIRO management's ready acknowledgment



(see the preamble) that some of the barriers to successful commercialisation hinge on social/management or intercultural factors, and that it was important to continue to develop the Organisation's cultural framework for its commercialisation activities.

The 1991 report of the Australian government's Commercialisation Task Force also concentrated on structural aspects of commercialisation. This was probably inevitable, however, in view of the focus of the Task Force's terms of reference on models and mechanisms, and financial mechanisms in particular (see Free, 1991). This in itself provides an important message on the thinking of Australia's politicians and public servants on this question: This opportunity to fundamentally review and rebuild the national commercialisation effort was focused by the relevant Minister and his policy advisers onto financial mechanisms.

So the policies and practices of those responsible for developing and operating at least CSIRO's commercialisation ventures, as well as the approaches of those responsible for setting the broader framework within which commercialisation takes place, have often given little attention to aspects other than the formal legal-administrative bases of ventures and their contractual implications. Occasional acknowledgment of the importance of the underlying social and intercultural dynamics seems not to have been reflected in management or operating procedures or policy measures.

It is appropriate to ask why this has been the case, and to wonder whether an analytical focus on social/intercultural processes might profitably complement contract-based approaches to describing and

understanding commercialisation.

#### D. INSIGHTS AVAILABLE THROUGH STUDYING THE SOCIAL/INTERCULTURAL BASIS OF COMMERCIALISATION

The literature of sociology has long conceptualised a main dimension of social solidarity and cohesion in dualistic terms (Alpert, 1990, p.34). Essentially the same key dimension of social organisation provides the basis for Durkheim's mechanical-organic forms of social solidarity (Durkheim, 1972), Tonnies' concepts of *Gesellschaft* and *Gemeinschaft*, Spencer's "two fundamentally unlike kinds of political organization, proper to the militant life and the industrial life, respectively" (Spencer, 1923, p.568), and Maine's original distinction between contract-based and status-based societies (Maine, 1906).

For example, Parsons (1973[a]), in discussing Tonnies' conceptualisation, describes how *Gesellschaft*

involves a 'compromise' of interests of the parties [who] are held to obligations ... typically limited by the terms of the contract. ... The burden of proof is on him who would require the performance of an obligation ... [T]he specific relations are, within a framework of institutional norms, *ad hoc* for the specific acts or complexes of action [pp.141, 144 & 146].

This is to be contrasted with *Gemeinschaft*, which is

a broader relationship of solidarity over a rather undefined general area of life and interests. ... [T]he parties ... share benefits and misfortunes in common ... [O]bligations ... are typically unspecified and unlimited. ... [I]n order to understand the specific acts they must be seen in the context of the wider total relationship between the parties ... [A]cts [here] constitute particular modes of expression of deeper-lying, more permanent attitudes [pp.142 to 144 & 146].

These theories and perspectives all emphasise that understanding

social cohesion depends on understanding the interactions between these two types of social system (see Durkheim, 1972, p.138). They all also suggest that analysis of social organisation from only one of the two perspectives defined by this dimension will inevitably give a distorted, and perhaps erroneous, picture of social cohesion. As Heberle says, Tonnies

cannot conceive *empirically* of a purely *Gesellschaft*-like condition of social life. ... Without this element of *Gemeinschaft*, no understanding, no agreement, no formal contract would be possible. In the rare situations where the element of *Gemeinschaft* is reduced to an utmost minimum, relations between men become dehumanized and cease to be social ... [Heberle, 1973, p.54].

This interdependence is reinforced by a number of more recent consolidations of this ground. Thompson, Ellis and Wildavsky, for instance, observe that

Any theory of viable ways of life must be able to account for the two modes of organizing - hierarchy and markets - that dominate social science theories [1990, pp.13 & 14].

Yet the preceding discussion showed research on, and policy initiatives for, commercialisation to have concentrated on the *Gesellschaft*-like legal, contractual and obligational aspects rather than the *Gemeinschaft*-like social and behavioural aspects.

This tendency to under-emphasise the *Gemeinschaft*-like side of innovation systems has been identified in a somewhat different guise by Lundvall (1988), who notes the reluctance of innovation researchers to work with transactions based on tacit knowledge and know-how. Because these commodities cannot readily be translated into the quantitative variables that are the traditional wherewithal of economics-based

studies (says Lundvall), "important aspects of the national system of innovation [are] regarded [by some researchers] as being outside the realm of economic science" (p.363).<sup>7</sup>

So both sociological theory and conclusions from some areas of innovation research suggest that social/intercultural perspectives are likely to yield fundamental insights into what it is that makes a commercialisation arrangement cohesive and enduring.

#### **E. KEY SOCIAL/INTERCULTURAL ISSUES IN COMMERCIALISATION ARRANGEMENTS**

Those of the commercialisation/innovation works cited above that consider human factors in depth suggest how the often conflicting cultures in commercialisation ventures, and the threatening and polarised atmosphere that sometimes flows from those intercultural differences, can come to have a detrimental effect. The nature of the contact entailed in commercialisation can jeopardise traditional individual and institutional roles (Geisler and Rubenstein, 1989, p.50), or threaten value systems pertaining to (for example) researchers' search for respect from their peers and preference for highly defined outcomes (Martin, 1991, pp.370 to 373; Frosch, 1984, p.11). Or this contact can be seen to have unfavourable implications for future career progression and rewards (Geisler and Rubenstein, p.50; Martin, p.372; Goldhor and Lund, 1983, p.149).

The authors quoted argue that participants' perceptions of how worthwhile an interactive research-production venture is and how much commitment it warrants will be significant in determining whether the venture is likely to succeed. They also argue that these perceptions will be directly influenced by how compatible the venture and its

social/management arrangements are with the participants' culturally-acquired values, norms, attitudes and behavioural preferences in the sorts of areas identified in the preceding paragraph.

Frosch, for instance, highlights how much a venture can be threatened by researchers' or company people's disquiet (at one point he even calls it "contempt") about inconsistencies with their values and priorities (1984, p.11).

The participant observation of many CSIRO commercialisation ventures described in the preamble assists with translating the culture-based factors flagged in the literature into more specific questions of interest. It does so by suggesting ways in which researchers' and company executives' values, norms, attitudes and preferences seem to frame perceptions of CSIRO-company commercialisation ventures.

On the one hand, this observation suggested that researchers and company business-development executives consistently have different attitudes and orientations towards specific key dimensions of the commercialisation process. These attitudes/orientations can sometimes be moderated in each of the populations by people's often different social experiences; a publicly-funded researcher who has spent a significant period in industry can be very different in these terms, for example, from a researcher whose whole working life has been confined to publicly-funded research. But very often the main apparent 'catch-points' in particular projects reported on to the SIROTECH Board seemed to stem from such differences.

One important differing attitude/orientation centres on *the project*

*team* handling a particular commercialisation venture, and the basis of the parties' involvement in it (Frosch, 1984, pp.11 to 13). There are signs that researchers can prefer a project team based less on role definition and more on flexible use of the various skills and know-how available, while business-development and production people can prefer working in teams with reasonably well defined roles.

Commitment to *the product* (rather than the line of scientific/technological work involved in creating the product) and acceptance that *the product's success* will constitute a large part of the measure of the work's success (Martin, 1991, pp.372 and 373; Goldhor and Lund, 1983, pp.149 and 150; Klimstra and Raphael, 1992) also seem sometimes to present difficulties to researchers. These emphases do not seem to faze commercial people.

Other important attitudes/orientations for which there is some suggestion of difference between researchers/research managers and company people include the preferred role for *managers/leaders* (Frosch, 1984, pp.14 and 15; Dubinskas, 1985, pp.26 to 28); the place for *planning* (Frosch; Dubinskas, pp.28 and 74); the place for *inputs from outside* the immediate *project team* (Frosch, p.12); and the overall, global orientation towards the work (Klimstra and Raphael, 1992).

At the same time, the participant observation of CSIRO-based ventures, supported by themes in the literature of innovation/commercialisation, suggested that these frequent differing attitudes and beliefs seem often to be complemented by a set of *fundamentally similar* concerns, fears, doubts and challenges in the thoughts of researchers and company people entering commercialisation arrangements. These seem large-

ly to fall into four categories:

- \* concern about the unknown, uncertainty and gaining the skills and approaches necessary to deal with the unknown (see Frosch, 1984, p.11; Goldhor and Lund, 1983, p.150; and Martin, 1991, pp.373 to 378), and hesitancy in dealing with people from other backgrounds (see Geisler & Rubenstein, 1989, p.50; Goldhor & Lund, p.149; and Frosch, p.11);
- \* concern about 'takeover' by others of one's traditional territory and traditional functions, and a resultant loss of control (see Geisler & Rubenstein, 1989, pp.46 to 54);
- \* doubt about the selected partner's ability or commitment, and about how tight and lasting a team can be formed with that partner (see Geisler & Rubenstein, 1989, pp.49 & 50, and Goldhor & Lund, 1983, p.150); and
- \* unease about long-term commitments of this nature, and in particular about the possible effects of the particular relationship on other, often longstanding, relationships.

These frequent differing and shared attitudes, orientations and beliefs of researchers and business people approaching commercialisation arrangements can be consolidated into a list of slightly more general key issues and concerns. These more general concerns are about:

- \* *The unknown*: failure; working with people from other cultural backgrounds and with new approaches.

- \* *Territoriality, autonomy:* unreasonable control of one's activities.
- \* *The particular partner* and the partner's abilities and motivation.
- \* Effects of the arrangement on *other relationships*.
- \* *Resources:* scale and timeframe of commitment.
- \* *Teamwork:* whether the type of teamwork required is acceptable and appropriate.
- \* *Outcomes and rewards.*
- \* *Management styles and values.*

These concerns seem to be sufficiently widespread and important to warrant their nomination as prima facie contributors to the framework within which people view, and react to, events and processes taking place in commercialisation. Their importance is reinforced by many 'hands-on' practitioners of commercialisation. They featured prominently, for instance, in discussion at the March 1989 "commercialising public sector intellectual property" conference in Adelaide arranged by the Adelaide Innovation Centre; papers by Hartley, Gaffney and Horgan, for example, emphasised these sorts of intercultural concerns.

The Geisler and Rubenstein, Martin, Frosch, Goldhor and Lund, and Klimstra and Raphael reasoning already discussed suggests that these sorts of concerns can influence how effective a commercialisation arrangement will be. So a better understanding of how they manifest themselves and how shared meanings emerge to clarify their implications and consequences, could well offer valuable guidance for the establishment of effective commercialisation arrangements in the future.



Many perspectives from the social sciences - like the primarily cultural, cognitive, personality, management or leadership perspectives discussed by Worchel and Austin (1986) - would seem able to contribute to an improved understanding of what fundamentally makes a commercialisation arrangement more cohesive and enduring. Both the literature already referred to and the observation of CSIRO's commercialisation ventures previously described suggested one particular potentially helpful approach. This literature and observation suggested that most of the concerns identified above have their origins firmly in *both* the management and social arrangements adopted in the commercialisation venture *and* the participants' cultural preferences and orientations, *and* in the interplay of the two.

There seem to be clear suggestions from CSIRO's experience that teamwork, for example, can readily be encouraged by suitable management arrangements. These might feature (for instance) a mandated consultative basis for major decisions, or carefully constructed teams for various parts of the project. But people's predispositions seemed often either to mitigate or to accentuate the effectiveness of these management arrangements. Quite simply, some people's preferences seemed to incline them more towards pursuing a team approach to their work. Although there was no guarantee from the observations of CSIRO commercialisation ventures that these predispositions were culturally generated, the facts that they were widespread and tended to show up in similar forms in the behaviour of people from a particular sort of company or a particular sort of laboratory suggest that they may well have been.

If this was the case, careful initial selection of the commercial

partner taking account of culturally-acquired values, norms, attitudes and preferences, would seem to have potential to make any one set of management arrangements work better.

A similar conclusion is reached when working from the opposite direction: from the parties' cultural frameworks. Participant observation of many CSIRO commercialisation ventures suggested that a participant's fear or concern about excessive control of his activities, for example, or reservations about a highly team-oriented approach, which would inevitably have originated in large part in the person's organisational culture, could often be mitigated or accentuated by the management/social arrangements adopted in the venture. Transparent management arrangements or a requirement for consultation before major decisions are taken seemed often to go some way towards allaying this fear/concern. On the other hand, there were suggestions from these CSIRO ventures over the 1980s that obscure definition of each party's obligations or management responsibilities that were highly weighted towards the partner (for example) might have exacerbated the fears and concerns.

These observations suggested essential thrusts for the research providing the basis of this thesis.

On the one hand, the apparently strong guidance of participants' behaviour and thinking - and arguably of their commitment as well - provided by *social/management conditions* in a venture suggested that research on contributors to effective commercialisation should aim to articulate the dynamics underlying those conditions.

At the same time, research on commercialisation should also aim to improve our understanding of *the cultural factors* directly underpinning the issues and concerns discussed above. A culture-oriented analysis can help clarify how people's differing meanings and interpretations bearing on these issues and concerns influence the interactions in commercialisation ventures; and ultimately perhaps help determine how effective a particular venture might be.

This argument points, then, to two families of social/intercultural *indicators* (see Geisler and Rubenstein, 1989, pp.55 to 58) of precisely what it is that makes a commercialisation arrangement a cohesive and sustainable social entity. These indicators will be defined more precisely in following discussion.

Identification of the likely significance of *the interplay* between these two families of indicators described above suggested a further focus for research seeking a better understanding of the restructuring of social relationships in the formation and development of a laboratory-company interface. This research, it seems, would profit from also looking in depth at influences on the social structuring process that emerge from *the actual contact situation* as it evolves and sets its own ways of operating and its own ways of approaching the challenges to smooth commercialisation.

The development of the thesis gives attention to this possibility of the emergence of significant social structuring forces from the very interactive situation itself.

## F. THE COMMERCIALISATION INTERFACE

The strong *intergroup* basis of the commercialisation process means that study of social/intercultural influences on commercialisation should incorporate intergroup perspectives and theories. This orientation, together with the study's cultural emphasis, demands that attention be given to analysing behaviour at, or close to, the various boundaries between and around the parties, their representatives and their sets of values, attitudes and preferred ways of behaving. As Holmes, Ellard and Lamm observe, "An understanding of the dynamics of social systems now requires that we focus on the roles of persons who operate at the boundary or interface between groups" (1986, p.343).

At the same time, commercialisation is also an *intragroup* process. It entails forming and developing what amounts to a single new group: the *supragroup* constituted by the combined, integrated workforce of research agency and company people. So study of the process should also encompass the driving forces in, and on, this supragroup, which is the vehicle for interplay of the social/management forces and the culturally-acquired values, norms, attitudes and preferences discussed previously.

This supragroup constitutes the heart of the commercialisation process, so often neglected in previous studies. The importance of this *interface* between culturally diverse parties has been captured by the National Board of Employment, Education and Training, which recommended that attention shift from "blending the two cultures as a whole", onto the actual innovation interface (National Board of Employment, Education and Training, 1993, executive summary, p.9).

*The commercialisation interface*<sup>8</sup> is therefore a crucial focus for identifying and articulating driving forces on cultural adaptation in the commercialisation process. The descriptors of "the interface" include values, expectations and behaviours shared by each party and between the parties; the strengths of commitment to these values, expectations and behaviours; and patterns of communication, knowledge and power within and between the parties.

The interface is to be distinguished from *the formal legal-administrative commercialisation* arrangement itself, which hereafter is termed "the commercialisation arrangement", "the arrangement" or "the venture". The descriptors of "the arrangement" are its content and form characteristics: the type of technology it addresses, its degree of definition and formality, its timescale, and similar parameters.

Being a small social group in its own right, the commercialisation interface should be generally amenable to investigation through the sorts of analyses applied to the establishment and development of other small groups: analyses centring on cohesion, communication, trust and conflict, for example. Some of these approaches would also seem likely to be able to contribute to the cultural orientation of the study, already identified.

But it is likely that some group-development theories and perspectives will be stretched to their limits by the demands of analysing the social and cultural influences on development of a supragroup of this particular type. The group-development processes at work in commercialisation ventures are likely to be somewhat unusual, as a result of the often unusual basis on which the laboratory group and the company

group come together.

One characteristic of this merging process seems to be overwhelmingly important: the participants' continuing membership of the social system of their 'parent' laboratory or company group long after they have become full members of the supragroup pursuing the commercialisation task. The situation seems often to entail possession of 'dual citizenship'. The actors can be encouraged to retain their 'old' 'citizenship' by both strong culturally derived values and ways of thinking often shown by the groups and individuals coming together (discussed in the preceding section), and organisational arrangements. The 'parent' bodies will be resourcing and supporting the commercialisation venture in various ways, and may be physically hosting the venture. Furthermore interface participants will often be expected to retain some of their positions and responsibilities in the 'parent' body in conjunction with their membership of the interface.

In their discussion of (university) researchers' institutional loyalty, Geisler and Rubenstein identify this phenomenon of simultaneous membership of the 'old' and the 'new' groups. Even after researchers have entered an arrangement to work with a company on developing a new product, they often continue to "organize their activities in the best interests and in conjunction with the objectives and the mission of their university" (Geisler and Rubenstein, 1989, p.50).

So it is likely that development of the theoretical base for the study, in following chapters, will need to look beyond conventional approaches to group-development, or at very least to combine a number

of different approaches to group-development.

#### G. THE SOCIAL EFFECTIVENESS OF THE COMMERCIALISATION INTERFACE

Ultimately, a particular commercialisation arrangement is effective if it attains successful, efficient and rapid introduction of the commercial product or process involved.

But many parameters of commercialisation and many variables from the discipline of economics (or elsewhere) could be used to determine whether a particular arrangement has been effective. It is by no means clear how the most salient parameters could best be identified. Geisler and Rubenstein characterise economics/contract-based assessment of this sort of intergroup interaction as a global, unstructured process, with frequent disagreement on this very question of what denotes "success" (Geisler and Rubenstein, 1989, p.54). Geisler and Rubenstein also note (p.55) that this sort of assessment of the effectiveness of innovation arrangements demands very long timescales. Mostly it will also demand examination of a large number of cases before the prime determinants of effectiveness can be identified with confidence.

Geisler and Rubenstein describe the benefits of an alternative approach to assessment, using *indicators* of effectiveness. These are normally based in the behavioural or social sciences. Their scope can include subjective assessment of the intensity of a contact, and its "flavor" (Geisler and Rubenstein, 1989, pp.55 to 58).

Preceding arguments suggest that 'indicators' based on social/inter-cultural parameters could be most helpful reflections of the effect-

iveness of a commercialisation venture. Furthermore, such measures seem likely to be operationally useful in the analyses to be carried out later in this thesis. Use of such an approach would, for example, enable a venture's effectiveness to be assessed while it is still under way. The depth of study necessarily entailed would probably also mean that relatively few cases would be needed to enable likely prime contributors to effectiveness to be identified.

This reasoning focuses attention onto the *effectiveness* of commercialisation interfaces as social entities in their own right. This in turn raises the key question of which specific dimensions of effectiveness provide the best, most convenient and most useful measures for the thesis's analysis of the influence of social/management and intercultural factors.

Variables that could serve as operationally useful reflections of interface effectiveness are discussed in the commercialisation/innovation literature. Roberts' (1988) description of the factors that are most important at various stages of the innovation process, for instance, homes in on management values.

During innovation's early stages, loose boundaries around the ideas and values of the research group and those of the technology-using group are important (says Roberts). Loose boundaries permit pursuit of "parallel and diverse approaches", aimed at "letting many flowers bloom" and "stimulating a variety of inputs" (Roberts, 1988, p.13). This is encouraged by loose management control. Later in a project, during the actual development of the commercial product, team cohesiveness and focus are keys to success. "Single-minded even somewhat



rigid adherence to plan" is important (Roberts, 1988, p.13).

Variables that become important at different stages of innovation ventures are also identified by Maidique and Hayes (1984). Very different approaches are needed, according to Maidique and Hayes, to manage the "paradox" of the "chaos versus continuity" that obtain at different stages of the innovation process (p.24). Managing the "chaos" of invention demands flexibility to encourage widespread, regular and deep person-to-person contacts, while managing the "continuity" of large-scale product-development demands consolidation of skills from various areas, and a strong mission-orientation.

Gupta, Raj and Wilemon (1987) also describe the different management emphases required for different aspects of the innovation process. The important "give-and-take relationships" between R&D and technology-using groups in companies demand both flexible management and an open sharing of ideas and values. Flexibility is especially important, say Gupta et al, when it comes to the "cost, design and feature tradeoffs" necessary for "a common understanding of important issues" (p.38). Flexibility also has much to do with the very important management value of tolerating failure (p.42). Openness in communication is embodied, say Gupta et al, in frequent open challenge and confrontation between the parties, and in attempts to understand the other party's point of view (p.38).

At the same time, Gupta et al's "high-integration" companies (which are good innovators) generally were able and willing to focus closely on the key dimensions of the problem at hand and to integrate people into tight project teams. These companies had, for example, clearer

role definition than "low-integration" companies, and a higher commitment to physically bringing together the necessary people from the various areas and various cultural backgrounds, to work on the job at hand (Gupta et al, 1987, pp.41 & 42). "High-integration" companies also had the ability to make research people and technology-using people feel as if "they shared equally in the rewards from successfully commercializing a new product" (p.42).

Goldhor and Lund (1983) also emphasise the importance, for successful innovation, of an eclectic combination of management approaches. The parties must together develop a flexible management outlook, especially in connection with reward systems and assessment of the real commercial value of the technology concerned (pp.149 and 150). They must also encourage wide-ranging open interaction between the various pairs of people and groups involved (p.148). But at the same time a high degree of focus is also demanded, especially in managing risk and uncertainty (p.148).

And it is not only theorists on commercialisation/innovation who subscribe to the importance of different social structuring variables at different stages of a supragroup's evolution. Remarkably similar arguments come from social scientists addressing the formation and development of similar sorts of supragroups in very different social settings.

Zander (1983), for instance, following examination of many groups in society and industry, also emphasises the contrasting management values and social structuring frameworks conducive to effective inter-group contact at different times. Often, confusion about who has

responsibility (and over what domain) and poorly defined procedures for managing issues can be fatal to an intergroup interaction (Zander, 1983, p.88). Here, developing a greater definition and focus for the supragroup's activities can increase the effectiveness of contact. But at other times and in other circumstances (according to Zander), *increasing* the flexibility of the relationship can be most important.

These theorists on development of effective supragroups consistently identify four specific reflections of supragroup effectiveness, then: the supragroup's *openness*, *flexibility*, *cohesiveness* and *focus*. There is quite widespread agreement that a particular supragroup will more likely be an effective vehicle for intergroup contact if, at key stages of its development, it

- \* encourages *open* communication and interaction between the partners (and where necessary, between the supragroup and the outside world);
- \* is *flexible* enough to cope readily with the full range of issues arising: including unexpected and/or unpalatable issues;
- \* draws the parties together into a *cohesive*, united team; and
- \* *focuses* maximum attention and effort onto the key dimensions of the tasks at hand and onto important problems and issues as they arise.

Many broad areas or schools in the social sciences reinforce these reflections of effectiveness.

Many anthropologists and social psychologists, for example, emphasise the need, if a supragroup is to be as effective as possible, for *open* and spontaneous *communication across the intergroup boundary* (see Wallman, 1986; and Triandis, 1975, p.48, for instance).

Some sociologists specialising in structural analysis of intergroup processes lend strong support to the importance of *flexible* management arrangements. Brewer and Miller, for instance, do so through identifying category-independent roles as a key influence on effectiveness (1988, p.320).

Contact theorists tend to regard *cohesion* as the ultimate measure of effectiveness.

The contact theorists are joined by some schools of conflict theory when it comes to the importance of *focus* as a measure of effectiveness. A willingness or keenness to focus the supragroup's attention onto shared goals is held by intergroup contact theorists to be one of the main signs of a healthy contact, while focusing conflicts onto specific issues is held by many conflict theorists to be most conducive to supragroup effectiveness.

The participant observation of CSIRO's commercialisation ventures over the 1980s also confirmed the importance of these four reflections of effectiveness. Most of the apparent hallmarks of generally successful CSIRO commercialisation ventures listed in the preamble hinge on these characteristics (in various combinations).

These four reflections of interface effectiveness appear to be largely

mutually independent. An interface that features open communication (for instance) need not necessarily show cohesiveness, while one that has a strong focus on the key tasks need not necessarily show much flexibility in addressing the unexpected or the unpalatable.

#### H. THE SUBSTANCE OF THE THESIS

It was reasoned earlier in the chapter not only that social/intercultural perspectives can improve our understanding of the commercialisation process, but also that the effectiveness and sustainability of the commercialisation interface will depend to a significant extent on formalised methods of social structuring and social control adopted as the interface is established and developed as a small group. One specific aim of the study is to articulate this dependence.

To this end, an analytical framework incorporating those dimensions of social behaviour judged likely to contribute most to interface effectiveness is developed and used to investigate the effectiveness of a number of actual commercialisation cases. The literature review in chapters 2 and 3 creates this analytical framework by consolidating theoretical perspectives from

- \* intergroup contact theory;
- \* theories of trust;
- \* theories of conflict;
- \* theories of power;
- \* theories on acculturation taken from ethnic studies;
- \* theories on acculturation taken from organisational studies and related areas; and
- \* theory on symbolic representations bridging intercultural gaps.

Sociological theory emphasises how important it is to avoid treating interactive processes as if they are taking place in a vacuum, at a single point in time isolated from the interaction's history. Mills (1959), for example (and his view is supported equally unequivocally by Levi-Strauss, 1963, p.9 et seq.), is adamant that

No social study that does not come back to the problems of biography, of history, and of their intersections within a society, has completed its intellectual journey [p.12].

This argument mandates that *the commercialisation interface's historical context* be incorporated into the thesis, and identifies a second specific aim for the study: To analyse immediate interface social processes (the contact, trust-based, conflict and other processes pointed to by the theoretical perspectives listed immediately above) in their historical context.

Since the commercialisation interface itself will seldom have any history to speak of, and in view of the cultural orientation of the study, the interface's historical context can be conceptualised as deriving from the culturally-acquired values, norms, attitudes and preferences actually brought into the interface by the participants. Cultural theory is identified in the thesis as the vehicle for analysing and characterising this 'cultural baggage' of the participants.

At the same time, earlier discussion identified the need to integrate study of a group's *Gemeinschaft* basis (embodying the group's social and interpersonal linkages) with study of its *Gesellschaft* basis (embodying its structural, contract-based linkages). This thesis addresses this need by incorporating prominently into the study *the commercialisation interface's contemporary, structural context*. This

context is best represented by characteristics of the 'hard' administrative commercialisation arrangement underlying the interface (like the arrangement's complexity, duration and degree of definition; the stage to which the technology had been developed at the time the arrangement was established; and how the arrangement relates to each party's existing business). This emphasis introduces a third specific aim for the study: To analyse immediate interface social processes in their structural context.

The final aim of the thesis is to articulate how these three hypothesised sources of influence on interface effectiveness - coming from formalised patterns of social behaviour, the interface's historical/cultural context and its contemporary/structural context - interact.

This discussion has articulated the objectives of the thesis, which can be drawn together in one general fundamental research question, and four more specific research questions, each of which focuses on an aspect of the general question. The research questions are:

1. How does the social structure of laboratory-company commercialisation interaction take root, grow and endure?
2. Which dimensions of social behaviour contribute in their own right to effectiveness of commercialisation interfaces? How does that contribution come about?
3. Which dimensions of social behaviour are encouraged or reinforced by culturally-acquired values, norms, attitudes and preferences brought into the research-company interaction by the participants?
4. Which dimensions of social behaviour are encouraged or reinforced by implications of characteristics of the underlying formal administrative commercialisation arrangement?

5. How do the dimensions of social behaviour and their cultural and structural contexts interact? How is this interaction best represented in a paradigm or model for analysing and articulating contributors to interface effectiveness, and for guiding the construction of effective commercialisation interfaces in the future?

As the analytical framework identified from the theory reviewed in chapters 2 and 3 is applied and the analysis investigating the five research questions unfolds in later chapters, four things become clear.

First, the framework provides a generally helpful and instructive vehicle for understanding the dynamics of commercialisation, and reveals much about the evolution of effective, enduring commercialisation interfaces. This conclusion addresses the first research question, at the most general level.

Second, it also becomes clear that a number of the dimensions of social behaviour constituting the analytical framework influence interface effectiveness. This conclusion addresses the second research question. These dimensions provide the substance of the theoretical model of important contributors to interface effectiveness which is the focus of the fifth research question.

Third, it is shown that some of these dimensions of behaviour that will constitute the model were encouraged or reinforced by participants' 'cultural baggage' and/or by the commercialisation arrangement's characteristics, while others were not. This conclusion addresses the study's third and fourth research questions. The former dimensions are conceptualised as "*context-dependent*" dimensions of social behaviour, because they obtain much of their force from



sources rooted in the interface's historical/cultural and/or contemporary/structural contexts. Dimensions of behaviour found *not* to have been affected by participants' 'cultural baggage' or by the commercialisation arrangement's characteristics are conceptualised as "*context-independent*" dimensions. These necessarily obtain much of their force from social characteristics and processes that developed in the interface itself, as it evolved and set its own ways of operating and its own ways of tackling the challenges to smooth commercialisation.

Fourth, the analysis shows that each of these dimensions of social behaviour influenced interface effectiveness mainly in one or the other of two different ways. Some dimensions made their main contribution through influencing the way each party and its representatives and managers fundamentally approached involvement in the interface (an "*individual*" mode of influence), and others through influencing the way the interface, as a social entity in its own right, set about its tasks (a "*collective*" mode of influence).

The interplay between different types of behaviour in the interface and the interface's contexts amounts to a 'structuring' process. This helps generate the interface's social dynamics, which the analysis shows to be much more than the sum of the social action brought into the interface. Clearly the commercialisation interface is very much the product of social adaptation: adaptation of individuals to the social forces generated in the interface itself and elsewhere, and adaptation of the interface as a small group to the cultural and other forces bearing on it.

The thesis's findings on how a particular dimension of social behav-

our gains its influence on interface effectiveness are set out in the theoretical model in the two figures in chapter 11; the model is reproduced below, from Figure 2.

**SOCIAL INFLUENCES ON EFFECTIVENESS  
OF COMMERCIALISATION INTERFACES**  
(reproduced here from Figure 2, in chapter 11)

**Mode of Influence on Interface Effectiveness:**

	<b>Individual:</b>		<b>Collective:</b>	
	Dimensions of social behaviour that have their main impact through influencing the way:		Dimensions of social behaviour that have their main impact through influencing the way:	
<b>Source of Influence on Interface Effectiveness:</b>	<b>Con- text- Depend- ent:</b>	<ul style="list-style-type: none"> <li>* each party &amp; its representatives &amp; managers fundamentally approach involvement in the interface, with</li> <li>* the dimension of behaviour being encouraged or reinforced significantly by the interface's cultural/structural contexts</li> </ul>		<ul style="list-style-type: none"> <li>* the interface as a social entity in its own right approaches its tasks, with</li> <li>* the dimension of behaviour being encouraged or reinforced significantly by the interface's cultural/structural contexts</li> </ul>
		<b>(A)</b>	<b>(B)</b>	
	<b>(C)</b>		<b>(D)</b>	
	<b>Con- text- Inde- pend- ent:</b>	Dimensions of social behaviour that have their main impact through influencing the way: <ul style="list-style-type: none"> <li>* each party &amp; its representatives &amp; managers fundamentally approach involvement in the interface, with</li> <li>* the dimension of behaviour <i>not</i> being encouraged or reinforced by the interface's cultural/structural contexts</li> </ul>		Dimensions of social behaviour that have their main impact through influencing the way: <ul style="list-style-type: none"> <li>* the interface as a social entity in its own right approaches its tasks, with</li> <li>* the dimension of behaviour <i>not</i> being encouraged or reinforced by the interface's cultural/structural contexts</li> </ul>

The significance of the thesis rests on its generation of this genuinely two-dimensional model for identifying and articulating important contributors to interface effectiveness. The thesis argues that what really counts in establishing and maintaining an effective commercialisation interface is not the list of influential dimensions identified through the study, but rather the interplay between the *mode* and the *source* of their impact on the interface. Identification and articulation of the interaction of *individual* and *collective* influences on interface effectiveness, through *context-dependent* and *context-independent* channels, contributes fundamentally to our understanding of the dynamics that drive the research-business interface.

The model's documentation of these interactive influences on interface effectiveness enables a wide range of variables potentially relevant to constructing effective and sustainable research-business interfaces to be articulated and analysed in the fashion of this study. The insights resulting from this thesis could directly inform further studies of the commercialisation process based on dimensions of behaviour identified from quite different theoretical perspectives. The study's insights also offer the prospect of the significant practical improvements to management of the commercialisation process articulated in chapter 11.

## J. THE STRUCTURE OF THE THESIS

Chapters 2 and 3 formulate the analytical framework for illuminating the social and intercultural dynamics of commercialisation. Thirty-four dimensions of social behaviour identified from the theoretical perspectives articulated in chapters 2 and 3, which are likely, prima facie, to influence interface effectiveness, provide the basis for

this framework. These dimensions, grouped into five conceptual categories for the purpose of the analysis, are identified in Table 5, at the end of chapter 3. The five elements of the analytical framework relate to:

- \* how people approach key interface relationships;
- \* the interface's intergroup social structure;
- \* conflict in interfaces;
- \* power relationships in interfaces; and
- \* development of the interface's cultural base.

A study to determine whether the framework helps in understanding the dynamics of the commercialisation process, and to articulate that understanding in terms of the research questions set out in the preceding section, is established in chapters 4 and 5. The vehicles for the investigation are four wide-ranging case studies of CSIRO-company commercial interaction. Use of a case study approach, concentration on CSIRO-based ventures and the bases on which the case studies were selected are all argued in chapter 4. Data on each case study were collected through interviews with key interface participants from each party, supplemented by written material from the files of the CSIRO unit involved. The methodology for collecting and validating the data is also described in chapter 4.

Chapter 5, together with the first part of volume 2, describes the four case studies, social/intercultural processes and events occurring in them, and important characteristics of the four formal administrative commercialisation arrangements. Chapter 5 also carries out a preliminary analysis of the likely influence on interface effectiveness

of each of the dimensions of social behaviour providing the basis for the analytical framework. This preliminary analysis eliminates, as likely significant contributors to effectiveness, 11 of the 34 dimensions. The remaining dimensions of social behaviour, which constitute the final form of the analytical framework, are set out in Table 10, at the end of chapter 5.

The full detailed analysis, carried out in chapters 6 to 10 respectively for the five elements of the analytical framework, entails examination of data from the case studies to assess the influence on interface effectiveness of each dimension of social behaviour. Important aspects of the analysis are the processes I term 'looking backwards' and 'looking sideways' from the interface: towards the interface's historical/cultural and contemporary/structural contexts respectively.

Chapter 11 consolidates the results of the analyses, develops the theoretical model referred to in the research questions, and also illustrates how the model can be applied to inform both future studies of the commercialisation process and the day-to-day management of commercialisation ventures.

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#### Notes to Chapter 1:

1. A good measure of the greatly increased contribution of higher value-added products to Australia's industrial base and wealth-generation is the proportion of the nation's exports accounted for by the so-called "elaborately-transformed manufactures". In

the five years from 1989 to 1993, these products' share of exports increased from 14.6% to 20.9%. In absolute terms this increase was from \$6.9 billion to \$13.1 billion: an annual growth of  $17\frac{1}{2}\%$ , compared with annual growth of  $7\frac{1}{2}\%$  for all exports (Australian Department of Foreign Affairs and Trade, 1993). Even so, these products still comprise only 9% of Australia's exports, compared with between 30 and 50% for many other countries (Bureau of Industry Economics, 1996).

2. This is reflected in the amount of R&D the business sector pays for (Phillips, 1993) and performs. In 1984/85, the business sector had performed \$731 million worth of R&D, or just on 30% of the total national R&D effort, which was valued at \$2.416 billion. In 1990/91, the business sector performed \$2.017 billion worth of R&D, or just on 40% of the national total of \$5.088 billion (Australian Bureau of Statistics 1990/91 (a) and (b)). Between 1981 and 1992, spending on R&D by the business sector as a proportion of Australia's gross domestic product rose by an average annual rate of 13% (Science and Technology Budget Statement, 1995-96).
3. The review in this chapter extends beyond commercialisation of technology from publicly-funded research, into the broader process of industry's technology-based innovation (using technology from various sources). Different forms of innovation often involve similar social/intercultural interaction, and it is quite possible that research on human factors in innovation (generally) will be directly relevant to the more specific commercialisation process.

4. *Organisational learning*: "The ways firms build, supplement and organize knowledge and routines around their activities and within their cultures, and adapt and develop organizational efficiency through improving the use of the broad skills of their workforces" (Dodgson, 1993[a], p.376). A finer categorisation of learning often taken up in this context is "learning by doing" (Arrow, 1962); for more recent discussion, see Price Waterhouse, 1985, pp.50 to 57.
  
5. Although it must be acknowledged that some contractual/structural initiatives could have the incidental effect of improving the social/intercultural base of commercialisation ventures. The government's policy that research agencies themselves generate at least 30% of their operating budgets, for example, will inevitably have encouraged more - and perhaps deeper - interorganisational and intercultural interaction.
  
6. This was misnamed at the time; the title on the report was "Review of CSIRO's *Commercial* Activities" (emphasis added), but it was specifically about *commercialisation*.
  
7. Similar observations have been made about the use of outcomes from basic research in Australia. A report by the National Board of Employment, Education and Training (1995) describes how the traditional embodiment of these outcomes in scientific papers and commercial products is being superseded by their embodiment in "ideas, qualified people and ... technology, production and marketing know-how" (p.43). There have been few

attempts to study transfer of tacit knowledge and know-how through "quantify[ing] the benefits diffused through the movement of people and the development of linkages and networks" (p.24). This is to be contrasted with the thorough study of the "codified knowledge" outputs, which "lend themselves to ready quantification and [well-developed] analytical techniques" (p.36).

8. Conceptualisation of the commercialisation interface - which can be quite complex - has been kept as simple as possible in this study. Although some of the interfaces to be examined here involve more than two parties, even those arrangements fall well short of representing the full range of combinations of technology creator-technology developer-technology user-research/commercialisation financier. It was felt that the complicated social processes being investigated could best be articulated through a relatively simple conceptualisation of the interface. The increased understanding of the commercialisation process resulting from the study could profitably be extended through follow-up studies of more complicated, and more culturally diverse, interfaces.



## **CHAPTER 2**

# **FORMATION AND DEVELOPMENT OF THE COMMERCIALISATION INTERFACE AS A SMALL GROUP**

## CHAPTER 2

### FORMATION AND DEVELOPMENT OF THE COMMERCIALISATION INTERFACE AS A SMALL GROUP

#### A. INTRODUCTION

Preceding discussion characterised commercialisation interfaces as quite complicated social arrangements, rich in immediately relevant interactions, events and processes, and often also in their mix of cultures. Participants' 'dual citizenship' through continuing membership of their 'old' social systems in the laboratory or the company in conjunction with membership of the interface's social system, often adds to the complexity. So do substantial changes to key interface parameters over time. The high stakes often involved and the sometimes strong emotional involvement of participants in what can be highly politicised and polarised situations can amplify intercultural and interorganisational issues and conflicts, thereby complicating the scene even more.

This relative complexity is reflected in this study's five inter-related research questions, developed in chapter 1.

A synthesis of theoretical perspectives was needed as a base for a focused analytical framework capable of coping with this social/management situation. It seemed that constructing this framework could be helped by breaking down the social processes likely to be at work, into a number of discrete areas. Each of these areas would be likely to present more simple, homogeneous issues, able to provide the necessary focus.

Two broad families of 'indicators' of interface effectiveness identified in chapter 1 provide a first basis for such a breakdown.

The first family of indicators related to how the formalised social and management conditions in a commercialisation venture influence participants' commitment and group cohesion as the interface develops as a small social group. The events and processes bearing on and flowing from these social and management conditions define the task of this chapter. The broad question to be addressed is

*Which areas of theory, and which perspectives provided by them, are likely to offer the best insights into development of the commercialisation interface as a small group, in the formalised social and management conditions that prevail in commercialisation?*

Likely influences on social processes and events occurring during formation and development of commercialisation interfaces were identified from the relatively limited body of literature that substantively addresses relevant aspects of commercialisation/innovation (see chapter 1), and from preliminary examination of broadly relevant literature from sociology, social psychology, anthropology and organisational studies. The participant observation of CSIRO commercialisation ventures over several years, which identified prima facie characteristics of unsuccessful and successful commercialisation ventures (listed in the preamble), was also helpful for this purpose.

This literature and observation pointed towards two broad types of forces likely to influence the social structuring processes and events constituting commercialisation interaction. These centre respectively on *the integration and consolidation* of behaviour and approaches of the various individuals and groups, and *the resolution of disparate or*

*incompatible* behaviour and approaches of these individuals and groups.

It appeared (especially from the participant observation of many CSIRO commercialisation ventures described in the preamble) that variables accounting for much of the former area of study (focusing on leadership and trust, for instance) are often prominent in social processes that seem to be critical in successful commercialisation ventures. At the same time, variables accounting for much of the latter area of study (focusing on conflict, for instance) often seemed prominent in social processes that seem to be critical in *unsuccessful* ventures.

The literature identifies the frequent failure of studies of group-development to instil a balance between these two types of forces. Indeed Pettigrew (1986, p.169) argues that most social psychology is markedly out of balance in this sense; applications of social-psychological theory "typically stress similarity (mechanical solidarity) and ignore the socially binding significance of differences (organic solidarity)". A concentration on both these sets of forces should help this study avoid such pitfalls.

A two-pronged approach based on these two sets of forces defines the structure of this chapter. Following the introduction in this section, the first half of the chapter (sections B to D) reviews theory for articulating the role of claimed cohesion-inducing variables in development of the commercialisation interface as a social entity. The second half (sections E and F) reviews theory for investigating the role of potentially fragmenting or destructive variables.

Even within each of these areas, though, many potentially valuable

theoretical perspectives were presented by the literature. The most helpful approaches were identified by assessing how well each theoretical perspective was likely to cope with the particular demands of this study and the sometimes unusual characteristics of many commercialisation interfaces.

Particular demands of the study stem from the strong focus on intercultural boundaries and on the culture-related behaviour of participants at or near those boundaries, as well as from the previously mentioned complicated interplay of variables in commercialisation interfaces.

The preamble identified a number of sometimes unusual characteristics of many commercialisation interfaces. Quite apart from the frequent 'dual citizenship' discussed earlier in this section, often there has been no previous interaction between the parties, and the interface's operating arrangements and its cultural system will have to be built 'from the ground up'. This places particular importance on construction of the interface's prism for viewing the world in which it has come to exist, and in particular on how this happens during the interface's early days. In contrast to the situation with many other small groups, we are often able to identify the actual genesis of a commercialisation interface, by relating it to the act of establishing the underlying formal administrative commercialisation arrangement. This also suggests it might be helpful to be able to analyse events and processes in this supragroup in its early days.

In addition, often in commercialisation there is a wide difference between parties' degrees of commitment to, and dependence on, the ven-

ture. Both the participant observation of many CSIRO commercialisation ventures and preliminary observations from the interfaces to be examined in the present study suggest that quite often the future well-being (and perhaps even the future existence) of one party can depend on success of the venture concerned, while for the other party the venture is relatively unimportant. This imbalance seems to be greater than with many other small supragroups.

#### **B. THEORY LIKELY TO CONTRIBUTE TO UNDERSTANDING INTERFACE COHESION AND SOLIDARITY**

Five areas of theory that have been prominent in the evolution of thinking on the development and cohesion of small groups initially showed signs of helping to understand the social/intercultural processes and events in commercialisation (and perhaps ultimately interface effectiveness). All five areas of theory were reviewed.

These areas of theory were:

- \* Homans' theory on group formation, development and cohesion (Homans, 1951);
- \* cognitive dissonance theory (see especially Festinger, 1957; and Bar-Tal, 1986);
- \* theoretical approaches rooted in other cognitive processes, such as organisational learning theory (some immediately relevant perspectives from these approaches are reviewed by Dodgson, 1993[a]);
- \* Merton's reference group theory (Merton, 1968); and

- \* contact theory (see especially Allport, 1979; Cook, 1962; Pettigrew, 1961; Stephan and Stephan, 1996).

*Homans' theory of group-development* depends on a tripartite system of forces on group members as the group develops cohesion and effectiveness. These forces stem from people's activities in the group, their interaction with other group members and their sentiment towards other group members. The process manipulating the forces, which is at the heart of Homans' group-analysis methodology, is the evolution of the interface's "external system" into its "internal system".

While Homans' theory certainly accommodates intercultural boundary processes, the situations for which it was developed and in which it has been applied have generally not had highly permeable system boundaries. There is no evidence that Homans sees either the three fundamental forces or his system-evolution process as depending to any significant extent on constituent groups' social systems or on a strong overlay of pressures from outside the group (such as characterises commercialisation interfaces). It is clear that Homans sees group development as being driven essentially by interpersonal interaction within the group and by personality-based factors (see especially Homans, 1951, pp.110 to 125 and pp.273 et seq.).

Indeed de Voto, in his foreword to Homans' seminal 1951 book, was able to identify as a central theme of the theory, the influence on group cohesion and effectiveness of "feelings inside the group *which have no direct bearing on the group's relation to the environment*, by sub-groups and cliques, by jealousies and rivalries and admirations" (de Voto, 1951, p.xv, emphasis added).

Any theory of which this can proudly be said would hardly seem to be conducive to a full understanding of a social system that is evidently highly influenced by culture-based perspectives and expectations participants often carry over from their former (and continuing) social situations.

While both *cognitive dissonance theory* and *cognitive processes/organisational learning theories* deal quite forthrightly with some cultural factors, they seldom give much acknowledgment to the complicated interplay of cultural and other perspectives or the problematic intercultural boundary processes that are so evident in commercialisation.

Argyris and Schon's organisational learning theory, for instance, while readily acknowledging the part played by organisational culture, tends to view that culture as a *single, consolidated* corporate culture, and to grant a strictly limited place to intercultural differences. This is reflected in Argyris and Schon's conclusions about what can prevent effective organisational learning:

Difficulties with and barriers to organizational learning arose as it became clear that the original decision was wrong. Questioning the original decision violated *a set of nested organizational norms* [1978, p.3; emphasis added].

Cognitive dissonance theory, while acknowledging the part culturally-generated group values can play in identifying, and then reducing, cognitive dissonance, invariably gives much more attention to other influences: notably individuals' thought processes (which might or might not have a high loading on the culture of the group from which the individual comes).



Merton's version of *reference group theory*, by contrast, clearly pays ample attention to intercultural and boundary processes, is able readily to handle a complicated interplay of cultural perspectives, and is centrally about the continuous flux of people, symbols and beliefs from one group to another. But this theory concentrates on *sequential* movements of people between groups, as membership of one group supercedes membership of another. Merton's theory does not deal substantively with the *simultaneous and continuing* membership of more than one well defined and often passionately endorsed group that is central to many commercialisation interfaces.

So there are few signs that any of the first four of these areas of theory would cope all that well with the particular demands of the present study or the unusual characteristics of many commercialisation interfaces.

By contrast, *contact theory* by its very nature is well placed to illuminate the relatively complicated intercultural relationships (see Schofield, 1991) and the social and management influences on people at or near intercultural boundaries (see Stephan and Stephan, 1996, p.68). Contact theory should also readily handle the influence of interface characteristics like the 'dual citizenship' of some participants and the uneven motivation of the parties to some interfaces. After all, contact theory has been developed largely through studies of ethnic and racial interaction in situations with such characteristics (Stephan and Stephan, 1996, pp.62 et seq.).

Contact theory offers the additional prospect of casting light onto a widespread supposition often made about the intergroup basis of com-

mercialisation (for example, in seminars and workshops on commercialisation, and in reviews of publicly-funded laboratories). This supposition is what Sherif describes (1966, p.146) as "the uncritical acceptance of a hedonistic associationism": the supposition that the simple step of bringing together (in the case of commercialisation interfaces) publicly-funded researchers and company executives will necessarily increase mutual understanding, convergence in thinking, and ability and willingness to work together.

It would seem most worthwhile to assess whether a "hedonistic associationism" has any place in the social/management situation being examined here, or whether it is the fundamental structural, social and intercultural details of a particular contact situation that determine whether the interaction will be effective.

So, of the five well-established areas of theory on group development reviewed in this section, contact theory seemed most likely to come to grips at a fundamental level with the sort of restructuring of social systems that occurs in the formation and development of a commercialisation interface. A number of immediately relevant perspectives from contact theory are articulated in the following section.

### C. INTERGROUP CONTACT THEORY

The contact theory developed mainly by Allport (1979), Cook (1962), Pettigrew (1961) and Sherif (1966) draws heavily on Simmel's work in the early years of the century. More recent research (like that of Hewstone and Brown, 1986; Brown and Turner, 1981; Pettigrew, 1986; Stephan and Stephan, 1996) has added notably to the original body of theory.

Contact theory varies in its focus and depth. Bochner believes that much contact research has lacked theoretical sophistication and rigour, with the emphasis having been on generating a great deal of diffuse data. Often the systematic building and testing of models and theories has not been pursued (Bochner, 1982, p.16). Instead, "the contact hypothesis [has been] like a living organism that has evolved and developed over time" (Stephan and Stephan, 1996, p.63).

At the same time, Bochner and Stephan and Stephan acknowledge signs that, within this often loose theoretical environment, lines of theory with some rigour and sophistication *have* developed:

[M]any variables in addition to those initially proposed have been studied in intergroup contact situations. ... [T]he conceptual model underlying the contact hypothesis began to resemble an extension of the classical social psychological model developed by Lewin ... The [evolved] model has implications for both empirical and applied research on intergroup contact [Stephan and Stephan, 1996, pp.69 to 74].

The structured yet flexible social psychology-based contact theory in the Allport/Sherif mould, elaborated by Stephan and Stephan and others, comes close to the systematically developed and tested theoretical model envisaged by Bochner. This is the branch of contact theory concentrated on here.

At its simplest, contact theory embodies "the long and widely held belief that interaction between individuals belonging to different groups will reduce ethnic prejudice and intergroup tension" (Hewstone and Brown, 1986, p.1). Allport originally, and most contact researchers since (see summary in Hewstone and Brown, 1986, pp.6 et seq.), have identified conditions that must exist if contact is to provide

the basis for effective, constructive interaction between those from different cultures. As Allport identified these basic conditions:

The outcome of contact would be favourable when participants were of equal status, pursuing common goals and backed by social and institutional support [summary of Allport's conditions described by Hewstone and Brown, 1986, p.4; see also Harrington and Miller, 1992, pp.159 to 178, and Stephan and Stephan, 1996, pp.68 to 70].

There has been much discussion of how 'equal status' should be measured. Should it be taken to mean equal status *within* the contact situation, or equal status *in broader community situations*? (See, for example, Norvell and Worchel, 1980; Riordan, 1978.) Hewstone and Brown draw attention to Riordan's conclusion that these two types of status equality "are not mutually exclusive, but rather interrelated and overlapping" (Hewstone and Brown, 1986, p.8). This will arguably particularly be so in situations such as commercialisation interfaces, where in all likelihood retention of the 'dual citizenship' already referred to will result in status in the respective organisations inevitably being largely carried over into the contact situation.

Cook added to and expanded on Allport's conditions for effective interaction. Notably, he argued that the contact situation must have "high 'acquaintance potential' (i.e. it enables individuals to get to know each other as individuals, rather than as stereotypical outgroup members)" (Cook, 1962 p.76; see also Amir, 1988).

Hewstone and Brown note (1986, p.6) that much early work concentrated on the *interpersonal* basis of the contact hypothesis. They proceed to argue the importance of a second, frequently neglected conceptualisation in contact studies, based on people's social relationships as

*group members*, and not as individual persons. The importance of viewing processes and events occurring in commercialisation interfaces as fundamentally intergroup processes/events (at the same time seeing them also as *intragroup* processes and events) was argued in chapter 1.

A lot of research on this intergroup side of contact theory has been devoted to one of two central concepts: the 'common goal' criterion originally identified by Simmel (see Stephan and Stephan, 1996, pp.64 and 65). Simmel had noted the often dire consequences "if the social groups involved are too far apart with regard to their purpose and in terms of the demands they make upon the individual" (Simmel, 1955, p.146). Sherif has since reinforced this as *the* focus for intergroup studies (Sherif, 1966, pp.130 and 147; see also Bochner, 1982, p.11).

Hewstone and Brown identify the other concept that is central to contact theory's contribution to understanding supragroup development. This is the concept of "generalisability" of contact-induced improvements in intergroup relations: the extent to which the effect generalises beyond specific settings and situations, and to other members of groups not actually present in the contact situation (Hewstone and Brown, 1986, p.17).

Hewstone and Brown discuss factors that can maximise generalisability. In the process they derive and consolidate an intergroup model for contact. They do this through building on Tajfel's social identity theory (Tajfel, 1978; Taylor and Moghaddam, 1987) and the work of Brown and Turner (1981).

Social identity theory says that social change through an individual's

entry to a new group can take place only through *the individual's established group* entering or affiliating with the new group. As Taylor and Moghaddam say, quoting an unpublished 1974 manuscript of Tajfel,

the individual ... is enclosed within the walls of the social group of which he is a member ... he cannot move out of his own into another group in order to improve or change his position ... [and] therefore the only way for him to change these conditions ... is together with his group as a whole, as a member of it rather than someone who leaves it [Taylor and Moghaddam, 1987, p.80].

Brown and Turner in effect extend social identity theory into the domain of contact theory. They do this by arguing that only genuinely intergroup contact, and not simply interpersonal relations between members of the different groups, can bring about fundamental alterations in intergroup relations. The focus therefore, say Brown and Turner, should be on "interaction between individuals qua group members, or in ways that alter the structure of group relations" (1981, p.60).

Through bringing together Tajfel's and Brown and Turner's reasoning, Hewstone and Brown in effect identify inter-related variables expected to be crucial for explaining the role of contact in reducing prejudice, misunderstandings and tension and in developing a solid, cohesive supragroup in a society.

The focus of contact should be "on fundamental similarities (e.g. 'There's only one race, the human race') *and* valued differences (e.g. symbols of culture, religious or ethnic pride)" (Hewstone and Brown, 1986, p.39, quoting Stephan and Stephan). Where there are opportunities to do so, the contact should extend to exploding myths about intergroup differences (Hewstone and Brown, 1986, p.39). At the same

time, each group should "achieve, preserve or defend its vital interests ... in such a way that the self-respect of other groups is not adversely affected at the same time" (Hewstone and Brown, 1986, p.35, quoting Tajfel). Each group should "view itself positively *and* hold positive stereotypes of outgroups, consistent with those groups' auto-stereotypes [thus enabling] each group [to be] seen as it wishes to be seen, and desired differences [to be] highlighted" (Hewstone and Brown, 1986, p.5).

These basic conditions for long-term positive flow-on from contact are augmented by Brewer and Miller's concept (1988, p.320) of *category-independent roles*. According to Brewer and Miller, allocation of roles different from those traditionally performed by people from each of the cultures, the active seeking out of such roles, and the acceptance by both parties that assumption of such roles is proper, will be fundamentally important determinants of whether the contact will have a lasting generalised effect on intergroup attitudes and behaviour.

Sherif suggests that an important precondition for developing the degree of understanding and empathy portrayed in the preceding two paragraphs is flexible thinking and willingness to 'move with the times'. This can come about through commitment to abandon the "morass of old arrangements and emotional smarts" by the display of "give-and-take among persons who have lived their lives in group contexts designed for domination or submission, suppression or rebellion" (Sherif, 1966, p.106).

The literature on the social/intercultural basis of commercialisation/innovation confirms that these perspectives on supragroup development

identified through contact theory are generally important in commercialisation interfaces.

Goldhor and Lund, for instance, in their discussion of ideal product-innovation arrangements, confirm the importance of readily-agreed and enthusiastically-pursued goals. They describe cases where development of plans that mesh the needs and expectations of the groups involved in the innovation activity, and the groups' coinciding milestones and review mechanisms, have been critical to successful innovation outcomes (Goldhor and Lund, 1983, pp.149 and 150).

Likewise Frosch, amid his insistence on avoiding two of his "enemies of technology transfer" ("good systematic management and businesslike attitudes"), acknowledges the importance of superordinate goals: provided they are pitched at a sensible level (Frosch, 1984, p.12).

Participant observation of CSIRO's commercialisation ventures also suggested that, as simple as it may be, correspondence of the parties' orientations towards, and commitment to, a venture's goals could be an important indicator of effectiveness. The historical review of project recommendations and progress reports submitted to the SIROTECH Board suggested that obscure or diffuse goals or lack of commitment to working out acceptable goals were prominent in at least some unsuccessful ventures.

A second key theme of contact theory - the importance of social and institutional support - is also flagged as an important variable in much of the limited literature on the social and intercultural basis of the commercialisation process (see, for instance, Martin, 1991,



p.373; Frosch, 1984, p.14; and Goldhor and Lund, 1983, pp.149 & 150). Management support was also suggested as a strong prima facie influence on interface effectiveness, by the historical review of project recommendations and progress reports submitted to the SIROTECH Board.

Likewise, the sorts of intergroup understanding and commitment, re-alignment of group roles and flexible thinking that underlie Hewstone and Brown's, Brewer and Miller's and Sherif's reasoning also seem to be important in the formation and development of commercialisation interfaces.

Gupta, Raj and Wilemon point out in their discussion of "give-and-take" relationships between research and industry, for instance, how important it is for each party to be open to the partner's viewpoint and to be sensitive to their needs and expectations (Gupta et al, 1987, pp.38 to 41).

The historical review of project recommendations and progress reports submitted to the SIROTECH Board identified several cases where respect for the other party's basic values and priorities seemed to be a cornerstone of what turned out eventually to be a generally successful commercialisation venture. It also identified many generally *unsuccessful* ventures characterised by one party's refusal to change its ways and/or to take on what they would regard as more adventurous roles in the interface.

Intergroup contact theory seems likely, then, to help explain the emergence and effectiveness of research-company commercialisation interfaces. Three aspects of intergroup contact stand out from this

discussion as being especially likely to influence social solidarity and intercultural understanding in commercialisation (and perhaps ultimately interface effectiveness); these will contribute to the analytical framework to be applied in later chapters. These are:

1. *Characteristics of the interface itself:* Whether the parties have come to accept common goals for the venture, together with an essentially co-operative approach to attaining them, and whether the contact situation has Cook's high "acquaintance potential".
2. *How each party pursues its objectives and values.* This includes how much parties focus on Hewstone and Brown's "fundamental similarities" and "valued differences", and whether they go beyond that, to become involved in exploding myths about inter-group differences. It also encompasses each party's willingness/keenness to preserve its partner's self-respect and to commit itself to abandoning outmoded ways of thinking and behaving.
3. *Each party's representatives' and management's roles in the interface, and their attitudes towards the venture.* This encompasses the relative status of the parties' representatives, and whether the contact involves the assumption and pursuit of category-independent roles. It also encompasses views on the arrangement and its importance, and support for it, from each party's main stakeholders and opinion-formers.

#### **D. TRUST BETWEEN GROUPS COMING TOGETHER IN COMMERCIALISATION INTERFACES**

The insights into interface processes and behaviour apparently offered

by intergroup contact theory do not extend very far into some important interface processes, like *trust*. The importance of trust in intergroup interaction has been highlighted by Webb and Worchel:

... group membership often produces distortions in the perceptions and evaluations of other groups, establishing the potential for mutual misinterpretations of each group's behavior. The perception of the other group as untrustworthy is probably a major source of tensions leading to conflict. ... The presence of trust may ... prevent some potential conflicts from arising, and the lack of trust may precipitate conflict where the conditions do not seem to justify it [1986, pp.213 & 214].

Within what Webb and Worchel describe (1986, p.216) as a largely unstructured body of theory, observation and experimentation on trust, the focus in the present investigation necessarily will be on *interorganisational trust*. Dodgson emphasises how important it is for companies (and others) collaborating in new, increasingly used modes of interorganisational relationships, to develop interorganisational trust (in addition to trust between individuals). He observes how, with interorganisational trust,

Collaboration can survive disruptive interpersonal rows, and the loss of important individuals provided trust is broad-based. Trust ... becomes engrained in organizational routines, norms and values. [Trust overcomes] the disincentive to cut and run. ... Trust mitigates [sic] against opportunistic reactions [Dodgson, 1993(b), p.91].

Fox calls this form of trust "institutionalised trust", which is "embodied in social arrangements, decisions and policies which men seek to impose on each other" (1974, p.99).

Here, amid the many different conceptualisations and meanings attached to trust (Webb and Worchel, 1986, pp.214 & 215), the term is being used in the sense suggested by Dasgupta. This conceptualises trust as

something that enables correct prediction of the actions of other people that have a bearing on one's own actions, when one's own actions must be chosen before the actions of those other people can be monitored (Dasgupta, 1988, p.51).

Van Dierdonck, de Backere and Engelen (1990, p.564), Lundvall (1988, pp.353 et seq.) and Hausler, Hohn and Lutz (1994) all confirm the importance of trust as an influence on laboratory-company interaction. So does experience with CSIRO's commercialisation arrangements. Review of project recommendations and progress reports submitted to the SIRO-TECH Board identified several cases where reluctance of one party fully to trust the other with sensitive information (for example) seemed to contribute to what ultimately turned out to be a generally unsuccessful venture.

Theories and concepts of trust seem by their very nature likely to cope well with the particular thrusts of this study and the characteristics of many commercialisation interfaces.

Any conceptualisation based on trust will almost inevitably give adequate attention, for instance, to the *distrust* that seems to be so significant in reconciling the strong affiliations most individuals/groups continue to have with their 'old' laboratory or company group.

Furthermore, trust-based conceptualisations can be expected to be particularly helpful in examining evolution of the cultural system of a commercialisation interface *from its early days*.

Other characteristics of many commercialisation interfaces also

expected to benefit from articulation in terms of trust include the often exceptionally wide differences between the parties, the frequent novelty of commercialisation activities to one or both parties, and the intimate, detailed information and opinion that often must be exchanged.

Participant observation of many CSIRO commercialisation arrangements, supported by preliminary examination of data from the interfaces to be examined in this study and by the literature on the social/intercultural basis of commercialisation/innovation, goes beyond identifying trust as an important variable in explaining interface effectiveness. This observation and literature actually suggests *particular aspects of trust* that seem often to be especially important.

One aspect stands out: performance by at least one party 'above and beyond the call of duty', by doing more in the venture than was demanded under the formal arrangement or by making concessions to the partner where these may not strictly have been necessary. The importance of such spontaneous concessions in research-commerce interaction is flagged by Gupta, Raj and Wilemon in their discussion of "give-and-take" relationships between researchers and marketing executives (1987, p.38). Review of project recommendations and progress reports submitted to the SIROTECH Board identified such spontaneous concessions in many projects that ultimately turn out to be generally successful ventures.

These observations suggest that a form of trust described by Sako (1992) might be especially important if the intercultural interaction entailed in commercialisation is to be effective. In her discussion of

"obligational contractual relations", as opposed to "arm's length contractual relations", among trading companies, Sako identifies the importance of what she terms *goodwill trust*. This is an expectation of open commitment by the partners to each other. This quite amorphous type of trust is fundamentally different from other more specific, lower order types of trust - "contractual trust" and "competence trust" - which are prerequisites for any interorganisational relationship to function smoothly.

Goodwill trust, which is also articulated by Fox (1974, pp.29 to 49) as "the spirit of give and take" and by Contractor and Lorange (1988, p.34) as "forbearance", comes about when there is "a sure feeling that trading partners possess a moral commitment to maintaining a trading relationship" (Sako, 1992, p.10). It often entails avoiding taking unfair advantage of one's position and offering the partner preferential treatment or help whenever the need arises. There is, in relationships based on goodwill trust, a long timeframe for reciprocity:

the principle of give-and-take is looser, so that exact reciprocity may be achieved, if ever, only over a very long time. ... [Obligational contractual relations] traders feel that mutual indebtedness or obligatedness at any time is a normal state of affairs which sustains a relationship [Sako, 1992, p.10].

Sako maintains that goodwill trust can actually be created; it is not solely a product of shared background and familiarity (Sako, 1992, pp.45 & 46). This can be done through the development of "studied trust" (the term of Sabel, 1990), which entails "creating trusting personal and business relations in previously mistrusting environments" (Sako, 1992, p.47). "Studied trust" can come about if actors successfully engage in "reinterpreting their collective past, and

especially their conflicts, in such a way that trusting cooperation comes to be seen as a natural feature, at once accidental and ineluctable, of their common heritage" (Sabel, 1990, p.4; see also Webb and Worchel's discussion of the "sequence of steps involving reciprocal exposure and reinforcement [which] is required for the establishment of a relationship of mutual trust": 1986, p.223).

Of all theories to do with trust, theory on goodwill trust seems most likely to cope with the particular needs of this study and the characteristics of many commercialisation interfaces. This theory can be expected to provide especially helpful guidance for investigating behaviour in the complicated and inherently uncertain intercultural situation in many commercialisation interfaces: especially during the earliest stages of an interface's lifetime. This is the time when a partner's extraordinary steps to grant unexpected assistance and concessions should be most reassuring.

The preceding discussion has identified four inter-related but reasonably discrete hallmarks of goodwill trust expected to contribute significantly to making interfaces more conducive to constructive and creative patterns of thinking and behaviour. These are:

- \* avoidance of 'pressing home' advantages over the partner, and/or offers of special concessions;
- \* delay in 'calling in' obligations one party has to the other;
- \* repeated trust-demonstrating actions; and

- \* the parties' reinterpretation of their collective pasts to engender trusting attitudes.

Fox extends theory on goodwill trust by contrasting his "give-and-take" relationships with low-trust relationships, and flagging the often serious consequences of "demand[s] that men behave in a high-trust manner within what they perceive as a low-trust situation. ... [S]uch demands are doomed to failure" (p.169).

In similar vein, Macauley, working from his interest in vertically integrated businesses, builds on Durkheim's reasoning about non-contractual bases of contracts. Macauley warns against excessively planned ventures, "even where agreement can be reached at the negotiation stage" (1963, p.64). 'Over-contractualised' arrangements can be counterproductive, says Macauley (and this argument is further developed by Webb and Worchel, 1986, p.222), because

Some businessmen object that in such a carefully worked out relationship one gets performance only to the letter of the contract. Such planning indicates a lack of trust and blunts the demands of friendship, turning a cooperative venture into an antagonistic horse trade [Macauley, 1963, p.64].

This reasoning by Fox, Macauley and Webb and Worchel identifies a second aspect of trust with apparent implications for formation and development of effective commercialisation interfaces. This reasoning can be embodied in a simple proposition: The effectiveness of commercialisation interfaces will be jeopardised by any conflict between demands for a tight, fully commercial agreement and demands that trust be relied on as much as possible.



There are signs that often researchers (in particular) will be sceptical about how necessary a tight, fully commercial agreement is, and whether such an agreement can possibly reflect the "real" needs in commercialisation. The historical review of project recommendations and progress reports submitted to the SIROTECH Board highlighted the challenge SIROTECH often faced in advocating contractually complete, 'tight' arrangements when researchers preferred trust-based arrangements.

Frosch would not be surprised at this. He documents how "the legalistic adversarial attitude" that drives research-commerce interaction has resulted in "bureaucratic management techniques" which encourage people to think in adversarial ways when "questions of incentive, questions of who gets the credit, and questions of organizations" should instead be left to trust (Frosch, 1984, p.14).

Both theoretical perspectives on trust discussed in this section - goodwill trust, and the tendency to 'over-contractualise' arrangements rather than rely more on trust - seem likely, then, to help explain the emergence and effectiveness of the research-company commercialisation interface. Both perspectives will contribute to the analytical framework to be applied in later chapters.

#### **E. CONFLICT IN COMMERCIALISATION INTERFACES**

The literature on the social and intercultural basis of the commercialisation and innovation processes and policy reviews of research-company interaction often overlook the important role of tension among the actors. Sometimes this tension - mostly conceptualised as conflict<sup>1</sup> - can be healthy and constructive, sometimes potentially

destructive for the interface.

Roberts' work is an exception; Roberts points to the importance of Kuhn's "creative tensions": "a mix between comfort-reinforcing stability and conflicting challenge" (1988, p.17). Gupta, Raj and Wilemon also investigate conflict processes in their "high-integration" companies (whose innovation activities tend to be most effective). They note that conflict in such companies tends to be fundamentally different from conflict processes in "low-integration" companies. In the former types of companies, "R&D-marketing conflicts were resolved sooner and at lower organizational levels", for example, with "senior management of high-integration firms seldom [being] involved in these conflicts" (Gupta et al, 1987, p.41).

Both preliminary observation of data from the interfaces to be examined in this study and participant observation of many CSIRO commercialisation arrangements over the 1980s suggest that conflict is a fundamentally important variable in the commercialisation process. The latter observation identified consequences of uncontrolled conflict in many of CSIRO's less successful commercialisation arrangements, ranging from long-term withdrawal from any form of contact between the parties, to vehement legal action resulting in millions of dollars in damages; and from pedantic enforcement of the fine print in a contract, to collusion and political pressure.

Most conflict-based theories of group development and group cohesion, and certainly those of Brown, Coser and Deutsch to be reviewed in this section, seem likely to cope well with the main thrusts of this study and the unusual characteristics of many commercialisation interfaces.

These theories place a deal of emphasis, for instance, on both the interplay of different cultural values, norms, attitudes and preferences through the interaction of people near intercultural boundaries, and influences from people's continuing affiliations with other groups. Conflict-based theories also seem intrinsically to cope well with interactions where differences in the parties' understandings and expectations are relatively wide, and where there are many interrelated issues (as often seems to be the case in commercialisation).

There are good signs, then, that a better understanding of conflict's role and mode of operation could help understand what makes the social/intercultural conditions in commercialisation more conducive to effective development and endurance of the supragroup.

#### 1. The Amount of Conflict in Commercialisation Interfaces

Many distinct lines of conflict theory have emerged since Simmel set much of the scene for contemporary conflict theorists in the early years of the century (Collins, 1988, pp.118 & 119). Brown stakes out his position in this broad field by identifying and discussing two main traditions of the social sciences that are closely related to the respective potentially unifying and potentially destructive forces on social groups discussed in section A. One tradition emphasises social diversity and development; here conflict is seen as "energizing, creative and evidence of social dynamicism". The other tradition emphasises integration and stability in society; here conflict is seen as "disruptive, dangerous and indicative of underlying social pathologies" (Brown, 1983, pp.6 and 7).

Perhaps largely because of his leanings towards the latter tradition,

Brown departs from many researchers on conflict who pass by the bland subject of the amount of conflict in social situations, in favour of subjects presumably seen as more challenging or more fundamental (like the structure of conflict, or relationships between conflict and underlying group characteristics). Brown concentrates on articulating concepts and theory for analysing the relatively simple effects of different amounts of conflict present in social situations. In particular, he analyses the amount of conflict in *inter-organisational interfaces*, which he sees as a greatly underutilised concept.

This is a view shared by Worchel (1986, pp.288 & 289), who maintains that this lack of attention means that "Anyone interested in inter-group conflict resolution is faced with the prospect of extrapolating from research utilizing two individuals as subjects [which] must be done with extreme caution ...".

This emphasis on intergroup processes is of course highly consistent with this study's conceptualisation of commercialisation as (inter alia) an intergroup activity.

Brown describes detrimental effects on interface cohesion and effectiveness of both too much conflict and too little conflict, against the concept of the level of conflict that is "just right" for a given interface (1983, pp.47 to 49). His arguments are summarised in the box on the following page.

## BOX:

**SUMMARY OF BROWN'S ARGUMENTS ON HOW EXCESSIVE OR INSUFFICIENT LEVELS OF CONFLICT AFFECT INTERFACE COHESION AND EFFECTIVENESS**  
(from Brown, 1983, pp.48, 49, 222 & 223)

*With excessive conflict, interface participants typically*

*perceive themselves as innocent victims and their opponents as malignant villains; they regard opponents with antagonism, hostility and extreme distrust; communications between the parties are reduced in amount and quality by distrust and distortion; coercive tactics of influence are extensively used ... These perceptions, communications and actions tend to interact to reinforce each other in escalating cycles that often produce poor decisions ... and reduced capacity of the interface to sustain productive conflict in the future.*

*Too little conflict also produces problems in terms of social cohesion. These problems can hinge on either suppression of critical differences when discussion is important, or withdrawal from the conflict:*

*The dynamics of suppressed conflict involve perceptions that deny differences and overemphasise similarities, restricted communications about topics that might generate controversy, and actions that submerge differences and suppress productive disagreement. ... [with withdrawal], differences may be recognized but not explicitly articulated between parties; communications are reduced as parties avoid potentially controversial interaction; representatives avoid engagement, ignore differences, or leave the field to prevent conflict.*

*At an organisational level, too little conflict between organisation representatives can result in suppression of differences through interorganisational collusion, which in effect reduces each party's autonomy. Relations featuring very low levels of conflict "amount to an unintended merger of organizations that obscures differences important to them or to contextual parties".*

*Or too little conflict between organisations can result in withdrawal from differences through interorganisational isolation, including "a false sense of organizational independence. Organizations can fail to recognize interdependencies, avoid interaction that would produce disagreement, and reduce engagement that would help them recognize and manage common problems".*

Brown proceeds to articulate the pragmatic steps available to the parties' representatives in an interface (as well as to interface managers) to control the amount of conflict. This emphasis makes Brown's approach especially suited to the study of conflict processes in commercialisation interfaces, because it seems that much of the control of conflict here has to come from ad hoc steps by the participants themselves. Observations reported in the preamble suggested that often those responsible for managing commercialisation ventures tend to let conflict run its course, with relatively little management intervention. Under these circumstances, a self-contained and relatively simple conflict-management regimen (like Brown's) should be most likely to provide practical assistance to the participants themselves, and perhaps ultimately most likely to make interfaces more effective.

Brown's practical steps available to bring about a more effective balance of conflict in different types of situations have two thrusts: towards altering individual representatives' form of *involvement in the interface*, and towards changing *the direction of development of the interface*. The main actions to these ends identified by Brown are summarised in Table 1.

Brown extends his reasoning on conflict-balance to encompass *complex interfaces*. He defines "complex interfaces" as "interfaces at which two or more simple interfaces interact", but at the same time he identifies the definitive characteristic of such interfaces as being "when conflicts involve several different issues". A "complex interface" in Brown's terminology, then, can be simply a single interface incorporating conflicts on more than one issue.

TABLE 1

**ACTIONS TO BRING ABOUT A MORE SATISFACTORY CONFLICT BALANCE**  
(references are to Brown, 1983)

For Decreasing Excessive Conflict:		For Increasing Too-Little Conflict:
<b>A. Altering Individual Representatives' Involvement in the Inter-face</b>		
<b>Altering repre-sentat-ives' percept-ions:</b>	<p>Furnishing them with new in-formation &amp; interpretations, to reduce saliency of negat-ive stereotypes (pp.193 &amp; 243)</p> <p>Educating them on "the dyn-amics of cultural polarisat-ion ... [and] intercultural warfare" (pp.193 &amp; 243)</p> <p>Clarifying "the importance of interdependencies" (p.243)</p>	Alerting them to likelihood & dangers of cultural homogen-isation or isolation, & edu-cating them on other cul-tures' assumptions, differ-ences & similarities (pp.201 & 202)
<b>Improving cross-cultural communi-cations:</b>	Targeting communications about the very process of cross-cultural communicat-ion (pp.193 & 194)	Targeting "unspeakable" top-ics. Interrupting "self-rein-forcing pattern of withdraw-al". Reducing "perceptions of each other as irrelevant ..." (pp.202 & 252)
<b>Altering repre-sent-atives' actions:</b>	<p>Separating out culturally loaded issues (p.194)</p> <p>"Posing new alternatives that allow parties to shift from entrenched positions without losing face" (p.194)</p> <p>Adopting "early warnings" to identify and discuss problems "before they be-come polarized" (pp.194 &amp; 195)</p> <p>Altering "the representing, protecting and transacting functions of organizational boundary spanners" (p.244)</p> <p>"Separat[ing] out threats to organizational survival" to avoid "contaminat[ing]" other easily solved issues (p.244)</p>	<p>Identifying &amp; springing "'emotional booby traps' in culturally symbolic issues" (p.202)</p> <p>"Articulating alternative outcomes that are culturally relevant" (p.202)</p> <p>"Recognizing and dealing with cultural issues ... that en-courage their interaction without fulfilling their fears" (p.252)</p> <p>"Recogniz[ing] issues and alternatives that link the organizations" (p.253)</p>

[Table 1 continued on following page]

TABLE 1 (continued)  
ACTIONS TO BRING ABOUT A MORE SATISFACTORY CONFLICT BALANCE

B. Changing the Direction of Development of the Interface		
Changing the interface:	<p>Involving more "moderates" in the interface (p.195)</p> <p>"The definition of interface boundaries around organizational coalitions whose members would ordinarily be in conflict" (p.245)</p>	<p>"Redrawing boundaries of homogeneous interfaces to include more cultural diversity" (p.204)</p> <p>"Opening external boundaries to new information, loosening formal rules ..., and negotiating more flexible norms" (p.204)</p> <p>"Dealing openly with cultural differences carefully avoided elsewhere in the organization" (p.205)</p>
Changing one or both organizations:	<p>Involving "representatives who do not need to speak for their entire cultural heritage", who "are less prone to extreme positions or stereotyped action" (p.197)</p> <p>"Role definitions that do not isolate individuals as single tokens at an interface" (p.197)</p> <p>"Loosely coupling" boundary-spanning groups to the rest of the organisation, "to buffer external uncertainties and dependencies" (p.247)</p>	<p>"Clarifying cultural identities and interests and taking a hard look at stereotypes of cross-cultural similarities" (p.205)</p> <p>"Designing representatives' roles that encourage ... vigorous representation" (p.205)</p> <p>"Making ... cultural parties in some ways more similar" (p.206)</p> <p>"Alter[ing] goals, markets, technologies, locations, or other organizational factors central to interface relations" (p.206)</p> <p>"Alter[ing] or discontin[ing] ... boundary management activities used to reduce conflict ..." (p.256)</p>
Altering the context:	<p>Making clear senior management's interest in improving intercultural dealings (p.197)</p> <p>Calling on "forces in the larger context whose impact is only indirect" (p.248)</p> <p>"Enlist[ing] public support for reduced conflict" (p.248)</p>	<p>Organisational superiors giving explicit recognition to cultural differences (p.206)</p> <p>"Formal organizational structures and policies that encourage cultural diversity ... [or] interdependence" (p.207)</p>



The present study adopts *both* of Brown's definitions of "complex interface", because the interplay of issues both in a single interface (that is, an interaction of a single unchanging group of people) and through a number of inter-related interfaces seems to be crucial for the types of interaction to be examined here. This extension of Brown's reasoning makes his approach even more germane to conflict processes in commercialisation interfaces, because it will be seen that the interfaces to be looked at in this study clearly tend to be complex interfaces.

According to Brown, the various issues and simple interfaces making up a complex interface sometimes eventually converge to focus on the same issues and parties. These are *correlated* complex interfaces, which tend to

create well-articulated issues, easily identifiable parties, obviously necessary interfaces, and representatives who speak for constituencies bounded by multiple criteria. Correlated conflicts of interest create the potential for extreme escalation ... and correlated suppression or withdrawal patterns may also be expected to create extremes as well [Brown, 1983, p.277].

Complex interfaces can on the other hand be constituted by several *crosscutting* issues and simple interfaces, which can suppress or modify each other's effects. Crosscut interfaces

exhibit poorly articulated or even contradictory issues, parties fragmented by inconsistent loyalties, confused interface definition and organization, few or inconsistent contextual interventions. Behavioral dynamics at such interfaces may be episodic or inconsistent, and withdrawal may be particularly common [Brown, 1983, pp.277 & 279].

Brown argues that complex interfaces can be made more effective by realigning issues or simple interfaces to decrease convergence at

correlated interfaces, or to increase convergence at crosscut interfaces (Brown, 1983, p.288). But care is needed, because in a crosscut interface action "can solve problems at some interfaces only to produce new difficulties - sometimes unexpected problems at previously unrecognized interfaces" (p.292).

## 2. Types of Conflict in Commercialisation Interfaces

Several perspectives that have contributed greatly to the development of contemporary conflict theory complement Brown's reasoning by going well beyond the simple amount and balance of conflict in intergroup interactions, to look at a range of qualitative characteristics of conflict. These characteristics include conflict's structure, what conflict focuses on, and precisely how conflict relates to the social system in which it developed. These perspectives include those of Simmel (1955), Cooley (1918), Weber (1949), Rex (1961), Coser (1956) and Deutsch (1973).

Of these theorists, the last two mentioned - Coser and Deutsch - together present a number of readily applicable and reasonably far-reaching perspectives bearing directly on the main types of conflict arising in the sort of supragroup under discussion here. The focus in this discussion will be on Coser's and Deutsch's reasoning.

Coser identifies the effects on the stability of a society (or a group within a society), of *the number, range and intensity of conflicts* present. A single major conflict slicing through a society or group is likely, according to Coser, to have a more disruptive effect than many different types of conflict permeating the society or group. With a single major conflict

dividing the members into two hostile camps ... the single cleavage will very probably put into question the basic consensual agreement, thus endangering the continued existence of the group [Coser, 1956, p.77].

With a larger number of relatively small conflicts, on the other hand (under what Collins terms "the 'grid-lock' model" of social conflict), "there is conflict in so many directions that no one dimension can become very intense" (Collins, 1988, p.123).

Coser also relates conflict processes to *the rigidity/flexibility of the social system* in which conflict has developed. Relatively rigid social systems can provide effective "safety-valve institutions", but they tend not to be able to readjust to changed conditions. According to Coser, this "permits the accumulation of occasions for conflict and hence of hostilities which may eventually directly threaten consensual agreement" (1956, p.79). This contrasts with the situation in more flexible social systems where, says Coser, the very existence of conflict makes it most unlikely that the relationship's consensual agreement will be threatened.

Structural variations among the conflicts in the interfaces to be examined in this study and among the social systems within which those conflicts occur, provide a potentially rich opportunity for Coser's structural approach to illuminate conflict's influence on interface effectiveness. Participant observation of many CSIRO commercialisation interfaces suggested that structural characteristics of conflict and of the social system can influence interfaces' long-term effectiveness. The thoroughness of definition of management and operating arrangements in an interface (and therefore probably the rigidity/flexibility in the interface as a social system), for instance, often

seemed to bear directly on a particular interface's success in commercialising the particular technology or know-how.

The likely significance of this factor is supported by Gupta, Raj and Wilemon's observations on the qualitatively different conflicts occurring in their "high-integration" and "low-integration" companies (Gupta et al, 1987, p.41).

Coser looks also at relationships between types/strengths of conflicts and both the values and interests of the groups in conflict and the way those groups draw upon, and identify with, the personalities of their members. Specifically, Coser predicts that the only conflicts that will be positively functional for an interaction will be "those which concern goals, values or interests that do not contradict the basic assumptions upon which the relationship is founded" (1956, p.80), and that conflict will be less severe and less disruptive in

groups that appeal only to a peripheral part of their members' personality, ... than in groups wherein ties are diffuse and affective, engaging the total personality of their members ... [The latter] groups will tend to suppress conflict, but if it occurs nevertheless, it will be intense and passionate [pp.68 & 69].

Participant observation of many CSIRO commercialisation ventures over the 1980s again suggested that both these influences may well be significant. Historical review of commercialisation project proposals and progress reports submitted to the SIROTECH Board suggested, for example, a tendency for less successful ventures to involve company people who have a 'total personality' identification with the supra-group constituting the interface.

The characteristics of conflict on which Coser builds his theory tend to be somewhat diffuse. It would seem sensible to extend this study's investigation of contributors to interface effectiveness to encompass more specific conflict variables, a number of which are covered by Deutsch's theory. In particular, *the focus of conflict* would seem to be most helpful. Deutsch contrasts conflicts based on "principles, precedents and rights" with "here-now-this" conflicts. He predicts that the latter conflicts,

which are localized in terms of a given time and place and specified in terms of particular, delimited actions and their consequences, are much easier to resolve constructively than conflicts that are defined in terms of principles, precedents, rights, etc. .... [Deutsch, 1973, p.370; see also Tajfel and Turner, 1986, pp.23 & 24].

Again participant observation of many CSIRO commercialisation ventures suggested that tying down points of conflict might well influence interface effectiveness. The apparent reluctance of those managing CSIRO-based commercialisation ventures to take steps to manage conflict has previously been noted. However the preamble also notes that where such attention *is* forthcoming from the management of one or the other party, notable revivals of seemingly doomed commercialisation ventures have apparently started with systematic translation of points of conflict into 'hard' issues.

And the significance of this technique is reinforced by Gupta, Raj and Wilemon's experience with "high-integration" companies (whose research-product interfaces tend to be more successful). Gupta et al found that conflict in these companies tended to be concentrated on issues that had (in Deutsch's terms) a distinctly 'here-now-this' flavour, like "different views over development schedules" (Gupta et

al, 1987, p.41).

The elements of conflict theory reviewed so far in this discussion concentrate on *immediate* effects of conflict. Most conflict theorists at least touch upon one *less direct* effect of conflict: its frequent flow-on to other types of relationships not notably based on conflict (Coser, 1956, pp.122 & 123. Conflict is one means of gaining knowledge about unknown people and circumstances, says Coser, thereby establishing a basis for other forms of interaction. Coser's suggestion of how this might happen in practice seems to be especially instructive for understanding how conflict processes can contribute to developing a clearer framework for guiding people's thinking and behaviour:

By bringing about new situations ... partly or totally undefined by rules and norms, conflict acts as a stimulus for the establishment of new rules and norms ... [and] brings into ... conscious awareness ... norms and rules that were dormant before the particular conflict ... This very consciousness makes the contenders aware that they belong to the same moral universe [Coser, pp.124 & 127].

Broader positive flow-on of conflict-learned behaviour would seem to be most desirable, and most likely to contribute significantly to interface effectiveness, in social arrangements of the nature of commercialisation interfaces, where so much of a party's reasoning and behaviour is often completely new to its partner and the social situation itself is often in need of early definition and articulation.

### 3. Managing and Controlling Conflict in Commercialisation Interfaces

Worchel notes the "interesting paradox" whereby

There has been a great deal of attention paid to determining what factors lead to intergroup conflict and to the effects of such conflict on intragroup processes, but,

until recently, there has been relatively little study of the means by which intergroup conflict can be effectively reduced [1986, p.288].

The previously observed reluctance of some managers of commercialisation interfaces to take overt strategic steps towards managing conflict suggests that study of how conflict is actually controlled in practice by interface participants 'at the coalface' might well cast light onto the development of interface effectiveness.

Brown's reasoning on managing conflict, based simply on the amount of conflict present in the social situation, which has already been presented, offers some prospect of developing this understanding. However it would seem to be useful to complement Brown's approach with an approach to conflict management/control based on qualitative, intrinsic characteristics of conflict.

Worchel reviews the limited literature addressing intergroup conflict-reduction/management, concentrating on the theories of Deutsch and Sherif, contact theory, theories of co-operation, balance theory, reinforcement theory and cognitive dissonance theory. Deutsch's approach has been selected from those approaches for attention in this study because it couples pragmatic analysis and comparison of the thought and behaviour patterns of each party to a conflict, with practical guidance for applying this knowledge to the 'construction' of interfaces with a conflict-control capability.

Deutsch describes how "excessive tension reduces *the intellectual resources* available for discovering new ways of coping with a problem or new ideas for resolving a conflict" (1973, p.355; emphasis added).

This happens as conflict affects parties' time perspective (resulting in "a focus on the immediate rather than the overall consequences of the perceived alternatives"); flexibility (through polarising their thoughts into "black and white, for or against, good or evil"); and objectivity (making the social system susceptible to "fear- or hope-inciting rumors"). Conflict also introduces defensiveness and pressures to conform socially (Deutsch, 1973, pp.352 to 355).

The effect of these reduced intellectual resources is often amplified by the parties' differing *orientations towards the actual conflict*:

One side may experience the conflict and be motivated to resolve it; the other side may be content with things as they are and not even be aware of the other's dissatisfaction. Or, both may recognize the conflict, but one may be oriented to a win-lose situation while the other may be seeking a cooperative resolution [Deutsch, 1973, p.388; see also Heath's somewhat cynical discussion of how "the individual may not realize that he is in a strong bargaining position, or he may not have the wit to take advantage of it": Heath, 1976, p.105].

The combination of conflicting orientations and reduced intellectual resources can readily lead, says Deutsch, to escalation of conflict through inappropriate "influence procedures" that will elicit resistance, and "alienating techniques" which ignore the values and norms that govern interaction. These are techniques like negative sanctions (where positive action might be called for), and "influence that is excessive in magnitude" (Deutsch, 1973, pp.389 and 390).

Participant observation of many CSIRO commercialisation ventures suggested that a number of Deutsch's "alienating techniques" and over-reactions may be at the heart of many less successful commercialisation ventures. The historical review of project recommendations and



progress reports submitted to the SIROTECH Board suggested, for instance, that both "fear-inciting rumours" and widely differing orientations towards the basis of any conflict could well be widespread in less successful ventures.

Deutsch argues the importance of channels which, amid these influence procedures and techniques, focus conflict towards productive ends. He emphasises the *regulation* of conflict: its limitation/control by regulated or institutional forms, social roles, social norms and rules for conducting negotiations. Having identified the conditions necessary for the institutionalisation and regulation of conflict (like each party's ability to act as a single entity, and willingness to accept the outcome of regulated channels for conflict-control whatever it may be) and the conditions that make it likely that the regulations will be adhered to by the parties (like the clarity, definition and transparency of the rules, the extent of social approval of them, their apparent consistency with one's interests, compliance by the other party, and experience in adhering to the rules), Deutsch identifies the conditions under which regulated channels "will be used to wage conflict competitively or to resolve it cooperatively" (1973, pp.377 to 381).

Institutionalised conflict-reduction is likely *to fail*, says Deutsch, where the parties

(1) feel that their existence or their rights are under threat ... ; (2) think that their survival is endangered ... ; (3) are torn by internal factionalism that gets displaced onto the ... relationship; (4) have little local autonomy ... ; (5) are constantly subjected to changing conditions ... [p.381].

Study of the institutionalised handling of conflict would seem to offer particular prospects for casting light onto conflict-control in commercialisation interfaces, for two reasons. First, broadly relevant social roles, social norms and institutional forms, as well as the threats to survival and the constantly changing conditions referred to by Deutsch, often seem to be prominent features of these interfaces. Second, the more conflict-management mechanisms are incorporated into institutionalised arrangements, the easier it should be for interface participants themselves, rather than managers overseeing the interface, to control excessive conflict. The importance of this for the health of commercialisation interfaces was identified previously.

The discussion in this section has identified several conflict-based theoretical perspectives likely to help explain the emergence and effectiveness of the research-company commercialisation interface. These encompass the balance of conflict (and the build-up of excessive conflict); the structure of conflicts and of the social system within which conflict develops; foci of conflict; the conditions under which conflict-learned behaviour transfers to new non-conflict situations; and the management of situations of excessive conflict. Potentially important specific dimensions of social behaviour identified through each line of theory, which will contribute to the analytical framework to be applied in later chapters, are consolidated in Table 2, at the end of this chapter.

#### F. POWER IN COMMERCIALISATION INTERFACES

Many of the processes addressed in the preceding discussion are ultimately markedly affected by how *power*<sup>2</sup> is applied in commercialisation interfaces. As Bacharach and Lawler say (1981, p.21), "A strong case

can be made for ... making power a central concern of almost any sociological analysis. [Under the exchange theory they were discussing at this point], power becomes the heart of the sociological enterprise."

Power in its own right has long been one of the most researched and discussed concepts in the social sciences; this was especially so in the 1970s (see reviews by Bacharach and Lawler, 1981, chapters 2 and 3; and Blumberg, 1987; and, for power in organisational settings, Pfeffer, 1981, chapters 1 to 4). But power is also an "abused and misunderstood" concept (Thomas, 1976, p.889; see also Hickson, Hinings, Lee, Schneck and Pennings, 1971, p.218; and Nagel, 1975, pp.9 to 11), which has often been pursued in futile directions (Nagel, pp.7 to 9), and which has often 'scared off' researchers because it is so problematic (Pfeffer, 1981, p.2). In particular, non-hierarchical forms of power - including those bearing on inter-organisational dealings - have often been ignored (Pfeffer, 1981, pp.3 and 4).

The relationship between conflict and power, and whether the actual manifestation of the one is a necessary precursor of the other, has also long been discussed in the literature (for brief reviews, see Nagel, 1975, p.154 et seq; Lukes, 1974, pp.13 to 15 and 23; and Crespi, 1992, chapter 4), but arguably not all that well researched (Gricar and Brown, 1981).

The relationship between conflict and power, together with the clear importance of power plays in many of the successful and unsuccessful CSIRO commercialisation ventures observed over the 1980s, suggest that power-based perspectives could add depth to the framework for analysing contributors to interface effectiveness, mapped out through the

preceding discussion. Immediately relevant theories of power are reviewed in this section.

The reasoning used here for relating the attainment and exercise of power to development of the interface as a small group, and ultimately to the development of interface effectiveness, hinges on a simple argument. This is the argument that a group in which power is exercised properly by those who possess it, in approximate proportion to the amount of power really possessed (where, as Pfeffer says, "the social pressures and social norms ... sanction the power distribution and ... define it as normal and acceptable": 1981, p.6), is likely to feature smooth, well-considered relationships, and mutual respect and understanding.

Such relationships are in turn (it is argued) more likely to become the base for an effective interface. In Pfeffer's words, "Such social acceptance and social approval adds stability to the situation and makes the exercise of power ... more effective" (1981, p.6). The consequences for intergroup conflict of *a mismatch* between power and legitimacy are articulated by Austin (1986, pp.173 and 174), Webb and Worchel (1986, pp.223 & 224), and Thompson, Ellis and Wildavsky (1990, p.65).

This argument implies that sources or bases of power in the interface (see Bacharach and Lawler, 1981, p.34). should desirably be clearly understood and accepted by the parties. Modes of exercise of power that clarify bases of power in the interface and encourage the parties to accept the power relationships, can therefore be expected to contribute significantly to interface effectiveness.

Most theories of power would seem able at least in general terms to cope with the thrusts of this study and the characteristics of many commercialisation interfaces. Most theories of power would seem necessarily to cope quite well, for instance, with actors' ongoing 'dual citizenship'; resolving conflicting group loyalties can be expected often to come down to whether the interface or the 'parent' laboratory/company has the greater power and applies that power more effectively. Development of the interface's cultural system in its earliest days would also seem likely to benefit from analysis from power perspectives. This is the time when the uncertainties and doubts discussed in chapter 1 would seem to open particular opportunities for one party or the other to exercise its power (either legitimately or otherwise).

Indeed these uncertainties proved to be a useful guide for homing in on particular theories of power likely to help explain the emergence and effectiveness of the research-company commercialisation interface. So did the frequent requirement for the interface itself (as it develops) to define some of the parameters and 'rules of the game' that will apply to it. Other helpful guides were the essentially adversarial flavour of many interfaces, and the prima facie importance of control of the interface's resources: especially resources in the form of the specialised skills available to the interface.

These sorts of characteristics of many commercialisation situations suggested that any theory of power likely to help explain interface effectiveness should give prominent attention to exchange/substitutability of each party's inputs (vide Bacharach and Lawler, 1981, chapter 2), asymmetric power relationships (vide Nagel, 1975, chapter

9), control of resources (vide Pfeffer, 1981, chapter 4; Bacharach and Lawler, 1981, chapter 2), and perhaps social networks and structures.

Some theoretical perspectives conforming generally with this prescription were ruled out by the frequent existence in commercialisation interfaces of what the economists call a 'spoilt market', in the sense that one party (and sometimes both parties) is not really free to offer its inputs in an open-market fashion.<sup>3</sup> Rational choice theory/social exchange theory/dependency theory (see Heath, 1976, and Bacharach and Lawler, 1981, chapter 2), for instance, would seem to be invalidated by this characteristic.

Ultimately three quite narrow and specialised, but well established, theories of power with the emphases described above were identified; they are articulated in the remainder of this section. The consistency and cohesiveness among these theories should be emphasised; resorting to three narrow, specialised theories is not as piecemeal as it might seem. The theories have a common lineage in the work of Weber and to some extent in that of Parsons, and of course the emphases described in the preceding discussion have the effect of weaving them together.

#### 1. Strategic Exercise of Power To Pre-Emptive Ends

Blau (1964) articulates a theory of power in intergroup relationships which systematically relates the strategies needed to attain and retain power as a particular social situation unfolds, to the conditions of dependence and to the social structure more generally. If a person is to apply his resources to achieve power over others, he must "compel them to comply with his directives as a condition for obtaining the needed benefits at his command" (Blau, 1964, p.121).

Blau identifies various means of doing this, two of which will be articulated here, because they seem to be directly relevant to the type and stage of laboratory-company contact embodied in the interfaces to be examined in this study.<sup>4</sup>

First, Blau points out how important it is for someone to have "the ability to prevent others from resorting to coercive force to effect their demands" (1964, pp.121 & 122). He describes major power-plays where each party's actions are aimed at preventing the other party from exercising *its* power. One is drawn inexorably towards the analogy of two Sumo wrestlers jostling for positional advantage!<sup>5</sup>

Second, Blau argues that

power depends on people's needs for the benefits those in power have to offer. ... Groups and individuals in power have a stake in helping to perpetuate and spread the relevant social values and in opposing counter-ideologies that depreciate these values [1964, p.122].

These two thrusts of Blau's approach seem to make it especially suitable for attempting to understand how power relationships help structure the social/cultural system constituting the commercialisation interface. Blau's reasoning could, for example, cast light onto the part sometimes played in commercialisation by what perhaps almost amounts to blackmail: as with the resort to political influence evident in some of CSIRO's ventures. Many theories of power which lack Blau's emphasis on dependence and coercion and rely instead on rule-based, law-based or reward-based concepts, would seem unlikely to cope all that well with this aspect of interaction.

According to Blau's reasoning, the greatest clarification of power

bases and power relationships, and quite possibly the greatest chance of having those power bases and relationships accepted by all parties, will come through the strategic, pre-emptive modes of exercising power identified above: as opposed to reactive, spur-of-the-moment power plays. It can be expected that, other things being equal, interfaces where one party concentrates on trying to prevent the other party from exercising *its* power, and interfaces showing evidence of spreading of a powerful party's values through opposing "counter-ideologies", will be more effective interfaces.

## 2. Coping with Uncertainty in Critical Intraorganisational Areas

Since developing a commercialisation interface involves, in effect, creating a single organisation, it seemed likely to be helpful to supplement the analytical framework emerging from the preceding discussion, by a perspective from power theory that hinges on *intraorganisational* concepts. Such a perspective is available in Pfeffer and Salancik's (1977) application of strategic contingencies theory to intraorganisational power relationships. This consolidates earlier work of Hickson, Hinings, Lee, Schneck and Pennings (1971), Crozier (1964), and Perrow (1970), and has in turn been amplified through further work by Pfeffer (1981).

Pfeffer and Salancik argue that an organisational unit's power in the organisation (in this study, this means one party's power in the interface) is a function of the extent to which the unit's function is "the most critical organizational function" and the extent to which it is "the source of the most important organizational uncertainty" (Pfeffer and Salancik, 1977, p.230; see also Pfeffer, 1981, pp.97 and 98). The unit's power is determined by how well the unit *cope*s with



uncertainties in these critical areas.

Its focus on uncertainty (as well as its basis in intraorganisational relationships) seems to make Pfeffer and Salancik's theory especially apposite for investigating commercialisation interfaces; uncertainty's pivotal role in many interfaces was identified previously.

According to Pfeffer and Salancik, the greatest clarification of power bases and power relationships, and quite possibly the greatest chance of having those power bases and relationships accepted by all parties, will come as parties successfully cope with uncertainty in areas that are critical to the interface's functioning. It can be expected that, other things being equal, interfaces where one party clearly underlines its power by demonstrating that it can cope with uncertainty in critical intraorganisational areas will be more effective interfaces.

### **3. Exercise of Meta-Power/Relational Control**

Baumgartner, Buckley, Burns and Schuster (1976) articulate the role of meta-power and relational control in structuring and strengthening social hierarchies. This approach draws together the full range of variables defining what these authors describe as the processes of morphostatis and morphogenesis that drive the development of social structures.<sup>6</sup>

*Meta-power* is the power actually to shape "social relationships and social structures through the manipulation of the components of the interaction system" (Baumgartner, Buckley, Burns and Schuster, 1976, p.224). The exercise of meta-power is *relational control*:

control over social relationships and structures ... [A]lthough an actor may have social power within an interaction framework (e.g. greater ability than others to select a preferred outcome ...) he may or may not have power to structure social relationships, to alter the 'type of game' the actors play, or to manipulate or change the distribution of resources or the conditions governing interactions or exchanges ... [pp.224 & 225].

Baumgartner et al also emphasise factors that act against endorsed management channels for developing a social structure. *Institutionalised decentralisation*, for instance, is part of a pluralistic power system that allows

actors other than the central leadership ... [to] control strategic resources. This gives them the possibility of mobilizing these resources to carry out structuring activities and to counteract [the leadership's] attempts to amass further power [p.235].

The concepts of meta-power, relational control and institutionalised decentralisation seem to be immediately relevant to analysing power in 'brand new', relatively poorly defined social arrangements where the participants are 'feeling around' for principles and the 'rules of the game'. This was argued in preceding discussion to be precisely what commercialisation interfaces do during their early stages.

According to Baumgartner et al, the greatest clarification of power bases and power relationships, and quite possibly the greatest chance of having those power bases and relationships accepted by all parties, will come as one party develops and successfully uses meta-power through relational control, and perhaps also as institutionalised decentralisation develops in the interface. It can be expected that, other things being equal, interfaces where meta-power/relational control are exercised will be more effective interfaces.

The three power-based theoretical perspectives identified in this discussion centre on attempts to prevent one's partner from getting into a position to exercise *its* coercive potential, and to spread its own social values and oppose "counter-ideologies that depreciate these values" (Blau, 1964, p.122); successfully coping with uncertainty in critical intraorganisational areas; and meta-power/relational control and the associated institutionalised decentralisation. These perspectives will be incorporated into the analytical framework to be applied in later chapters.

**G. SUMMARY: THE KEY THEORETICAL PERSPECTIVES, AND THE DIMENSIONS OF SOCIAL BEHAVIOUR IDENTIFIED THROUGH THEM**

Development of the social/intercultural interface associated with a commercialisation arrangement between a laboratory and a company is fundamentally a process of group-development. This chapter reviewed theories and conceptualisations of group-development, and specifically theories/conceptualisations of development of supragroups of the nature of commercialisation interfaces, to identify perspectives likely to be useful for understanding and guiding establishment and operation of coherent, effective, sustainable commercialisation interfaces. The main theories reviewed related to the key processes of *contact* and *conflict*. Complementary theories relating to the development of *trust* and the exercise of *power* were also encompassed. The most relevant dimensions of social behaviour identified from theory in these four areas, which will be incorporated into the framework providing the basis for the analysis to be carried out in later chapters, are summarised in Table 2.

TABLE 2

SUMMARY OF THEORETICAL PERSPECTIVES, AND IMPORTANT DIMENSIONS  
OF SOCIAL BEHAVIOUR IDENTIFIED FROM EACH THEORY,  
IDENTIFIED IN THIS CHAPTER

Area of Theory:	Main Theor-ists Drawn on:	Important Dimensions of Social Behaviour:
Inter-group con-tact	Allport, Cook, Pettigrew, Hewstone/ Brown, Stephan/ Stephan	<ul style="list-style-type: none"> <li>* Identification and pursuit of shared goals</li> <li>* Intimacy of the contact</li> <li>* Emphasis of similarities/explosion of inter-cultural myths</li> <li>* Acting in ways that preserve partner's most valued differences</li> <li>* Abandonment of no-longer-suitable ways</li> <li>* Approximate status balance between parties' representatives</li> <li>* Assumption of category-independent roles</li> <li>* Strong and consistent management support</li> </ul>
Trust	Sako, Contractor/ Lorange, Fox	<ul style="list-style-type: none"> <li>* Goodwill trust</li> <li>* Reliance on contract in the relationship, at the expense of trust</li> </ul>
Con-flict	Brown, Coser, Deutsch	<ul style="list-style-type: none"> <li>* Development of excessive conflict in accordance with Brown's reasoning</li> <li>* Handling excessive conflict in accordance with Brown's approaches</li> <li>* Maintenance of conflict at too low a level</li> <li>* Number of conflicts</li> <li>* Flexibility/rigidity of the social system in which conflict develops</li> <li>* Focus of conflict on goals/values/interests questioning the founding assumptions of the relationship</li> <li>* Way in which the groups in contact appeal to their members' personalities</li> <li>* Conflict kept focused on definite object of contention</li> <li>* Conditions under which conflict-learned behaviour transfers to new non-conflict situations</li> <li>* Conflicting orientations towards the conflict <u>per se</u></li> <li>* Conflict's reduction of "intellectual resources"</li> <li>* Regulated or institutionalised channels for conflict-resolution</li> </ul>

[Table 2 continued on following page]

TABLE 2 (continued)

SUMMARY OF THEORETICAL PERSPECTIVES, AND IMPORTANT DIMENSIONS  
OF SOCIAL BEHAVIOUR IDENTIFIED FROM EACH THEORY,  
IDENTIFIED IN THIS CHAPTER

Area of Theory:	Main Theorists Drawn on:	Important Dimensions of Social Behaviour:
Power	Blau, Pfeffer/ Salancik, Baumgartner <u>et al</u>	<ul style="list-style-type: none"> <li>* Strategic use of power to pre-emptive ends</li> <li>* Parties' attempts to actively spread their own social values</li> <li>* Coping with intraorganisational uncertainty in critical areas</li> <li>* Use of meta-power and relational control</li> <li>* Institutionalised decentralisation</li> </ul>

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Notes to chapter 2:

1. *Conflict*: "Incompatible behavior between parties whose interests differ ... Conflict is the result of both conflicting interests and incompatible behavior." *Interests*: "Recognized and unrecognized stakes that are affected by the interaction of parties". *Incompatible behavior*: "Action be one party intended to oppose or frustrate the other party" (Brown, 1983, pp.4 & 5).
2. *Power*: "The ability (potential or actual) to impose one's will on others" (Hodge & Anthony, 1988, p.512); see also Pfeffer, 1981, chapter 1, and Bacharach and Lawler, 1981, chapter 2.
3. Relationships in commercialisation interfaces will often have proceeded so far as to have 'locked out' any meaningful choice of an alternative supplier. Hence if the company leaves the arrangement with this particular research laboratory or if the

laboratory leaves the arrangement with this particular company, the technology or know-how or service sometimes simply will not become available to industry and the public at all.

4. In all, Blau (1964) identifies four ways of pursuing his strategy of forcing others to comply with one's wishes. To achieve power over others, a person must "remain indifferent to the benefits they can offer him in exchange for his ... [by, inter alia] encouraging competition among the suppliers of essential service ..." (p.120). He must, secondly, "assure the continued dependence of others on the services one has to supply by barring access to alternative suppliers ..." (p.121). These first two of Blau's theoretical perspectives would seem to be practically inaccessible to the study because of the 'spoilt market' effect described in the introduction to section F. It would be pointless to focus on power-based explanations of interface effectiveness that rely on alternative suppliers, when the likelihood of alternative suppliers coming to play a meaningful part in commercialising a particular technology is so low.

The discussion in this chapter therefore takes up only Blau's remaining two ways for a person to "compel [others] to comply with his directives as a condition for obtaining the needed benefits at his command".

5. The importance of this strategic use of power to pre-emptive ends in CSIRO's commercial interactions with companies is clear from one of the first statements on the subject made by CSIRO's

new Chief Executive. Shortly before he assumed the CSIRO role, McIntosh discussed the balance of activity under each CSIRO-industry collaborative research arrangement. He pointed out that a publicly-funded laboratory writes the memorandum of understanding covering the project

when you've still got the leverage, it's too late once you've invented the science and they've got it just as much as you've got it, there's no incentive to collaborate downstream. ... The fun bit is to make sure that having done [the science], ... you actually keep your rights open downstream to exploit the results [McIntosh, quoted in The Canberra Times newspaper, 26 August 1995].

6. Baumgartner et al (1976, p.216) categorise these sets of variables as

- (i) environmental, technological, and other material forces;
- (ii) social structural factors (like political-legal, economic and social class relationships and structures);
- (iii) cultural or ideational factors (like ideology, socialisation and education); and
- (iv) social action and interaction.

These variables can operate "either at cross purposes or in more or less compatible ways ... to structure ... interaction systems" (p.217). All these variables and their conflicting or cumulative effects seem to be of most important in the development of the commercialisation interface, yet many theories of power neglect some of them.

## **CHAPTER 3**

# **DEVELOPMENT OF THE INTERFACE'S CULTURAL SYSTEM**



## CHAPTER 3

### DEVELOPMENT OF THE INTERFACE'S CULTURAL SYSTEM

#### A. INTRODUCTION

Chapter 2 took the first steps towards developing a framework for analysing the social dynamics of commercialisation interfaces and for improving our understanding of contributors to interface effectiveness. It did so by drawing together perspectives from theories of contact, trust, conflict and power likely to help illuminate development of the interface as a small group.

The social processes and forces at work as a commercialisation interface evolves as a small group necessarily take effect against the background provided by the interface's *cultural system*. This system develops as the interface's values, norms, attitudes and preferred ways of behaving are formulated.

In effect the interface's cultural system is a prism through which the participants view and interpret events and processes occurring in the interface, events and processes impinging on the interface, and each party's and its representatives' approaches to the commercialisation task. This conceptualisation of "culture" is along the lines of both Spradley and McCurdy's (1975, p.5) and Werner and Topper's (1979, p.34).

The literature emphasises how important it is for a supragroup's cultural system to provide clear and constructive guidance for all participants' thinking and behaviour. Each participant should be able to

discern in the interface's cultural system a respect for his or her own key values and norms. As Furnham and Bochner observe, "If two cultures are to be bridged, their specific social skills, interpersonal rules and underlying values must form part of the curriculum" (1986, p.211).

Sales and Mirvis (1984, especially pp.109 and 131) describe a supragroup that furnishes each participant with such a consistent, unambiguous understanding of the expectations, needs and preferred ways of behaving of all the people involved, as having "cultural integrity".

"Cultural integrity" does indeed seem to be an important basis for an effective supragroup, because it should help eliminate often serious causes of intercultural conflict. These can take the form of Gregory's differing meanings and differing senses of priority between parties (Gregory, 1983, p.359), and Triandis's "wrong attributions" about the behaviour of others, which come about when one party has an inadequate understanding of the other party's cultural framework and expectations (Triandis, 1975, p.41).

But it seems likely that attainment of "cultural integrity" will sometimes be a lengthy and problematic process in commercialisation interfaces. Chapter 1 highlighted the often complicated and confusing differences between the cultures of publicly-funded laboratories and technology-using companies. The pre-existing cultural systems can be every bit as different as the cultures of most of the pairs of racial, ethnic, national, organisational and other groups whose cultural dynamics have been the subject of much examination. Indeed, one might almost wonder whether some commercialisation interfaces effectively

involve two completely different societies, rather than two cultures in the same society (Bochner, 1982, p.8; Martin, 1991).

The frequent need to develop a commercialisation interface's cultural system 'from scratch', in the absence of any initial system of values and norms (also discussed previously), would seem to offer further opportunities for one party's values and priorities to overwhelm the possibly incompatible values and priorities of its partner.

Many challenging questions and issues are posed by the coming together of such culturally diverse groups and individuals in a situation demanding negotiation of a cultural system at least broadly acceptable to the supragroup as a whole, and consistent with the main values and priorities of the constituent groups and individuals. The literature review in this chapter concentrates on the key over-arching question bearing on development of this cultural system:

*What areas of theory are most capable of identifying and articulating contributors to rapid, smooth, effective cultural adaptation, and perhaps ultimately most capable of identifying significant contributors to interface effectiveness?*

As with theory on group-development in chapter 2, the relative social/intercultural complexity of the commercialisation interface suggested that breaking down influences on culture-construction into a number of smaller, more readily manageable areas, might be profitable. Each such area would be likely to present more simple, homogeneous issues, which should readily provide foci for the analytical framework.

To this end, a preliminary review of broadly relevant literature from sociology, anthropology, social psychology and organisational studies

suggested investigation of broad families of theory bearing on two aspects of cultural adaptation:

- \* *The process of actually building a coherent culture for the interface. Construction of an interface's cultural system to the necessary stage (see Gregory, 1983, p.359) amounts to *acculturation* of the interface in the sense described by a number of traditional anthropology theorists (like Herskovits, 1958, pp.14, 15 et seq).*
- \* *The influence on thinking and behaviour in the interface, and social structuring of the interface, of the culturally-acquired values, norms, attitudes and preferences *brought into the interface* by the participants.*

Even within each of these families of theory, the number of potentially helpful perspectives presented by the literature was again large. A search for themes most likely to offer the deepest insights into the *process* of acculturation of commercialisation interfaces identified three potentially helpful and immediately applicable areas of theory.

The first was suggested by the many strong similarities between the culture-construction process being discussed here and culture-construction in societies incorporating ethnic groups. Notwithstanding some significant differences between the entry of the parties into these two wider communities,<sup>1</sup> the two merging/integration processes seem to raise similar issues. Both processes seem, for instance, to raise similar concerns for the individuals involved, centring on isolation, incompatibility and uncertainty. They also seem to rely on a

broadly similar combination of 'cultural baggage' brought into the contact situation and characteristics of the situation per se.

Participant observation of many CSIRO commercialisation ventures identified the sorts of concerns and problems that provide much of the substance of ethnic studies (like reluctance to co-operate or collaborate, objections to 'throwing in one's lot' with the community, and failure to meet obligations or expectations). This observation also suggested that significantly more of those concerns and problems stem from *researchers'* 'strangeness' and uncertainties in the technology-based commercial product-development world, than from *company people's* 'strangeness'/uncertainties. More often than not, then, the research partner can be identified with the minority in the ethnic studies literature, and the company with a majority group in the mainstream society.

These observations suggested that the rich body of theory on inter-group interaction in *ethnic studies* would be an obvious body of theory for this study to review.

Second, there are equally clear similarities between the culture-construction process in commercialisation and culture-construction when whole organisations of various types (companies, bureaucracies) come together in corporate takeovers or mergers. Fears of domination, forced cultural change, loss of control and the unknown seemed to be common to commercialisation interfaces and these corporate supra-groups. It therefore seemed appropriate for this study to review theory on *organisational acculturation*.

The limited literature on the social/intercultural side of commercialisation, participant observation of many CSIRO commercialisation ventures and preliminary observations from the interfaces to be examined in this study all suggested that participants in commercialisation interfaces often use *symbolic representations* of important interface events and processes in various ways to mediate construction of a coherent cultural framework. Theory on the ways people use symbolic representations in intergroup interaction constitutes the third and final area of theory turned to to illuminate the process of acculturation of commercialisation interfaces, and its possible ultimate influence on interface effectiveness.

Perspectives from these three bodies of theory will be reviewed in sections B to D respectively. The later sections of the chapter will identify complementary perspectives for developing understanding of the other aspect of cultural adaptation identified above: how the culturally-acquired values, norms, attitudes and preferences brought into the interface by the participants affect thinking and behaviour in the interface and social structuring of the interface.

Whether they address the actual process of acculturation or manifestation of the participants' 'cultural baggage', theories on cultural adaptation inevitably tackle processes and events central to the commercialisation process. They necessarily devote much attention to complicated intercultural boundaries, for instance, as well as to supragroup characteristics that feature in many commercialisation interfaces (like the 'dual citizenship', and the frequent wide difference between interface parties' commitment to, and dependence on, the venture). All the theory reviewed in this chapter would therefore

appear, prima facie, well suited to illuminating the social/intercultural basis of this particular form of supragroup.

#### B. ACCULTURATION THEMES FROM ETHNIC STUDIES

The literature on the social/intercultural basis of commercialisation/innovation pointed to two common broad approaches to ethnic merging/integration that could be most helpful to the present study.

This literature focuses, on the one hand, on processes that in effect structure the social situation in commercialisation/innovation through mandating *how the parties' values, priorities, skills and experiences should fit together*. Van Dierdonck, de Backere and Engelen (1990, p.558), and Geisler and Rubenstein (1989, p.46), for instance, discuss these processes in the context of reconciling publication of results with the commercial protection of intellectual property. Goldhor and Lund (1983, p.148) discuss them in the context of "organisational matching". And Gupta, Raj and Wilemon (1987, pp.39 to 41) discuss these processes in the context of role exchange and the involvement of marketing people in product-development.

At the same time, this literature on the social/intercultural basis of commercialisation/innovation also focuses on *leadership* of the process of cultural change; see, for example, van Dierdonck, de Backere and Engelen, 1990, p.563; and Goldhor and Lund, 1983, p.149.

The participant observation of many CSIRO commercialisation ventures confirmed the importance of both intercultural 'fit' and leadership of cultural change. The historical review of project recommendations and progress reports submitted to the SIROTECH Board suggested strong

tendencies for

- \* more successful ventures to feature a certain minimal level of contribution by both parties to all facets of the venture's operations, and for less successful ventures to restrict one party to a narrow, discrete role that often seemed to discourage its skills and views from penetrating the other party's activities and thinking; and
- \* CSIRO's team in relatively successful ventures to have a strong, imaginative leader with (by CSIRO's standards) well-rounded experience.

Characteristics of many commercialisation interfaces described in the preceding chapters also confirm the likely importance of both structural and leadership aspects of acculturation. The relatively complicated interplay of organisational cultures and related factors, for example, suggests that structural perspectives may well be centrally important, while the frequent maintenance, long after entry to the interface, of strong links to the 'parent' unit's cultural system and its ongoing activities, suggests that imaginative leadership of cultural change might also be crucial.

Perspectives from these two prominent theoretical approaches to ethnic adaptation are identified and articulated in this section.

#### 1. **Structural Facilitation of the Integration or Merging of Cultures**

Smith deals with this subject at the broad societal level. Noting how often "cultural differences are limited to certain institutional



spheres of activity ..., or, perhaps, to certain forms of social organisation" (Smith, 1986, pp.194 & 195), he identifies three types of *pluralism* that can structure a society. As further articulated by Jenkins (1986, p.180), these are:

- \* *cultural pluralism*, in which a society's different ethnic groups "are not relevant in the political sphere or as a criterion of citizenship";
- \* *social pluralism*, in which ethnicity, although "relevant in terms of political organisation", "does not affect citizenship, the incorporation of individual members of ethnic groups into the state"; and
- \* *structural pluralism*, "in which ethnic identity directly affects citizenship and the incorporation of collectivities into full membership of the state".

This same conceptual distinction seems to be useful for explaining constitutional foundations of specific supragroups in society. For the supragroup constituting the commercialisation interface,

- \* *Cultural pluralism* might be seen to exist where both constituent groups<sup>2</sup> have both full 'citizenship' and full 'political' rights: full powers of self-determination, full and equal access to leadership roles, and full and equal say in determining the supragroup's policies and actions. Each aspect of the interface's operations is performed by whoever can perform it best, in a fully integrated way.

- \* *Social pluralism* might be seen to exist where the constituent groups have, and are widely acknowledged as having, equal 'citizenship' rights in the sense of being 'full' contributing members of the interface, but distinct channels for 'political' organisation and representation. Each group can pursue 'political' interests (like strategically furthering the interface's objectives) only through group-specific channels. Social pluralism would make for an interface which is split operationally, and has multiple agenda. But the cohesion of such an interface would not necessarily be jeopardised, provided the substance of the social pluralism (like the details of the underlying legal-administrative commercialisation arrangement) had been developed through consultation and consensus.
  
- \* *Structural pluralism* might be seen to exist where one interface group has neither full 'citizenship' rights nor the right to full 'political' representation. This group is not recognised as a genuine member of the interface, and is generally seen as an interloper, having a restricted, very specific and subservient interest in the interface and not being 'entitled' to pursue its 'political' interests, in the sense of strategically furthering the interface's objectives. One party is the leader of the interface in all respects, while the other is a dominated 'minority'.

Smith extends this conceptualisation of the structural foundation of societies, into modes of incorporation of individuals/groups into pluralist societies. He attributes to what he terms segmental and differential modes of incorporation (based respectively on social and

structural pluralism), completely different "social and cultural tensions, problems and developments", none of which occurs under cultural pluralism. Smith argues that

whatever its 'real nature', the phenomenon of ethnicity depends for its social significance on its place in and under the prevailing structures of incorporation ... . It is easy to cite examples of structures that have fostered or created ethnic divisions where these were formerly absent, and ignored or eliminated them where formerly important [1986, p.198].

The participant observation of many CSIRO commercialisation ventures suggested that arrangements that turn out to be generally unsuccessful sometimes failed to incorporate the company's or (more commonly) the laboratory's essential values, norms, attitudes or preferences into the interface's cultural system. Many cases were encountered where one party's limited opportunities for pursuing an interface's 'political' interests seemed to be associated with reduced motivation, and ultimately significant conflict. There seemed to be good prima facie signs in many of the interfaces that the structural basis of incorporation had "fostered or created" Smith's "ethnic divisions".

The preceding discussion of how groups' cultural systems can fit together at a macro level when a supragroup is formed can profitably be complemented by analysis at a *micro* level. Mendoza presents an apparently useful and immediately applicable categorisation of how the parties' existing cultures are drawn upon in furnishing the values and norms of a composite group. (For another similar categorisation, see Bochner, 1982, pp.28 & 29.) Mendoza describes four typical patterns of acculturation. These are

*cultural resistance*, either active or passive, against the acquisition of alternate cultural norms, while maintaining

native customs; *cultural shift*, a substitution of alternate cultural forms for native customs; *cultural incorporation*, an adaptation of customs from both native and alternate cultures; and *cultural transmutation*, an alteration of native and alternate cultural practices to create a unique subcultural entity [Mendoza, 1989, p.373].

The participant observation of many CSIRO commercialisation arrangements suggested that very often neither party's system of values and norms alone provides an adequate basis for the interface's culture. Often social action at the interface seems to restructure roles, boundaries, perceptions and expectations so much that a completely new backdrop is needed to cope with the new patterns of interaction. (This need clearly existed with two of the four interfaces to be examined in the present study: the MMP and I<sup>2</sup> interfaces, described in chapter 5 and at the beginning of Volume 2.)

It would seem from this that Mendoza's *cultural transmutation* and *cultural incorporation* might well be more efficacious forms of acculturation in commercialisation interfaces than *cultural shift*.

It is also arguable that cultural transmutation may prove to be a more efficacious basis for acculturation than cultural incorporation, to the extent that the former has the potential to provide a more flexible, environment-responsive, 'purpose-built' cultural system. But at the same time, the precise opposite can be reasoned: Cultural incorporation should be more effective, because the interface culture thereby created tends to contain more that is known to the parties, and more that is likely to cushion their transition into what can be a strange and disconcerting social situation.

## 2. Leadership and Facilitation of Cultural Change

Among theories from sociology and anthropology on leadership of cultural change during formation and consolidation of supragroups, the collection of ideas brought together under Barth's editorship in his 1969 book, *Ethnic Groups and Boundaries* is perhaps the most instructive. Barth and his colleagues present a number of perspectives which give every sign of helping to understand the social processes driving the entry of researchers (in particular) into commercialisation interfaces.

Having identified the importance of *agents of change* - "the 'new elites': the persons in the [minority] groups with greater contact and more dependence on [the broad society]" (p.33) - Barth identifies the strategies available and attractive to these influential characters:

- (i) they may attempt to pass and become incorporated in the pre-established industrial society and cultural group;
- (ii) they may accept a 'minority' status, accommodate to and seek to reduce their minority disabilities by encapsulating all cultural differentiae in sectors of non-articulation, while participating in the larger system ... in the other sectors of activity;
- (iii) they may choose to emphasise ethnic identity, using it to develop new positions and patterns to organize activities in those sectors formerly not found in their society, or inadequately developed for the new purposes [p.33].

Barth proceeds to identify implications of these strategies. Under the first, the agents' ethnic group will be "denuded of its source of internal diversification" and will probably remain as a culturally conservative ethnic group with a relatively low rank in the larger social system. Adoption of the second strategy "will prevent the emergence of a clearly dichotomizing poly-ethnic organization, and ... probably lead to an eventual assimilation of the minority". Adoption of the third strategy "generates many of the interesting movements that can

be observed today ..." (Barth, 1969, p.33).

It is to this third of Barth's strategies that Siverts turns. Whereas Barth (and he is supported by Haaland: 1969, pp.70 and 71) describes leaders of cultural change readily "chang[ing] their label so as to avoid the costs of failure", resulting in "a flow of personnel from one identity to another and *no* change in the conventional characteristics of the status" [p.133], Siverts explains leadership of cultural change in the opposite terms. Agents of change (in the ethnic group he was studying), says Siverts,

while boasting of their knowledge of Ladino ways, do not aspire to be accepted as Ladinos but are rather anxious to obtain recognition in their own society. ... The Indian highlander is always an Indian whether at home or interacting with Ladinos. ... his Indianhood is the very basis for interaction [Siverts, 1969, pp.115 & 116].

According to Siverts (p.111), leading and facilitating cultural change through a merging/integration of cultures demands that this bond with the 'old' culture be broken suddenly, with resolution and "a complete transposition, involving the abandonment of home, family and whole way of life". The agent of change takes desperate measures - "the only way out when everything else seems to fail" - and becomes resigned to starting off at the bottom of the broader society. Only this approach to entry to a new culture, says Siverts, will engender the motivation and commitment necessary if the cultural change leader is to successfully loosen boundaries between the 'old' and the 'new' cultures.

One line of reasoning in ethnic studies that cuts directly across Siverts' notion of a sudden and desperate breaking of bonds with the 'old' culture, and provides an alternative approach for examining

leadership of acculturation in commercialisation, is put forward by Eidheim (1969). Through his concept of *identity management*, Eidheim proposes a 'double life' approach to leading cultural change: "Under the disability of a stigmatized ethnic identity", members of a minority ethnic group try to "qualify" themselves as full participants in the broader society by developing "techniques to avoid or tolerate sanctions" from opinion leaders in that society (Eidheim, 1969, p.40). These techniques hinge on distinct spheres of interaction that define and maintain an *identity dichotomy* (p.40). According to Eidheim,

each party turns to ethnically closed stages to interpret and discuss the idiomatic content of public encounters with reference to identity. ... It is in the articulation between these two, i.e. in the routine of establishment of public stages versus ethnically closed stages that the organizational significance of identity emerges most clearly [pp.48 & 49].

This process is also described by Ballis Lal using Blumer and Duster's concept of *dualisms*: "subordinate groups vacillating between an insistence on their own 'specialness' and thus reinforcing solidarity among group members, or emulating the behaviour of a dominant group in an effort to improve the rank order of the group as a whole" (Ballis Lal, 1986, p.228). Ballis Lal captures the dilemma for groups and their members and leaders "at the base of the social, economic and political structure":

whether to celebrate and retain their 'likeness' (which some may feel consigns them to the base), or whether to emulate and assimilate. *These two contradictory attitudes may be held by different members of the group at the same time* [Ballis Lal, p.288, quoting Blumer and Duster; emphasis added].

Eidheim, Ballis Lal, Blumer and Duster (see also Sherif, 1966, p.69) would all stress how important it is for management practices, and in-

deed the whole 'spirit' of a commercialisation interface, to permit if not encourage key participants, during the early stages of acculturation, to 'live' in both cultures simultaneously, or to alternate between the cultures.

The degree of dislocation and displacement of beliefs and preferences often experienced in researchers' entry into commercialisation interfaces arguably warrants analogy with Siverts' "precarious livelihood ... at the bottom of the social ladder", Eidheim's "sanctions from the local [interface] population" and Blumer and Duster's survival "at the base of the social, economic and political structure". There would seem to be a good chance that these theories on leadership of cultural change in the merging or integration of groups into a society will be helpful for understanding the particular form of merging/integration into a supragroup taking place in the commercialisation interface.

So review of literature from anthropology and structural sociology identified two areas of theory judged likely to illuminate how a commercialisation interface can develop a coherent and well defined cultural system, with a likely return to interface effectiveness. The first area relates to the structural basis for creating this cultural system, and how elements of one or both parties' cultural system are incorporated into it. The second area of theory relates to leadership of cultural adaptation; theoretical perspectives identified focused on the importance of both a sudden, resolute break with change agents' 'old' culture and "identity management"/vacillation between their 'old' and 'new' cultures. These perspectives from theory on ethnic adaptation will contribute to the analytical framework to be applied in later chapters.



### C. ACCULTURATION THEMES FROM ORGANISATIONAL STUDIES, AND RELATED AREAS

It seems likely that theory focusing on particular aspects of the acculturation of commercialisation interfaces could provide a valuable complement to the quite broad, sometimes diffuse perspectives articulated in the preceding section. A closer focus on the particular management challenges posed by commercialisation interfaces, for example, or the particular new behaviour they demand, might be instructive.

The literature of organisational studies seems likely to provide such a closer focus. Organisational acculturation is a fragmented part of organisational studies, which until recently seems to have been researched in a somewhat patchy fashion. Two particular approaches to organisational acculturation seem most suitable to draw on here, because they give signs of a sound basis in sociology, social psychology or directly related areas, and they embody processes that seem to be critical in the acculturation of commercialisation interfaces. One of these approaches has to do with acculturation in the course of *takeover of one company by another*, while the other concerns the re-definition of organisational boundaries in the course of increasingly common forms of *company mergers*.

Sales and Mirvis describe the coming together of two quite different corporate cultures in the course of a takeover. They explain how that takeover resembles "the contact between two societies that results from the migration of peoples, a military invasion, and the annexation of territory". In all such contacts, say Sales and Mirvis, "each phase ... poses unique problems for the culture involved in the transition and the ways these problems are resolved ultimately affect cultural integrity" (Sales and Mirvis, 1984, p.109).

Reasoning from several of these types of intercultural changes and adaptations, Sales and Mirvis formulate a quite conventional four-by-two matrix of forms of acculturation, embodying two forms of integration (multiculturalism and pluralism), two forms of assimilation ("melting pot" and "pressure cooker"), two forms of rejection (withdrawal and segregation), and two forms of deculturation (marginality and ethnocide). On the basis of observations from their corporate takeover, they discuss, largely inconclusively, what determines which of these approaches to acculturation each party will adopt, and when (or whether) that approach will be transformed into one of the other approaches.

Sales and Mirvis then move on to make what seems to be their most valuable (and certainly their most concrete) contribution to knowledge on organisational acculturation. This addresses the important but often neglected task of *managing a culture in transition*. While Sales and Mirvis's reasoning relates to culture-merging/integration *in takeovers*, their conclusions seem to be general enough to apply to boundary changes that are closer to mergers (like the creation of commercialisation interfaces).

Ultimately, Sales and Mirvis articulate (1984, p.131) four crucially important, reasonably discrete aspects of managing the coming together of culturally diverse groups:

- \* "strategic and emotional preparation" for entering the interface, and "rehearsal of [the] possible implications";
- \* the early development of ground rules for cross cultural

contact;

- \* "management of internal processes of polarization, evaluation and ethnocentrism, as well as interface conflicts resulting from differences in philosophy, values and behavior"; and
- \* "scanning of ~~the~~ culture and its reexamination following change".

This approach furnished by Sales and Mirvis seems likely to be especially helpful for examining acculturation of commercialisation interfaces. It should enable identification of any preparation, rehearsal and 'culture-threat management' in the interfaces to be investigated in this study. It should also be able to establish whether those activities avoided (or at least gave notice of) culture-based 'catch-points', and whether they aided smooth acculturation, and perhaps ultimately interface effectiveness.

There were signs from the participant observation of many CSIRO commercialisation ventures that at least one of the steps in Sales and Mirvis's approach - early development of ground-rules for cross-cultural contact - often features in ventures that turn out to be generally successful. At the same time, generally *unsuccessful* arrangements seemed often to have given little attention to either "strategic and emotional preparation" or "management of internal processes of polarization, evaluation and ethnocentrism".

Sales and Mirvis's approach concentrates on *management* of culture-integration and cultural incompatibilities. The thrust of the present

study towards the social forces impacting on key participants near important intercultural boundaries makes it desirable to complement this management-oriented perspective with a *boundary-oriented* perspective. Organisation theory providing this perspective is introduced by Badaracco (1988). Badaracco's work has its genesis not so much in theories of social or cultural integration as in American business philosophy: specifically, in the work of Drucker, and in reaction to Sloan's 'one-boss/one-hierarchy/one-culture' philosophy.

Badaracco examines merging of organisations (companies, but his themes clearly apply to other organisations as well) in certain domains of activity. He observes that "changes are taking place on the boundaries of firms, rather than at their core, where analysts and observers have, for decades, sought and found them" (1988, p.67). Traditional boundaries between organisations are being blurred or replaced by co-operative networks.

The implications of this blurring for organisational roles, expectations and interactions, and for actors' orientations, knowledge and power, are profound, according to Badaracco (1988, p.67). Close, intimate relationships are established between separate organisations. There is genuine sharing of authority, decision-taking and management. "Firms are neither fully independent nor is one wholly dependent on the other" (Badaracco, 1988, p.73). Most importantly, company cultures are opened to outside influences.

Kanter identifies the direct impact of this "coalitional view of organizations" on the very values and priorities of managers and employees of organisations. She sees "less 'inside' that is sacred - perman-

ent, untouchable, unchangeable people, departments, business units, or practices - but more outside that is respected" (Kanter, 1991, p.74).

Establishment of a commercialisation interface amounts to an accentuated, discontinuous, formally mandated case of breaking down interorganisational boundaries. Badaracco's reasoning suggests a rudimentary approach for assessing how well the parties to each of the interfaces to be examined in this study coped with changing organisational and cultural boundaries. It also suggests certain qualities and ways of thinking people will need in these entirely new organisational environments. A short-list of such qualities/ways of thinking would include (see Badaracco, 1988, pp.78 to 85, and Kanter, 1983, p.28) the ability and willingness to manage by politics, not by authority; to manage by monitoring, not by directing; to serve more than one master; to share decision-taking (notably with those from different cultural backgrounds); to manage sideways and upwards, as much as downwards; and to think in an integrative way, rather than the segmented way that is well adapted to traditional monolithic forms of organisation.

But these predispositions and abilities, like the ideas raised by Sales and Mirvis, still centre on *management* behaviour and responses to management forces. It would seem useful for analysing acculturation of the particular type of multi-organisation arrangement encountered in commercialisation, for the analytical framework to encompass behaviour of *interface participants other than managers* near intercultural boundaries: provided such a framework does not become too diffuse.

Such a focus becomes available if one moves from Badaracco's conceptualisation of changing boundary conditions in, and around, organisat-

ions, to Habermas's theory on the same subject, and in particular on the restructuring in recent years of the public and private spheres of individuals in organisations and societies. Habermas argues that people's thinking and behaviour is now exposed to much more scrutiny in the public domain than they have been used to. He illustrates this through identifying changes in the functions performed by, and expected of, *the family* in contemporary society. Over a period of years and decades the family has lost many of its traditional functions. More particularly, the family has

lost its power to shape conduct in areas considered the innermost provinces of privacy ... Private autonomy was maintained not so much in functions of control as in functions of consumption ... all aspects not directly relevant to task performance [were eliminated] from intra-familial relationships ... individual family members are now socialized by extrafamilial authorities, by society directly [Habermas, 1989, pp.155 & 156].

Habermas describes the threat some people perceive when expected to participate in interactions that are so much in public view (see also Webb and Worchel's reasoning about possible bases of this threat: 1986, p.222). The perception of threat will perhaps be exacerbated where critical aspects of the social situation are ill-defined and where actors' knowledge of the subject is lacking in some respects (as has been argued previously often to be the case in commercialisation interfaces).

If individuals nowadays are to continue to have access to the private-domain channels of communication and interaction that were once the norm, says Habermas (1989, p.158), they must 'opt into' an arrangement that allows this. If the circumstances make this impossible or impractical, Habermas argues that the people whose activities are mainly

affected by this change can themselves play a significant part in mitigating its detrimental effects on them and on their group's functioning. They can do this through the seemingly simple step of becoming reconciled with the new pattern of communication, authority and "commodity control".

Earlier discussion identified the apparent detrimental effect in some commercialisation interfaces that have been observed for several years, of people's reluctance to share their information and thoughts. Accordingly, Habermas's reasoning on reconciliation with the inevitability of public-domain 'socialising' in contemporary society would seem to be as instructive here as in his analysis of the family.

Specifically, acculturation of commercialisation interfaces can be expected to be smoother and more complete if the participants have accepted the practical implication of Habermas's message set out in the preceding paragraph: Thinking and behaviour in the interface must be as open as thinking/behaviour in the 'private' domain of the company group or laboratory (or the even more private domain of the research group within the laboratory).

The discussion in this section reviewed theory from organisational studies and related areas, to identify two perspectives likely to illuminate how a commercialisation interface's cultural system can develop more smoothly and more completely: with a likely return to interface effectiveness. The first perspective relates to preparation and rehearsal for, and management of, culture-threat and cultural change; the second to people's willingness or keenness to behave and think openly in the 'public' domain represented by the interface. Both

perspectives will contribute to the analytical framework to be applied in later chapters.

#### D. SYMBOLIC REPRESENTATIONS OF IMPORTANT INTERFACE PROCESSES AND CONCEPTS

Many of the processes and concepts identified in the preceding discussion amount to, or are directly based on, the use of symbols in one way or another. The importance of symbol analysis in group-development generally has been widely discussed (see Morgan, Frost and Pondy, 1983, p.13 in particular; and Elder and Cobb, 1983, p.35 in particular).

Research on the use of symbols in the social development of *organisations* like companies or bureaucracies seems likely to have specific implications for the acculturation of commercialisation interfaces. Morgan, Frost and Pondy represent organisations as "miniature societies with a distinctive social structure, reflected in various patterns of action, language, discourse, laws, roles, ritual, custom, ceremony, norms, folklore, stories, beliefs, myths, etc" (1983, p.18); that is, with distinctive symbolic structures. Furthermore

Every topic which the organizational researcher studies has a symbolic aspect of some kind. ... By using the functioning of symbols as an added lens, a deeper and more comprehensive understanding of organizations is possible ... [This] may provide a key for unlocking new understanding of organizational activities and processes [Morgan et al, 1983, pp.31, 70 & 200].

Anthony Cohen also urges more attention to the role of symbols in organisation development. Symbols contain the meanings that an organisational group needs to operate effectively:



Symbols 'express' other things in ways which allow their common form to be retained and shared among the members of a group, whilst not imposing upon these people the constraints of uniform meaning, and ... continuously transform the reality of difference into the appearance of similarity with such efficacy that people can still invest the 'community' with ideological integrity [Cohen, 1985, pp.18 & 21].

It is important, says Cohen, to 'get inside' the symbolic constructs of any organisational group, and "to look *outwards* from its core" (Cohen, 1985, p.20). Concepts like Triandis's "subjective culture", which focuses on ethnic groups' idiosyncratic ways of perceiving their environments (Triandis, Vassiliou, Vassiliou, Tanaka and Shanmugam, 1972), and Bochner's "faulty attributions" (Bochner, 1982, p.17) give a hint of just how valuable this sort of analysis of symbolic representation could be for developing understanding of acculturation of commercialisation interfaces.

A broader conceptualisation like the symbolic structures of interfaces, which underpins virtually all aspects of acculturation, should complement the more specific leadership and boundary perspectives introduced in the preceding section.

A number of fundamental issues in symbolic representation raised by Cohen and by Elder and Cobb seem to be directly relevant to commercialisation interfaces' development of a coherent cultural system.

Cohen highlights the facility for symbols to "'express' ... things in ways which allow their common form to be retained and shared among the members of a group, whilst not ... compromising their individuality", and to disguise status differentiation and/or leadership arrangements (Cohen, 1985, p.34). At the same time, communities 'import' symbolic-

ally based structural forms, but "infuse them with their own meanings and use them to serve their own symbolic purposes ..." (Cohen, 1985, pp.18 and 37).

Elder and Cobb place a deal of weight on the use of symbolic language and symbolic behaviour by powerful groups to maintain their control in areas where it is threatened, and by weaker groups to increase their support (Elder & Cobb, 1983, pp.129 & 130).

Preliminary observations from the interfaces to be examined in this study suggest widespread strategic use of myths, organisational stories, ritual and visions in many of the contexts described by Cohen and Elder and Cobb. In an attempt to provide a focus for drawing on the use of symbolic representations to understand the acculturation of commercialisation interfaces, the following discussion will concentrate on just one process: *the use of symbols to smooth over specific gaps between the different 'worlds'* of participants, including their use to address the very real 'culture shock' that can come from the initial contact of these 'worlds'. The significance of intercultural gaps in commercialisation was demonstrated in chapter 1.

The challenge of closing intercultural gaps between researchers and business-development people, and attaining a better 'meshing' of these two cultures, is discussed by Dubinskas, in an analysis of social processes in genetic engineering firms (Dubinskas, 1985). He attributes a significant part of "the culture chasm" between scientists and (business-trained) managers in these companies to the two populations' different *time perspectives* and the attitudes flowing from this difference (Dubinskas, 1985, pp.26, 30 & 74). Broadly similar conclusions

are reached by Klimstra and Raphael (1992), Landau (1992), and Geisler and Rubenstein (1989).

But this difference is arguably only one of a number of important contributors to Dubinskas's "culture chasm". The participant observation of many CSIRO commercialisation ventures suggested a number of other contributors: most of them also flagged in the literature. They include apparent differing perspectives and interpretations of the concepts of *investment*<sup>3</sup> (see Latour and Woolgar, 1979, pp.190 to 192), *national interest*,<sup>4</sup> *commitment* (see Geisler & Rubenstein, 1989, pp.47 to 49), *co-operation*, *competitiveness*, *compromise* (see Geisler & Rubenstein, 1989, pp.45 & 46), and *forms of accountability* (see Klimstra and Raphael, 1992).

These many research-industry intercultural gaps cast doubt on whether a focus on the use of symbolic representation to close these gaps will narrow down the subject to a manageable scope. It seemed to be necessary to look at more specific contexts within which symbolic representations are used to close research-industry intercultural gaps. To this end, a directly relevant specific usage of symbolic representation was identified in Bourdieu's conceptualisation of *the transition of a 'lay' person into the political world* (Bourdieu, 1991).

Bourdieu attributes the difficulties of that transition to the entrant's frequent failure to

adhere to the principle of the oppositions which produced the arguments that generated ... distinctions ... between two words or two turns of phrase in a crucial debate, programme, platform, motion or resolution [p.185].

So lay persons' failure to understand the profound significance of some issues stems from their inability to come to grips with the degree of polarisation that drives the political world. Nothing, says Bourdieu, "either in the institutions or in the agents, the acts or the discourses they produce, has meaning except relationally, by virtue of the interplay of oppositions and distinctions" (Bourdieu, 1991, p.185).

This overwhelming inability to comprehend the basic premises that drive the other culture has much in common with Toffler's explanation of culture-shock in the form of future shock (Toffler, 1970, especially chapter 6), and Bochner's explanation of role-shock and role-strain (Bochner, 1982, p.17 et seq.).

Preliminary observations from the interfaces to be examined in this study and the participant observation of many CSIRO commercialisation ventures, supported by Geisler & Rubenstein (1989, pp.44 & 45), suggest that Bourdieu's observations may well help greatly to understand the acculturation of commercialisation interfaces. This observation and literature suggest that uncertainties and challenges often experienced by researchers entering the commercial world can centre on exposure to the 'warring camps' of competing companies, where so much effort goes into establishing and amplifying differences between products and services, with no middle ground and little willingness to compromise or share.

Much of the literature on symbolic representation would suggest that the creative, strategic use of symbols can go a long way towards cushioning this shock of sudden entry to such an alien world. It can be

expected that those interfaces in which symbols are used creatively and positively (especially by the researchers) to reconcile and explain polarised values and perspectives in the techno-commercial world will be relatively open, flexible, cohesive and focused. Those interfaces in which the parties use symbolic representation either rarely or in a negative, defensive fashion, to discredit or criticise their partner's ways, can be expected to be significantly less effective.

#### E. VALUES, NORMS, ATTITUDES AND PREFERENCES OF PARTICIPANTS: CULTURAL THEORY

Chapter 1 emphasised the importance, in developing a commercialisation arrangement's *Gemeinschaft* basis, of *both* the social/management conditions in the venture *and* cultural influences. This raises the notion that a combination of social/management and cultural perspectives could help also in identifying theory likely to illuminate how the values, norms, attitudes and preferences brought into the interface by the participants affect behaviour in the interface and social structuring of the interface; and perhaps thereby interface effectiveness.

Perhaps the second of the two aspects of cultural adaptation identified in section A of this chapter could best be illuminated, then, by theory that integrates earlier social *and* cultural influences on the thinking and behaviour of interface participants.

Through relating culturally-acquired behavioural orientations to the social (or management) environment in which the person lives (or works), *theories of social space* perform exactly this integration.

Douglas explains how important it is to be able to characterise "the package of ideas and values that are going to surround anyone once a

pattern of social relations is chosen", because "each pattern of rewards and punishments moulds the individual's behaviour" (Douglas, 1982[a], p.3). People will be unable to make sense of their surroundings unless they can develop principles to give guidance on how to behave, and this guidance will come (inter alia) from their social context. Under social space-based approaches, "most values and beliefs can be analysed as part of society instead of as a separate cultural sphere" (Douglas, 1982[a], p.7).

Thompson has argued at length the importance of this theoretical link between social environment and culture-based worldviews: see Thompson, 1982, pp. 33, 323 & 324; Thompson, Ellis & Wildavsky, 1990, p.21; and Schwarz and Thompson, 1990, p.54.

Like Douglas, Thompson and their colleagues, Bourdieu, through his concept of the *habitus*,<sup>5</sup> theorises about links between people's social experiences and their worldviews. People who occupy adjoining positions in social space "are placed in similar conditions and submitted to similar conditions, and have every chance of having similar dispositions and interests, and thus of producing practices that are themselves similar ..." (Bourdieu, 1990, p.129). Accordingly there is a need, says Bourdieu, to improve our understanding of how experience in a particular social environment influences cultural perspectives of people who reside side-by-side in social space.

Gluckman also relates individuals' personal outlooks and preferences to their social experiences. He identifies two modes of social interaction, taking place respectively through a "simplex" social system, where people play highly specialised roles in single-stranded highly

specific relationships, and a "multiplex" social system, where people "confront each other repeatedly and frequently in the contexts of other activities" (Cohen, 1985, p.28). Again the point is that fundamentally different outlooks on the world and on the approaches necessary to cope with the world's challenges, come from inhabiting each type of social system.

The participant observation of many CSIRO commercialisation ventures described in the preamble suggested that the values, norms, attitudes and preferences of researchers and the social/management arrangements in which these cultural predispositions and orientations had largely been formed, were indeed often interdependent. There were suggestions, for example, that CSIRO's more successful leaders of commercialisation ventures tend to have a more adventurous and open outlook on working with industry. There were also suggestions that they tend to come from a CSIRO division or research group (or both) whose management philosophy and structure have long been (by CSIRO's standards) flexible, adventurous, open-minded and applications-oriented.

It follows from this discussion that major questions for this study concern, first, the extent to which experiences acquired in a particular social/management environment contribute to people's cultural predispositions and orientations relevant to participation in commercialisation, and, second, whether these predispositions/orientations help understand facilitators of, and impediments to, cultural adaptation in commercialisation.

Of social space approaches, the one apparently offering most to the present study is Douglas's *cultural theory*. In recent years cultural

theory has been applied along a number of lines that emphasise its relevance to commercialisation interfaces. Bloor and Bloor (see later in this section), for instance, have worked on the employment of scientists in industry.

Cultural theory has the advantage over other potentially useful social space approaches of being a more fundamental theory; as Thompson, Ellis and Wildavsky say (1990, p.97), cultural theory actually "seeks to explain why [individuals or groups] want what they want as well as how they go about getting it", whereas other theories tend to explain only the latter.

Cultural theory also has a notable dynamic capability (see Thompson et al, 1990, p.69; Ostrander, 1982, p.29; Schwarz and Thompson, 1990, p.70) which could be especially useful for illuminating the quite rapid cultural adaptation often observable in commercialisation.

Furthermore, cultural theory offers the distinct advantage of succinctly defining social space through two largely independent dimensions. As Thompson, Ellis and Wildavsky say, a

virtue of [cultural theory's] framework is that the categories are formed from dimensions rather than being derived ad hoc from observation. ... By generating a mutually exclusive and jointly exhaustive set of categories for the domain of social life, this typology meets the logical requirements of classification [1990, p.14].

Cultural theory's two dimensions should readily be able to be related to the sorts of variables forming the basis of this study, and seem particularly likely to meet the needs of analysing the acculturation of commercialisation interfaces.



Elements of cultural theory especially likely to illuminate acculturation of commercialisation interfaces are articulated in the remainder of this section.

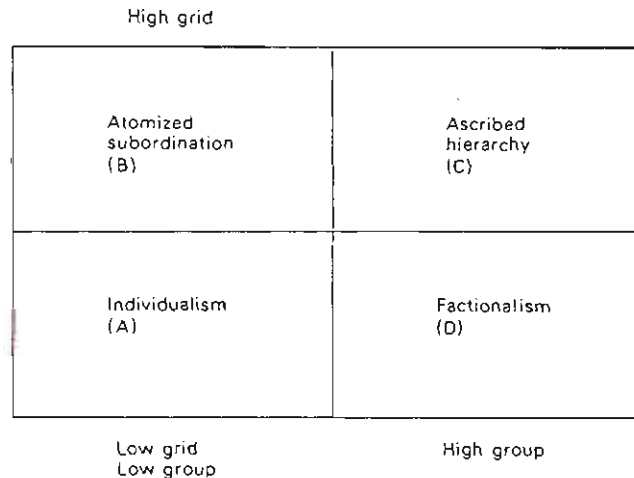
The conceptual base of cultural theory is a 2x2 matrix characterising any individual's position in social space. This matrix is defined by two orthogonal dimensions: *grid*: "the degree to which an individual's life is circumscribed by externally imposed prescriptions"; and *group*: "the extent to which an individual is incorporated into bounded units" (Thompson, Ellis & Wildavsky, 1990, p.5). Following the reasoning given above, the matrix defines the "cosmological correlates" (Ostrander, 1982, p.24) of a person's social experience. Douglas's description of the "four possible social environments in which an individual may be found" and their ramifications (Douglas, 1982[a], p.4) is presented in the box on the following page.

Schwarz and Thompson (1990, pp.61 et seq) document the views of the world that can be associated with positions in this social space, and label those in each of Douglas's segments A, B, C and D (see figure in the box) respectively "individualists", "fatalists" (Rayner calls them "stratified individuals": 1986, p.585), "hierarchists" (or "bureaucrats": Rayner), and "egalitarian group members". Schwarz and Thompson succinctly summarise characterisations often attached to those in each segment, and their interdependence (also see Thompson, Ellis and Wildavsky, 1990, pp.4 & 89 to 97):

## BOX:

## CULTURAL THEORY'S FOUR SOCIAL ENVIRONMENTS

Douglas's diagrammatic representation of the four grid/group environments (Douglas, 1982[a], p.4) is:



Douglas describes the characteristics of location in each segment as follows:

Square A (low grid, low group) allows options for negotiating contracts or choosing allies and in consequence it also allows for individual mobility up and down whatever the current scale of prestige and influence. Square B ((high grid, low group) is the environment which ascribes closely the way an individual may behave. In any complex society some categories of people are going to find themselves relegated here to do as they are told, without the protection and privileges of group membership. Square C is the environment of large institutions where loyalty is rewarded and hierarchy respected: an individual knows his place in a world that is securely bounded and stratified. Finally, square D is defined by the terms of the analysis as a form of society in which only the external group boundary is clear: by definition all other statuses are ambiguous and open to negotiation. The two-dimensional diagram presents a set of limits within which the individual can move around [but] it is not possible to stay in two parts of the diagram at once [Douglas, 1982(a), p.4].

Thompson, Ellis and Wildavsky define an additional area of the grid/group matrix, covering the autonomous way of life based on withdrawal "from coercive or manipulative social involvement altogether" (Thompson *et al*, 1990, p.7). This is the zone of the hermit: "a relaxed and unbothered self-sufficiency" (Thompson *et al*, 1990, p.10). But this zone has no relevance to the sorts of interaction under discussion here, and will not be mentioned again.

Hierarchists trim and prune social transactions until they fit neatly into their orderly ambit, individualists pull them into the marketplace, egalitarians strive to capture them into a kind of voluntary minimalism ... and fatalists endure with more or less dignity whatever comes their way ... Individualists ... need the hierarchists to enforce the law of contract, the hierarchists need the fatalists to sit on top of, the egalitarians need the inegalitarian excesses of the individualists and the hierarchists to criticise, and so on [Schwarz and Thompson, 1990, pp.8 & 142].

Cultural theory can illuminate attitudes towards, and commitment to, *roles and occupations* in modern society (where social experience will be largely dictated by the management arrangements). Making sense of one's surroundings and choosing "intellectual strategies" for "survival in a particular pattern of social relations" (Douglas, 1982[a], p.7) will inevitably be centrally important for the social situation in which one spends one quarter or one-third of one's time, and in which one often has a high commitment and emotional investment. As Mars says,

Occupations can, in fact, be treated as cultures and the way a job is actually structured 'on the ground' can be assessed by using the grid and group dimensions. ... People at work ... need a fit between what they do and the justifications, explanations and excuses they can give for doing it. ... the pressures on people towards making such a fit are socially determined and they cover the processes of selection (and self-selection is important here), training, and the operation of social controls that are exercised when training is over and incorporation in a job is complete [1982, pp.25 & 34].

Two directions of application of cultural theory to employment situations, and to the behaviour/thinking of people in employment, that are directly relevant to the present study will now be discussed.

Bloor and Bloor (1982) report an empirical application. They reconstructed the 'standard' cultural theory dimensions and the four grid/

group segments to make them more meaningful to the company situations hosting the industrial scientists constituting their study, and investigated whether "knowing the position of a scientist on the grid/group diagram allows us to predict the picture of science and nature that scientists will discern in their experimental work" (Bloor & Bloor, 1982, p.83). Bloor and Bloor conclude that

... in a largely unselfconscious way, people do describe their social experience in a fashion that can be related to the grid and group axes. Things that the scientists said which were just so much background material, sprang into prominence ... Although the task of operationalising the central concepts of grid and group has only just begun, it proved impossible to resist the conclusion that here was a tool of analysis that genuinely allows progress to be made [p.102].

Douglas raises a major methodological question about this form of application of cultural theory. She asks "Did these types select their social niches or did they, in one year, adapt so thoroughly as to suggest a perfect match?" (Douglas, 1982[a], p.13). Mars (1982, p.35) discusses the same issue. He identifies three ways in which a person can accommodate "lack of fit between job and cosmology":

[I]f a person cannot adapt his values, beliefs and attitudes to suit the job's demands, he can resign and withdraw mentally from the conflict; secondly he can suffer breakdown; or thirdly, he may survive incompatibility [through] alienation.

Indications are that the employment situations examined through the present study seldom demanded "mental withdrawal", "breakdown" or "alienation". Whereas Bloor and Bloor's scientists had a year before filled an existing niche in a longstanding and already well established group, the participants in the interfaces to be analysed here had mostly been in their CSIRO or company management/social matrix for

much longer. Indeed mostly they had played a prominent part in actually creating the laboratory or company group and in defining its management and institutional arrangements, values and priorities, and thereby in shaping their own social space.

It seems that the present study can afford to apply cultural theory with somewhat less trepidation than Bloor and Bloor could.

The second direction of application of cultural theory in employment situations in science/technology is along theoretical lines. David Bloor investigates (after Lakatos, 1976) how mathematics and individual mathematicians cope with deviations from, and anomalies to, accepted mathematical theories and expectations (Bloor, 1982).

These deviations/anomalies are conceptualised as *monsters*, or pathological cases, rather than simply as counterexamples. Bloor articulates the different ways mathematicians in the various grid/group segments have for coping with monsters: from *monster-barring* (whereunder monsters are not acknowledged as such, but are somehow fitted into the mathematician's existing classificatory scheme: suitably expanded or changed) to *monster-adjusting* (whereunder the monsters themselves are adjusted so that they can be seen to fit into the existing classificatory scheme). Caneva (1981, pp.107 to 110, & 115) associates four well defined categories of monster-handling (monster-assimilation, embracing, adjusting and barring) with the four grid/group segments.

If scientists' outlooks on the place and value of various types of scientific work (Bloor and Bloor) and on various breeds of 'monsters'

(David Bloor, and Caneva) can be related in this way to social environment and the associated worldview, it seems reasonable to argue that a scientist's or technologist's views on entering and participating in certain types of research-industry interaction can also be related to the person's position in social space and the associated worldview. It should be readily possible to predict certain types of commercialisation arrangements that sit well with a researcher's or a company person's social space-derived orientations and preferences, and other types of arrangements that violate those orientations/preferences (that is, are 'monsters'). It should be possible ultimately to predict an influence of these outlooks on the effectiveness of the commercialisation interface.

The basis of this study's application of cultural theory, then, is that the theory can predict both patterns of cultural orientations and preferences characteristic of interface participants coming from the various segments of social space, and the likely influence of those orientations/preferences on cultural adaptation in the interface (and perhaps thereby on interface effectiveness). Determining whether or not the connection between orientations/preferences and social/management environments obtains for the participants in commercialisation interfaces, and whether this assists in illuminating interface cultural adaptation and effectiveness, will be an important part of the analysis in later chapters.

#### **F. MANIFESTATION OF CULTURAL THEORY IN COMMERCIALISATION INTERFACES**

'Looking backwards' from each interface (see chapter 1) to identify how participants' 'cultural baggage' encourages or discourages effective cultural adaptation in commercialisation interfaces requires the

generation of predictions for cultural influences on *the specific dimensions of social behaviour* identified in the preceding chapter and the first half of the present chapter. This section generates these predictions.

Given the large number of dimensions of social behaviour involved, a general procedure is needed for doing this. This procedure largely follows from the discussion in section E of chapter 1 which identified issues often apparently of widespread concern to people entering commercialisation interfaces. These issues and how they are addressed can be expected to play an important part in determining enthusiasm for, and commitment to, a particular interface, and perhaps thereby in influencing interface effectiveness.

Review of these issues shows most of them to have a high loading on two basic aspects of social interaction: *interpersonal relations*, and *approaches to the unfamiliar and the unknown*. These two aspects of interaction can therefore be expected to provide a sound base for looking at how cultural theory can be expected to manifest itself in commercialisation interfaces.

It seems advisable to add a third aspect of interaction directly reflecting the common subject matter researchers and company people actually deal with in all commercialisation interfaces: *science and technology*, and in particular the best means of profitably using science/technology in developing new commercial products and processes.

How cultural theory is expected to manifest itself in commercialisat-

ion interfaces will therefore be articulated through these three aspects of the behaviour and thinking of people participating in commercialisation interfaces: their behaviour and thinking bearing on interpersonal relations, approaching the unfamiliar and the unknown, and science and technology and its effective use. Cultural theory's manifestation in commercialisation interfaces is articulated in these terms in Appendix 1. The driving forces for behaviour in interfaces of people from each segment of social space, identified through the reasoning in Appendix 1, are summarised in Table 3.

TABLE 3

DRIVING FORCES FOR BEHAVIOUR OF PEOPLE FROM EACH SEGMENT  
OF SOCIAL SPACE, EXPECTED TO MANIFEST THEMSELVES  
IN COMMERCIALISATION INTERFACES  
(identified through the reasoning in Appendix 1)

**Low Grid/Low Group Segment (Individualists):**

- \* Sense of urgency
- \* Situations raising profile and strengthening self-centred network
- \* One-to-one relationships (especially relationships with fellow specialists), rather than team membership
- \* Catholic choice of friends/associates
- \* Risk-taking and learning from mistakes
- \* Entering the unknown; keenness on intercultural dealings
- \* Adaptation of own standards to make anomalies less anomalous
- \* Cosmopolitan basis of rewards
- \* Rewards for the individual to whom they are due
- \* 'Organic' social/management arrangements
- \* Informal, ad hoc management

**High Grid/Low Group Segment (Fatalists):**

- \* Insecurity, diffidence
- \* Fate
- \* Malleability and helplessness; readiness to take on others' values, norms, symbols
- \* Eclectic collection of worldviews
- \* Excitement of new challenges

[Table 3 continued on following page]



TABLE 3 (continued)

**DRIVING FORCES FOR BEHAVIOUR OF PEOPLE FROM EACH SEGMENT  
OF SOCIAL SPACE, EXPECTED TO MANIFEST THEMSELVES  
IN COMMERCIALISATION INTERFACES**

**High Grid/High Group Segment (Hierarchists):**

- \* Focus on roles, "the system" and orderliness
- \* Role definition and complementarity
- \* Risk-aversion: unless decisions are made by experts whom they accept
- \* Blame-shedding
- \* Thorough sounding out of the ground before entering unknown territory; keeping research and commercial development separate
- \* Keeping even the most anomalous within the existing conceptualisations
- \* 'Local' basis of rewards
- \* Formal, systems-based management: planning, reporting and detailed assessment

**Low Grid/High Group Segment (Members of Egalitarian Groups):**

- \* Distrust of, and scepticism about, others
- \* Fear of other groups' influences on them; fear of takeovers; fear of how others do things
- \* Careful and conservative working with those from other cultures; much attention to clarifying other culture's agenda
- \* Resistance to pressure to bend their standards
- \* Simple/naive explanations of events and relationships
- \* Allowing conflict to smoulder
- \* Blaming "the system" for wrongs
- \* Preference for open, transparent management
- \* Having as many transactions as possible pass into the public domain

It would be possible at this point to relate these key manifestations of cultural theory to *all* the dimensions of social behaviour identified in chapter 2 and the first half of this chapter. But the large number of those dimensions means this would require considerable effort, and it is sensible to look ahead to the following two chapters, where a preliminary analysis of these dimensions' influence on interface effectiveness is formulated and carried out. The outcome of that preliminary analysis is summarised in Table 9, in chapter 5.

It will be seen from that table and the discussion immediately following it that 23 of the total of 34 dimensions of social behaviour identified in chapter 2 and the first half of this chapter ultimately come through the preliminary analysis. It would not be sensible to articulate predictions from cultural theory for the other 11 dimensions of social behaviour, because people's social space-generated orientations and preferences necessarily could not have acted to encourage or reinforce the influence of those dimensions on interface effectiveness. This could not have happened because those 11 dimensions are shown through the preliminary analysis to be most unlikely to have had any such influence.

Furthermore, for some of the 23 dimensions of social behaviour judged most likely, prima facie, to influence interface effectiveness, it did not prove possible to generate meaningful predictions from cultural theory. It was sometimes not feasible to identify ways in which (for example) individualists' behaviour defined by a particular dimension should differ from hierarchists' behaviour. What will be articulated in the remainder of this section is therefore the predicted effect of people's values, preferences and priorities identified through cultural theory, in encouraging or reinforcing *between one-third and one-half* of the 34 dimensions of social behaviour identified in chapter 2 and the first half of this chapter. These predictions are generated in Appendix 2, and the conclusions summarised in Table 4.

TABLE 4

PREDICTED INFLUENCE OF PARTICIPANTS' POSITIONS IN SOCIAL SPACE,  
ON EACH DIMENSION OF SOCIAL BEHAVIOUR

(summarised from Appendix 2)

Dimension of Social Behaviour	Predicted Effect of Grid/Group Position on Behaviour: Dichotomy between	
Willingness/keenness to identify & pursue shared goals & a shared sense of purpose	Hierarchists, who will and be willing/keen to operate in this mode	Individualists, who will be at least indifferent and sometimes hostile towards operating in this mode
Intimacy of the contact	Individualists & fatalists, who will be relaxed about working in close relationships with those from another culture	and Egalitarians, who will resist or be ill-at-ease in close relationships
Keeness to emphasise intercultural similarities, & explode intercultural myths	Hierarchists & egalitarians, who will respect intercultural differences	and Individualists, who will be keen to explode intercultural myths
Willingness to preserve partner's most cherished & valued differences & self-respect	Hierarchists, who will be at least willing and often keen to preserve their partner's differences	and Individualists, who will be reluctant to compromise on their own ambitions just to preserve their partner's differences & self-respect
Willingness to re-think old ways & ideas	Individualists, who will be willing if not keen to abandon no-longer-suitable old ways	and Hierarchists, who will be reluctant to abandon no-longer-suitable old ways
Attitudes towards goodwill trust	<p>In this case a trichotomy among:</p> <p>Fatalists, who will work best in situations of high trust</p> <p>Egalitarians, who can be expected to show little trust</p> <p>Individualists, who will promote feelings of distrust at the same time as distrusting others</p>	

[Table 4 continued on following page]

TABLE 4 (continued)  
 PREDICTED INFLUENCE OF PARTICIPANTS' POSITIONS IN SOCIAL SPACE,  
 ON EACH DIMENSION OF SOCIAL BEHAVIOUR

Avoidance of conflict & keeping conflict that does arise at a low level	Individualists, who will show little evidence of striving for low levels of conflict	and	Hierarchists & fatalists, who will prefer to avoid excessive conflict & to limit any conflict that does develop
Attitudes towards conflicts that question the basic assumptions on which the relationship is founded	Hierarchists & fatalists, whose attitudes will exacerbate effects of 'founding principles' conflicts	and	Individualists, who will be indifferent towards the basis of such conflicts
Keeness to use power strategically, to pre-emptive ends	Hierarchists, who will be keen to exercise whatever power they have in this way	and	Individualists, who will be keen to exercise whatever power they have in a more impulsive way
Coping with organisational uncertainty in critical areas	Individualists, who will thrive in such situations	and	Hierarchists, who will be ill-at-ease in such situations
Attitudes towards constitution of the interface on a basis of less than cultural pluralism	Individualists, who will demand their incorporation on a full culturally pluralist-id basis	and	Fatalists and hierarchists, who will be indifferent to whether the venture is based on cultural pluralism
Preparation & planning for, & management & consolidation of, cultural change	Hierarchists, who will welcome steps to these ends	and	Individualists, who will prefer minimal planning, with cultural change materialising with little announcement

**G. CONSOLIDATION OF THE DIMENSIONS OF SOCIAL BEHAVIOUR, AND THE CULTURALLY-ACQUIRED VALUES, NORMS, ATTITUDES AND PREFERENCES, IDENTIFIED THROUGH THE THEORETICAL PERSPECTIVES**

The social processes and forces at work as a commercialisation interface evolves as a small group (which were discussed in the preceding chapter) necessarily manifest themselves against the background provided by *the interface's cultural system*. The first half of this chap-

ter reviewed theory from sociology, anthropology, organisational studies and related areas, to identify perspectives most likely to assist in understanding important influences on *the process* of formation of that system, and perhaps ultimately most likely to assist in understanding important influences on interface effectiveness.

Apparently helpful theoretical perspectives were reviewed in section B, through the work of several theorists from ethnic studies; namely Smith, Mendoza, Barth, Siverts, Eidheim, Ballis Lal, and Blumer and Duster. Important dimensions of social behaviour identified through these perspectives relate to the basis of pluralism on which the interface is constituted; the precise way in which constituent cultures are drawn on; sudden discontinuous break with 'old' culture; and identity management/vacillation.

Apparently helpful perspectives were also reviewed, in section C, through the work of theorists from organisational studies and related areas; namely Sales and Mirvis, Badaracco and Habermas. Important dimensions of social behaviour identified through these perspectives relate to the examination/rehearsal/assessment/consolidation of culture-threat and cultural change; and participants' reconciliation with working in the commercialisation interface as a public domain.

Section D reviewed theory on the role of symbolic representations in formation and operation of supragroups of various types. Themes in this area were focused through reasoning furnished by Bourdieu. An important dimension of social behaviour identified related to the way in which symbolic representations are used to address intercultural gaps.

Altogether, the literature reviews carried out in chapter 2 and sections B to D of the present chapter identified 34 dimensions of social behaviour likely to contribute fundamentally to explaining interface effectiveness. The seven dimensions summarised in the three preceding paragraphs are to be added to the 27 identified through the review in chapter 2 (which were consolidated in Table 2). Together, these 34 dimensions of behaviour provide the basis for the framework that will be the vehicle for the analysis to be carried out in later chapters.

But it is necessary to impose some structure onto this framework. A convenient first breakdown of the dimensions of behaviour comes from the three broad categories that provided the structure for the literature reviews.

Ten of the dimensions (identified through the review in the first half of chapter 2) address and attempt to explain *integrative forces on the development of small groups*. Another 17 of the dimensions (identified in the second half of chapter 2) address and attempt to explain *potentially divisive forces on the development of small groups*. The remaining seven dimensions (identified in the first half of this chapter, and summarised earlier in this section) address and attempt to explain *development of a supragroup's cultural system*.

Review of the dimensions appearing in these three categories suggested that the first two categories were significantly less homogeneous than the third. The dimensions of behaviour constituting the first category ranged from those focusing on fundamentally different ways people in commercialisation interfaces approach key interface relationships (through, for example, seeking to preserve the partner's most valued

differences), to those focusing on aspects of the interface's intergroup structural base (like the degree of status balance between the parties' representatives, and the degree of intimacy in relationships that is permitted or encouraged in a particular situation).<sup>6</sup> The dimensions constituting the second category fall very clearly into the same two sub-categories in which they were discussed in chapter 2: to do with conflict and power respectively.

It seemed likely that a framework consisting of relatively homogeneous sets of manageable numbers of dimensions of social behaviour would be best placed to identify and articulate the key influences on interface effectiveness. It was therefore decided to break down each of the first two of these three categories of potentially helpful dimensions into sub-categories along the lines described in the preceding paragraph. So the dimensions to do with integrative forces on the development of small groups were sub-divided into dimensions mainly addressing how participants fundamentally approach interface relationships, and those mainly addressing the interface's intergroup structure.<sup>7</sup> The dimensions to do with potentially divisive forces on the development of small groups were sub-divided into conflict-based and power-based dimensions.

The resulting five-way categorisation of dimensions of behaviour provides the theoretical base for the framework for the analyses to be carried out in later chapters. This framework constitutes Table 5.

TABLE 5

THE FRAMEWORK FOR THE ANALYSIS TO BE CARRIED OUT IN LATER CHAPTERS

The Dimensions of Social Behaviour Constitute the Five Elements of the Analytical Framework, Which Concern Respectively:				
How Partici- pants Approach Key Interface Relationships	Interfaces' Intergroup Structure	Conflict in Interfaces	Power in Interfaces	Development of a Supra- group's Cul- tural System
Emphasis of intercultural similarities	Identificat- ion/pursuit of shared goals	Development of excessive conflict	Strategic use of power to pre-empt- ive ends	Basis of in- corporation into the interface
Preserving partner's valued diff- erences	Intimacy of contact	Handling ex- cessive con- flict	Attempts to spread own social val- ues	Way of draw- ing on con- stituent cultures
Abandonment of unsuit- able old ways	Status bal- ance between parties' re- presentat- ives	Maintaining conflict at too low a level	Coping with uncertainty in critical areas	Sudden, dis- continuous break with 'old' cul- ture
Goodwill trust	Category-in- dependent roles	Number of conflicts	Use of meta- power/relat- ional con- trol	Maintaining links with 'old' cul- ture
	Strong & consistent management support	Flexibility/ rigidity of social system within which conflict devel- ops	Institution- alised decen- tralisation	Preparing for and con- solidating cultural change
	Reliance on contract at expense of trust	'Founding assumptions' conflicts		Willingness/ keenness to work in the 'public' do- main
		Conflicting groups' ap- peal to their members' per- sonalities		Use of sym- bolic repre- sentation to address intercultur- al gaps
		Focus of con- flict		

[Middle column of Table 5  
continued on following page]



TABLE 5 (continued)

THE FRAMEWORK FOR THE ANALYSIS TO BE CARRIED OUT IN LATER CHAPTERS

Conflict in Interfaces (continued)
Transfer of conflict-learned behaviour to non-conflict situations
Conflicting orientations towards the conflict <u>per se</u>
Conflict's reduction of intellectual resources
Regulated channels for conflict-resolution

It was argued in the second half of the chapter that the influence on interface effectiveness of the values, norms, attitudes and preferences brought into the interface by the participants can be understood through applying *theories of social space*. *Cultural theory* is the particular social space-based theory argued to be most likely to offer fundamental insights into cultural adaptation in this situation, and ultimately into contributors to interface effectiveness. Predictions for how cultural theory will manifest itself in commercialisation interfaces by acting to encourage or reinforce the individual dimensions of social behaviour, were summarised in Table 4.

Cultural theory is pivotal to the study, because it provides one of two 'cross-linking' concepts that bind together the analyses of a large number of influences on interface effectiveness. It is the basis for the process of 'looking backwards' from the interface, towards participants' culturally-acquired values, norms, attitudes and preferences in their former social/management situation, which should provide answers to the third of the study's research questions (see chapter 1). 'Looking backwards' should be a key tool for increasing commercialisation managers' awareness of the *Gemeinschaft* side of the commercialisation process (also see chapter 1). A better appreciation of participants' thoughts, motives and concerns as they actually approach involvement in the interface (as can be provided by cultural theory) should encourage commercialisation managers to complement their well documented attention to the contractual and administrative basis of commercialisation, with at least a reasonable amount of attention to the human factors.

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### Notes to chapter 3:

1. While the integration of ethnic groups into wider communities normally poses no question of which is the minority group, this is not always so clear in the case of commercialisation interfaces. It will sometimes be the case that *both* sets of participants are in effect from minority cultures; the interface, even though it is constituted solely by representatives of the partners, constitutes the wider community, and sometimes it can do so for both (or all) groups coming together to make up the

interface. At the same time, the entry of each group into a commercialisation interface often can have an immediate profound effect on the interface and its system of values and norms. Indeed the entry of one of the groups can provide much of the supragroup's cultural base. This contrasts with an ethnic group's entry into the wider community, which may expand or enrich the community in some ways, but is likely to have a mainly localised effect.

2. This discussion is restricted to the situation where there are only two constituent groups, although of course there can be more, and indeed there are more than two constituent groups in some of the interfaces to be examined in this study.
3. Many CSIRO commercialisation interfaces suggest that researchers tend to envisage investment in terms of single projects, and indeed single parts of single projects. They also tend to restrict the concept to 'hard' investment: cash and 'costable' inputs. Signs are that business people, on the other hand, tend to adopt a much broader definition: one that relates 'pure' investment to outputs and programmed inputs and regards the output from a present investment ultimately becoming the investment for some other activity. Their conceptualisation of 'investment' therefore seems to be based on continuity and strategy, as opposed to researchers' pragmatism and limited strategic horizons.
4. Again, there were signs from CSIRO commercialisation ventures that many industrial leaders and industrial research/technology

managers tend to see "national interest" as being embodied completely in a healthy corporate sector: increased profits for companies equate to national well-being, and an effective research-based industrial venture is one that quite simply furthers the company's interests and well-being. There were suggestions that many researchers, on the other hand, see this perception as shallow and incomplete, and perhaps almost perverted. They seem to believe that 'national interest' surely must have more dimensions than these, exclusively profit-driven ones.

5. *Habitus*: People's "mental structures through which they apprehend the social world" (Bourdieu, 1990, p.131), and which makes for "a world of common sense, a social world which seems self-evident" (p.132).
6. These structural aspects of the social-intercultural basis of the supragroup constituting the interface are to be distinguished from, although ultimately they are inevitably related to, structural aspects of *the underlying formal administrative commercialisation arrangement*. These latter aspects will be discussed in chapter 4, and will be taken up in the 'looking sideways' parts of each analysis.
7. There was a degree of arbitrariness in this second level of breakdown when it came to one or two dimensions of social behaviour. The dimension "identification/pursuit of common goals", for instance, has a foot in each of the 'approach to interface relationships' and the 'interface's intergroup struc-

ture' camps. Opportunities and encouragement to contribute to development of shared goals, and to set about genuinely pursuing those goals, can be expected to come prominently from *both* the participants' ways of approaching interface relationships *and* the intergroup structural details in a particular situation. With these dimensions it was necessary to choose the subcategory more appropriately regarded as containing the dimension concerned.

## **CHAPTER 4**

### **ESTABLISHING, INTERROGATING AND ARTICULATING THE CASE STUDIES**

## CHAPTER 4

### ESTABLISHING, INTERROGATING AND ARTICULATING THE CASE STUDIES

#### A. INTRODUCTION

This chapter describes the methodology and approach for applying the analytical framework developed in the preceding chapter to investigate the study's research questions, which were articulated in chapter 1. It follows from the research questions that the analysis of data from the interfaces to be looked at in the study must incorporate two main steps, directed to identification and elucidation of

- \* The influence on interface effectiveness of the dimensions of social behaviour constituting the analytical framework, *in their own right*.
- \* *Any encouragement or reinforcement of that behaviour*, coming from either culturally-acquired values, norms, attitudes and preferences brought into the interface by the participants or implications of the characteristics of the underlying formal administrative commercialisation arrangement. This second step in the analysis is based on the processes of 'looking backwards' from the interface (with the aid of cultural theory), and 'looking sideways' from the interface (with the aid of a categorisation of the 'hard' characteristics of each of the underlying formal commercialisation arrangements). These processes inject into the analysis the interfaces' cultural/historical and structural/contemporary contexts, the importance of which was demonstrated in chapter 1.

Taken at face value, the first step in the analysis would comprehensively investigate the influence on interface effectiveness of all 34 dimensions of social behaviour constituting the analytical framework. However as foreshadowed previously, the effort involved in the analysis can be reduced significantly by applying a suitable preliminary analysis of the likely influence on interface effectiveness of each of those dimensions. This will permit the full detailed analysis, carried out in chapters 6 to 10, to be restricted to examining the influence of behaviour that has been shown to be more likely, prima facie, to have a significant influence on interface effectiveness.

The study therefore requires methodology and an approach for carrying out this preliminary analysis, as well as for initially collecting the data and for carrying out the full detailed analysis. Accordingly, this chapter describes, and where necessary develops, methodology and an approach to be used later in the thesis to three ends:

- \* *Accessing and collecting the data for the study*, including identifying the commercialisation interfaces to be studied (section B).
- \* *Preliminary analysis of the likelihood of a particular dimension of behaviour influencing interface effectiveness* (section C).
- \* *The full analysis* in chapters 6 to 10 (section D).

## B. ACCESSING AND COLLECTING THE DATA FOR THE STUDY

Two broad needs guided the choice of how many interfaces and what sorts of interfaces were likely to generate the most helpful data.



On the one hand, clearly it would be necessary to go into each interface in substantial detail. The effect on interface effectiveness of the parties' and their representatives' behaviour and thinking as they resolve conflicts or develop trust in their relationship (for example), can be fully understood only through looking at close quarters at the behaviour, perceptions, values and priorities of the people concerned. This depth of study, which is consistent with studies of such aspects of interpersonal, intergroup, interorganisational and intercultural interaction reported in the literature, meant that the study could not realistically encompass more than a handful of commercialisation interfaces.

On the other hand, the variability across commercialisation arrangements in the types of participant, types of technology, communication patterns, complexity, duration and the other relevant descriptive variables, made it desirable to encompass as many different types of interface as feasible. Only inclusion of a reasonable sample of interfaces would enable conclusions to be generalised at all widely.

The approach that seemed best to reconcile these conflicting demands was a *case study* approach. Such an approach entails in-depth examination of a small number of interactions selected for the range of relevant issues they raise, and generalising from them conclusions that are likely to apply to the class of social situation in question (see Becker, 1970, pp.75 et seq).

Several arguments determined what sorts of case studies would best meet the investigation's needs. These arguments centre on which research laboratories and which types of companies the case studies

should come from, what stage of evolution the projects should desirably be at, and a number of pragmatic considerations likely to affect the validity and/or the reliability of data. They are summarised in Appendix 3.

Based on the reasoning in that appendix, four CSIRO-company case studies were chosen from the hundred or more ventures potentially available, and from the approximately 20 actively investigated as possibilities. The four chosen, as well as their wide variation in terms of both the characteristics of commercialisation ventures and the social processes apparently important in commercialisation, are summarised in chapter 5 and described in detail at the beginning of Volume 2.

It seemed reasonably clear at the outset of the investigation that the most useful data would come from approaching the case studies through a field investigation of some description. The inflexibility and preconception that are the essence of most documentation-review and questionnaire/survey approaches (by contrast) would clearly be anti-thetic to some of the needs.

For instance, the lack of guidance through earlier studies of this subject made it desirable that the approach provide adequate opportunity for ongoing development of hypotheses during data gathering, as further angles and issues emerged. Becker places a premium on methodology which both "seeks to discover hypotheses as well as to test them", and permits "analysis [to be] carried on *sequentially*, important parts of the analysis being made while the researcher is still gathering his data" (1970, p.27, emphasis as in original; see also Hill, 1970, p.324). (In fact, some of the most profitable lines of

analysis in this study were developed significantly after preliminary examination of some of the data. This was especially helpful for defining the four measures of interface effectiveness: openness, flexibility, cohesiveness and focus.)

In addition, if it was to help understand the practicalities of commercialisation, the approach adopted needed to get to the heart of "a particular organization or substantive problem rather than demonstrat[e] relations between abstractly defined variables" (Becker, 1970, p.26). Arguably, a good way of doing this is to focus on relatively few important events in each interface, rather than on broad ongoing operating arrangements.

In many ways, the needs pointed to a field study based on *the observer as a participant* in the social/management situation of the informants. Becker (see especially chapter 2, "Problems of Inference and Proof in Participant Observation", in Becker, 1970) argues persuasively that participant observation copes very well with the needs identified in the two preceding paragraphs. Appendix 3 notes 'offers' of case studies received in advance of the project, and there seems little doubt that these offers could quite easily have been translated into full participant observation studies, with the author 'living in' one or a few (but probably only one) of the interfaces for an extended period.

Clearly, such an approach would have capitalised on the author's experience with CSIRO's commercialisation activities (see the preamble). Becker identifies the value of data-gathering strategies that capitalise on selective, balanced use of such experience; it can facilitate alternation between (for example) 'playing dumb' and being knowledge-

able about issues, and between the general and specific manifestations of problems and issues (Becker, 1970, pp.50, 60 & 61). While the author's background may well have been a valuable adjunct to any data-gathering approach, it would probably be best used through a highly interactive face-to-face approach (like participant observation).

But there were strong strategic and pragmatic arguments against an approach based on this extreme form of interaction with those in an interface. Participant observation would risk losing any advantage of remoteness, disinterest, confidence or flexibility coming from the role of *the stranger* (or "the marginal man, the newcomer, the sojourner, the dual man, the cosmopolitan": Harman, 1988, p.11), discussed by Simmel. As Simmel says, the stranger

approaches [the group] with the specific attitude of "objectivity" ... he often receives the most surprising openness - confidences which sometimes have the character of a confessional and which would be carefully withheld from a more closely related person ... [Simmel, 1950, p.404].

Because [the stranger] is not involved enough to affect the outcome of anything he is told, he does not pose a threat; yet he is a compelling listener by virtue of his objective stance. ... [The] stranger is culturally competent ... while social variables exclude him from being regarded as one of the "own" [Harman, 1988, p.18].

In addition, there was danger that participant observation could have:

- \* restricted the investigation to a single case study, which may have prevented generalised conclusions (see Becker, 1970, p.80);
- \* encountered difficulty with the infrequent face-to-face contact in some commercialisation interfaces (with participant observation sometimes being largely restricted to observing periodic

meetings, occasional visits and telephone calls);

- \* raised fears about relatively uncontrolled access to commercially confidential information and to CSIRO people's innermost thoughts at a time when CSIRO's commercialisation dealings were being increasingly scrutinised by important stakeholders; and
- \* been divisive. Because parts of some interfaces were located overseas, the participant observation might have been not so much in the interface, as in one or another of its constituent groups.

On the balance of these advantages/disadvantages of each approach, it was decided that the best data would probably come from an approach somewhere near mid-way between participant-observation and 'stranger-observation'. Facets of each approach judged to be practicable in this situation and unlikely to jeopardise the validity of the data, were incorporated into relatively lengthy, informal, non-directive interviews with key participants in each interface. Arrangements for the interviews, for capture of the data from them, and for guarding against widely discussed dangers in collecting data through field studies of this type, are described in Appendix 4.

The interviews remained in approximate balance between participant-observation and 'stranger-observation'.

On the one hand, the investigator's familiarity with the process of commercialising technology from publicly-funded research as well as with much of the scientific subject matter of the case studies, taken

with the unstructured, informal interviews and the opportunity for relatively close interaction, took the interviews significantly along the dimension of participant observation.

On the other hand, too much participation in the interviewee's social situation was obviously out of the question; everyone knew that this was largely a single encounter, with little prospect of anywhere near the level of ongoing intimacy associated with a full participant-observer approach. It was clear that the investigator, while having "the stranger's" "cultural competence" in the eyes of the laboratories (at least), was practically excluded from membership of either laboratory group or company group.

This balance enabled the essential advantages of both participant-observation and 'stranger-observation' to be drawn on. The intimacy of participant-observation was called on, for example, in framing follow-up questions to informants' comments. Some of these subsidiary questions could have come only from a questioner reasonably familiar with local politics and the 'ins-and-outs' of the research group or the company group concerned. The remoteness of 'the stranger', on the other hand, was called on (for example) to elicit additional, or deeper, information through claiming ignorance of what an informant was talking about.

The impression formed early on in the interviews, and retained throughout the study, was that the balance in these terms was about 'right' for effective collection of wide-ranging valid data. This was confirmed through 'stock-takes' on the data being collected, carried out during the interview program. There was no evidence of either

interviewees becoming frustrated with the ('stranger') investigator's naivety or lack of knowledge and understanding, or sensitivity about an interview getting 'too close to the bone' as a result of the relative intimacy coming from the investigator's partial participation in the interviewee's social situation.

Comprehensive *written material*, in the form of a full up-to-date file in the CSIRO division or institute, complemented the interview data for three of the case studies.<sup>1</sup> Although this included published material (advertisements, newspaper articles), it was mostly unpublished material (final and draft agreements, correspondence between the parties, submissions to management/government, board papers, minutes of meetings, file notes). Much of the material was confidential on commercial or other grounds.

This material was reviewed about nine months after most of the interviews had been conducted, and at least the broad pattern of social/intercultural events and processes was articulated from it. Notes were taken from the material, and copies were taken of several dozen pages on each venture, bearing on the most critical social/intercultural events and processes. This material became central to the case summaries, serving as a valuable means of both validating and giving depth to views provided in the interviews. It sometimes enabled new perspectives to be gained.<sup>2</sup>

### C. PRELIMINARY ANALYSIS OF THE INFLUENCE ON INTERFACE EFFECTIVENESS OF DIMENSIONS OF SOCIAL BEHAVIOUR: AN INTERFACE'S CULTURAL 'SHAPE'

The preliminary analysis of the likely influence on interface effectiveness of each dimension of social behaviour is based on a comparison

between evidence of that behaviour at work in each case study, and the four interfaces' different levels of *conduciveness to effective social interaction*.

This comparison demanded a suitable measure of each interface's "conduciveness to effective social interaction". Use of such a measure would mean that those dimensions of social behaviour whose effect is markedly at odds with the implications of the measure would not need to be examined in the full detailed analysis in chapters 6 to 10; such dimensions would necessarily be most unlikely to have fundamentally influenced interface effectiveness.

For example, suppose this broad measure of conduciveness to effective interaction suggests that one particular interface of the four in the case studies is likely to be more effective overall than the other three. And suppose a particular dimension of social behaviour is shown to have played a prominent part in, say, two or perhaps all three of these latter interfaces that are apparently less conducive to effective interaction, but no significant part in the one interface that is apparently more conducive to effective interaction.

The effect of this dimension is the opposite of the effect expected of a dimension that strongly influenced interface effectiveness; this dimension is tending to *increase* the effectiveness of *less effective* interfaces, and to play no part in accounting for the effectiveness of the one *more effective* interface. Accordingly, such a dimension would necessarily be most unlikely to have contributed fundamentally to interface effectiveness, so it would not be worth looking seriously at it through the full detailed analyses.



Some other dimension *would* be subjected to the full analyses to be carried out in chapters 6 to 10, if it related in the opposite way to the interfaces' conduciveness to effective interaction: that is, if it played a prominent part in the one interface that is apparently more conducive to effective interaction, but no significant part in the interfaces that are apparently less conducive to effective interaction. It would be distinctly possible that this dimension contributed fundamentally to the overall effectiveness of the interfaces.

The four indicators of interface effectiveness articulated in chapter 1 - the interface's openness, flexibility, cohesiveness and focus - cannot themselves (taken either singly or in combination) be used as this preliminary measure of an interface's conduciveness to effective interaction. Some of these indicators are not readily measurable without detailed examination. Nor are these variables perfectly correlated; an interface's openness can be high (for example) while its flexibility and focus are low.

So this preliminary analysis demanded identification of some other practical, functional and 'user-friendly' initial measure of an interface's conduciveness to effective interaction. It would be helpful if this measure was able to estimate an interface's likely openness, flexibility, cohesiveness and focus *at different times*, because the interface's apparent effectiveness at the times of the interviews and the review of written material could be atypical of its effectiveness over a longer period. Both the participant observation of many CSIRO commercialisation ventures and preliminary observations from the case studies in this investigation suggested that it would be wise for this preliminary analysis to be based on a longer term view.

The basis for such an estimate of an interface's conduciveness to effective interaction was to be found in the interface's overall *cultural character*. Consistent with the thrust of the study, an interface's "cultural character" is represented here through the boundary processes occurring between the constituent parts of the interface's cultural system. Wallman has described how well boundary processes can encapsulate cultural systems. She suggests three specific facets of cultural boundaries that capture the essential cultural dimensions of social systems: "the nature of the boundary; the dynamics of the relation between its two sides; and the context or 'structural ecology' of the boundary process" (1986, p.230).

It was reasonably clear from the participant observation of many CSIRO commercialisation ventures over the 1980s (described in the preamble) that *differences in boundary permeability* often distinguished between generally more effective ventures and generally less effective ones.

In more successful ventures, boundaries *within* the interface tended to encourage interpenetration of the parties' values, attitudes and preferred ways of behaving, and the boundary *around* the interface tended to stake out the important values, norms, attitudes and preferences of the interface itself as a small group. Mostly the cultural system shared by the parties accounted for a large part of the interface's own cultural base, although sometimes other repositories of values, norms, attitudes and preferences (like the industry's or a third party's) were also significant. Sometimes the parties' contributions to the interface's cultural system seemed to have been about equal, while sometimes that cultural system incorporated many more of one party's values, norms, attitudes and preferences than the other's.

And this observation also showed that in the generally *less effective* CSIRO ventures over many years, internal boundaries often *discouraged* interpenetration of parties' ideas, thoughts and perspectives, while the external boundary often failed to define all that clearly the interface's own key values, norms, attitudes and orientations.

These sorts of 'conductive' or 'unconductive' cultural boundary systems are also clearly at work in studies of social/intercultural aspects of innovation/commercialisation drawn on in preceding chapters (like the Dubinskas, 1985; Frosch, 1984; Goldhor and Lund, 1983; Martin, 1991; and Geisler and Rubenstein, 1989 studies): even if those studies seldom actually analyse boundary structures and dynamics per se.

These observations suggest that those commercialisation interfaces most likely to be conducive to effective interaction will be those whose cultural boundaries show:

- \* much sharing of values, norms, attitudes and preferences between the parties;
- \* that 'pool' of values/norms/attitudes/preferences to account for most of the interface's cultural base; and
- \* the interface's own cultural base itself to be well demarcated.

The boundary relationships applying in any interface would seem to be well captured by a simple diagrammatic 'snapshot' of interface *cultural 'shapes'*. Ten main types of interface cultural 'shapes' were identified from the more than one hundred CSIRO commercialisation ventures

monitored and analysed over the 1980s in the way described in the preamble. These 'shapes' are portrayed in the diagrams in Appendix 5, where the patterns of communication, understanding, collaboration and commitment most likely to be associated with each are also set out.

Such simple diagrammatic representations of interface cultural boundary systems seem either explicitly or implicitly to pick up most important interface boundary processes and issues, like Wallman's "nature of the boundary", "dynamics of the relation between its two sides" and "context or 'structural ecology' of the boundary process" (Wallman, 1986). It seems possible, for example, to deduce with a reasonable degree of confidence from any one cultural 'shape' the commonality of values, norms, expectations and preferences across each boundary, the likely main behavioural inclinations and orientations of people operating from positions near the boundary, and the boundary's roles in the eyes of each party.

Analysis of interfaces' cultural 'shapes' should enable the interfaces in the case studies to be divided at least into two categories: those interfaces likely to be more conducive to effective interaction and those likely to be less conducive to effective interaction.

The reliability of this categorisation can be increased by giving attention also to *changes in* each interface's cultural 'shape' over the interface's lifetime.

An interface's cultural system can be argued to have become more conducive to effective social interaction if there has come to be more interpenetration of the parties' ideas, values and priorities, and

clearer demarcation of the interface's own cultural base. The diagrams were presented in Appendix 5 in a generally increasing order of both interpenetration of the parties' ideas, values and priorities *and* demarcation of the interface's cultural base. Clearly, a shift over an interface's lifetime from diagrams 1, 2 or 3 in Appendix 5 towards diagrams 4, 5 or 6, and from diagrams 4, 5 or 6 towards diagram 7, represents an improvement in cultural 'shape'. Of course, since diagram 7 represents an apparently culturally 'healthy' structure, it would be hoped that any interface whose cultural 'shape' starts off near diagram 7 will remain relatively unchanged in these terms.

A preliminary analysis of likely influence on interface effectiveness of each dimension of social behaviour, based on the approach developed here, will be carried out in the following chapter. Evidence of each dimension at work in the interfaces in the case studies will be compared, in the way described at an abstract level at the beginning of this section, with the estimate of each interface's conduciveness to effective interaction developed in this section. Only those dimensions that come through this preliminary analysis will be subjected to the full detailed analysis in chapters 6 to 10.

#### D. THE DETAILED ANALYSES IN CHAPTERS 6 TO 10: 'LOOKING BACKWARDS' AND 'LOOKING SIDEWAYS' FROM THE INTERFACES

Having first investigated the direct influence on interface effectiveness of a particular dimension of social behaviour alone, each of the analyses in chapters 6 to 10 will then

- \* 'look backwards' to investigate whether the participants' culturally-acquired values, norms, attitudes and behavioural preferences encouraged or reinforced that behaviour; and

- \* 'look sideways' to investigate whether characteristics of the underlying formal administrative commercialisation arrangement encouraged or reinforced the behaviour concerned.

To take as an illustration the first dimension of social behaviour identified from the theory in chapter 2 - willingness or keenness of the parties to identify and pursue shared goals and a shared sense of purpose in the venture:

Table 4 predicts from cultural theory that people from two segments of social space - the hierarchist and egalitarian group environments - will be keener or more willing to identify and pursue shared goals and a shared sense of purpose. Table 6, later in this section, will identify various characteristics of underlying formal commercialisation arrangements - such as relatively long duration - also expected to encourage the identification and pursuit of shared goals. The second step in each analysis in chapters 6 to 10 will investigate whether interface participants are in fact more inclined to identify and pursue shared goals and a shared sense of purpose, and whether any extra attention to shared goals/shared purpose is more likely to flow through to make interfaces more effective, where these contextual factors are present.

Because the methodology for 'looking backwards' from the interface towards participants' 'cultural baggage' follows integrally from cultural theory, which was introduced and articulated in the preceding chapter, that methodology in effect has already been developed (see section F of chapter 3).

The methodology for '*looking sideways*' from the interface, on the other hand, stems not from theoretical perspectives articulated in earlier chapters, but from detailed reasoning from the characteristics of commercialisation arrangements. The key characteristics of commercialisation arrangements therefore must be defined, and each characteristic's implications for each dimension of social behaviour predicted.

The participant observation of many CSIRO commercialisation ventures (described in the preamble), preliminary observations from the case studies in this investigation, and the literature on social/intercultural aspects of commercialisation/innovation suggested that the essence of any commercialisation arrangement can be captured by the sets of key descriptors of its *content* and *form* introduced respectively in the boxes on the following two pages.

Table 6 (following the boxes) identifies which of these arrangement characteristics can be predicted to encourage or reinforce participants' behaviour along the dimensions constituting the analytical framework (Table 5). The reasoning used to predict which arrangement characteristics will act in this way in concert with a particular dimension of social behaviour is simple. To take again as an illustration the first dimension of social behaviour identified in chapter 2 (the adoption of shared goals and development of a motivation for pursuing them): It was simply reasoned that the parties to a commercialisation arrangement are more likely to articulate, adopt and pursue shared goals where:

[This reasoning is given on page 174,  
following the boxes and Table 6.]

**BOX:**  
**THE ESSENTIAL CONTENT CHARACTERISTICS**  
**OF COMMERCIALISATION ARRANGEMENTS**

**Descriptors Characterising the Type of Technology**

- \* The end the technology is aimed at attaining through the commercialisation arrangement: a new industrial **product**, a new or improved **method** for processing/manufacturing an existing product, or occasionally a combination of the two.
- \* The course through which the technology is intended to attain its end (see Roberts, 1988, p.27): through a single major 'big bang' (see Mensch, 1975), or a series of **incremental improvements**. A **product** has been classified here as a 'big bang' innovation if it is a major new product in terms of either value (that is, predicted turnover) or market niche (that is, it does a job very much better than products already available). A **process** is a 'big bang' innovation if it is a major new process, likely to produce a product via a fundamentally new route, with virtually the whole of that route being part of the innovation concerned. For another conceptualisation, see Johns, 1989.
- \* The stage to which the technology had been developed at the time the arrangement came into being: whether it had been developed to a **relatively advanced stage** by the laboratory alone (or, perhaps, with some other partner), or was being applied from a **relatively elementary stage**: perhaps even direct from 'raw' research. In the former situation, the venture will normally centre on later-stage activities (product design, process design, commissioning equipment and fault-finding), while in the latter situation it will encompass most parts of the 'development' phase of the R&D process.

**Descriptors Characterising the Technology's Relationship to Each Party's Business and Plans**

- \* Whether the product/process to be based on the technology is **part of an existing line of business** with which the party is familiar (even if the area covered by the arrangement *per se* might be untried), or a **new line of business**, with which the party is acquainted at no more than the broadest level (see Roberts, 1988, p.26).
- \* Whether the line of business of which the product/process will be part is **central and crucial** to the party's future, in the sense that the party will very likely 'sink or swim' on the strength of it, or **less central and crucial to the party's future**. Importance to a party's (and, conceivably, both/all parties') future can stem from the profile of the arrangement, the proportion of total activities the arrangement accounts for, and what the research group or the company has staked on the venture. Failure of a venture that is central/crucial to a party could jeopardise its future resources and support, or could even mean that the party will go out of business.



**BOX:****THE ESSENTIAL FORM CHARACTERISTICS OF COMMERCIALISATION ARRANGEMENTS****Type of Arrangement**

The fundamentally different classes of commercialisation arrangement, as described in Appendix 3(A).

**Definition and Formality of the Arrangement; Planning of the Arrangement; the Focus or Vision for the Arrangement**

Definition of each party's responsibilities and expectations, planning and forethought going into setting up the arrangement, and the extent of articulation of the arrangement's aims.

**Unanimity and Consistency of Support for the Arrangement from All Relevant Levels of Management**

Gupta *et al* (1987) identify many ways in which management support can influence the effectiveness of innovation: including through promoting integration, tolerating failure and consolidating reward systems.

**Identification of the Arrangement with One Person (or a Small Number of People) from One Party or the Other**

Some commercialisation arrangements are seen to be 'Smith's baby', rather than a genuine corporate venture.

**Duration of the Arrangement**

An arrangement can be set up for a total period of a month or two (as with some consultancy arrangements), or for many years.

**Complexity of the Arrangement**

Reflected in variables like the number of parties involved, differentiation of the parties' roles, and the legal complexity of the arrangement.

**Novelty, Sensitivity, Politicisation and Profile of the Arrangement**

Some commercialisation arrangements are conventional, uncontroversial, low profile and unpoliticised, while others are quite novel, touch on many sensitivities of stakeholders, and have a high profile in the relevant industrial or scientific communities.

**How the Arrangement Came About**

Appendix 6 gives a seven-way categorisation of channels through which commercialisation arrangements can be initiated. Two additional inter-related variables are also needed to capture fully how an arrangement came about: Which party played the main part in initiating it. Which party brought to bear more strength and passion in establishing it.

**The Balance Between the Parties' Power and Responsibilities**

Are responsibilities and power genuinely shared, or is it expected that one party will put in more effort?

TABLE 6

**COMMERCIALISATION ARRANGEMENT CHARACTERISTICS PREDICTED  
TO ENCOURAGE OR REINFORCE DIMENSIONS OF SOCIAL BEHAVIOUR  
CONSTITUTING THE ANALYTICAL FRAMEWORK (TABLE 5)**

Dimension of Social Behaviour:	Characteristics That Should Encourage or Reinforce This Dimension of Behaviour:
Focus on fundamental cultural similarities, explosion of intercultural myths	* The technology was not highly developed when the arrangement was entered into
Abandoning no-longer-suitable old ways	* The arrangement was novel, sensitive and/or politicised
Goodwill trust	* The arrangement came into being through collaboration between the parties, with enthusiasm from both parties
Shared goals, & motivation for attaining them	* The technology was not highly developed when the arrangement was entered into * The arrangement was highly articulated, planned, focused, and visionary * Strong and consistent management support for the arrangement * The arrangement was long-term * The arrangement came into being through collaboration between the parties, with enthusiasm from both parties
Intimacy of contact	* The technology was not highly developed when the arrangement was entered into * The arrangement was identified with one person or group within each party * The arrangement was long-term * The arrangement was novel/sensitive * The arrangement came into being through collaboration between the parties, with enthusiasm from both parties
Category-independent roles	* The technology was not highly developed when the arrangement was entered into * The arrangement came into being through collaboration between the parties, with enthusiasm from both parties
Brown's mechanisms for development of excessive conflict	* The arrangement had low definition & planning, & little vision * Weak & inconsistent management support for the arrangement * The arrangement was complex * The arrangement was novel and sensitive
Handling excessive conflict in accordance with Brown's approaches	* The arrangement had low definition & planning, and little vision * The arrangement was long-term

[Table 6 continued on following page]

TABLE 6 (continued)

**COMMERCIALISATION ARRANGEMENT CHARACTERISTICS PREDICTED  
TO ENCOURAGE OR REINFORCE DIMENSIONS OF SOCIAL BEHAVIOUR  
CONSTITUTING THE ANALYTICAL FRAMEWORK (TABLE 5)**

Brown's mechanisms for development of unhealthy low levels of conflict	* The arrangement was routine, non-sensitive unpoliticised and/or low-profile
Conflict about subjects that question basic assumptions on which the arrangement was founded	* Strength/passion shown by both parties when arrangement was being developed * The arrangement was highly articulated, planned, focused and visionary
Strategic use of power to pre-emptive ends	* The arrangement was highly articulated, planned, focused, and visionary * The arrangement was long-term
Use of meta-power/relational control	* The arrangement came into being mainly through unilateral action & enthusiasm from one party
Culturally pluralistic basis of incorporation	* The technology was not highly developed when the arrangement was entered into * The arrangement came into being through collaboration between the parties, with enthusiasm from both parties * Power and responsibilities were well balanced
Acceptance of basis of incorporation other than cultural pluralism	* The venture represents existing line of business for one partner, and new line of business for the other * The arrangement was novel/sensitive * The arrangement came into being mainly through unilateral action and enthusiasm from one party
Preparation & planning for, & management & consolidation of, cultural change	* The arrangement was highly articulated, planned, focused and visionary * The arrangement came into being through collaboration between the parties, with enthusiasm from both parties
Willingness/keenness to perform in the 'public' domain of the interface	* The technology was not highly developed when the arrangement was entered into * The arrangement came into being through collaboration between the parties, with enthusiasm from both parties
Constructive, open-minded, positive & co-operative use of symbols	* The arrangement was highly articulated, planned, focused, and visionary * The arrangement was novel, sensitive, politicised and/or high-profile

the technology was not highly developed when the arrangement came into being	because	in all probability, both parties would then necessarily have played a significant part in deciding the directions in which the technology would be developed: and the goals necessary to get there
the arrangement was highly articulated, planned, focused and visionary	because	other things being equal, articulation, planning, focusing and development of a vision would necessarily entail identification and adoption of overt goals
the arrangement had unanimous and consistent support from the management of both parties	because	such support would normally be forthcoming only after the goals of the venture had been clearly set out
the arrangement was long-term	because	commitment of both parties for a long term is likely only after the goals of the venture had been clearly set out
the arrangement came into being through collaboration between the parties, with enthusiasm from both parties	because	again, this would be more likely to have incidentally resulted in clear articulation of the venture's goals.

Not all the dimensions of social behaviour constituting the analytical framework appear in Table 6, because a number of the dimensions will be shown in chapter 5 to perform poorly in the preliminary analysis of likelihood of influence on interface effectiveness. It is sensible here (as it was also in chapter 3) to look forward to results of that preliminary analysis (summarised in Table 9), in order to avoid the futile step of identifying arrangement characteristics expected to act to encourage or reinforce those particular dimensions of behaviour.

In addition, it did not prove possible to predict any arrangement characteristics that should encourage or reinforce a number of the di-

mensions of social behaviour. Where this was the case, the particular dimensions have simply been omitted from Table 6.

However it is not enough to show through the analysis in later chapters that the characteristics of commercialisation arrangements identified in Table 6 were more often present when the corresponding dimension of social behaviour had an evident influence on interface effectiveness. This could be a product of nothing more than coincidence. One could be more confident that the arrangement's possession of these characteristics is significant for a particular dimension of social behaviour *if these characteristics can be shown themselves to have had a positive influence on interface effectiveness.*

To remain with the same example used earlier (identification/pursuit of shared goals): Arrangement characteristics' encouragement or reinforcement of the influence of this dimension of behaviour on interface effectiveness will be clearer if one thing can be shown. Not only should those interfaces in which identification/pursuit of shared goals positively influenced interface effectiveness be based on commercialisation arrangements having at least a majority of the five characteristics appearing opposite this dimension in Table 6. It should also be possible to show that the very presence of these characteristics in the arrangement positively influenced interface effectiveness.

The 'looking sideways' part of each analysis in chapters 6 to 10 therefore aims to discern any direct influence on interface effectiveness of implications of these arrangement characteristics, thereby addressing the study's fourth research question, set out in chapter 1.

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**Notes to chapter 4:**

1. Access to the CSIRO files on the fourth case study was also volunteered, but unfortunately it was found that shortly before they had disappeared while being transported between CSIRO/SIROTECH locations.
2. The written material on the MMP project (see chapter 5 and the description in Volume 2), for instance, unearthed a progress report to the government which emphasised both the extent of role-interchange taking place in this interface, and the prominence of MIM at one stage as a supposedly impartial source of advice to the government in this area of technology/industry. The material on the I<sup>2</sup> interface (also see chapter 5 and Volume 2) confirmed how immutable OPTUS management's commitment to I<sup>2</sup> for a limited period of two years was.

## **CHAPTER 5**

### **THE CASE STUDIES AND THEIR CHARACTERISTICS**

## CHAPTER 5

### THE CASE STUDIES AND THEIR CHARACTERISTICS

#### A. EACH CASE STUDY AND ITS MAIN DIRECTIONS OF DEVELOPMENT

Application of the approach and the methodology described in the preceding chapter identified four case studies, and generated the data to be analysed in the remainder of the thesis. The four case studies are termed DUNLENA, MMP (for "magnesium metal project"), I<sup>2</sup> (for "intelligent interface"), and SIROSCOUR. The first part of Volume 2 draws on the data collected to describe, for each of the case studies,

- \* the formal administrative commercialisation arrangement and its evolution;
- \* the broad course of development of the associated social interface;
- \* the interface's occupants, and their behaviour in important interactive events and processes; and
- \* key events and processes in the construction of the interface's system of values, priorities and preferred ways of behaving.

This section describes the establishment, constitution and concept of the arrangement providing the basis of each case study, and draws directly on the descriptions in Volume 2 to briefly summarise the main features of both the 'hard' arrangement and the associated social/intercultural interface.



## 1. DUNLENA

Over a period of several years up to the mid-1980s, CSIRO's (then) Division of Applied Organic Chemistry had synthesised a number of promising chemical compounds for controlling agricultural pests. A licensing arrangement had been entered into in 1982 with a Japanese company to produce and market one of these products. This had been generally successful in commercial terms, but the view had developed in the minds of senior CSIRO managers that Australia was not getting enough economic return from either this particular arrangement or the Division's outstanding synthetic organic chemistry expertise generally. There was particular concern about whether adequate return would be gained from a particular potentially valuable family of compounds based on a new chemical concept articulated in the Division.

A broad outline was plotted for a major R&D joint venture to commercialise these compounds. Following advertisement in 1983, Du Pont was selected as CSIRO's partner in this task. A joint venture company, DUNLENA, was incorporated in 1985, with Du Pont owning 49% and Australian partners 51%.

Conceptually, the arrangement was that the relevant CSIRO group would apply its specialised synthetic chemistry expertise to produce a continuous flow of compounds with potential for controlling agricultural pests. Du Pont would progressively feed the compounds through its very complex and time-consuming existing procedures for testing compounds: biologically, toxicologically, environmentally and for manufacturing practicability. The day-to-day activities of each party's representatives in the venture would be managed by the party itself; DUNLENA would be the umbrella body bringing together the two sets of inputs.

DUNLENA as an entity would be overseen by a company board and a corresponding technical committee, both of which would be constituted by the two parties. DUNLENA would own any compounds successfully coming through the testing program.

It was recognised from the outset that the chance of a successful compound coming from the arrangement was not high. The timeframe for the venture, until it became known whether any of the first promising compounds going through the whole testing process were going to be 'winners', would be several years. Total investment would be several million dollars; the venture would account for all the time and effort of the CSIRO Division's agricultural chemicals researchers, which represented between one-quarter and one-third of the Division's total research effort.

**BOX: SUMMARY OF MAIN DIRECTIONS OF DEVELOPMENT OF DUNLENA**

*After a difficult first two years, during which period the CSIRO group refused to provide Du Pont with structural details of the compounds they were providing for testing, the arrangement has worked very well: so much so that the parties subsequently entered into a second joint venture to work together on tailoring polymers for particular specialised applications. The partners' roles, responsibilities, performance and potential returns are almost unreservedly accepted by both parties. A few promising compounds (of the couple of hundred per month produced by the CSIRO group) have now progressed much of the way through Du Pont's testing regimen. The arrangement is still as active as ever: more than 10 years after its establishment.*

*This interface offers outstanding insights into the successful superseding of one party's culture by the other party's, in tackling complicated long-term product-development requiring the highest possible degree of trust, from the earliest stage of a major R&D program. The interface features a remarkably even balance of power. It illustrates the adoption of innovative management attitudes, values and roles, and a deal of compromise and principle-bending, in controlling an initial situation of high conflict.*

## 2. MMP

In 1986, a small company, Queensland Metals Corporation (QMC), discovered a rich lode of accessible magnesite near the central Queensland coast and near existing interdependent industry. This opened an opportunity for Australia to develop a world-competitive presence in the rapidly growing magnesium metal industry. One reason magnesium has not previously found wider use is the inconvenient and expensive paths for producing the metal to high levels of purity from the different feedstocks. QMC's possession of a uniform, accessible, high-quality supply of magnesite would be a powerful point of leverage. QMC's investigations showed the cost of metal production would compare favourably with that for other sources.

QMC set about planning strategic development of an Australian magnesium-processing industry. Technology addressing the special processing needs of QMC's resource would be needed, especially in view of Australia's then limited knowledge of magnesite processing. CSIRO's services would be required to develop such technology; QMC had already commissioned some research from CSIRO.

QMC, with their contacts in CSIRO and elsewhere, won over CSIRO's then Chief Executive and a number of key Ministers, obtaining their support for a concerted national effort to develop the necessary technology and the industry. The federal government agreed in late 1991 to inject \$20 million directly into the venture, through CSIRO. The Queensland State government had previously agreed to invest \$5 million, also through CSIRO.

QMC also approached Australian mineral-processing companies with the

capacity to participate in developing the resource. MIM Holdings became associated with the venture. At the same time, it was evident that a company (necessarily a foreign company) with experience relevant to the downstream magnesium metal industry must also be involved. The Japanese company UBE Industries - long involved in producing casting and related machinery used (inter alia) for magnesium - became involved in this capacity.

Out of these negotiations there emerged an unincorporated R&D joint venture, which will in due course provide the basis for a production joint venture consisting of MIM, UBE and QMC. The R&D arrangement hinges on a CSIRO research manager (CSIRO C: see list of those interviewed, in the description of MMP in Volume 2) who would transfer to MMP to manage the project, an overseeing management committee, and an "evaluation group" providing guidance to CSIRO C. The management committee and the evaluation group consist of representatives of the parties. CSIRO C and the evaluation group are the day-to-day guiding forces on the venture.

R&D valued at \$50 million, including construction of a \$37 million semi-commercial-scale pilot plant due to be operating in mid-to late 1996, would be undertaken over six years. Half the funding would come from government (see above), and the other half from the commercial partners. Most of the research would be done by CSIRO. By mid-1993, 40 scientists/engineers were working on the project, and 44 contracts of various types had been entered into.

## BOX:

## SUMMARY OF MAIN DIRECTIONS OF DEVELOPMENT OF MMP

*The MMP arrangement has a number of interesting - in some cases unique - aspects:*

- \* CSIRO C's inexperience/naivety in the ways of large-scale industrial R&D, and in many of the tasks he is managing.*
- \* CSIRO's ability to inject cash earmarked by the government for investment in this commercialisation project, rather than merely pre-existing technology or research capability funded by CSIRO internally.*
- \* The absence of a customer, in the normal sense, for the project's output. Rather than an experienced company ready to bring the research findings into commercial use, the customer is the consortium of MIM, UBE and QMC, none of which is in the mainstream magnesium metal production business.*

*Bearing in mind MMP's scope and ground-breaking features, and the wide spread of the parties' cultures and management experience, the project has developed remarkably well. Much progress has been made towards overcoming the main technical challenges. Several social/management/intercultural processes were prominent in development of the interface as a social group. Notable were trust/distrust, compromise/trade-off and problem-solving; a strong team spirit and strong dyadic bonding between various parties and their representatives; a prominent role for 'missionaries' in the various parties and elsewhere; and insightful management practices and philosophies.*

3. I<sup>2</sup>

I<sup>2</sup>, a spin-off invention generated through long-standing environmental research, is a communications interface having many potential applications in connecting data logging equipment (measuring a range of environmental and other parameters) with the office or laboratory of the person using the data.

Commercialisation of I<sup>2</sup> was embodied in an R&D arrangement between CSIRO and OPTUS based on a memorandum of understanding entered into in

1990; this followed a chance meeting of the relevant people from CSIRO and OPTUS at a conference two years earlier. A management committee with representatives from both parties oversaw the work, which aimed at developing the product to a stage where it could be sold off to a licensee as a going concern. It was intended that this would happen within about two years.

Under the agreement, CSIRO was to contribute the R&D inputs (as well as the original technology), which would account for about one-third of the time of the relevant CSIRO group. OPTUS was to pay cash to CSIRO for some of that R&D. OPTUS was also to inject the requisite commercial skills and knowledge.

[see box summarising main directions of development of I<sup>2</sup>,  
on following page]

#### 4. SIROSCOUR

Over many years up to the mid-1980s, CSIRO's Division of Wool Technology had developed outstanding technological know-how on multi-stage wool scouring. In 1987, the Division advertised for a licensee to commercialise the product based on this know-how: SIROSCOUR. SIROSCOUR is a major piece of industrial engineering; each SIROSCOUR line costs around \$2 million to install.

Process Design & Fabrication (PD&F) were selected as CSIRO's commercial partner, and in 1989 entered an agreement to develop and install the first SIROSCOUR line in the plant of a scouring operator, Greenfields. Greenfields was based on an experienced wool-handling (but not wool-processing) company.

## BOX:

SUMMARY OF MAIN DIRECTIONS OF DEVELOPMENT OF I<sup>2</sup>

Several aspects of the I<sup>2</sup> commercialisation arrangement are interesting, including the product's genesis as an unashamed spin-off from basic research in an environment division of CSIRO, and the extent of CSIRO's commercial activities in the venture.

The arrangement worked reasonably well, within the constraints of OPTUS's limited inputs and limited management commitment (which in turn were largely caused by strong pressures on OPTUS as it took over the role of Australia's second national telecommunications carrier). At the same time, it became clear that OPTUS was unable to inject the necessary commercial know-how, outside the immediate area of satellite communication systems. OPTUS's role changed over two years, from collaborative joint venture partner to a customer of the CSIRO group, contracting research services from CSIRO.

A number of important social/management/intercultural processes and events featured in development of the I<sup>2</sup> interface as a social group. Notable among them were

- \* differing comprehensions of the project and what it was all about;
- \* varying degrees of support for the venture from various levels of management and from other groups in each party;
- \* importation of a rudimentary cultural system for the interface, from outside the respective cultural bases of the two parties;
- \* changing expectations of one party (OPTUS) as a result of their evolving role in the Australian community;
- \* an increasing power/knowledge imbalance between the parties as the venture proceeded; and
- \* outstanding illustrations of flexibility and adaptation, as OPTUS's inability to inject the requisite commercial skills became clear.

The SIROSCOUR arrangement was poorly documented by the standard of CSIRO commercialisation ventures. This was partly attributable to absence of an agreement between CSIRO and PD&F covering this specific

venture (although there was, of course, the more general licensing agreement between the two), and absence of an agreement between CSIRO and Greenfields. The only formal agreement immediately driving this arrangement was that between Greenfields and PD&F. But even allowing for this unusual triangular arrangement, SIROSCOUR was notable for its relative lack of specification of responsibilities, obligations, expectations and procedures for resolving differences.

Several of SIROSCOUR's social/intercultural factors described in Volume 2 made it virtually impossible for the interface to overcome major difficulties that arose with Greenfields' SIROSCOUR line. When the magnitude of these technical difficulties was acknowledged after almost two years, Greenfields engineers started to work with PD&F's people, CSIRO's experts and others, to try to overcome the problems. The parties established an emergency task-force to sort out the problems. The task-force, led by an experienced consultant from the industry, did just this, through several months of intensive effort. The SIROSCOUR line then started producing, and is still producing, top-quality scoured wool.

Failure of the arrangement itself to produce an operational scouring line, and the consequent inability of PD&F to sell more than the one initial SIROSCOUR line, resulted in CSIRO revoking the PD&F licence in 1990, and issuing two new licences in late 1991/early 1992 (not long before the data were gathered for this study). This initiated a second 'loop' in the commercialisation of SIROSCOUR.



## BOX:

*SUMMARY OF MAIN DIRECTIONS OF DEVELOPMENT OF SIROSCOUR*

*The SIROSCOUR commercialisation arrangement had many interesting or unusual elements; these included*

- \* its basis in loosely defined know-how (as compared with 'hard' technology);*
- \* its relatively low degree of definition;*
- \* the preponderance of inexperienced players and small companies;*
- \* the triangular arrangement of the main parties;*
- \* involvement of the Australian Wool Corporation as a shareholder in Greenfields; and*
- \* the prominent role of former CSIRO people in one of the licensee companies in the second 'loop' of SIROSCOUR, and in solving problems encountered in the first 'loop'.*

*Several of these factors contributed to major technical difficulties with Greenfields' scouring line. Ineffectual attempts to tackle those problems, combined with fundamental management/social/intercultural difficulties, led to rapid deterioration in SIROSCOUR as a commercialisation vehicle. The SIROSCOUR interface is notable for the range of intercultural and social/management issues it raises. These vary from the prevalence of 'after-the-event' attempts to retrieve situations when they were clearly lost, to severe attitudinal problems on the part of some parties; from arguments about 'who did what' and 'who said what', to almost malicious undermining of partners' positions; and from incompatible understandings of what the project was really all about, to questions about what each party's real obligations were. The interface's handling of these issues offers insights into (*inter alia*) fundamental processes of communication, conflict, power and cultural adaptation.*

## B. ELABORATION OF DATA FROM THE CASE STUDIES

It is necessary, prior to commencement of the full analysis in chapter 6, to take the data from the case studies to a further stage, in three respects. This is done in the remainder of this chapter.

First, the taxonomy of arrangement characteristics developed in the preceding chapter is applied to identify the main characteristics of each of the formal commercialisation arrangements. This provides the basis for the analyses to 'look sideways' from the respective interfaces, to identify any encouragement or reinforcement of each dimension of social behaviour, coming from interfaces' structural contexts.

Second, the positions in social space of the participants in each interface are established, providing the basis for the analyses to 'look backwards' from the interfaces, to identify any encouragement or reinforcement of each dimension of social behaviour, coming from participants' 'cultural baggage'.

Finally, the preliminary analysis of likely influence on interface effectiveness formulated in chapter 4 is carried out on each of the 34 dimensions of social behaviour constituting the original form of the analytical framework (Table 5). Identifying which of those dimensions are most likely, prima facie, to contribute fundamentally to interface effectiveness enables construction of the final form of the analytical framework.

#### **1. Main Characteristics of Each Formal Commercialisation Arrangement**

Appendix 7 identifies which arrangements in the case studies possess the various content characteristics and form characteristics which were argued in chapter 4 to capture the essence of any commercialisation arrangement. It does this through illustrating extreme positions on the dimension defining each characteristic. Table 7 extends the reasoning illustrated in Appendix 7, to position *all* arrangements against each characteristic.

TABLE 7

## THE CASE STUDIES' POSSESSION OF EACH CHARACTERISTIC

(following the reasoning illustrated in Appendix 7)

CONTENT CHARACTERISTICS (full description of characteristics in chapter 4):		
Stage of development of technology when venture created	DUNLENA & MMP	Not highly developed; research outcomes being commercialised directly
	I <sup>2</sup> & SIROSCOUR	Highly developed; significant steps by CSIRO towards 'in house' development
Centrality to parties' future?		
A. For CSIRO:	DUNLENA, I <sup>2</sup> , MMP	Central/crucial
	SIROSCOUR	Not central/crucial
B. For companies:	SIROSCOUR [for both companies] ) MMP [for QMC] )	Central/crucial
	DUNLENA, I <sup>2</sup> , MMP ) [for MIM & UBE] )	Not central/crucial
Existing or new line of business?		
A. For CSIRO:	DUNLENA, S'SCOUR & MMP )	Existing
	I <sup>2</sup>	New
B. For companies:	DUNLENA & MMP ) [for all 3 companies] )	Existing
	I <sup>2</sup> , S'SCOUR [for both companies] )	New
'Big bang' or incremental	DUNLENA, I <sup>2</sup> , MMP	'Big bang'
	SIROSCOUR	Incremental
Product/process aim	DUNLENA & I <sup>2</sup>	Product
	MMP	Both, but essentially process
	SIROSCOUR	Process

[Table 7 continued on following page, with the form characteristics]

TABLE 7 (continued)  
THE CASE STUDIES' POSSESSION OF EACH CHARACTERISTIC

FORM CHARACTERISTICS (full description of characteristics in chapter 4):		
Type of arrangement	I <sup>2</sup>	Relatively informal development joint venture
	S'SCOUR	Multi-party collaborative development arrangement based on licensing
	DUNLENA	Formal incorporated R&D joint venture
	MMP	Formal unincorporated multi-party R&D joint venture
Definition/formality/planning/vision	I <sup>2</sup>	Quite poorly defined, informal, unplanned, moderately focused, visionary
	S'SCOUR	Poorly defined, moderately formal, relatively unplanned, moderately focused, moderately visionary
	D'LENA ) MMP )	Well defined, formal, planned, highly focused, visionary
Management support	I <sup>2</sup>	Low (from both parties)
	S'SCOUR ) DUNLENA )	High (from both/all parties)
	MMP	High from CSIRO, QMC & UBE; variable from MIM
Identification with one group, or 'belongs to' corporation?	I <sup>2</sup>	One person/group (both CSIRO & OPTUS)
	S'SCOUR ) DUNLENA )	Corporation (for both/all parties)
	MMP	For UBE & QMC: Corporation. But since QMC essentially consists of its two leaders, this virtually means 'one group'. For CSIRO & MIM: Quite high degree of 'ownership' by one group.
Duration	I <sup>2</sup>	Relatively short-term
	S'SCOUR	Medium-term
	D'LENA, MMP	Long-term
Complexity	I <sup>2</sup> , D'LENA	Simple
	S'SCR, MMP	Complex
Novelty/sensitivity/politicisation/profile	I <sup>2</sup>	For CSIRO: Routine, sensitive with some stakeholders, non-politicised, low profile. For OPTUS: Novel, sensitive, slightly politicised, low profile.

[Table 7 continued on following page]

TABLE 7 (continued)

## THE CASE STUDIES' POSSESSION OF EACH CHARACTERISTIC

<b>Novelty/ sensitiv- ity/poli- tisation/ profile (con- tinued)</b>	S'SCOUR	Non-sensitive, non-politicised, low-profile. For CSIRO & PD&F: Routine. For Greenfields: Novel.
	DUNLENA	For CSIRO: Novel (because of its scale & dur- ation), moderately sensitive & politicised (committing so much to a transnational corpora- tion), high-profile. For Du Pont: Novel, non- sensitive, non-politicised, low-profile.
	MMP	For CSIRO & QMC: Novel, non-sensitive, moder- ately politicised, high-profile. For MIM: Novel, moderately sensitive with some stake- holders (because of its novelty), moderately politicised, low-profile. For UBE: Routine, non-sensitive, non-politicised, low-profile.
<b>How arrange- ment came about</b>		
<b>A. Route for es- tablish- ing arrange- ment</b>	I <sup>2</sup>	"Plaintive plea"
	S'SCOUR	"Do us and yourselves a favour" & "Let's develop our business together"
	D'LENA, MMP	"Let's develop our business together"
<b>B. Main part in initi- ating</b>	I <sup>2</sup>	Both
	S'SCOUR	CSIRO
	DUNLENA	Both, but mainly CSIRO
	MMP	QMC
<b>C. Strength &amp; pass- ion shown by each party</b>	I <sup>2</sup>	By CSIRO : High By OPTUS : Moderate
	S'SCOUR	By CSIRO and PD&F : Low By Greenfields : Moderate to high
	DUNLENA	By both parties : Moderate/High
	MMP	By CSIRO & QMC : High By MIM & UBE : Low
<b>Balance in power &amp; re- sponsibil- ities</b>	I <sup>2</sup>	Weighted towards CSIRO
	S'SCOUR ) DUNLENA )	Well-balanced
	MMP	Somewhat weighted towards CSIRO & QMC

## 2. Positions in Social Space of the Parties to the Interfaces in the Case Studies

The analyses will 'look backwards' from the interfaces, as described in chapter 3. This will enable investigation of whether the behavioural preferences predicted for people from different segments of social space (Tables 3 and 4) are evident in the case studies, and whether that behaviour encourages or reinforces the influence on interface effectiveness of each of the dimensions of social behaviour constituting the analytical framework.

This approach requires establishing the position in social space of the CSIRO and company groups and individuals in each interface. Appendix 8 identifies the position along cultural theory's grid and group axes, and consequently on the grid/group matrix, of these people's management, institutional and social environments. These positions are summarised in Table 8.

## 3. Preliminary Analysis of Likely Influence on Interface Effectiveness of Each Dimension of Social Behaviour

It is now possible to carry out the preliminary analysis of likely influence on interface effectiveness on each of the dimensions of social behaviour constituting the original form of the analytical framework (Table 5). As articulated in chapter 4, this preliminary analysis requires comparison of the prominence of each dimension of social behaviour in each interface, with changes in the interfaces' cultural 'shapes' over time.

Appendix 9 applies the approach developed in chapter 4 and Appendix 5, to establish the cultural 'shape' of each of the interfaces in the case studies: first when the venture was established, and then at the

TABLE 8

**THE PARTICIPANTS' POSITIONS IN SOCIAL SPACE**  
(summarised from Appendix 8)

Position of CSIRO People/Person:		Position of Company People/Person:
High grid/high group (hierarchists)	<b>D'LENA</b>	High grid/high group (hierarchists)
Low grid/low group (individualists)	<b>I<sup>2</sup></b>	High grid/low group (fatalists)
High grid/high group (hierarchists)	<b>S'SCOUR</b>	PD&F:            )   Low grid/low )   group (individ- Greenfields:    )   ualists)
Low grid/high group (member of egalitarian group)	<b>MMP</b>	QMC:            Low grid/low group (individualists)
		MIM & UBE: High grid/high group (hierarchists). [For UBE, this is a pre- dicted & indirectly established position: no interviews were possible.]

time the data were collected (or, in the case of SIROSCOUR, at the time the interface was terminated, shortly before the data were collected). Appendix 9 establishes that over the respective interfaces' lifetimes, the cultural 'shapes' of the DUNLENA and MMP interfaces became much more conducive to effective interaction, the cultural 'shape' of the I<sup>2</sup> interface did not change significantly, while the cultural 'shape' of the SIROSCOUR interface became much less conducive to effective interaction.

Appendix 10 identifies how prominent each of the 34 dimensions of social behaviour from Table 5 was in each of the four interfaces. Appendix 10 thereby has the effect of documenting how each dimension distinguishes among the interfaces.

The middle column of Table 9 summarises Appendix 10's assessments. Where possible, it does so for all four interfaces, although for some dimensions of social behaviour, one or two of the interfaces could not possibly or sensibly be used, in which case only two or three of the interfaces are included.

The final column of Table 9 uses three ratings - "strong"- "moderate"- "weak-negative" - to describe the degree of correspondence between the prominence of each dimension of social behaviour in the respective interfaces, and changes in the interfaces' cultural 'shapes' over their lifetimes (summarised above). For some dimensions the correspondence has been labelled "n.a." (not applicable), because for various reasons it was not possible to estimate it. For example, it will be seen from the discussion in Appendix 10 that it was not possible to determine how prominent a number of the dimensions of social behaviour were in most or all of the interfaces.

As in earlier chapters, the first dimension of social behaviour articulated in the literature review in chapter 2 - identification and pursuit of shared goals - will be taken to illustrate how the methodology was applied to generate the entries in Table 9:

It is clear from Appendix 10 that this dimension played a prominent part in framing the social interaction and social structuring in DUNLENA and MMP, but little part in SIROSCOUR and even less a part in I<sup>2</sup>. So the middle column of Table 9 describes this dimension's role in the DUNLENA and MMP interfaces as "prominent", in the SIROSCOUR interface as "moderate" and in the I<sup>2</sup> interface as "obscure".



It will be recalled that Appendix 9 showed that the cultural 'shapes' of DUNLENA and MMP improved over the interfaces' lifetimes, the cultural 'shape' of SIROSCOUR deteriorated markedly, while the 'shape' of  $I^2$  remained unchanged. The correspondence between the prominence in the interfaces of the dimension "identification/pursuit of shared goals", and changes in the interfaces' cultural 'shapes' over their lifetimes can therefore be summarised:

- \* The two interfaces in which the parties' identification and pursuit of shared goals was a prominent factor (DUNLENA, MMP) are the two interfaces whose cultural 'shapes' improved over their lifetimes.
- \* The interface in which the parties' identification/pursuit of shared goals was significant but not overwhelmingly important (SIROSCOUR) is the interface whose cultural 'shape' deteriorated markedly.
- \* The interface in which the parties' identification/pursuit of shared goals was not at all in evidence ( $I^2$ ) is the interface whose cultural 'shape' did not change appreciably.

This substantial, but by no means perfect, correspondence between the prominence of this dimension of social behaviour in the respective interfaces, and changes in the interfaces' cultural 'shapes' over their lifetimes warrants the "moderate" entry in the final column of Table 9.

TABLE 9

CORRESPONDENCE BETWEEN PROMINENCE IN EACH INTERFACE OF DIMENSIONS OF  
SOCIAL BEHAVIOUR, AND CHANGES IN INTERFACES' CULTURAL 'SHAPES'  
(see Appendix 10)

Dimension	Prominence of This Dimension in Each Interface	Correspond- ence between Prominence, & Changes in Cultural 'Shape'
Emphasis of intercultural similarities & explosion of intercultural myths	n.a.	n.a.
Acting in ways that pre-serve partner's most valued differences	DUNLENA/MMP/I <sup>2</sup> : Prominent SIROSCOUR : Obscure	Strong
Abandoning no-longer-suit-able ways	DUNLENA : Prominent SIROSCOUR : Obscure	Strong <sup>†</sup>
Goodwill trust	DUNLENA : Prominent MMP/I <sup>2</sup> : Moderate SIROSCOUR : Obscure	Strong
Identification and pursuit of shared goals	DUNLENA/MMP : Prominent SIROSCOUR : Moderate I <sup>2</sup> : Obscure	Moderate
Intimacy of contact	n.a.	n.a.
Approximate status balance between main representat-ives of the parties	DUNLENA/I <sup>2</sup> : Prominent SIROSCOUR : Obscure	Strong
Assumption of category-in-dependent roles	DUNLENA/MMP/I <sup>2</sup> : Prominent SIROSCOUR : Obscure	Strong
Strong and consistent man-agement support	D'LENA/MMP/S'SCR : Prominent I <sup>2</sup> : Obscure	Weak- negative
Reliance on contractual arrangements at the ex-pense of trust	No sign of this phenomenon in the interfaces	n.a.
Development of excessive conflict in accordance with Brown's reasoning	n.a.	n.a.
Handling excessive conflict using the approaches ident-ified by Brown	DUNLENA : Prominent SIROSCOUR : Obscure	Strong <sup>†</sup>
Maintenance of conflict at too low a level	n.a.	n.a.

[Table 9 continued on following page]

TABLE 9 (continued)

Dimension	Prominence	Correspondence
Number of conflicts	MMP/I <sup>2</sup> /S'SCR : Prominent DUNLENA : Obscure	Weak-negative
Flexibility/rigidity of the social system within which conflict develops	S'SCR/I <sup>2</sup> : Prominent (i.e. flexible) D'LENA/MMP : Obscure (i.e. rigid)	Weak-negative
Conflict about subjects that question the basic assumptions on which the relationship is founded	n.a.	n.a.
Way in which the groups in contact appeal to their members' personalities	n.a.	n.a.
Conflict kept focused on definite object of contention	DUNLENA/I <sup>2</sup> : Prominent SIROSCOUR : Obscure	Strong
Conditions under which conflict-learned behaviour transfers to new non-conflict situations	n.a.	n.a.
Conflicting orientations towards the conflict <u>per se</u>	I <sup>2</sup> : Obscure DUNLENA/MMP : Moderate SIROSCOUR : Prominent	Weak-negative
Conflict's reduction of "intellectual resources"	S'SCR/D'LENA : Prominent I <sup>2</sup> /MMP : Obscure	Weak-negative
Regulated/institutionalised channels for conflict-control	DUNLENA : Prominent MMP/I <sup>2</sup> /S'SCR : Obscure	Weak-negative
Strategic use of power to pre-emptive ends	DUNLENA : Prominent SIROSCOUR : Obscure	Strong*
Parties' attempts to actively spread their own social values	No sign of this phenomenon in the interfaces	n.a.
Coping with organisational uncertainty in critical areas	n.a.	n.a.
Use of meta-power/relational control	DUNLENA : Prominent SIROSCOUR : Obscure	Strong*
Institutionalised decentralisation	No sign of this phenomenon in the interfaces	n.a.

[Table 9 continued on following page]

TABLE 9 (continued)

Dimension	Prominence	Correspondence
Basis of incorporation of parties into the interface	D'LENA/MMP : Prominent (i.e. cultural pluralism) I <sup>2</sup> /S'SCR : Obscure (i.e. less than cultural pluralism)	Strong
Precise mode of drawing on cultures of constituent groups in forming interface's culture	MMP : Prominent (i.e. cultural transmutation) D'LENA/I <sup>2</sup> : Obscure (i.e. cultural shift)	Weak-negative
Sudden, discontinuous break with 'old' culture	MMP/I <sup>2</sup> : Prominent DUNLENA : Obscure	Weak-negative
Maintaining links with 'old' culture	n.a.	n.a.
Preparation & planning for, & management & consolidation of, cultural change	DUNLENA/MMP : Prominent SIROSCOUR : Obscure	Strong
Willingness/keenness to perform in the 'public' domain of the interface	DUNLENA/MMP : Prominent I <sup>2</sup> /SIROSCOUR : Moderate	Strong
Mode of using symbolic representation	MMP/D'LENA : Prominent (i.e. positively, constructively) SIROSCOUR : Obscure (i.e. negatively, aggressively)	Strong

\* An asterisk highlights the fact that these "strong" ratings were based on only two, rather than three or all four, of the interfaces. Accordingly they must be treated with some caution.

### C. THE FINAL FORM OF THE ANALYTICAL FRAMEWORK

The eight dimensions whose effect is identified in Table 9 as having "weak-negative" correspondence with changes over time in the interfaces' cultural 'shapes', together with the dimensions "reliance on contractual arrangements at the expense of trust", "parties' attempts

to actually spread their own social values" and "institutionalised decentralisation" (of which there was no sign in the interfaces), will be taken no farther in the analysis. As argued previously, it is most unlikely that these dimensions could have had a significant influence on interface effectiveness.

The dimensions of social behaviour where the correspondence was coded "n.a." (apart from the three identified in the preceding paragraph) *will* be taken to the full detailed analysis; it is just that with these dimensions the correspondence forming the basis of the preliminary analysis was not able to be used to generate an initial assessment of likely influence on interface effectiveness. These dimensions will therefore have to be approached in the following chapters without the benefit of prima facie support from this preliminary analysis.

The remaining, potentially most influential, 23 dimensions of social behaviour constitute Table 10, which is the final form of the analytical framework.

TABLE 10

THE FINAL FORM OF THE FRAMEWORK FOR THE ANALYSES  
TO BE CARRIED OUT IN THE FOLLOWING FIVE CHAPTERS

(derived from Tables 5 and 9)

The Dimensions of Social Behaviour Constitute the Five Elements of the Final Form of the Analytical Framework, Which Concern Respectively:				
How Participants Approach Key Interface Relationships	Interfaces' Intergroup Structure	Conflict in Interfaces	Power in Interfaces	Development of a Supra-group's Cultural System
Emphasis of intercultural similarities	Identification/pursuit of shared goals	Development of excessive conflict	Strategic use of power to pre-emptive ends	Basis of incorporation into the interface
Preserving partner's valued differences	Intimacy of contact	Handling excessive conflict	Coping with uncertainty in critical areas	Maintaining links with 'old' culture
Abandonment of unsuitable old ways	Status balance between parties' representatives	Maintaining conflict at too low a level	Use of meta-power/relational control	Preparing for and consolidating cultural change
Goodwill trust	Category-independent roles	'Founding assumptions' conflicts		Willingness/keenness to work in the 'public' domain
		Conflicting groups' appeal to their members' personalities		Use of symbolic representation to address intercultural gaps
		Focus of conflict		
		Transfer of conflict-learned behaviour to non-conflict situations		

## **CHAPTER 6**

### **ANALYSIS:**

#### **DEVELOPMENT OF THE COMMERCIALISATION INTERFACE AS A SOCIAL GROUP:**

#### **INFLUENCE OF HOW PARTICIPANTS APPROACH KEY INTERFACE RELATIONSHIPS**

## **CHAPTER 6**

### **ANALYSIS:**

#### **DEVELOPMENT OF THE COMMERCIALISATION INTERFACE AS A SOCIAL GROUP:**

#### **INFLUENCE OF HOW PARTICIPANTS APPROACH KEY INTERFACE RELATIONSHIPS**

##### **A. INTRODUCTION**

The analyses carried out in this chapter and the following four chapters apply the analytical framework developed in the preceding chapter, to attempt to understand influences on the social effectiveness of the commercialisation interfaces in the case studies. The analyses focus on the study's fundamental research questions, which were developed in chapter 1. The questions are reproduced in the box on the following page.

The first research question is an over-arching general question that will necessarily be answered through the answers to the other four questions. As foreshadowed in earlier chapters, each analysis first seeks to contribute to answering the second research question by investigating the influence on interface effectiveness of one of the dimensions of social behaviour constituting the analytical framework, in its own right. The analysis then investigates any encouragement or reinforcement provided for that behaviour, by two sets of factors rooted in interfaces' contexts: the values, norms, attitudes and preferences brought into the interface by the participants (thereby addressing the third research question), and implications of the characteristics of the underlying commercialisation arrangement



(thereby addressing the fourth research question).

The interplay of conclusions from these two stages of each analysis will help answer the fifth research question.

#### BOX

##### *THE STUDY'S FUNDAMENTAL RESEARCH QUESTIONS*

1. *How does the social structure of laboratory-company commercialisation interaction take root, grow and endure?*
2. *Which dimensions of social behaviour contribute in their own right to effectiveness of commercialisation interfaces? How does that contribution come about?*
3. *Which dimensions of social behaviour are encouraged or reinforced by culturally-acquired values, norms, attitudes and preferences brought into the research-company interaction by the participants?*
4. *Which dimensions of social behaviour are encouraged or reinforced by implications of characteristics of the underlying formal administrative commercialisation arrangement?*
5. *How do the dimensions of social behaviour and their cultural and structural contexts interact? How is this interaction best represented in a paradigm or model for analysing and articulating contributors to interface effectiveness, and for guiding the construction of effective commercialisation interfaces in the future?*

Each analysis assesses influences on interface effectiveness in terms of the four specific indicators of effectiveness identified in chapter 1 (openness, flexibility, cohesiveness and focus). However for simplicity, the conclusions at the end of each analysis summarise the dimension's influence on interface effectiveness only in general terms.

Each analysis looks *selectively* at influences on interface effectiveness. The aim is to glean critical information from the case studies to illuminate whether that particular dimension of behaviour influences interface effectiveness, and how that influence comes about. This means (for example) that each analysis examines the minimum number of case studies necessary to gain insights into whether, and how, that particular dimension of social behaviour acted to influence interface effectiveness. Sometimes this demands that all four interfaces be analysed, but mostly it is possible to reach conclusions from analysis of only three, and sometimes even two, of the interfaces.

Quite apart from what this aim of selectivity implies, it is simply not possible to use some interfaces to examine some dimensions of social behaviour, because those interfaces do not provide illustrations of the behaviour concerned, or the illustrations they do provide are confused by other variables.

The analyses in these five analytical chapters draw pragmatically and quite extensively on each other. Although the dimensions of social behaviour are relatively free-standing and well defined, naturally there are notable similarities between some pairs of dimensions when it comes to analysing their influence on interface effectiveness.<sup>1</sup>

This commonality of influences is amplified by the fact that some arrangement characteristics are predicted to encourage or reinforce more than one dimension of behaviour; Table 6 identifies several characteristics each expected to act to encourage or reinforce six or more of the 23 dimensions of social behaviour.

Where similar arguments bear on the influence on interface effectiveness of more than one dimension of behaviour, normally the relevant observations and evidence are presented substantively only where they are most directly relevant or where they arise for the first time. For the most part, analysis of other dimensions relies on cross-references to these substantive presentations of observations and evidence.

Just as some arrangement characteristics are predicted to encourage or reinforce several dimensions of social behaviour, so also the commercialisation arrangements in some of the case studies possess more than one characteristic predicted to encourage or reinforce some dimensions of social behaviour (Tables 6 and 7). Where this is the case, not all of these characteristics are examined to discern the encouragement/reinforcement they provide. Examination of up to four or five characteristics would seem excessive in what are already quite long and complicated analyses.

Instead, in accordance with the aim of selectivity described above, in these cases one or two of the characteristics are selected *at random*, for examination in sufficient depth to identify any trend towards this set of arrangement characteristics influencing interface openness, flexibility, cohesiveness and focus, and to suggest how this influence might be coming about.

The structure for this chapter is provided by the four dimensions of social behaviour making up the first element of the analytical framework. So the chapter examines, first, the influence on interface effectiveness of the parties' attitudes and behaviour bearing on intercultural similarities and differences; second, the influence of

attitudes and behaviour bearing on preserving the partner's valued differences; third, the influence of different outlooks on abandoning (or adhering to) old established ways of doing things; and, finally, the influence of behaviour bearing on goodwill trust.

## B. EMPHASISING INTERCULTURAL SIMILARITIES, AND PLAYING DOWN INTERCULTURAL DIFFERENCES

The intergroup contact theory articulated in chapter 2 predicted that intergroup interaction will be smoother and more conducive to attaining a supragroup's aims, and will provide the basis for a more effective and enduring interface, where intercultural similarities are emphasised and intercultural differences played down.

### 1. The DUNLENA Interface

This interface tends to emphasise intercultural similarities in areas often claimed to be characterised by intercultural *difference*.

One such area is people's views on the reward system for researchers. The CSIRO group's leader, CSIRO E (see list of those interviewed, in the description of DUNLENA in Volume 2), drew out the unifying effect of the reward system within which the CSIRO scientists in DUNLENA were required to work, which they share with Du Pont's research chemists. He described (interview with CSIRO E, CSIRO Clayton, 17 September 1992) the challenges felt by the CSIRO people as they came to share this reward system with Du Pont's people, and the enthusiasm coming from their immersion for the first time in this system (although he did note reservations, to do with the CSIRO people's perception of a need still to "satisfy the outside world, as well as yourself" at staff promotion time, and their concern that "indications of interest from Du Pont are pretty rare". This contrasts with these researchers'

'traditional' system, where 'pats on the back' can be sought out by those who wish to solicit them.)

This was confirmed by CSIRO C and by Du Pont A; the latter described (interview with Du Pont A, Du Pont North Sydney, 21 August 1992) the effect on the CSIRO people's morale of being in the same reward system as the Du Pont people as "refreshing". These informants saw the CSIRO people's adaptation to this new form of reward as a powerful source of motivation for them and an important source of encouragement for team-building between CSIRO and Du Pont: and ultimately as a significant contributor to interface cohesiveness and focus (at least).

The CSIRO group's strong focus on the (potential) commercial product (rather than on technologies or lines of research) also embodied a perhaps surprising intercultural similarity. A number of interviewees, as well as the written material, illustrated this. So strong is the group's focus on the product, for instance, that according to CSIRO E the overwhelmingly important source of feedback to members of the group nowadays is each week's receipt from Du Pont of the results of biological testing on the group's compounds. This has become their overall measure of success. CSIRO E sees this process as being similar to the weekly lottery draw; "People get very toey if they don't get their biological results [on time] ... Me too; we all need our kicks" (interview with CSIRO E, CSIRO Clayton, 17 September 1992).

CSIRO E and Du Pont B (interviews, CSIRO Clayton, 17 September 1992; and Du Pont North Sydney, 21 August 1992 respectively) both noted the similarity between this driving force on the CSIRO group and the driving force on Du Pont R&D people. These informants believe that the

feeling of solidarity coming from this particular manifestation of intercultural similarity was critical for developing the interface's cohesiveness, focus and overall effectiveness.

There is good evidence in the DUNLENA case study, then, that the outlooks and behaviour of the CSIRO group (whose social/management environment was subjected to far more restructuring than the Du Pont people's) discredited common myths about intercultural differences between research and industry, and that this was an important part of the shaping of their approach to the venture. There are also clear signs that behaviour and thinking based on those attitudes and outlooks contributed significantly to development of interface cohesiveness and focus (at least).

It cannot be pretended, though, that the DUNLENA interface was driven solely by such reinforced intercultural similarities and scepticism towards claimed intercultural differences. In fact, this interface provides what is perhaps the ultimate example of an inter-party 'wedge', created at least in part by the CSIRO group's amplification, during the interface's early days, of the intercultural gap between themselves and Du Pont. This wedge was a prominent cause of the group's refusal to provide Du Pont with structural details of the compounds they were passing on for testing (see the description of DUNLENA in Volume 2). Until it was mitigated by increasing trust and respect, this amplified intercultural difference had a profound detrimental impact on interface effectiveness.

So the CSIRO people's outlooks and behaviour bearing on intercultural similarities and differences depend largely on the period examined.

For the first 18 months to two years of the interface's 11-year lifetime, these people respected and amplified intercultural *differences*, but from then on they respected and amplified intercultural *similarities*. The CSIRO people's transition between these two states of mind is a cornerstone of a number of later analyses: notably the analysis of the use of symbolic representations, in section E of chapter 10.

It seems reasonable to give more weight to the longer term trend in the participants' thinking and behaviour. This is consistent with the emphasis throughout this study on the end-point reached by each interface and its cultural system (see discussion in chapter 4). And after all, the period during which the interface, and the CSIRO people in particular, have been overwhelmingly emphasising intercultural similarities accounts for between 80 and 90% of the interface's lifetime.

DUNLENA should be regarded on the whole, then, as an interface in which the researchers came to respect, and indeed to amplify, intercultural *similarities*. And as already noted, this respect for intercultural similarities had much to do with how they approached their involvement in the DUNLENA venture, and flowed through to have a distinctly positive influence on interface effectiveness.

Table 4 in chapter 3 suggested that groups from hierarchical environments (like both DUNLENA parties) might be expected to be conservative in the attention they give to amplifying intercultural similarities and exploding intercultural myths. So the DUNLENA interface's (eventual) emphasis of intercultural similarities came about in spite of, rather than because of, what were argued to be the participants' culturally-acquired preferences.

An indication of why this might be so comes from one characteristic of the formal commercialisation arrangement upon which the DUNLENA interface rests. Table 6 identified that one arrangement characteristic - the technology having been developed to only an early stage at the time the arrangement was established - as being likely to encourage the parties to amplify interface similarities and explode intercultural myths.

The DUNLENA arrangement possesses this characteristic in abundance (Table 7). Indeed DUNLENA was established specifically to take early steps towards commercialising technology embodied in 'raw' research data. It would be difficult to find another commercialisation venture focusing on technology at such an early stage of development.

This concentration on technology at its earliest stage was an integral part of the fundamental conflict previously referred to, centring on the CSIRO group's initial firm refusal to provide Du Pont with structural details of the compounds it had synthesised. This conflict provided a low base of openness, flexibility, cohesiveness and focus for the interface to build on. But once this one conflict was under control, the positive influence on interface effectiveness of the early stage the technology was at, was remarkable. This constituted a common talking point for the interviewees.

The fact that the technology was at such an early stage of development permitted each party, for example, to work on the project in much the same way (at least when viewed at the micro level) as it works *outside* the DUNLENA arrangement, and to directly exploit in DUNLENA most skills, practices, knowledge and attitudes developed for working in



this mode (interviews with Du Pont A and Du Pont B, Du Pont North Sydney, 21 August 1992; and CSIRO A, University of Melbourne, 16 September 1992). This certainly seemed to increase the interface's cohesiveness and openness. As Du Pont A said, "We each contributed our own strengths, and ... they weren't fighting each other. The groups worked as a team, in much the same way as parts of Du Pont."

This positive effect on the interface's openness and cohesiveness (and perhaps even on its focus and flexibility) of 'early-stage' establishment of the arrangement could well have been strong enough to override other considerations (like participants' culturally-acquired values, norms, attitudes and preferences). Perhaps no cultural predilections or preferences (whatever positions in social space they originated from) could have persuaded the participants to set aside the implications of this one overwhelmingly significant characteristic of the arrangement. If it came to a choice between the two, the latter would inevitably win out. Or at very least the influence of this arrangement characteristic would have been strong enough to cancel out the participants' culturally-acquired conservativeness towards emphasising intercultural similarities *after a time*: perhaps after the period of 18 months to two years it took for the CSIRO group to start providing compound structural details to Du Pont.

## 2. The MMP Interface

Like DUNLENA, MMP is also something of a curate's egg when it comes to acknowledging or exploding intercultural myths/differences. But here the variation is not over time, but among participants. One party - QMC - virtually specialises in exploding intercultural myths. QMC regards the very act of removing intercultural barriers, through the

difficult process of bringing together the diverse MIM, UBE and CSIRO cultures, as one of their main tasks. As Political Staffer said (interview, Parliament House Canberra, 11 September 1992), "[QMC] realise that CSIRO ... had a different culture. ... What was critical was the role [QMC as a] small company played in bringing these different cultures together."

Many interview comments attested to the direct positive influence of QMC's steps to this end, on the interface's openness and cohesiveness; these are discussed in the analyses of development of the interface's cultural base, in chapter 10.

QMC's significant 'culture-reconciling' task contrasts with the approaches of both MIM and the public sector researcher who had recently entered the world of managing product-development, CSIRO C (see list of those interviewed, in the description of MMP in Volume 2).

MIM's main representative, MIM A, spent much of the interview emphasising intercultural *differences* - differences with respect to management methods, 'value-adding' activities and perceptions of the role of research, for instance - and demonstrating that these differences are as marked in the MMP arrangement as they have traditionally been claimed to be.

CSIRO C, for his part, also emphasised important intercultural differences, like the two cultural systems' different valuations of teamwork and urgency.<sup>2</sup> This is not to say that CSIRO C clung to his 'old' culture; it will be shown in chapter 10 that he did not. But it seems clear that he recognised and respected intercultural differences.

Indeed actions (mostly actions of MIM rather than CSIRO C) generated by intercultural differences seemed to provide one of the few threats to MMP's openness, flexibility, cohesiveness and focus. QMC B described in no uncertain terms, for instance, the frustration coming from MIM's perception of cultural differences between themselves and UBE: MIM wished at times "to put on the safety boots and kick [UBE] ..." (interview with QMC B, QMC Brisbane, 22 September 1992). By comparison with UBE's thinking, MIM's was (according to QMC B) "an awful commercial culture". QMC B and MIM A both pointed to the detrimental impact this emphasis on intercultural differences had had on interface cohesiveness and flexibility (in particular) for the first year or so of the MMP venture's lifetime.

So there is evidence that the influence on MMP's effectiveness of behaviour associated with intercultural similarities/differences varies from the distinctly positive influence of QMC's reconciliation of cultures, to the sometimes negative influence of MIM's predilection to emphasise intercultural differences. In each case the party's fundamental approach to the venture seems to have been directly coloured by its views on intercultural similarities/differences.

It seems likely that the participants' positions in social space contributed notably to these attitudes towards intercultural similarities/differences, and thereby to interface effectiveness. The outlooks described in the preceding discussion are completely consistent with predictions from cultural theory. Table 4 predicted that people from a hierarchist environment (like MIM) and people from an egalitarian group environment (like CSIRO C) will be keen to maintain and respect intercultural differences, with people from an individualist environ-

ment (like QMC) being keen to explode intercultural myths.

The MMP parties' approach to intercultural similarities/differences does not seem to have been made more homogeneous by implications of the characteristics of the underlying MMP commercialisation arrangement. While Table 7 shows that the arrangement clearly possessed the one characteristic predicted (Table 6) to encourage parties to value intercultural similarities and to be sceptical about claimed intercultural differences - the technology being at an early stage of development when the arrangement was established - evidently it did not have full effect (because some participants went to some length to emphasise intercultural differences).

There were clear signs that some of the participants placed a premium on the fact that the technology the interface was working with was at an early stage of development. It is evident from many of CSIRO C's comments how readily he acknowledged that his powerful position in the interface owed everything to early-stage research being such a prominent part of the venture. The QMC people also made very clear their motivation for establishing a vertically integrated magnesium metal industry: which under the circumstances could be done only through developing the technology needed 'from scratch'.

It was clear that the interface would have been less cohesive and focused (assuming that the venture would have come into being at all) had these people's motivation and commitment been reduced through the technology being more highly developed at the outset.

But at the same time there is clear evidence that some parties would

have welcomed working with technology that had been somewhat further developed before the arrangement was instigated. MIM A, for instance, pointed out (interview, MIM Brisbane, 22 September 1992) that MIM would have been less sceptical of QMC's behaviour had they known more about the technology that was to be at the heart of the venture: which would necessarily follow from the technology being further developed. It is clear that less scepticism between QMC and MIM would have done wonders for interface cohesiveness and openness at various stages.

So with MMP, the participants' positions in social space seemed to be more influential in determining outlooks on intercultural similarities/differences than the characteristics of the underlying formal commercialisation arrangement. Perhaps this was because the values and behavioural preferences predicted from cultural theory are so very central to handling intercultural similarities/differences; it can be expected that few variables will be as 'driven' by social space-determined values and preferences.

Be that as it may, the fact is that the MMP case study shows the exact opposite of the findings from analysis of DUNLENA (above). There, implications of the characteristics of the underlying formal commercialisation arrangement offered more encouragement or reinforcement for this dimension of behaviour "emphasising intercultural similarities, and playing down intercultural differences", than did culturally-acquired preferences.

A possible explanation of this reversal could lie in the very essence of the DUNLENA venture. DUNLENA is fundamentally and uniquely about transforming 'raw' research results into a product. All of that inter-

face's tasks, including Du Pont's testing regimens, are virtually integral with the research process. While the MMP arrangement was also working with 'raw' research results, these did not actually constitute the focus of this arrangement; many central aspects of the MMP arrangement, like the economics of the various production routes, were not part-and-parcel of the research process. Perhaps this difference in raison d'etre was enough to prevent MMP's working with undeveloped technology from having the over-riding effect identified with DUNLENA.

### 3. The SIROSCOUR Interface

Clearly the CSIRO people in SIROSCOUR were keen to recognise, and sometimes to emphasise, intercultural differences. This view seems ultimately to have coloured the whole interface.

CSIRO D, for instance (see list of those interviewed, in the description of SIROSCOUR in Volume 2), dwelt on PD&F's unrealistic degree of commercial drive and consequent narrow thinking, and what this contributed to failure of the SIROSCOUR venture. The company's drive to try to develop the whole scouring system 'from scratch' (rather than buying many components 'off-the-shelf': see the description of SIROSCOUR in Volume 2) resulted from the company's naivety in believing that "they might be able to shut the technology up if they let nobody else in" (interview with CSIRO D, CSIRO Geelong, 18 September 1992).

This focus on narrow commercial aims resulted, according to CSIRO D, in misplaced confidence; the SIROSCOUR project was (and this intercultural difference was described in essentially the same terms, by CSIRO C) "a classic case of high-tech. chemical engineers seeing a

low-tech. agricultural industry, and saying 'It's easy'."

Misunderstandings or uncertainties arising from these perceptions of intercultural differences by the CSIRO people clearly contributed to the rapid deterioration in SIROSCOUR's openness, flexibility, cohesiveness and focus. It will be seen section A of chapter 8 that consequences of these misunderstandings/uncertainties were at the heart of most of the conflicts in the SIROSCOUR case study.

The people from the two companies, on the other hand, showed few signs of emphasising intercultural differences, above and beyond the almost mandatory passing criticism of CSIRO's "public service mentality", embedded in a "research culture". One of their few specific emphases of intercultural differences came in the form of PD&F's surprise at the CSIRO group's naive views on reworks of engineering tasks. As PD&F said (telephone interview, 21 October 1992), "It's almost as if they thought this was at a laboratory scale."

Such fleeting references to intercultural differences aside, the companies' (many) criticisms of CSIRO's approach and behaviour seemed to be based not so much on cultural difference and a resultant inability of the CSIRO group to understand the companies' views, as on CSIRO's operating procedures and competence. These related, for instance, to CSIRO's alleged dishonesty (for example, in describing what they had to sell and what skills they had to inject), and incompetence or at least carelessness (for example, in not having properly vetted PD&F before they licensed them and commended them to Greenfields). It seems that these criticisms by the companies could largely have been made of *any* technology-providing partner: whether from public sector research

or elsewhere.

So while it would be an overstatement to describe the two companies as exploding myths about intercultural differences, it does seem accurate to portray them as being willing generally to accept the CSIRO and small company cultures as at least compatible, and indeed probably similar in some respects. Furthermore even when Greenfields offered views on some of CSIRO's values and priorities that were sometimes incompatible with industry's needs (such as the increasing emphasis on revenue-generation in CSIRO at the expense of what they saw as productive, effective assistance to companies), the views were not put forward as causes of major breakdown of SIROSCOUR. Rather, they were put forward as matters of fact in detached, rational statements.

And even when the company people *did* attribute aspects of the breakdown of the SIROSCOUR interface to actions of CSIRO, they tended to attribute those actions to poor policies imposed from above (like the drive for CSIRO to work with Australian companies at almost any cost) rather than *this particular CSIRO group's* values and priorities.

PD&F's and Greenfields' tendency to play down intercultural differences seemed to condition these parties' whole approach to the venture, and thereby to play a significant part in maintaining the interface's openness, cohesiveness and focus as long as they were maintained. Acknowledgment of this came with PD&F's admission (telephone interview, 21 October 1992) that the company had been able to understand and accept CSIRO's low degree of documentation of the SIROSCOUR process. It will be seen from chapter 8 that this limited documentation ultimately became the basis for much of the conflict in this



interface. But eventually the CSIRO group's apparently stronger tendency to emphasise intercultural differences seemed to have had more effect, and SIROSCOUR's openness, cohesiveness and focus (in particular) seemed to have suffered as a result, in the ways described in the description in Volume 2, and in chapter 8.

The outlooks on intercultural differences described in the preceding discussion were expected on the basis of cultural theory (see Table 4). People from an individualist social/management environment (like PD&F and Greenfields) were expected to play down intercultural differences, and perhaps even to emphasise intercultural similarities, while people from a hierarchist environment (like the CSIRO group) were expected to emphasise intercultural differences.

The tendency for at least some of the SIROSCOUR parties to emphasise intercultural differences might be expected to be encouraged by implications of the characteristics of the underlying SIROSCOUR commercialisation arrangement. Table 7 showed this arrangement to lack the one characteristic expected to encourage recognition of intercultural *similarities* (Table 6): the technology being at an early stage of development at the time the arrangement was instigated.

And there is significant evidence that the technology's maturity when the arrangement was established had a detrimental effect on interface openness and cohesiveness (at least). This evidence came most clearly from PD&F (telephone interview, 21 October 1992). Among the many obstacles to interface effectiveness he identified, he saw the biggest as being CSIRO's dishonesty, or at least selective revelation of facts. Mostly when he mentioned this, he tied it in with PD&F's re-

latively late arrival on the scene. The consequences of this late arrival included PD&F's inability to verify the research reports handed to them by CSIRO, their lack of say in precisely what their task in the venture was, and their lack of opportunity to confirm the CSIRO group's level of practical knowledge of scouring.

PD&F also noted that his company's task in developmental jobs like this is normally, and should in this case have been, "turning the process, already developed, into an industrial reality". Of course this implies the more the technology is developed at the time PD&F becomes involved, the better. But it assumes that the direction of development of the technology by CSIRO alone was correct and sensible (in PD&F's opinion). PD&F were not convinced this was the case here.

Several interviewees identified detrimental consequences for interface effectiveness (especially openness and cohesiveness), of PD&F's restricted inputs. These are taken up in the analysis of the way the parties' cultures fit together, in section A of chapter 10; in the analysis of power relationships in section A of chapter 9; and in the analysis of trust later in the present chapter. Clearly, PD&F's inputs would have been much less likely to have been restricted in these ways had PD&F been involved with SIROSCOUR when the technology was less developed: as happened with companies' involvement in some of the other case studies.

At a more general level, the broad pattern of the SIROSCOUR case study also suggests that the interface would have been more effective had it been established when the technology was less developed. Some of the more serious conflicts would arguably have been less likely to have

developed had this happened.

Conflict SIROSCOUR B, for instance (regarding what CSIRO did and did not provide to PD&F by way of engineering drawings, and what they should have provided: see section A of chapter 8), would have been much less likely to have developed had the interface come into being sooner. Likewise it seems probable that PD&F's unawareness of the difficulties of handling wool (claimed by a number of interviewees, notably CSIRO C and Greenfields) would have been corrected at an earlier stage. This may well have flowed through to avoid formation of one of this interface's main barriers to effective commercialisation.

#### 4. Conclusions

This analysis constitutes a notable first step towards answering the study's research questions, and towards illuminating the social effectiveness and endurance of commercialisation interfaces.

It was shown that behaviour associated with emphasising intercultural similarities contributed to interface effectiveness in the case studies, while behaviour associated with emphasising intercultural differences tended to undermine interface effectiveness.

Beyond this, the analysis identified a clear encouragement or reinforcement effect on this dimension of behaviour, coming from the values, norms, attitudes and preferences brought into the interfaces by the participants, and from implications of the characteristics of the formal administrative commercialisation arrangements underlying the interfaces.

At the same time the analysis also showed that this behaviour influenced the social dynamics of the case studies mainly through affecting the way each party fundamentally approached its involvement in the interface (rather than affecting the way the interface itself, as a small group, set about its tasks).

### C. PRESERVING PARTNERS' MOST VALUED AND CHERISHED DIFFERENCES

Intergroup interaction will also be smoother and more effective, say Hewstone and Brown (see chapter 2), and a supragroup will be a more enduring social vehicle, where each group can "view itself positively *and* hold positive stereotypes of outgroups, consistent with those groups' autostereotypes [thus enabling] each group [to be] seen as it wishes to be seen, and desired differences [to be] highlighted" (Hewstone and Brown, 1986, p.5).

This dimension is closely related to behaviour bearing on intercultural similarities and differences, investigated in the preceding section. But here, a decision by an interface participant to preserve the partner's most valued differences can often demand moderation of his own expectations from the arrangement. Preserving the partner's valued distinguishing features may well demand significant compromise.

Unfortunately it is not possible to investigate whether characteristics of the formal administrative commercialisation arrangements in the case studies acted to encourage or reinforce behaviour bearing on the preservation of a partner's most valued differences. This cannot be done because it was not possible to identify any arrangement characteristics likely to encourage or reinforce this dimension of social behaviour (Table 6).

## 1. The DUNLENA Interface

The 'venue-for-manufacture' issue (see the description of DUNLENA in Volume 2) embodied a 'most cherished' value for both parties. CSIRO passionately wanted its responsibility for developing Australian industry embodied in a clause strongly stipulating manufacture of any commercially viable compounds in Australia, while Du Pont equally strongly wanted its reputation for sound business strategies reflected in a financially and strategically sensible manufacturing arrangement.

The importance in CSIRO's thinking of arrangements for future manufacture is clear from a number of papers in the Division's files. It is pivotal, for example, to a January 1983 file note by the Division's Technical Secretary, documenting 27 January 1983 discussions in the Division about the strategy for the forthcoming venture, and to a 13 May 1983 letter from the Division to CSIRO's (then) Commercial Group.

The issue's importance to Du Pont was made clear by both the Du Pont interviewees and other interviewees.

Several interviewees - notably CSIRO A (interview, University of Melbourne, 16 September 1992) and Du Pont A (interview, Du Pont North Sydney, 21 August 1992) - went out of their way to describe how the compromise of 'manufacture in Australia if economically feasible' was seen by both parties to have maintained their key values. This single outcome from the negotiations seems to have boosted interface openness, cohesiveness and focus, and possibly flexibility as well. CSIRO C (interview, CSIRO Clayton, 17 September 1992) noted the focus this outcome had provided for the interactive tasks the two very different groups were to undertake, while CSIRO A (interview, University of

Melbourne, 16 September 1992) doubted whether the intercultural understanding could have become anywhere near as high as it had without such a symbol of understanding.

A second illustration of one party preserving its partner's most valued differences (articulated by CSIRO E, SIROTECH and the Du Pont people) is the consensus between the CSIRO group and Du Pont that the former should be able to maintain their cultural identity. Du Pont had no intention whatsoever of strongly influencing the CSIRO group's approach to its research. Rather, Du Pont wanted only to make the best of what the CSIRO group found, recognising the different background and perspectives offered by the CSIRO people. The minutes of the 25 March 1988 meeting of the DUNLENA Technical Committee have Du Pont C expressing

enthusiasm and optimism for the chemistry undertaken at CSIRO. He noted that the approach taken was complementary to Dupont and saw this as healthy - that we would not want to Dupontize CSIRO.

Most interviewees identified preservation of these different values as a main contributor to DUNLENA's cohesiveness, openness and focus. It encouraged the CSIRO people to share ideas and material with Du Pont, and to participate in joint planning of DUNLENA's research program.

It matters little that the objective observer might well question how much the CSIRO group *did* preserve its most important differences; what counts is what critical values and differences those involved *perceived* as being protected. This is discussed in the analysis of power relationships in chapter 9, as well as in the analysis of flexible thinking later in this chapter.

Table 4 predicted that people from hierarchical environments (like both the DUNLENA partners), would be at least willing, and often keen, to preserve their partner's most valued differences. So the DUNLENA parties' (and particularly Du Pont's) major steps towards preserving their partner's most valued distinguishing features were consistent with predictions from cultural theory.

## 2. The I<sup>2</sup> Interface

This case study also clearly demonstrated how each party had acted to preserve its partner's most valued differences, and how those actions had influenced fundamental approaches to participating in the venture. Only one illustration will be called on here, because the signs from it are so clear. It centrally concerns the conflicts with the greatest potential to destroy the interface: see section A of chapter 8.

The subject is the CSIRO group's respect for OPTUS's status as an evolving national telecommunications service company (see the description of I<sup>2</sup> in Volume 2). It would have been very easy, notwithstanding the cash that OPTUS were putting in to I<sup>2</sup>, for the CSIRO group to have said to OPTUS "It doesn't matter what your obligations might be as a telecommunications company; you are in I<sup>2</sup> for a specific purpose, and we insist that you honour your obligations to us." Yet CSIRO never said this. Instead they 'bent over backwards' to understand and respect OPTUS's higher obligation. As CSIRO A said,

[W]e recognise that [OPTUS] has some sensitivities in this area and also some justifiable reservations in terms of having the technology readily available to a direct competitor [30 August 1991 letter from CSIRO A to a senior OPTUS manager].

A number of informants, and OPTUS A in particular, attested to the

positive effect of this tolerant approach on interface cohesiveness.

OPTUS A described how impressed OPTUS's senior management had been by the additional tasks the CSIRO group had taken on. These had flowed to CSIRO as a direct result of OPTUS's inability to participate in I<sup>2</sup> in the way originally envisaged, and this in turn had resulted partly from OPTUS's evolving national responsibilities. OPTUS A believes (interview, CSIRO Black Mountain, 20 August 1992) that this tolerant approach was significant in providing the interface with the flexibility to remain in existence long enough to initiate joint OPTUS/CSIRO work for applying the technology underpinning I<sup>2</sup> in other directions. Without this behaviour associated with preserving the partner's distinguishing features, said OPTUS A, the interface would have been less cohesive (and necessarily much less flexible).

At face value, such conciliatory behaviour on the part of the CSIRO group is at odds with predictions from cultural theory. Table 4 predicted that such a group, from an individualist environment, would not pay much attention to respecting their partner's valued differences, but rather would 'go for broke' to ensure the partner's inputs: whatever the cost.

However, the CSIRO group's behaviour does not necessarily invalidate the hypothesis that the participants' cultural preferences/orientations generally acted to encourage or reinforce behaviour associated with respecting the partner's most valued differences. This conciliatory behaviour by CSIRO can perhaps be understood by casting it against an extreme force, originating in the interface's external environment, that was at work in I<sup>2</sup>. This is the strong political and community



pressure for OPTUS to develop as Australia's second national communications carrier. There are suggestions that, far from quietly accepting OPTUS's backing out of the arrangement, the CSIRO people would have liked to have insisted, in the best individualist style, on OPTUS meeting their half of the deal.

SIROTECH spoke, for instance, of some frustration in CSIRO with OPTUS's non-performance. He saw the CSIRO group's acceptance of that non-performance as pragmatic resignation to the inevitable: "We had to make the system work within the constraints we had, and the partner and their behaviour was one of them" (interview, SIROTECH Melbourne, 14 August 1992). The same point was made by CSIRO A (interview, CSIRO Black Mountain, 26 August 1992).

So perhaps the CSIRO group's appreciation that OPTUS's inability to meet its obligations was being driven partly by the company's evolving role as the second national telecommunications carrier, over-rode the CSIRO people's 'natural' predisposition (as individualists) to insist on their 'pound of flesh'.

### 3. The SIROSCOUR Interface

SIROSCOUR provides considerable evidence that *lack of* attention to preserving most valued differences can have a direct *detrimental* impact on interface cohesiveness and openness (at least). The most instructive illustration of this relates to steps aimed squarely at undermining what was arguably PD&F's most valued distinguishing feature: their conviction that their skills and experience allowed them to successfully tackle handling and processing challenges posed by *any* material in *any* process. This belief dictated to PD&F how the

SIROSCOUR venture should operate and what they could contribute to it.

The other parties were keen to straighten out PD&F on this score because, as Greenfields said, PD&F "had no respect for wool [or] for the complexities [it posed]. That is probably their downfall" (interview, Greenfields Melbourne, 16 September 1992). The undermining, or at least questioning, of this claimed valued distinguishing feature of PD&F was identified by virtually every interviewee as a main fragmenting force. CSIRO C, CSIRO D and CSIRO B all toyed with the thought of how SIROSCOUR would have gone had PD&F compromised on what was, in effect, their most valued difference. Or as the CSIRO people put it, had PD&F been "less vain" (CSIRO C and CSIRO D: interviews, CSIRO Geelong, 18 September 1992) or "less arrogant" (CSIRO B: interview, CSIRO Geelong, 13 September 1992).

Indeed, the unfolding of most of the social processes in this interface seems to be directly linked to PD&F (eventually) coming to grips with the fact that wool was *not* able to be approached with the same engineering precepts as other materials can be. PD&F's belated abandonment of this most valued distinguishing feature seems to be directly related to the limited success the SIROSCOUR venture eventually had (see the description in Volume 2).

Both the other parties contributed to undermining PD&F's most valued differences; many of the comments and criticisms offered in the interviews by the CSIRO interviewees and Greenfields stressed the futility of PD&F's driving value for its involvement in SIROSCOUR. At face value, this criticism of a partner's values does not rest easily with the CSIRO group; it will be recalled from Table 4 that such people,

from a hierarchist environment, were expected to respect their partner's most valued differences.

There are signs, though, that the CSIRO group's indifference to preserving PD&F's most valued differences came to the fore only after the interface had reached the stage of breaking down, and that during the interface's earlier days the CSIRO people were at least aware of the possible damaging consequences of undermining PD&F's distinguishing features. All the CSIRO interviewees showed willingness and ability to reason from PD&F's perspectives. This was especially noticeable from the comments of CSIRO B and CSIRO A. The former, for example, in casting his mind back to SIROSCOUR's early days, said "They were out of their depth ... I felt extremely sorry for them. I know that I've always felt bad about it ... It was a very sad affair" (interview with CSIRO B, CSIRO Geelong, 13 August 1992).

The CSIRO group's lack of respect for valued differences of one of its partners seems to have materialised, then, essentially as an act of desperation when the interface was already doomed: after the system for social structuring of SIROSCOUR had been shown to have failed these hierarchists. Arguably the CSIRO people's cynicism about PD&F's "most valued difference" played a less conspicuous part in the continuous, inexorable deterioration of the interface's openness, flexibility, cohesiveness and focus, almost from the day it was established, than did the lack of respect for PD&F's main distinguishing feature by the other *individualist* party: Greenfields. As predicted from cultural theory (Table 4), Greenfields' attitude towards PD&F's inability to tackle their task seemed to be more forthright, and to have shown up in the venture's earliest days; this is reflected in the dismay Green-

fields reported upon first hearing of the sort of small company CSIRO was intending to license (interview with Greenfields, Greenfields Melbourne, 16 September 1992).

This is not to deny the mutual respect between Greenfields and PD&F, discussed in section D of the following chapter; Greenfields seemed to be more dismissive of what PD&F was (Greenfields thought) being *forced* (by CSIRO) to do, rather than their (culture-based) ways of doing it.

#### 4. Conclusions<sup>3</sup>

This analysis complements the analysis of intercultural similarities/differences in the preceding section, to help answer the study's research questions, and to help illuminate the social effectiveness and endurance of commercialisation interfaces.

There was clear evidence that at least one of the SIROSCOUR parties, and to a certain extent a second of them, was disinclined to preserve a partner's most valued differences. This retarded development of interface effectiveness. On the other hand, the DUNLENA and I<sup>2</sup> parties' attention to *preserving* their partners' most valued differences aided development of interface effectiveness quite markedly.

Here also, the same two quite distinct channels of influence on interface effectiveness were identified: The influence of behaviour associated with preserving partners' most valued differences, like the influence of the intercultural similarities/differences behaviour investigated in the preceding section, depended on encouragement or reinforcement from the interfaces' cultural contexts (the interfaces' *structural* contexts could not be investigated), *and* acted through

affecting the way each party fundamentally approached its involvement in the interface.

#### **D. ADAPTIVE, FLEXIBLE THINKING, TO COPE WITH THE NEW SITUATION BEING ENCOUNTERED**

Chapter 2 identified a further important prerequisite for developing the intergroup understanding and empathy that provide the hinge for intergroup contact theory: a commitment to flexible thinking and a willingness to 'move with the times' and to abandon the "morass of old arrangements and emotional smarts" by the display of "give-and-take among persons who have lived their lives in group contexts designed for domination or submission, suppression or rebellion" (Sherif, 1966, p.106). It was reasoned in chapter 2 that a commercialisation interface characterised by adaptive, flexible thinking will tend to be a more effective and enduring interface.

The question investigated in this section is closely related to the 'intercultural similarities' and 'preserving valued differences' questions investigated in the preceding sections. But this dimension addresses a party's flexibility in its *self*-evaluation and in setting *its own* values and norms, rather than its views of, and responses to, *its partner's* values and norms. There is a significant implication that new perspectives will be adopted and old ways abandoned *voluntarily*, rather than under duress after an old way of thinking has shown itself to be unproductive.

##### **1. The DUNLENA Interface**

The DUNLENA case study provides an outstanding illustration of how important it is for maximum interface effectiveness, for a party to be willing to adopt new perspectives and to abandon no-longer-suitable

old ways. This illustration centres on the CSIRO people's preparedness - after a deal of soul-searching in most cases - to abandon 'old ways' that were distinctly unsuitable for this work with Du Pont. This was described by CSIRO E as

a move from 'academic science' to 'commercial science'. The former is much more precise or 'nit-picking' ... You do a reaction or synthesis with particular care, and you examine the products very carefully and you also characterise them in an absolutely thorough way: a very hidebound way ... You rapidly realise that investing a lot of work in any one compound is essentially wasteful. To do all the various degrees of characterisation on one compound... is a luxury you can't afford. [You have to] leave it at that, and go on to the next compound. That caused a great deal of angst in the group. Some individuals were barely able to cope with it ... They felt it was shoddy ... Some [still] have not got over it ... A manifestation of this is the abandonment of a commitment to yield-increasing chemistry. In this arrangement, ... it took some people quite a while to realise that the only thing that matters was getting enough compound out of your reaction ... for testing [interview, CSIRO Clayton, 17 September 1992].

The impact on all four of interface openness, flexibility, cohesiveness and focus, of the CSIRO group's willingness to cast its thinking into these completely foreign terms is clear. Obviously the interface could never even have come into existence without at least a commitment from the CSIRO group to work in this mode. Du Pont could not possibly have worked in a compound-development arrangement, and certainly would not have invested the arrangement with its confidence or its corporate commitment, with researchers unwilling to apply the sort of approach to compound-generation described by CSIRO E.

The "angst" described by CSIRO E and other interviewees should not be surprising based on cultural theory's reasoning. Abandoning old ways to the extent demanded of the CSIRO people is completely at odds with the preferences of such people, from a hierarchist environment: see

Table 4. So this group's marked steps in this direction took place *despite* the culturally-acquired orientations and preferences of the participants, but these steps did follow a lot of prevarication; as would be anticipated from cultural theory.

Indeed it is interesting to contrast the major cultural change actually undergone by the CSIRO group not only with their predicted attitude towards thinking and behaving in fundamentally new ways but also with the amount of cultural change they *perceive* themselves as having undergone. Discussion in the preceding section foreshadowed an inconsistency in this respect. It seems that the CSIRO group was beset by a serious case of wishful thinking that may well have been driven by their culturally-acquired intentness on retaining established ways.

Something that might have encouraged this (eventual) abandonment of the hierarchist's preference for conservative thinking is suggested by a characteristic of the DUNLENA commercialisation arrangement. Table 6 identified only one characteristic expected to encourage the parties to abandon old, no-longer-suitable ways of doing things: the arrangement being novel, sensitive and politicised. Table 7 shows that the DUNLENA arrangement is, from the point of view of the CSIRO group, novel, sensitive and politicised.

There is a reasonable amount of evidence that this novelty/sensitivity/politicisation tended to have a positive effect on the interface's effectiveness. A good illustration comes from the CSIRO group's concentrated 24-hours-a-day shiftwork to produce a promising compound in the quantities needed by Du Pont, within the timescale it was needed (see the description of DUNLENA in Volume 2). A number of interview-

ees, including CSIRO B and CSIRO C (interviews, CSIRO Clayton, 17 September 1992), offered essentially the same observations about this behaviour: that this was a foreign mode of working for the CSIRO people, that this was but one reflection of how novel the DUNLENA arrangement was to the group, and that only a high feeling of team membership and enthusiasm for DUNLENA's objectives had brought about this extreme behaviour.<sup>4</sup> They also noted that this behaviour had in turn led to notable feelings of solidarity with the Du Pont people.

Indeed CSIRO C (interview, CSIRO Clayton, 17 September 1992) attributed to this one symbolic event, a significant role in reversing the CSIRO group's initial refusal to provide Du Pont with structural details of their compounds. It will be recalled from the description of DUNLENA in Volume 2 and from discussion in section B of this chapter, that this refusal was by far the most significant barrier to DUNLENA's openness and flexibility: and probably its cohesiveness as well.

It could be that the impact in the CSIRO people's minds of such novel events in DUNLENA, and of the whole aura of novelty and strangeness surrounding the venture, made it difficult for even categoric hierarchists like them to stick with their preferred traditional ways of doing and thinking about things: at least beyond the first 18 months to two years.

## 2. The SIROSCOUR Interface

Two of the three SIROSCOUR parties consistently showed a notable reluctance to rethink their perspectives and ways of doing things. It is clear that this was at the heart of one of the interface's fundamental problems (PD&F's insistence on building all components of the first



SIROSCOUR line 'from scratch'), which is analysed at several points in the thesis.

This reluctance also seemed to underlie CSIRO's doubt about tackling problems head-on. The attitude seems to have been that the Division should not have to intervene in SIROSCOUR any more than they had intervened in various earlier arrangements: even if SIROSCOUR was going off the rails. Greenfields' lament (interview, Greenfields Melbourne, 16 September 1992) that CSIRO never chastised PD&F for the way they were tackling their task clearly amounts to a requiem for the CSIRO Division's failure to be more adventurous and outgoing, and to move with the times. So does CSIRO B's lament: "I wish we had had the foresight to really get into [PD&F] and say to [PD&F] "Don't do this, because you are jeopardising our technology." ... I wish we had done that ..." (interview, CSIRO Geelong, 13 August 1992).

This reluctance to start thinking and behaving in fundamentally new ways, which was so clear in PD&F's and the CSIRO group's behaviour, was not evident in the behaviour of the other SIROSCOUR partner, Greenfields. Nevertheless it seems to be reasonably clear that, on the whole, tried-and-tested approaches and methods with which the parties were comfortable tended to prevail in this interface: whatever difficulties they might pose.

Furthermore it is clear that conservative attitudes (especially those of PD&F) were a significant contributor to the interface's rapidly reducing cohesiveness, openness and flexibility. PD&F's insistence on building all components of the first SIROSCOUR line 'from scratch', for instance, is shown elsewhere to have been a major contributor to

the rapidly decreasing cohesiveness, openness and flexibility in this case study (see the analysis of the development and pursuit of shared goals - section A of chapter 7 - and the analysis of the focus of conflicts - section G of chapter 8). CSIRO B actually identified PD&F's inflexible thinking as the overwhelmingly significant factor in the interface's rapid deterioration (interview, CSIRO Geelong, 18 September 1992), and other interviewees came close to this same conclusion.

There is mixed evidence in SIROSCOUR on the effect of the participants' culturally acquired values, norms, attitudes and preferences on their inclination to adopt new perspectives and new ways of doing things and to abandon old, no-longer-suitable ways.

On the one hand, it was expected on the basis of cultural theory (see Table 4) that people from a hierarchical environment (like the CSIRO group) would be reluctant to move with the times in the sense being discussed here: as they were. On the other hand, the individualists from the companies were predicted to be relatively adventurous in this respect. One of the companies, Greenfields, did not demonstrate much inclination at all to abandon *or* to stick with old, no-longer-suitable ways, while the other, PD&F, showed itself to be just about as conservative in this respect as any party to any of the case studies.

Again, implications of the characteristics of the underlying commercialisation arrangement provide a possible explanation for absence of behaviour predicted from some participants' 'cultural baggage'. It will be recalled that Table 6 identified only one characteristic expected to encourage the parties to abandon old, no-longer-suitable ways of doing things: the arrangement being novel, sensitive and/or

politicised. The SIROSCOUR arrangement was notable for its *lack* of this characteristic (see Table 7); SIROSCOUR was a completely conventional and traditional arrangement, with the only controversy coming from matters of operating detail (like CSIRO's choice of a small untested Australian company as its licensee).

There is some evidence that the SIROSCOUR case study's paucity of unusual or sensitive features had a detrimental effect on the interface's effectiveness: especially its focus and cohesiveness.

Specifically, there was a suggestion from a number of the informants that the interface would have been more inclined to focus on issues that were largely ignored had an element of sensitivity or politicisation been injected. All parties either took steps or regretted not having taken steps that amounted to attempting to inject more novelty/sensitivity/politicisation. PD&F's steps to this end took the form of referring the whole SIROSCOUR situation to the Australian Wool Corporation. Greenfields' steps took the form of threats of legal action and pointing out to CSIRO the error of their ways in not having said to PD&F (regarding the company's decision to design and construct all parts of the SIROSCOUR line 'from scratch'), "You're stupid, doing it this way" (interview with Greenfields, Greenfields Melbourne, 16 September 1992). CSIRO, for its part, felt that they "should have jumped up and down more" when it became clear what PD&F were doing in this respect (interview with CSIRO B, CSIRO Geelong, 18 September 1992).

It is possible, then, that the lack of any element of novelty, sensitivity or politicisation imposed on the interface such an atmosphere of conservative thinking that even an individualist party like PD&F

was forced to abandon its 'natural' predilection to regularly review its perspectives and ways of doing things.

### 3. Conclusions

As with both the preceding analyses, this analysis made a substantial contribution to answering the study's research questions and to illuminating the social effectiveness and endurance of commercialisation interfaces.

The one DUNLENA partner from whom a high degree of flexible thinking was demanded (the CSIRO group) eventually successfully adapted its thinking in the necessary ways. The SIROSCOUR interface, on the other hand, for the most part adhered to established ways of thinking. There was clear evidence that these outlooks had the predicted influence (positive and negative respectively) on interface effectiveness.

It was ultimately concluded that the influence of this dimension of behaviour, like the influence of behaviour associated with intercultural attitudes and actions, depended on encouragement or reinforcement from the interfaces' cultural and structural contexts. At the same time it was clear that behaviour associated with adopting new perspectives and abandoning outmoded ways acted through affecting the way each party fundamentally approached its forthcoming involvement in the interface (rather than affecting the way the interface, as a small group, set about its tasks).

So once again, the same two quite distinct channels of influence on interface effectiveness identified through the two preceding analyses were identified here as well.

## E. DEMONSTRATION OF GOODWILL TRUST BETWEEN INTERFACE PARTICIPANTS

And these same two channels of influence were also at work in the case studies when it came to this final dimension of behaviour to be investigated in this chapter: behaviour associated with the demonstration of trust between the parties and their representatives.

Chapter 2 argued that Sako's concept of goodwill trust would provide insights into the establishment and endurance of commercialisation interfaces beyond those provided by intergroup contact theory. Supragroups based firmly on goodwill trust will, according to Sako, provide smoother, more effective vehicles for collaborative activities of this type, than will supragroups lacking this form of trust.

### 1. The MMP Interface

The interview with QMC B continually turned to trust among various pairs of partners - as well as its antithesis, threats/suspensions - as what really makes this interface 'tick'. The interface realised its full potential as a vehicle for collaborative R&D, said QMC B, only after the various pairs of parties had established relationships based on deep trust. QMC B described resolution of the question of where CSIRO C and his evaluation group should be located, for instance, in these terms. QMC's office was selected as the location because this would least disturb the trust relationship between MIM and UBE; locating the project managers at QMC was "the least threatening alternative" (interview with QMC B, QMC Brisbane, 22 September 1992).

SIROTECH summed up both the importance of trust between the two large companies and QMC's role in engendering this trust:

It was evident in all activities that the atmosphere of mutual trust and goodwill promoted by QMC was yielding returns. Both MIM and UBE expressed and demonstrated willingness to understand and accommodate the intent of the other on all issues that arose, and to explain their own intent [interview, SIROTECH Melbourne, 14 August 1992].

Other key participants also saw many of the important issues in terms of trust. MIM A, for example, characterised MIM's relationship with UBE in these terms; things have now settled down, and UBE now really trusts MIM,

but we are very sensitive to this balance thing all the time in the trust [between the two companies]. ... [UBE] sees that MIM should not take a predominant role; and nor should UBE. ... They're fearful of MIM grabbing this thing ... Provided you accommodate [how it works], you are showing your trust, and once you are showing your trust by saying "I understand that and am accommodating you in that area", what you get back is absolutely the same: matched trust [interview with MIM A, MIM Brisbane, 22 September 1992].

That trust in MMP amounts to Sako's goodwill trust is clear from the following classical signs of goodwill trust (articulated in chapter 2), in all parties' approaches to the venture:

- \* *Willingness to defer the partner's obligations for a long period.* One reflection of this was MIM's frequently-stated preparedness to look to the long term for its return from the venture. As MIM A said (interview, MIM Brisbane, 22 September 1992), "Solutions to problems and potential problems will come only from patience and trust on the part of everyone." Another reflection was CSIRO's willingness to accept shares in QMC as remuneration for their research services over many years. This represents a substantial deferral by CSIRO of QMC's obligation to pay for CSIRO's research.

- \* *Willingness to offer more than the contractual relationship demands.* It would have been easy, and consistent with the arrangement's minimum formal obligations, for UBE (for example) to forget about MMP in its well established day-to-day dealings with other companies. In fact, UBE go out of their way to embed the MMP arrangement into this day-to-day business. UBE "have told Ford Detroit [for instance] that if they are interested in learning more about casting magnesium they should go and talk to UBE's Australian partners" (interview with MIM A, MIM Brisbane, 22 September 1992). "UBE made it clear that it was expecting to disclose to us all its knowledge on the major commercial alloys. Whilst we were not surprised at the substance of this, we were delighted at the frankness and willingness to cooperate this implied" (file note by SIROTECH following his 1991 visit to UBE).
  
- \* *Smooth, continuous, 'natural' growth of trust, based on "reinterpreting [the groups'] collective past, and ... their conflicts"* (Sabel, 1990, p.4). MIM A described (interview, MIM Brisbane, 22 September 1992) how UBE and MIM reached mutual trust precisely in this fashion; each recognised the other's claims to their own role in MMP and acknowledged what the other had had to forego. At the same time this also illustrates another goodwill trust characteristic: *the refusal to take unfair advantage of circumstances, or to 'score points'.*
  
- \* *Willingness to institutionalise trust through new arrangements and behaviour, and the abandonment of traditional, expected behaviour.* A good illustration is CSIRO's and MIM's agreement to location of CSIRO C and his evaluation group at QMC. As

previously noted, this entailed both CSIRO and MIM abandoning expected behaviour.

Just how much trust (often of the goodwill variety) influenced all parties' overall approaches to the venture, and ultimately MMP's openness, cohesiveness and focus (and probably also its flexibility), is evident from the frequent identification of trust as a (or *the*) cornerstone of the interface's solidarity and achievements (see the preceding discussion).

This is not to say, though, that the MMP interface was based on unmitigated goodwill trust. It was not. From time to time the interviews raised issues hinging on distrust, or at least on the absence of deep goodwill trust.

Distrust in the relationship between MIM and QMC, for example, was evident in QMC's attitudes towards MIM's due-diligence steps before they committed themselves completely to the MMP venture (see the description of MMP in Volume 2). MIM had made it clear that what they were doing was nothing more than reasonable due-diligence, "looking in an uncommitted way at the alternative ways" of getting into the international magnesium metal business (interview with MIM A, MIM Brisbane, 22 September 1992). QMC's distrust was evident in their insistence on sending someone along on MIM's worldwide survey of the magnesium metal industry, and in their 'head-on' tackling of MIM at the conclusion of that survey, with accusations of double-crossing and MIM's having 'led QMC on' (interview with MIM A, MIM Brisbane, 22 September 1992).

QMC distrusted and suspected MIM at a more general level too. QMC B



fears (interview, QMC Brisbane, 22 September 1992) that, because QMC will own only 10% of the proposed production joint venture (see the description of MMP in Volume 2), "MIM is likely at some point in the future to start to regard QMC as not a 'real' partner ..., and to start to take less notice of what we say".

Some distrust of QMC by MIM was also evident; this is reflected in MIM A's question (interview, MIM Brisbane, 22 September 1992) "If we [MIM] are paying all the money, why is all the action and control sitting with [QMC]?"

There was also significant distrust in *CSIRO C's* relationships with the other parties. This was reflected in his fears about how the other parties would treat him: "I feel very vulnerable, because if I put a step wrong, they'll chuck me out. ... There are all sorts of pitfalls for me. ... it's unlikely I'll last the four years" (interview with CSIRO C, CSIRO Port Melbourne, 14 August 1992).

The inevitable detrimental impact of distrust on MMP's openness and cohesiveness (and perhaps on its flexibility and focus as well) is obvious. The impact is clear from interview comments quoted earlier in this sub-section; from the analysis of attitudes towards intercultural similarities/differences, earlier in this chapter; and from the analysis of MIM's concerns about a prospective role in the interface based on less than full cultural pluralism, in section A of chapter 10.

The MMP interface might be summarised, then, as on the whole an arrangement featuring deep goodwill trust, but showing patches of distrust from time to time on specific issues. These 'patches' of dis-

trust seemed to hinge on both the behaviour and attitudes of CSIRO C and the QMC people, and on attitudes *of others* towards these people.

This situation should not be surprising in the light of cultural theory. Table 4 predicted that members of egalitarian groups (like CSIRO C) would show significant distrust towards their partners, while individualists (like QMC) would do likewise *and* would engender distrustful attitudes in others. (Cultural theory is ambiguous on attitudes of *hierarchists*' [like MIM and UBE] towards trust/distrust: see Appendix 2.)

One characteristic of the MMP arrangement was expected to encourage an on-the-whole trusting atmosphere in MMP. Table 6 suggested that an interface would rely more on trust if the underlying arrangement had come into being through an essentially collaborative approach by at least some of the partners. Table 7 shows that this was in fact how the MMP arrangement had come into being.

Furthermore there is ample evidence that this origin had a positive impact on MMP's openness and cohesiveness (at least). The QMC interviewees, CSIRO C and SIROTECH all repeatedly identified positive flows to interface openness and cohesiveness from the extensive early-stage collaboration between QMC and CSIRO. This was discussed extensively in connection with the critical roles of "missionaries" (see the description of MMP in Volume 2, as well as the analysis in section E of chapter 10).

Some interviewees, notably SIROTECH and QMC B, pointed out how important it was, if these roles were to have maximum effect, for them to be

initiated early on. SIROTECH observed (interview, SIROTECH Melbourne, 14 August 1992) that it was only the high degree of articulation and vision in the MMP arrangement, together with the fact that the arrangement had so obviously received the strongest support from all the Australian parties and the government, that had persuaded UBE to join it. If this high degree of collaborative development of the MMP idea by the Australian partners and the government had not taken place at the beginning of the project, UBE (described by SIROTECH - interview, SIROTECH Melbourne, 14 August 1992 - as "the cement in the deal") would not have 'come on board', and the project probably would not have progressed as far as it did.

## 2. The I<sup>2</sup> Interface

The two inter-related key issues in I<sup>2</sup> - CSIRO's tolerance of OPTUS's inability to inject all the inputs they had undertaken to provide, and CSIRO's acceptance of OPTUS's withdrawal as an active partner in the venture - were largely mediated by trust between the parties. Without trust, it seems unlikely that this interface would have lasted anywhere near as long as it did.

Trust's part in controlling the interface's diminishing cohesiveness, openness and focus was illustrated in OPTUS A's description of the reliance OPTUS placed on CSIRO taking on tasks which OPTUS should have undertaken, but which they were unable to. The OPTUS group placed themselves in CSIRO's hands to a surprising extent: including in areas in which the CSIRO group was most inexperienced. This had surprised CSIRO B (interview, CSIRO Black Mountain, 26 August 1992), who found it hard to believe that OPTUS would go into an arrangement in which power was so unbalanced. He believes that this made CSIRO more re-

spectful of OPTUS, and ultimately made the interface more cohesive. Other interviewees corroborated this.

But two qualifications must be placed on trust's role in I<sup>2</sup>.

First, the trust seemed often to lack the special characteristics of *goodwill* trust. A thorough search of the data on I<sup>2</sup> uncovered relatively little evidence of the sort of deep, ongoing, 'beyond-the-call-of-duty' trust that characterised MMP. To be sure, there were elements of deferral of obligations and refusal by each party to 'score off' the other. But at no stage were trust-based relationships institutionalised in the way described by Sako, and in the way identified for MMP in the preceding sub-section.

Second, it is evident that *distrust* also played a prominent part in I<sup>2</sup>. This emerged most starkly from CSIRO C's description of how the CSIRO group's interaction with OPTUS was based on treating OPTUS as a customer, rather than as a partner, and on hiding much from them:

If there were problems, they weren't mentioned to OPTUS. If they were, OPTUS would say "Oh no; CSIRO's done it again!" This would reduce the probability of future research contracts from OPTUS. You kept the good news [for OPTUS] to a maximum, and the bad news to a minimum. ... That formula seemed to have worked [interview with CSIRO C, CSIRO Black Mountain, 28 August 1992].

So trust was of variable importance in I<sup>2</sup>, and sometimes seemed to be more shallow than the form of trust described for MMP. Ultimately the key link seems to have been the relationship between trust and the changing pressures on OPTUS, and in particular the company's evolving role at the national level (see the description of I<sup>2</sup> in Volume 2). OPTUS's originally intended role in the arrangement had necessarily

changed so much that either OPTUS had to accept CSIRO doing things they would not normally do (and to trust the CSIRO group to do those things correctly), or OPTUS had to leave the arrangement altogether.

Trust in this interface seemed to a large extent, then, to have been *forced onto* one of the participants - OPTUS - rather than to have grown more naturally out of the parties' interaction (as with MMP).

It could well have been that both the partners realised that the actions of one of them were going to be constrained so much by this sort of externally imposed pressure that inter-party trust could never play the prominent role in  $I^2$  that it played in MMP. The more important driving force for  $I^2$  was always going to be political imperative, and trust was always going to be a qualified, one-sided affair. According to this reasoning, this environmental influence on  $I^2$  led at the same time to the OPTUS group placing quite a high degree of trust in CSIRO, and to CSIRO's expectations of OPTUS becoming quite pragmatic and cynical.

Notwithstanding any such effects of the external environment, the role of trust in  $I^2$  is broadly consistent with predictions from cultural theory. Table 4 suggested that fatalists (like the OPTUS group) would place a deal of trust in a partner - as OPTUS did - while individualists (like the CSIRO group) would both attract and display distrust. The CSIRO group *displayed* elements of distrust, although it certainly did not *attract it* from OPTUS. But perhaps this lack of distrust from OPTUS was more a product of a fatalist party's intentness on grasping leads from its partner than a product of breakdown in cultural theory's prediction for people from an individualist environment.

One characteristic of the underlying I<sup>2</sup> commercialisation arrangement was expected to increase the significance of trust. It will be recalled (Table 6) that an interface was predicted to be most likely to rely on trust if the underlying arrangement had come into being through an essentially collaborative approach by the partners. This was in fact how the I<sup>2</sup> arrangement had come into being (see Table 7).

Yet this collaborative initiation of I<sup>2</sup> seemed to be remarkably insignificant in influencing the I<sup>2</sup> interface's social development and effectiveness. Many other aspects of the CSIRO-OPTUS relationship (like the environmental pressures on OPTUS, already mentioned; management attitudes towards the venture; and the CSIRO group's commitment to broaden and deepen its commercial skills/knowledge) were more prominent in interviewees' descriptions of the social and cultural dynamics of this interface. It seems likely that something intervened to restrict the expected influence on interface effectiveness of I<sup>2</sup>'s collaborative genesis.

The most likely explanation would seem to come from the prominent factor in the interface's outside environment already focused on in this analysis: the rapidly developing political pressure on OPTUS to modify its role as it evolved into the country's second telecommunication carrier. Perhaps this came to over-ride the collaborative genesis of the arrangement in much the same way as it came to dictate a prominent part for inter-party trust. Perhaps OPTUS's inexorably developing national role placed the interface onto such a different basis from what had been envisaged when the arrangement was established, that 'all bets were off', with the close collaboration in establishing the arrangement now counting for little.

### 3. The SIROSCOUR Interface

The role of trust (sometimes including goodwill trust) in the interfaces investigated to this point, and its generally positive influence on interface effectiveness, contrasts with the situation in SIROSCOUR. Within a year, and probably sooner, even the level of trust necessary for each party to meet its minimum obligations had disappeared from SIROSCOUR. This had particularly serious consequences for the interface's cohesiveness and focus (especially), because, as highlighted in the description of SIROSCOUR in Volume 2, this arrangement was relatively undocumented. It relied to a greater than average extent on expectations and understandings about which party would do what, when and how they would do it, and what the involvement of the other parties would be.

The consequences of the evaporation of trust were exacerbated by the fact that Greenfields was using the SIROSCOUR project as its entree to the wool scouring business. Being so inexperienced in this area, they had to place a lot of trust in both PD&F (to provide the turnkey plant they had commissioned) and CSIRO (to inject adequate scouring know-how). As Greenfields said, they had such confidence in CSIRO and in CSIRO's assurances that they had vetted PD&F, that they did not even appoint their own project manager for the SIROSCOUR project.

The initial high level of trust in SIROSCOUR (see the description in Volume 2) dissipated rapidly with PD&F's ill-advised approach to their task and with evidence that CSIRO was not willing to do anything to attempt to change that approach.

Another important contributing factor seemed to be a general realisation

ion that CSIRO's practical scouring know-how and SIROSCOUR's exposure in the scouring industry were both very much less than had been understood. Both PD&F and Greenfields had trusted CSIRO to inject adequate practical scouring know-how, and claimed that CSIRO had undertaken to do so. Yet what PD&F had believed to be "an 85 to 90% level of understanding of the practical scouring process" turned out to be "something like 45%" (telephone interview with PD&F, 21 October 1992). It only later emerged (as components of the scouring line were found not to work) that the drawings and CSIRO's know-how were merely "indicative of what we think should happen; such-and-such a place does it differently" (telephone interview with PD&F, 21 October 1992).

This rapid collapse of trust in SIROSCOUR had the predicted effects, although they came about even more rapidly and completely than might have been anticipated. All interviewees pointed to a number of consequences of low levels of trust for all the parties' approaches to the venture: defensive communication, 'finger-pointing' (for example, on whether it had been PD&F or CSIRO who insisted on all components of the scouring system being designed and developed 'from scratch'), and territoriality (for example, on the issue of which party's know-how had eventually solved the problems that had developed). These consequences of distrust are the precise opposites of the consequences of goodwill trust in MMP, identified earlier in this analysis.

A search for reasons for this rapid drop-off in levels of trust in SIROSCOUR points to both the participants' values, norms, attitudes and preferences, and implications of the characteristics of the underlying commercialisation arrangement.



It is clear from the preceding discussion that the two individualist parties, whose culturally-acquired values and preferences were predicted (Table 4) to discourage trust-based behaviour (the two companies), played major parts in the rapid deterioration of the initial high levels of trust. But there is also some evidence that each company tended *to engender distrust* from the partners: as with CSIRO B's uncertainty about how much of what CSIRO had told PD&F had genuinely not been comprehended, and how much had been heard and absorbed, but not 'understood' (interview with CSIRO B, CSIRO Geelong, 13 August 1992). This attraction of distrust from others was also was predicted from cultural theory (see Table 4). (It is not possible to analyse in these terms the importance of *the CSIRO group's* culturally-acquired values and preferences, because it will be recalled that cultural theory is ambiguous on hierarchists' attitudes towards trust: see Appendix 2.)

At the same time, the characteristics of the SIROSCOUR commercialisation arrangement also seemed to be working to discourage reliance on trust. The SIROSCOUR arrangement had come into being in a classically unilateral fashion, on CSIRO's sole initiative and with enthusiasm only from the CSIRO group (see Table 7). This arrangement therefore lacked the one characteristic expected (see Table 6) to encourage or reinforce trust-based behaviour.

Furthermore there is significant evidence that this one-sided initiative to establish the arrangement had a distinctly detrimental effect on interface effectiveness. This evidence comes most clearly from the interview with PD&F; for the most part it was presented in section B, in investigating the significance of the advanced stage of development

of the technology on which SIROSCOUR was based. Among the many obstacles to interface openness, flexibility, cohesiveness and focus identified by PD&F, he saw the biggest obstacle (telephone interview with PD&F, 21 October 1992) as being CSIRO's dishonesty, or at least selective revelation of facts. Mostly when he mentioned this, he tied it in, at least implicitly, and sometimes explicitly, with PD&F's relatively late arrival on the scene. The consequences of this late arrival included PD&F's inability to verify the research reports handed to them by CSIRO, their lack of say in precisely what their task in the venture was, and their lack of opportunity to confirm the CSIRO group's level of practical scouring know-how.

The clear detrimental implications of these restricted inputs from PD&F for interface effectiveness - especially openness and cohesiveness - are discussed in detail in a number of the other analysis: notably the analysis of PD&F's limited inputs under SIROSCOUR's socially pluralistic basis of incorporation, in section A of chapter 10. By definition, these restricted inputs would have been much less likely to have come about had PD&F been involved in articulating and establishing the SIROSCOUR arrangement in the collaborative fashion that characterised the other case studies.

#### 4. Conclusions

Analysis of this final dimension of behaviour, like analysis of the three dimensions already examined, assists markedly with answering the study's research questions and with understanding the social dynamics of commercialisation.

There was evidence that the MMP interface's high level of goodwill

trust (albeit counterbalanced from time to time by significant distrust), I<sup>2</sup>'s variable but generally moderate level of trust and limited goodwill trust, and SIROSCOUR's rapidly depleted supply of trust (in any form), had the predicted influence on interface effectiveness.

In the broad, the influence on interface effectiveness of behaviour associated with goodwill trust was found to depend on encouragement or reinforcement from the interfaces' cultural and structural contexts. At the same time, this dimension's influence on interface effectiveness was found to have acted through affecting the way each party fundamentally approached its involvement in the interface. So once again the same two channels of influence on interface effectiveness identified through the preceding analyses were identified here as well.

#### F. CONCLUSIONS FROM ANALYSES IN THIS CHAPTER

These analyses examined the influence on interface effectiveness of the four dimensions of social behaviour constituting the first element of the analytical framework (Table 10), which relates to people's ways of approaching key interface relationships. These dimensions are

- \* emphasising intercultural similarities, and playing down intercultural differences;
- \* preserving partners' most valued and cherished differences;
- \* adaptive, flexible thinking, to cope with the new situation being encountered; and

- \* the demonstration of goodwill trust between interface participants.

Examination of this set of dimensions was helpful for understanding processes and events encountered in the case studies, and the social structuring of the interfaces. All four dimensions of social behaviour were shown to have had a major influence on interface effectiveness. Furthermore, all four dimensions were found to have influenced the social dynamics of the interface in the same fashion: through affecting the way each party and its representatives fundamentally approached involvement in the interface (rather than through affecting the way the interface itself, as a small group, set about its tasks).

Because these dimensions impacted on interface effectiveness through affecting these individuals' actions and attitudes, they can be described as having had *an individual mode of influence* on interface effectiveness.

Through these conclusions, these analyses have taken a significant first step towards answering *the first and the second of the study's research questions*: Behaviour relating to people's ways of approaching key interface relationships assists in understanding the genesis, growth and persistence of the social structure of laboratory-company commercialisation interaction, and helps directly in understanding interface effectiveness.

It would seem to be important for these dimensions of social behaviour to contribute to approaches and techniques that might be developed for analysing and articulating interface effectiveness (like the model to

be constructed through this study). It would seem to be equally important for those responsible for establishing, developing and operating commercialisation interfaces, and those participating in interfaces, to bring to bear the highest degree of self-examination and self-criticism of their thoughts, attitudes and knowledge as they set about preparing to work with another group in a commercialisation venture.

These conclusions provide part of the answer to *the study's final research question*, which will be returned to below.

*Both* participants' culturally-acquired values, norms, attitudes and preferences *and* characteristics of the underlying formal administrative commercialisation arrangements acted to encourage or reinforce two of these dimensions of social behaviour: preserving partners' most valued and cherished differences, and the demonstration of goodwill trust between interface participants.

With the other two dimensions, the effect of one of these sets of contextual variables seemed in some interfaces to overpower the effect of the other set. Sometimes participants' culturally-acquired values, norms, attitudes and preferences predicted to encourage or reinforce a particular dimension of behaviour seemed to have been 'swamped' by implications of the relevant characteristics of the underlying arrangement. Sometimes the opposite seemed to be the case: the participants' culturally-acquired values, norms, attitudes and preferences seemed to have been so fundamental to a particular dimension of behaviour as to overwhelm implications of the relevant arrangement characteristics.

Wherever either happened, it was possible to reason why, in these circumstances, one or the other set of contextual variables should indeed have more strongly encouraged or reinforced the behaviour concerned.

These analyses therefore contribute directly to answering both *the third and the fourth of the study's research questions*: Overall, behaviour relating to participants' ways of approaching key interface relationships was markedly encouraged or reinforced by the values, norms, attitudes and preferences they had brought into the venture, and by implications of the characteristics of the underlying formal commercialisation arrangement. The influence of these dimensions on interface effectiveness can therefore be described as distinctly *context-dependent*.

The analyses in this chapter together have taken an important step towards answering *the study's final research question*:

While the model to be constructed through the study should reflect the importance, for understanding, analysing, articulating and managing contributors to interface effectiveness, of this set of influential dimensions of social behaviour per se, it must also emphasise two other findings bearing centrally on the social structuring of the commercialisation interface. One is the finding that all four of these dimensions influenced the social dynamics of the interface mainly through affecting the way each party approached its involvement in the interface. The other is the high degree of interplay of these dimensions of behaviour with interfaces' cultural and structural contexts.

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**Notes to Chapter 6:**

1. Broadly similar arguments are relevant to analysing the influence on interface effectiveness of (for example) the pair of dimensions "emphasis of intercultural similarities" and "category-independent roles", and the pair "goodwill trust" and "maintaining conflict at too low a level".
2. CSIRO C's attention to these differences was somewhat clouded, however, by their confusion with both his unusual personal management style and his lack of knowledge of, and experience with, managing R&D ventures of this type. Often CSIRO C's emphasis of cultural differences merged into these other, related considerations. Under it all, however, CSIRO C has an obvious significant predilection to play up intercultural differences; certainly there were few signs of his exploding intercultural myths.
3. It was necessary for the analysis to regard the facets of behaviour relating to intercultural similarities and differences, examined in this section and the preceding section, as constituting two separate dimensions of social behaviour. Not the least significant reason for doing so was the two different sets of predictions generated from cultural theory, for how participants' 'cultural baggage' might encourage or reinforce this behaviour. The conclusion from the analyses in sections B and C is that both dimensions influenced interface effectiveness in essentially the same way; in particular, they both in-

fluenced how the participants themselves approach their forthcoming involvement in the venture concerned, while they were both markedly influenced by the interfaces' cultural contexts. Because of this clear similarity in the channels through which the two dimensions influence interface effectiveness, and because they stem from the same area of intergroup contact theory, it seems not only advisable but almost inescapable, when it comes to articulating the study's outcomes in later chapters, to 'roll up' the findings on these two sets of outlooks on intercultural similarities/differences, into a single dimension of social behaviour. After this analysis, these two dimensions of social behaviour will therefore be combined into a single dimension, "recognition of, and respect for, intercultural similarities and differences".

4. The CSIRO group's successful coping with this 'one-off' unusual (to them) task is not necessarily at odds with the interface's apparent desire (argued in section B) for each party to be able, at the micro-level, to function in DUNLENA in exactly the same way as they had been functioning previously. On a day-to-day basis the CSIRO group (as well as the Du Pont people) *were* able to operate in the mode they were used to. But superimposed on this familiar modus operandi at the macro-level were novel *concomitants* of their day-to-day work (like the task described here, and the completely new channels for feedback on their compounds, described in section B). The climate in DUNLENA was novel for the CSIRO group, even if many of the specific tasks were not.



## **CHAPTER 7**

### **ANALYSIS:**

# **DEVELOPMENT OF THE COMMERCIALISATION INTERFACE AS A SOCIAL GROUP: INFLUENCE OF INTERGROUP STRUCTURAL RELATIONSHIPS**

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#### **DEVELOPMENT OF THE COMMERCIALISATION INTERFACE AS A SOCIAL GROUP:**

#### **INFLUENCE OF INTERGROUP STRUCTURAL RELATIONSHIPS**

This chapter follows the approach used in chapter 6, to examine the influence on interface effectiveness of the second element of the analytical framework constituting Table 10. The dimensions of social behaviour making up this part of the framework are to do with the social structural relationship between the parties. The basic questions are whether the social/management and cultural circumstances in an interface permit or encourage behaviour bearing on the following aspects of social interaction in commercialisation, and whether - and how - that behaviour influences interface effectiveness:

- \* The parties' willingness/keenness to develop and pursue shared over-riding goals and a shared sense of purpose for the interface.
- \* The degree of intimacy among the participants permitted or encouraged by the arrangement.
- \* The degree of balance between the status of the various parties' representatives.

- \* The parties' willingness/keenness to recognise, develop and pursue category-independent roles in the interface.

#### A. IDENTIFICATION AND PURSUIT OF SHARED OVER-RIDING GOALS AND A SHARED SENSE OF PURPOSE

Chapter 2 identified the 'common goal' criterion for effective inter-group interaction, which has long been a cornerstone of contact theory, and argued that a strong commitment to identifying and pursuing shared goals and a shared sense of purpose based on those goals will be prerequisites for an effective commercialisation interface.

##### 1. The I<sup>2</sup> Interface

Most of the interviewees in this interface pointed to the parties' *conflicting* goals and their detrimental effect on interface effectiveness. The divergence in goals was captured by SIROTECH (see list of those interviewed in the description of I<sup>2</sup> in Volume 2). He identified the frustration and puzzlement coming from this difference in goals:

... there was a conflict of interest in where the money came from: we [CSIRO] only got our money from the sale of the device; [OPTUS] got their money from the sale of traffic *and* the device. They were always trying to get the device priced as low as they could. OPTUS, because of their conflict of interest, always seemed to be playing a game and we never could ever get to the bottom of it ... we could never figure out what OPTUS's real game plan was [interview, SIROTECH Melbourne, 14 August 1992].

CSIRO B was similarly puzzled by OPTUS's entry into a venture the goals of which were always clearly inconsistent with the company's charter and corporate goals. Ultimately he concluded that there must have been some obscure factor that had escaped him, and that OPTUS's "estimate that additional business attracted to INMARSAT by I<sup>2</sup> would be likely to 'roll over' onto OPTUS's own satellite must have been

correct [after all]" (interview with CSIRO B, CSIRO Black Mountain, 26 August 1992).

This puzzlement and frustration inevitably obscured what the interface needed to do to achieve its objectives (and how it might do it), and thereby helped make the interface less effective: probably less open, cohesive and focused, and perhaps less flexible as well. CSIRO B believes that from the beginning of the I<sup>2</sup> venture there was in OPTUS "a climate of confusion and cross-purpose that eventually played a major part in the I<sup>2</sup> venture lapsing" (interview, CSIRO Black Mountain, 26 August 1992). This was confirmed by OPTUS A, who believes that "CSIRO's puzzlement about how serious [OPTUS] really were made it particularly difficult to develop a tight working team, with the mutual confidence necessary in this sort of project" (interview, CSIRO Black Mountain, 20 August 1992).

This puzzlement and confusion rooted in the absence of shared goals clearly contributed to CSIRO's early conclusions that the OPTUS group would not be supplying the inputs they were supposed to, and that the product-development task would have to be undertaken by CSIRO alone. These conclusions led directly to adoption of CSIRO's somewhat secretive and cynical approach (the detrimental impact of which was described in the analysis of trust in section E of the preceding chapter), which in turn marked the beginning of the interface's breakdown: although, for reasons analysed elsewhere, that breakdown was resisted for some time.

There are limits to what cultural theory has to say on the influence of low goal-sharing on the effectiveness of the I<sup>2</sup> interface, because

cultural theory's predicted outlook on shared goals for one of the partners (OPTUS, from a fatalist environment) is ambiguous: see Appendix 2. The other party (the CSIRO group, from an individualist environment) was predicted to be at least indifferent to the clear identification of shared goals. In fact, the foregoing discussion showed that the CSIRO group was troubled by the continuing absence of shared goals, but this concern seems to have resulted more from confusion occasioned by the interface's continuously changing environment than from incompatibility with social space-acquired preferences and orientations.

The characteristics of the formal commercialisation arrangement underpinning this case study were expected to exacerbate the detrimental effect of the limited shared goals. Table 6 reasoned that an interface is most likely to develop shared goals and a motivation for attaining them if an arrangement has all or most of five characteristics:

- \* The technology not being very highly developed at the time the arrangement was entered into.
- \* The arrangement being highly articulated, planned, focused and visionary.
- \* The arrangement having unanimous and consistent support from the management of both parties.
- \* The arrangement being relatively long-term.
- \* The arrangement having come into being through one of the

'mutual', collaborative channels for creating commercialisation ventures.

Table 7 showed that the  $I^2$  arrangement possessed only one of these five characteristics: it was largely a mutually-identified and mutually-developed arrangement. It is necessary at this point to investigate whether the venture's general lack of these characteristics contributed to the interface's limited effectiveness.

As argued in the introduction to chapter 6, it would be excessive in such circumstances to dwell on all four of the relevant characteristics lacked by  $I^2$ . Instead, just two of them, chosen at random, will be looked at in sufficient depth to show that there is at least a trend towards this set of arrangement characteristics - or in this case absence of the characteristics - detrimentally affecting the interface's effectiveness. The two characteristics chosen to illustrate this are  $I^2$ 's low degree of articulation, planning, focus and vision; and its short duration.

There is much evidence (in addition to that bearing more directly on development of shared goals, presented earlier in this analysis) that the *low degree of articulation, planning, focus and vision* progressively undermined the interface's openness, cohesiveness and focus. OPTUS A identified one consequence of this characteristic for the whole project (interview, CSIRO Black Mountain, 20 August 1992): the tendency for OPTUS (in particular) to let the project 'drift', rather than monitor or plan its course to any significant extent. This resulted in CSIRO inexorably taking on all the marketing and commercial development tasks for the project, thereby fundamentally changing the

balance of inputs from the two partners and squeezing OPTUS out of the level of 'ownership' warranted by the pattern of their longer term involvement.

The effect of this on interface flexibility, cohesiveness and focus was obvious; the laissez-faire outlook on OPTUS's part was identified implicitly in earlier discussion as a prominent contributor to the interface's ultimate breakdown.

SIROTECH described another way in which I<sup>2</sup>'s lack of planning and articulation reduced interface effectiveness (interview, SIROTECH Melbourne, 14 August 1992): The ill-defined nature of the product forced OPTUS to air what should have been their private thoughts on I<sup>2</sup>'s ultimate form and capabilities with various potential buyers around the world. Sometimes CSIRO heard of these ideas "much later or as an aside". According to SIROTECH, quite understandably this undermined the interface's effectiveness: undoubtedly its cohesiveness and openness, and probably its focus as well.

Evidence (albeit mainly circumstantial) is also available on the detrimental effect on I<sup>2</sup>'s effectiveness of the venture's *short duration* (expected to be about two years: see the description of the venture in Volume 2).

On the one hand CSIRO A explained how much more effective the project could have been had the top management of each party appreciated "the amount of effort and time that needs to be applied to a successful transfer to industry" (interview, CSIRO Black Mountain, 26 August 1992). The implication was that the need to cut corners (an inevitable

result of the project being saddled with an unrealistic timeframe) jeopardised the interface's effectiveness: probably through reducing its focus, and perhaps its cohesiveness and openness as well.

At the same time, CSIRO C indicated (interview, CSIRO Black Mountain, 28 August 1992) that he would not be interested in accompanying the product to industry (should such an opportunity ever arise), because the scope of the project had been cut off prematurely, in the sense that rights to future developments of the technology were not included in the arrangement. If truncation of the project had this effect on CSIRO C's commitment, it would be most surprising if it had not had a detrimental effect on interface cohesiveness and focus (at least).

## 2. The SIROSCOUR Interface

PD&F's goal for SIROSCOUR was to develop and commission the first SIROSCOUR line through itself building all components: including the ancillary components that could readily have been bought 'off the shelf' (see the description of SIROSCOUR in Volume 2) . Greenfields' and CSIRO's goal (although PD&F do not exactly see this as CSIRO's unequivocal goal) was to get the line into place as quickly and effectively as possible, *using components obtained from the most convenient and sensible source.*

Several of the participants attribute much of the rapidly reducing social effectiveness of the SIROSCOUR interface as a small group to the lack of shared goals and a shared sense of purpose. As CSIRO D said (interview, CSIRO Geelong, 18 September 1992), "If PD&D had not tried to ... shut the technology up [by letting] nobody else in, they probably would have still been in there." Greenfields described



(interview, Greenfields Melbourne, 16 September 1992) how surprised the CSIRO group had been and how much the interface's cohesiveness and openness had been jolted when CSIRO learned, 'out of the blue', that PD&F's goal for the exercise was so vastly different from their own.

It seems likely, on balance, that the social space environment from which the parties came reinforced this interface's attitudes towards the development and pursuit of shared goals, and ultimately undermined interface effectiveness. Table 4 suggested that parties from an individualist environment (like PD&F and Greenfields) would delay goal-setting as long as possible, perhaps trying to avoid it altogether, and would be generally indifferent to shared goals as an important variable in supragroup development. A hierarchist party (like the CSIRO group), on the other hand, was expected to aim clearly and enthusiastically to have the interface develop, and respect, shared goals, and to be generally cognisant of shared goals as an important variable in supragroup development.

Indeed the CSIRO group did subscribe to the importance of goal-sharing and an over-riding sense of shared purpose. CSIRO C and CSIRO D, for example, both spent a lot of interview time (interviews, CSIRO Geelong, 18 September 1992) discussing the goal of providing Greenfields with a "turnkey plant", and explaining how differences between PD&F's and Greenfields' comprehensions of this concept explain much of the venture's failure.

Likewise with PD&F's goal of trying to 'reinvent the wheel' for all parts of the scouring line. CSIRO B attributed many of the interface's problems to this latter difference in goals:

I wish we had had the foresight to really get into them and say to [PD&F] "Don't do this because you are jeopardising our technology." I wish we had done that ... [interview, CSIRO Geelong, 13 August 1992].

CSIRO D (interview, CSIRO Geelong, 18 September 1992) attributed much of the eventual success in overcoming the venture's stalemate to the ultimate commitment of all three parties to a shared goal: the goal of systematically solving the technical problems one-by-one (through the taskforce that was established). But this came essentially after the interface per se had broken down.

So the CSIRO people in effect often lamented the interface's inability to bring the parties' goals closer together. The evidence is that the CSIRO people seemed often to be cognisant of the importance of shared goals, but unable to do much to bring them into being. Often they seemed to be thwarted by the other two (individualist) parties, who clearly showed a greater interest in various other issues centring on strategically positioning themselves, apportioning blame, and generally feeling sorry for themselves. Comprehensive search of the data on SIROSCOUR identified few hints of PD&F or Greenfields airing concerns about, or awareness of, differences in the parties' goals per se.

Like the I<sup>2</sup> arrangement discussed previously, the underlying SIROSCOUR arrangement lacked most of the characteristics expected to encourage a high degree of goal-sharing (see Table 6). Table 7 shows that the SIROSCOUR arrangement possessed only one of these five characteristics: it had strong and consistent support from the parties' management. In the interest of brevity, just one of the four relevant characteristics lacked by SIROSCOUR was chosen at random to illustrate a detrimental influence on interface effectiveness. (Again see the argu-

ments for this selectivity, in the introduction to chapter 6.) The characteristic "initiation of the arrangement by one party only, rather than as a collaborative venture" was chosen for this purpose.

Evidence that this mode of establishing SIROSCOUR had a strong detrimental influence on interface effectiveness was investigated in the analysis in section E of chapter 6. It was found there that interface openness and cohesiveness (especially) had suffered from the unbalanced way in which the venture had been established.

### 3. The DUNLENA Interface

Most of those interviewed in the DUNLENA case study remarked - often spontaneously - on the shared understanding of what the venture was all about and each party's at least adequate understanding of where the other party was coming from. Du Pont A, for instance, distinguished between joint ventures "of necessity" and those (like DUNLENA) "of genuine convenience"; that is, arrangements where

what the parties expect to put into and get out of the arrangement are genuinely complementary. These are win-win, rather than win-lose situations. We weren't carving up a cake; we were working out how to make a bigger cake ... *[This] is an example of two parties with the same sort of overall mission* [interview, Du Pont North Sydney, 21 August 1992].

Du Pont A went on to observe (and CSIRO A made the same point) that such genuinely shared aims and a tight, trusting effective relationship came readily to this interface. He suggested this was because the CSIRO people who established the arrangement had dealt not with Du Pont businessmen as such, but with technical people who happened to have new business arrangements as part of their responsibilities. CSIRO A attributed both shared aims and the effective, enduring inter-

face to the fact that the dealings were not between CSIRO's chemists and Du Pont chemists (such dealings would have introduced significant competition), but between CSIRO's chemists and the Du Pont *biologists* who run the testing process (interview with CSIRO A, University of Melbourne, 16 September 1992).

When Du Pont B was asked to identify a single 'make-or-break' point in the whole DUNLENA arrangement, he actually identified the acceptance by CSIRO and Du Pont of a shared goal: the "where economically feasible" clause qualifying manufacture in Australia (interview, Du Pont North Sydney, 21 August 1992). CSIRO C confirmed the importance of this, noting that Du Pont's acceptance of this clause had "provided a focus for the interactive tasks the two very different groups were to undertake" (interview, CSIRO Clayton, 17 September 1992). CSIRO A went even farther, and actually attributed the interface's cohesiveness, focus and overall effectiveness to Du Pont's identification with CSIRO's goals for the venture *even before the arrangement came into being*:

Du Pont was the only company [of those on the short-list] that understood - and displayed their understanding of - what the Division had to do [by way of keeping commercial activity in Australia], and why [it had to do it].

CSIRO A described the "palpable sense of relief in the Division" when the venture was established, "because the Division at last had a commercial partner prepared to align itself with CSIRO's real goals" (all three quotations from interview with CSIRO A, University of Melbourne, 16 September 1992).

This strong commitment of both interface partners to shared goals is

predicted by cultural theory. Both parties are from hierarchist environments, and Table 4 suggested that hierarchists place a premium on forms of interaction emphasising establishment and systematic pursuit of shared goals.

The characteristics of the formal administrative commercialisation arrangement underlying the DUNLENA interface also suggest that a high value would be placed on shared goals. Table 7 shows that the DUNLENA arrangement clearly possessed all five of the characteristics pointing towards such a preference. There is much evidence that these arrangement characteristics acted to strengthen the positive impact of shared goals on interface openness, flexibility, cohesiveness and focus. Again, not all five of the characteristics concerned will be used to demonstrate this impact; two of them have been chosen at random for this purpose. (Again, see the arguments for this selectivity in the introduction to chapter 6.)

The first is *the technology being at an early stage of development* when the arrangement was entered into. The strongly positive effects this had on the cohesiveness, focus and openness - and probably also the flexibility - of the DUNLENA interface over its lifetime were identified in section B of the preceding chapter. This concentration on technology at its earliest stage did raise one fundamental problem in the form of the CSIRO group's initial firm refusal to provide Du Pont with structural details of the compounds it had synthesised. In the process this provided a low base of openness, flexibility, cohesiveness and focus for the interface to build on. But the analysis in chapter 6 showed that once this reluctance was overcome the positive influence on interface effectiveness of the early stage the technology

was at, was remarkable.

The second characteristic of the DUNLENA arrangement chosen for investigation here is *the unanimous and consistent support the arrangement received from the management of both parties*. This exerted a strong influence on all four of the interface's focus, cohesiveness, openness and flexibility. Evidence of this is discussed as a central theme in many of the analyses, including the analyses of DUNLENA's construction of a coherent cultural framework, in chapter 10, and the analysis of the amount of conflict in this interface, in section B of chapter 8. Only a few of the more obvious pieces of evidence will be drawn together here. These rest on Du Pont's top management's willingness - indeed keenness - to:

- \* modify the company's internal procedures - at some inconvenience and cost - to ensure that Du Pont's own research was not impinging on CSIRO's;
- \* enter into the "manufacture in Australia if economically feasible" undertaking early on, with surprisingly little argument; and
- \* enter into the first-ever technology-development arrangement where Du Pont would own less than 50%, and where they would thereby lack ultimate control.

These management initiatives had direct implications for establishing and maintaining DUNLENA as an effective social/intercultural vehicle; indeed without two of the initiatives the venture clearly would never

have been established in the first place.

A number of interviewees illustrated how interface openness, flexibility, cohesiveness and focus depended on this support from management. CSIRO E, for instance, believes (interview, CSIRO Clayton, 17 September 1992) that the most profound contributor to interface effectiveness was what the CSIRO people generally saw as Du Pont's high ethical standards, reflected in the transparency and consistency of Du Pont management's handling of DUNLENA. CSIRO C said, only partly tongue-in-cheek, that Du Pont's management "are probably more honourable than CSIRO's" (interview, CSIRO Clayton, 17 September 1992).

Management support for DUNLENA was not all from Du Pont, however. The description of DUNLENA in Volume 2 describes *CSIRO management's* drive to make this venture work. Du Pont B attributed much of Du Pont's attraction to DUNLENA (both at the outset and since) to "the strong, consistent but low-key support ... from all levels of CSIRO's management. Without that support, the venture may not have come through the difficult first year or so" (interview, Du Pont North Sydney, 21 August 1992).

#### 4. Conclusions

Like all four analyses in the preceding chapter, this analysis contributed notably to answering the study's research questions, and to illuminating the social effectiveness and endurance of commercialisation interfaces.

There was clear evidence that consequences of I<sup>2</sup>'s and SIROSCOUR's conflicting goals retarded development of interface effectiveness, and

that DUNLENA's shared goals and the participants' keenness to pursue them increased interface effectiveness.

Here also, as with all four dimensions examined in chapter 6, the behaviour investigated was clearly encouraged or reinforced by the values, norms, attitudes and preferences brought into the interfaces by the participants, and by implications of the characteristics of the formal commercialisation arrangements underlying the interfaces.

But this analysis suggests that in another respect goal-identification/goal-sharing behaviour influenced the social dynamics of the interface in quite a different way from the mode of influence identified for the dimensions examined in the preceding chapter. This dimension influenced interface effectiveness through directly affecting *the way the interface itself, as a small group, set about its tasks*, rather than through affecting the way each party approached its involvement in the venture.

#### B. INTIMACY OF CONTACT<sup>1</sup>

These same channels of influence on interface effectiveness - an influence through encouragement or reinforcement from the interfaces' cultural and/or structural contexts, and through affecting the way the interface itself, as a small group, set about its tasks - were also at work in the case studies on this next dimension of social behaviour.

The articulation of contact theory in chapter 2 identified the intimacy between individuals and groups coming together in supragroups similar to commercialisation interfaces (or, as Cook terms it, the "acquaintance potential" of the contact) as an important prerequisite



for smooth, effective intergroup contact. This section investigates evidence on the influence on interface openness, flexibility, cohesiveness and focus, of the intimacy of two particularly close relationships<sup>2</sup> identified in the case studies. These are the relationships between QMC B and CSIRO C in MMP, and CSIRO B and OPTUS A in I<sup>2</sup> (see the descriptions of these two interfaces in Volume 2).

Normally, such an investigation would use control cases; the impact of these two close contacts on interface effectiveness would be compared with the impact of a few selected remote, aloof contacts. Unfortunately, though, while one can be confident from the information that *is* available that few other relationships in the case studies were as intimate as the QMC B-CSIRO C and CSIRO B-OPTUS A relationships, detailed data are simply not available on remote, aloof relationships. Such relationships for the most part were not discussed spontaneously in the interviews. Attempts to have them discussed were mostly set aside with assertions that they were not important, or that the interviewee did not know much about any such relationships that occurred in the interface. Investigation of the two 'intimate' contacts identified will therefore have to stand alone.

#### 1. The QMC B-CSIRO C Relationship in the MMP Interface

Clear evidence of the strength of this relationship and of its direct and marked influence on interface effectiveness (often on all four of openness, flexibility, cohesiveness and focus) is presented in detail in the analysis of goodwill trust (section E of the preceding chapter), and in the analysis of the parties' willingness or keenness to perform in the 'public' domain of the commercialisation interface (chapter 10). That thorough documentation in other analyses, as well

as in the description of MMP in Volume 2, have been drawn on to identify the driving forces on the QMC B-CSIRO C relationship, which provide the context for the analysis here. These driving forces on the relationship are

- \* CSIRO C's inexperience, uncertainty and strangeness in the world in which he was now leading a major project.
- \* The longstanding interorganisational relationship between QMC and CSIRO, and in particular the attitudes towards the other party (like trust and respect) demonstrated through that relationship.
- \* QMC B's status as the pioneer (together with QMC A) of the strategy underpinning the venture, and the consequent aura surrounding QMC B as an 'owner' of, and 'guiding light' for, the MMP project.
- \* QMC B's and CSIRO C's joint leadership (together with SIROTECH) of what had amounted to the early stages of the MMP venture (before MIM and UBE became members of the consortium).
- \* QMC B's status as CSIRO C's mentor on the development of technology-intensive minerals-based business.

'Looking backwards' and 'looking sideways' from the interface suggests how the intimacy of this relationship may have actually influenced interface effectiveness.

Table 4 shows that cultural theory envisages individualists (like QMC B) welcoming and encouraging intimate relationships of this type: provided they serve their immediate self-centred needs and aims. Members of an egalitarian group (like CSIRO C), on the other hand, are expected to be wary of such a relationship. So while QMC B's involvement in such a relationship is not surprising on the basis of cultural theory, CSIRO C's involvement, taken at face value, *is* somewhat surprising.

However it can be reasoned from the detailed circumstances of MMP and the driving forces on the relationship, that CSIRO C's involvement in such a relatively intimate relationship may not be completely inconsistent with his culturally-acquired values, norms, attitudes and preferences after all. There are strong signs that the relationship was actually driven by QMC B, with CSIRO C being virtually an unwilling and helpless, or at least unenthusiastic, party. Both QMC B and MIM A portrayed CSIRO C during the early days of the QMC B-CSIRO C relationship, as something of a manipulated tool of QMC. This picture has CSIRO C engaging in this close relationship at the initiative of QMC, to achieve QMC's ends. This view is discussed in the description of MMP in Volume 2, as well as in chapter 10's analysis of parties' willingness to behave and think in the 'public' domain of the interface, and in the analysis of category-independent roles, in section D of the present chapter.

This is not to deny CSIRO C's full, active participation in the relationship with QMC B once it was under way, or the many reflections of intimacy in CSIRO C's behaviour, like his ready sharing of private thoughts with QMC B (examined in section D of chapter 10). The point is simply that CSIRO C's action of *entering* an intimate relationship

with QMC B, which runs counter to predictions from cultural theory, may not have been completely voluntary. According to this line of argument, CSIRO C 'slipped into' this relationship without really having much say in whether he would.

Why, when CSIRO C found himself in this relationship with QMC B, was he willing to be manipulated in this way, in contravention of his culturally-determined preference for avoiding this very situation?

Perhaps because of the sheer technical and strategic potential of what QMC B had on offer. The quality of QMC's mineral resource and the attraction of the notion of a multi-party technology-based venture to establish and maintain Australia's control of that resource (see the description of MMP in Volume 2) were perhaps virtually irresistible to CSIRO C. Involvement in such a venture was not only compatible with his whole research career, it was perhaps almost an inevitable next step. If participation meant placing himself in the hands of someone from another culture, then even he - an egalitarian - would simply have to do just that. Indeed, joining the other culture might have been the only way for CSIRO C to exercise his egalitarian desire for society to profit from QMC's resource.

These two parties' engagement in this sort of intimate relationship is quite predictable from implications of the characteristics of the underlying formal commercialisation arrangement. Table 6 identified five characteristics as being likely to encourage such relationships:

- \* the technology not being very highly developed when the arrangement was entered into;

- \* the venture being identified with one person or group within each of the parties;
- \* the arrangement being long term;
- \* the arrangement being novel and/or sensitive; and
- \* the arrangement having come into being through collaboration between the parties, with enthusiasm from both parties.

Table 7 shows that the MMP arrangement possessed all five of these characteristics. The influence of two of them on interface effectiveness was investigated in earlier analyses. One of these characteristics - the arrangement having come into being through collaboration between the parties, with enthusiasm from both parties - was found to have had a strong positive influence on interface effectiveness (section E of the preceding chapter). Analysis of the other characteristic - the technology not being very highly developed when the arrangement was entered into - was inconclusive (section B of that chapter).

One of the remaining three characteristics - the venture being identified with one person or group within each of the parties - was selected at random for examination here. (Again see the rationale for this selectivity, in the introduction to chapter 6.)

There is clear evidence in the data collected that this characteristic did indeed have a strong positive influence on interface effectiveness. A number of interviewees pointed to positive effects on inter-

face cohesiveness and focus (at least) resulting from the possessiveness for the MMP venture of the two key QMC people (QMC A and QMC B), and most observers' clear association of the venture with these two people as individuals. It was as if the QMC people's passion and enthusiasm for the arrangement flowed from them to others (including partners and potential partners, and government Ministers and officials), thereby energising the interface.

Political Staffer, for instance (and he was supported along similar lines by MIM A), identified the importance, for the success of the whole project, of

the commitment on the part of the QMC people not to sell off their property at the maximum profit, but to maximise national benefit. ... The other players - especially, I think, the Japanese and the politicians - were very impressed that the QMC people were prepared to use their property in this way to promote national development [interview, Parliament House Canberra, 11 September 1992].

There is circumstantial evidence that MMP's identification *with CSIRO C* and the extent to which the venture is regarded as his 'baby', also positively influenced interface effectiveness. CSIRO C's awareness that MMP's success/failure would be seen as success/failure of his 'personal' scientific property is very clear from several interview comments: including CSIRO C's own comments. It is most doubtful whether CSIRO C would ever have taken the steps he did take to improve his management knowledge and management performance, had he not regarded the success/failure of the venture as reflecting directly on his personal scientific standing. As CSIRO C said (interview, CSIRO Port Melbourne, 14 August 1992), "Sometimes you've just got to back up your science with management".

The link between CSIRO C's development of his management knowledge and management performance from a very low base, and the various indicators of interface effectiveness (especially openness and focus), was well established through both the other analyses identified at the beginning of this sub-section (the analyses in section E of the preceding chapter and section D of chapter 10).

## 2. The CSIRO B-OPTUS A Relationship in the I<sup>2</sup> Interface

Here also, the strength of this relationship and its direct and marked influence on interface effectiveness are demonstrated in a number of other analyses. In particular, these are prominent parts of the analysis of trust in section E of the preceding chapter. As with the QMC B-CSIRO C relationship discussed in the preceding sub-section, this thorough argument in other analyses, as well as in the description of I<sup>2</sup> in Volume 2, have been drawn on to identify the driving forces on the CSIRO B-OPTUS A relationship, which provide the basis for the analysis here. These driving forces on the relationship are

- \* The changing pressures on OPTUS, the company's evolving role, the associated management indifference in OPTUS towards I<sup>2</sup>, and the resultant inability of the company to meet its obligations in the arrangement.
- \* The relative isolation of the I<sup>2</sup> project in both organisations.
- \* CSIRO's willingness/keenness to take on commercial roles not normally regarded as part of that Organisation's responsibilities, and CSIRO's (including CSIRO B's) inexperience in these roles.

- \* The imbalance in trust and power resulting from the preceding points.
- \* CSIRO's and OPTUS's, and indeed CSIRO B's and OPTUS A's, joint conception and joint initiation of I<sup>2</sup>.

Here also, 'looking backwards' and 'looking sideways' from the interface suggests how the intimacy of this relationship may have actually influenced interface effectiveness.

Table 4 shows that cultural theory envisages both an individualist (like CSIRO B) and a fatalist (like OPTUS A) welcoming and encouraging intimate relationships of this type: provided (in the case of CSIRO B) they serve the individualist's immediate self-centred needs and ambitions. And there seems to be little doubt that this relationship *did* serve CSIRO B's needs/ambitions; undoubtedly CSIRO B saw his status and rewards as being very much tied up with successfully pursuing work that is, by CSIRO's standard, highly commercial. What better way (CSIRO B must have wondered at the outset of the I<sup>2</sup> arrangement) of getting close to the real commercial action than getting close to the leader of the commercial partner's team?

Engagement in this sort of intimate relationship is not entirely consistent with implications of the characteristics of the underlying formal commercialisation arrangement. The I<sup>2</sup> arrangement possessed two (and to some extent a third) of the five arrangement characteristics identified in the preceding sub-section. The two characteristics definitely possessed were the venture being identified with one person or group within each of the parties, and the arrangement having come



into being through collaboration between the parties, with enthusiasm from both parties. And the second of these characteristics was shown (section E of the preceding chapter) to have had no discernible positive influence on interface effectiveness.

The arrangement's possession of the other of these two characteristics - *the venture being identified with one person or group within each party* - had a variable influence on interface effectiveness.

The arrangement probably lost as much as it gained from being the almost 'personal' property of OPTUS A.

On the one hand there is evidence (interviews with OPTUS A, CSIRO Black Mountain, 20 August 1992; and OPTUS B, OPTUS Sydney, 6 August 1992) that it was only OPTUS A's drive for the I<sup>2</sup> project that had persuaded OPTUS's management to become at all serious about I<sup>2</sup>. It would have been easy, in the confused management environment at the time and with the competing priorities (including the need to establish OPTUS's Mobilesat division in its own right: let alone developing a product that was always tangential to corporate product strategy), for OPTUS management not to have 'come to the party' at all, as far as I<sup>2</sup> was concerned.

On the other hand, a fundamental problem that beset I<sup>2</sup> was the limited commitment from OPTUS management; the detrimental influence of this on interface effectiveness is demonstrated in the analysis of trust in section E of the preceding chapter, and in the analyses of conflicts in I<sup>2</sup>, in chapter 8. It seems likely that management commitment would have been greater had OPTUS A and I<sup>2</sup> been more integrated into the

mainstream of OPTUS's development of its products and services. As it was, there is a strong hint that OPTUS management allowed I<sup>2</sup> as a product to 'drift' because they saw it as a 'toy' of OPTUS A; indeed OPTUS management's view was reported as "Go and play in the yard and see what comes out of it" (interview with OPTUS A, CSIRO Black Mountain, 20 August 1992).

To some extent the venture seemed to benefit from *CSIRO B's* 'personal' ownership of the product; there are distinctive signs of CSIRO's commitment and support for the project in its difficult times being stimulated by CSIRO B's passion. From OPTUS B's perspective,

[CSIRO B] provided all the energisation for the arrangement, and everyone certainly knew he was doing this. It was he who kicked it along when someone needed to take an initiative [interview, OPTUS Sydney, 6 August 1992].

But this also was a double-edged sword. Both CSIRO B and CSIRO A identified how this group's close identification with I<sup>2</sup> had alienated it from the rest of the Laboratory. As CSIRO B said,

Any success in CSIRO which attracts funds ... tends to get a negative reaction from all non-participating staff ... This is undeniable; it will stand any test ... [This leads to] more than a bit of hostility and jealousy. ... We've had to do what we've done despite our colleagues to a large extent. When they're put in a corner, you might get them to express some good things, but it's mostly snide, smart remarks ... There has [also] been some frustration because people perceive - probably correctly - that they can't get their work started because [the group concerned] is committed to I<sup>2</sup> ... [interview, CSIRO Black Mountain, 26 August 1992].

This, together with the knowledge that the group had to go back to working full-time in a service capacity with the Laboratory's various research groups in a year or so, inevitably caused the group occasionally to take a step backwards from I<sup>2</sup>. CSIRO A identified (interview,

CSIRO Black Mountain, 26 August 1992) the detrimental impact this had on interface effectiveness: even if this influence was somewhat overshadowed by other influences (like OPTUS's non-performance).

Overall, identification of the I<sup>2</sup> venture with one person and his group in CSIRO - like its identification with one person in OPTUS - must be regarded as an uncertain influence on interface effectiveness.

### 3. Conclusions

Like all the preceding analyses, this analysis contributed markedly to answering the study's research questions, and to understanding the social dynamics of commercialisation.

Notwithstanding the lack of data on less intimate relationships (which could have been used as control studies), there was clear evidence that both the intimate relationships investigated - the QMC B-CSIRO C relationship in MMP and the CSIRO B-OPTUS A relationship in I<sup>2</sup> - had a positive influence on interface effectiveness.

Ultimately it was concluded that this analysis demonstrated that behaviour associated with intimate contact gained its influence on the effectiveness of the interfaces in the case studies from the same source as did the goal-sharing behaviour analysed in the preceding section: through receiving encouragement or reinforcement from the interfaces' cultural and structural contexts. And the same *mode of influence* on interface effectiveness that had been at work on goal-sharing behaviour was found to be driving this dimension of behaviour as well; behaviour associated with intimate contact mainly affected the way the interface itself, as a small group, set about its tasks.

## C. APPROXIMATE STATUS BALANCE BETWEEN THE PARTIES' REPRESENTATIVES

### 1. Introduction

Behaviour associated with approximately equal-status relationships (or notably different-status relationships) between the parties' representatives in the case studies, gains its influence on interface effectiveness through a combination of channels different from all the channels of influence identified to this point in the analyses.

The status balance between representatives of groups in contact has long been a key variable of contact theory. Chapter 2 argued that an approximate status balance between the main representatives of parties to a commercialisation venture is likely to make for an effective and enduring interface.

This analysis cannot profitably 'look backwards' from the interfaces, because cultural theory's predictions on the significance of the relative status of the parties' representatives do not effectively distinguish among the segments of social space. Rather, it can be argued that people from at least three of the segments will be more at ease in relationships where they have status superiority. Such a relationship would seem far more likely to enable hierarchists (for example) to control the interaction to the stage where their risks are kept to a minimum, orderliness is instilled and everything is put into its place. At the same time status superiority should facilitate individualists' (for example) preferred urgent, self-centred bombastic behaviour.

Ultimately this inability to predict different preferences for status balance/imbalance for people from various segments of social space

means that there is no alternative but to set aside cultural theory here, and to concentrate on the many other more helpful applications of cultural theory (like those in the preceding analyses).

Nor can implications of the characteristics of each commercialisation arrangement be used to 'look sideways' in this analysis; Table 6 did not identify any arrangement characteristics as being likely to encourage or reinforce people's different approaches to equal-status and different-status interactions.

So this analysis will have to proceed solely on the basis of inter-group contact theory's immediate predictions for the influence of status balance on interface effectiveness.

The interfaces in the case studies fall into two categories in terms of the balance between the status of the parties' main representatives.

*DUNLENA* and *I<sup>2</sup>* are notable for an even balance of status. In both these interfaces, two key sets of representatives in each party (see lists of those interviewed, in Volume 2) who seem to be in a good position to articulate cultural beliefs and shared values and to generalise new perceptions throughout their organisation, are directly involved in the interface. In both cases, these two sets of managers seemed, as nearly as could be judged from the information available on organisational structures and people's roles, to be closely matched in status terms. This is the conclusion based on measures such as span of responsibility, autonomy, 'slot' in the corporation and assessed influence on corporate policy.<sup>3</sup>

The main representatives in *SIROSCOUR*, on the other hand, clearly differed in status. The main CSIRO people involved (see list of those interviewed, in Volume 2), who are program managers, had relatively narrow and specialised domains of responsibility. For example, each of them had only a handful of people working for him, at least insofar as this area of work is concerned. They are in the third tier of management within this Division of CSIRO, and in the fifth tier in CSIRO as a whole. By contrast, the key contact person from each of PD&F and Greenfields was the company's chief executive: albeit chief executive of a moderately small company.

Interestingly, the *SIROSCOUR* interface at the same time contains a contact with status *balance*: the contact between the people from the respective companies.

## 2. The *SIROSCOUR* Interface

Behaviour and attitudes reflecting the status imbalance in *SIROSCOUR* seem to have had a detrimental influence on interface effectiveness. Over the whole of the interface's lifetime, Greenfields was critical of CSIRO's policy and practices for selecting commercial partners, CSIRO's commercial understanding more generally, and their lack of forthrightness in directing the activities of PD&F. PD&F at the same time had consistently criticised CSIRO's limited commercial honesty and forthrightness. These attitudes were central to the views of the two chief executives concerned; they were mentioned several times in each interview, and obviously figured very prominently in these people's recollections of the venture.

It seemed to be quite clear that these complaints and criticisms took

a form expected to characterise higher-status people's dealings with lower-status people. For example, several interviewees identified their bold, assertive, bullying character; there seemed to be little gentle 'chipping away at the block', and few attempts at genuine persuasion. The bold, assertive, bullying actions included Greenfields' bombastic threat of legal action, and PD&F's flamboyant approach to the Wool Corporation for funding to take them through their difficult time. The 'conviction of the correct' was also in evidence: for example, in PD&F's insistence on tackling their task in their own way, rather than taking advice from their (lower-status, but in some ways more shrewd and better informed) CSIRO contacts.

It seems likely that these complaints/criticisms were all the more significant because they came from the chief executives of the companies. There was no opportunity for moderation of these people's attitudes through contact with their equal in CSIRO: if indeed that would have moderated their attitudes. In fact, PD&F lamented not having taken up their problems with SIROSCOUR at a higher level in CSIRO (telephone interview, 21 October 1992). At the same time, it seems very likely that these chief executives would have passed on the views recounted here to others in their respective companies, who presumably would have taken much notice of the criticisms of such senior people. This could well have placed even more emphasis on their criticisms, through having them fed into CSIRO at more than one level.

For their part, the CSIRO participants seemed often to adopt outlooks that might be expected to characterise *lower-status people's* contact with higher-status people. For example, the CSIRO interviewees perceived the attitudes and outlooks of the two companies (mainly PD&F)

variously as "arrogant", "aloof", "isolated" and "proud" (interviews with CSIRO C, CSIRO D and CSIRO B, CSIRO Geelong, 18 September, 18 September and 13 August 1992 respectively). Here also these perceptions were widely and strongly held, and regularly referred to.

The detrimental influence on interface effectiveness (especially on cohesiveness and openness) of the criticism, distrust, doubt, scepticism and disappointment associated with these asymmetric behaviours and attitudes is demonstrated in several of the other analyses, and in particular in the analysis of trust-based behaviour in section E of chapter 6.

By contrast, the tone of the (approximately equal-status) contact between Greenfields and PD&F showed few signs of the sorts of attitudes and behaviour described in the preceding paragraphs. This is not to say that this contact was all 'plain sailing'; it was not. Greenfields described at length the origin of his company's conclusion that PD&F was a "poorly run company" (interview, Greenfields Melbourne, 16 September 1992); his criticism of some of PD&F's most valued distinguishing features was described in section C of chapter 6. PD&F, for his part, in the final analysis saw Greenfields as a "naive" customer, by the standards of the materials-processing and manufacturing companies PD&F deals with (telephone interview, 21 October 1992).

But 'catch-points' between these two parties seemed to stem more from what were regarded almost as matters of fact, rather than from the sorts of passionately held attitudes or prejudices encountered in the other two inter-party contacts in this interface. Notably, through the whole SIROSCOUR experience, Greenfields and PD&F remained respectful.



Even after all the problems, PD&F still regarded Greenfields as "an extremely good client" (if a naive one: telephone interview with PD&F, 21 October 1992), while Greenfields showed that he understood the basis of PD&F's thinking on each of the SIROSCOUR issues. He demonstrated this in a number of different ways: for example, through readily identifying with the financial roots of PD&F's frustration with the SIROSCOUR experience (interview with Greenfields, Greenfields Melbourne, 16 September 1992).

Evidence of a positive influence on interface effectiveness from this equal-status PD&F-Greenfields relationship is rather nebulous. Among the few mildly positive influences on SIROSCOUR's effectiveness, PD&F's and Greenfields' continuing relatively high mutual respect looms quite large. Certainly this was identified by CSIRO B when he was asked about what had held the interface together so long; CSIRO B noted that Greenfields "kept on good terms with PD&F. If they [Greenfields] had turned on them, I think they would have been in real trouble psychologically; as it was, it wasn't too bad" (interview with CSIRO B, CSIRO Geelong, 13 August 1992).

### 3. The DUNLENA and I<sup>2</sup> Interfaces

Comprehensive search of the data from these two case studies revealed little evidence of the persisting, disruptive inter-party attitudes and behaviour that characterised the unequal-status interactions in SIROSCOUR.

Again this is not to say that the contacts in DUNLENA and I<sup>2</sup> were friction-free. They were not: as is shown through the analyses of DUNLENA's and I<sup>2</sup>'s conflicts, in chapter 8. But review of letters,

minutes of meetings and similar documents, and especially correspondence on more 'delicate' points, revealed frankness and mutual criticism that would arguably be unlikely between people of significantly different statuses. This was evident in the I<sup>2</sup> interface's successful coping with both OPTUS's inability to inject commercial perspectives and the company's eventual withdrawal from the arrangement (in its original form), and the DUNLENA interface's dismantling of major barriers to effective interaction (like the CSIRO group's initial refusal to supply Du Pont with structural details of compounds).

The positive influence of this frankness and mutual criticism on interface effectiveness is amply demonstrated, in the case of DUNLENA, in the analysis of the attention given to preparing for, and consolidating, cultural change (section C of chapter 10), and in the analysis of management of excessive levels of conflict (section B of chapter 8). In the case of I<sup>2</sup>, it is demonstrated in the analyses of the CSIRO group's attention to preserving OPTUS's most valued differences (section C of chapter 6), and the basis of parties' incorporation into the interface's social system (section A of chapter 10).

#### **4. Conclusions**

It must be noted that the evidence on which these conclusions are based is sparser than evidence from most of the other analyses. It is sometimes difficult to identify behaviour and thinking that are characteristic of equal-status and different-status interactions. Even where this is possible often one cannot be confident about attributing particular events and processes to status (im)balance when so many other related variables are also at work.

Nevertheless there is some evidence that status balance and status imbalance manifested themselves in significantly different types of behaviour. Some behaviour in approximately-equal-status relationships directly increased interface effectiveness, while behaviour in different-status relationships often undermined interface effectiveness.

As with both the dimensions investigated earlier in this chapter, this dimension of behaviour was shown to have influenced the social dynamics of the case studies through directly affecting the way the interface itself, as a small group, set about its tasks.

However this analysis differs markedly from all six preceding analyses insofar as it identified no encouragement or reinforcement effect coming from the interfaces' cultural and structural contexts. So behaviour bearing on inter-party status similarities/differences seems necessarily to have gained its influence on interface effectiveness from social characteristics that had developed in the interface itself.

#### **D. ASSUMPTION OF CATEGORY-INDEPENDENT ROLES**

This same combination of channels of influence on interface effectiveness, encountered for the first time in the analysis of behaviour bearing on inter-party status similarities/differences, was also at work in the case studies on the final dimension of social behaviour to be investigated in this chapter: behaviour associated with the identification and pursuit of category-independent roles.

Chapter 2 argued that the allocation, acceptance and performance of category-independent roles will be a fundamentally important determinant of the effectiveness of commercialisation interfaces. This dimens-

ion is closely related to one, and to a certain extent two others, of the dimensions investigated in chapter 6. The motivation to seek out, and then pursue, category-independent roles, and the motivation to permit or encourage the other party to do so, would seem to be especially closely affiliated with the motivation to emphasise intercultural similarities, and to play down intercultural differences (section B of chapter 6). This section's analysis will therefore draw heavily on evidence presented from these related perspectives in chapter 6.

This analysis is restricted to the roles of *the publicly-funded laboratory*. No conclusion is possible on *companies'* adoption of category-independent roles, because no clear instances of companies being in a position to contemplate adopting such roles were encountered in the case studies. CSIRO's commercialisation arrangements with companies are so diverse (see Appendix 3(A)) that they define a number of different category-*dependent* roles for companies, one or another of which encompasses each of the company roles in the case studies.

In any event, since it is the research people who are mostly expected to undergo more cultural change and to encounter more intercultural dislocation, research groups' and individual researchers' performance of category-independent roles is generally of much more interest.

### 1. The MMP Interface

CSIRO's partners in MMP went out of their way to remark on CSIRO C's smooth transition into his most category-independent role of manager of a large-scale commercial R&D program.<sup>4</sup>

QMC B, for instance, emphasised that when QMC had first come across

CSIRO C in 1986, he had been "well and truly in the CSIRO mould". But so successfully did he take on his category-independent role that for some years now QMC have viewed the CSIRO people, and especially CSIRO C, "as part of QMC's family ... as an extension of our organisation" (interview with QMC B, QMC Brisbane, 22 September 1992).

This adaptation was also remarked on by CSIRO A, CSIRO B and SIROTECH; the latter said

... the range of duties [of CSIRO C] is quite unusual for a CSIRO person in that the tasks require a range of skills normally found in commercial activities, not research activities confined to a Government laboratory. In particular I had in mind support for the in-licensing of Alcan technology, and managing the finances of the project in accordance with commercial standards ... [interview with SIROTECH, SIROTECH Melbourne, 14 August 1992].

Given CSIRO C's pivotal role in managing the MMP project, it was almost inevitable that such dedicated and successful adaptation to a category-independent role would ensure the interface would be in no doubt about how it should set about its tasks. This purposiveness seemed to have a direct positive effect on the interface's cohesiveness and openness, and probably on its focus and flexibility as well. As SIROTECH said, "[CSIRO C's] drive and flexibility, with [QMC B's] passion, were what created and maintained the project" (interview with SIROTECH, SIROTECH Melbourne, 14 August 1992).

Cultural theory's prediction for the interplay of participants' preferences and orientations with their assumption and acceptance of category-independent roles is very similar to its prediction for their interplay with willingness/keenness to emphasise intercultural similarities and explode intercultural myths. The latter relationship was

examined in section B of the preceding chapter, where it was concluded that MMP participants' positions in social space acted to encourage or reinforce these behaviours and attitudes. So it must be concluded here that the participants' behaviour bearing on category-independent roles was completely consistent with predictions from cultural theory.

It was concluded in section E of the preceding chapter that one particular characteristic of the MMP arrangement - its genesis in collaboration among at least most of the partners - had a positive effect on the interface's overall effectiveness. That characteristic was identified (Table 6) as one of two characteristics expected also to encourage the assumption of category-independent roles. So this conclusion is directly relevant here as well.

The second characteristic of the MMP arrangement predicted to influence the parties' willingness/keenness to take on category-independent roles (Tables 6 and 7) was the technology not being very highly developed when the arrangement came into being. This was the one characteristic of the MMP arrangement that was predicted also to influence the parties' willingness/keenness to focus on intercultural similarities. It was concluded in section B of chapter 6 that this characteristic had varied, but on the whole not all that strong, influence on interface effectiveness, and that other variables - notably the participants' culturally acquired values, norms, attitudes and preferences - should be given more weight. This conclusion is directly relevant here as well.

## 2. The I<sup>2</sup> Interface

Intuitively, one would expect to find clear signs of the CSIRO group's

undoubtedly highly category-independent role in  $I^2$  (see the description of  $I^2$  in Volume 2) having a direct and strong influence on interface effectiveness. But comprehensive search of the data gathered on  $I^2$  does not yield such evidence. It is not as if there is evidence to the contrary: that is, that the CSIRO group's category-independent role had a *detrimental* effect on interface effectiveness. But it is not possible to conclude with confidence that the category-independent role increased the interface's openness, flexibility, cohesiveness or focus.

It is appropriate to look at whether this anticipated influence on interface effectiveness may have been masked by either the participants' culturally-acquired values, norms, attitudes and preferences, or implications of the characteristics of the underlying formal commercialisation arrangement.

As in the preceding analysis, it is sensible to review the part played by participants' social space environments in encouraging or reinforcing the influence of this dimension of social behaviour, in the light of their influence in encouraging or reinforcing the dimension "concentration on intercultural similarities and explosion of intercultural myths" (section B of the preceding chapter). Table 4 predicted that individualists (like the members of the CSIRO group in  $I^2$ ) would enthusiastically explode intercultural myths, and it can be predicted that they will equally enthusiastically adopt and pursue a category-independent role (which they did).

But, as noted above, there is no evidence that behaviour associated with the dimension "assumption of category-independent roles" actually

made the  $I^2$  interface more effective. So it would seem doubtful whether the CSIRO group's culturally-acquired values, norms, attitudes or preferences ultimately acted to encourage or reinforce behaviour associated with *this* dimension.

Table 6 identified two arrangement characteristics expected to encourage identification and pursuit of category-independent roles. One of these was *the technology's development to only an early stage at the time the arrangement came into being*. Table 7 shows that the  $I^2$  arrangement did not possess this characteristic. But there are no signs that its absence discouraged either  $I^2$  party from pursuing or permitting category-independent roles. Comprehensive search of the data on  $I^2$  failed to reveal in any of the participants any yearning for technology that had been at an earlier stage of development when the arrangement had come into being.

The second characteristic of the  $I^2$  arrangement predicted to influence the parties' willingness/keenness to take on category-independent roles (Table 6) was *the arrangement's genesis in collaboration among at least most of the partners*. Table 7 shows that this was in fact how the  $I^2$  arrangement had come into being. But there is no evidence that this characteristic, which was investigated in section E of the preceding chapter, had more than a marginal influence on interface effectiveness.

As in a number of the preceding analyses, one is inclined to seek explanations for the somewhat surprising findings about influences on  $I^2$ 's social effectiveness, in the strong external forces acting on the interface. (These were discussed at length in sections C and E of the



preceding chapter.) It seems quite likely that the potentially profound influence of category-independent roles on interface effectiveness, demonstrated in other interfaces, was (like the trust-based and intercultural perceptions-based behaviour in I<sup>2</sup>) swamped by concomitants of OPTUS's rapid assumption of the role of Australia's second national communications carrier. Perhaps, deus-ex-machina-like, the different social conditions created by this changing role overwhelmed the anticipated positive effects of systematic role-exchange.

### 3. The SIROSCOUR Interface

In SIROSCOUR, there is significant evidence that each party's - and especially CSIRO's - restriction to category-*dependent* roles acted to amplify intercultural gaps, to the detriment of the interface's openness, flexibility, cohesiveness, focus and overall effectiveness.

Greenfields was critical of the CSIRO Division's adoption of a traditional, circumscribed role in their dealings with their licensee, PD&F. Greenfields identified the detrimental effects on interface openness and cohesiveness of this role as it related to both working with the licensee on gathering and analysing in-plant performance data, and controlling and guiding the work of the licensee more generally (interview, Greenfields Melbourne, 16 September 1992).

PD&F also believed that CSIRO's approach to dealing with the company was too 'arm's length'. PD&F would have preferred CSIRO to have adopted what would have amounted to a category-*independent* role entailing the status of industry-expert rather than solely research-expert, and involving collaboration and project management rather than solely licence-oversight. As PD&F put it (telephone interview, 21 October

1992), they would have found it much more helpful if the CSIRO group had adopted an outgoing, proactive approach, which "would have been appreciated by everyone", and would have made the interface operate more smoothly: very likely with a dividend to interface effectiveness.

Yet most interviewees described how the CSIRO group's role continued until the interface's very last days to centre on what might be described as the traditional CSIRO mode of working with companies, featuring arm's-length dealings, remoteness from the partners' immediate objectives, polarisation of the parties on some issues, and 'playing its cards close to the chest'. As PD&F said (telephone interview, 21 October 1992), they "had to drag everything out of CSIRO, piece-by-piece" (telephone interview with PD&F, 21 October 1992).

These attitudes towards category-(in)dependent roles are consistent with predictions from cultural theory. It was noted in section B of chapter 6, in the examination of the SIROSCOUR parties' attitudes towards intercultural similarities/differences, that the two companies (from individualist environments) were expected to emphasise intercultural similarities, while the CSIRO group (from a hierarchist environment) was expected to emphasise intercultural differences. It is but a small step from these predictions, to predict that:

- \* the companies will prefer those of the parties that have scope to play category-independent roles (and this really means the CSIRO group), to do so; and
- \* the CSIRO group will itself prefer to play a category-dependent role.

This is precisely the situation discussed in the preceding analysis.

SIROSCOUR possessed neither of the arrangement characteristics expected to act to encourage or reinforce behaviour associated with the interface's pursuit of category-independent roles (Table 7). The detrimental influence on interface effectiveness of SIROSCOUR's conservative approach to category-independent roles was therefore expected to be amplified by the obverse of these two characteristics: the technology having been developed to a relatively advanced stage at the time the arrangement was instigated, and the arrangement having come into being mainly through initiatives and enthusiasm of only one of the parties.

Analyses in the preceding chapter demonstrated that these characteristics did indeed have a detrimental effect on interface effectiveness.

#### 4. Conclusions

The MMP and  $I^2$  interfaces both showed a remarkable adoption of category-independent roles by the research groups or individuals, and a ready acceptance (and often active encouragement) by the partner that the researchers should play such a role. The SIROSCOUR interface showed a distinct absence of category-independent roles: even though the partners would probably have preferred the CSIRO group to have played such a role.

With the MMP and SIROSCOUR interfaces, there was clear evidence that these respective outlooks on category-independent roles directly influenced how effective the interface would be. With  $I^2$ , it was not possible to conclude with confidence that the CSIRO group's category-

independent role influenced interface effectiveness at all.

This analysis, like the preceding analyses, has therefore contributed further to articulating commercialisation interface dynamics: although the effect on interface effectiveness of behaviour bearing on the acceptance and performance of category-independent roles was not as marked as the effect of dimensions investigated in most preceding analyses.

This analysis does suggest quite strongly, though, that the influence this behaviour *did* have on interface effectiveness gained its force through precisely the same channels as the dimension examined in the preceding section: through directly affecting the way the interface itself, as a small group, set about its tasks, and receiving little encouragement or reinforcement from the interfaces' cultural and structural contexts. With this dimension also, the behaviour's influence on interface effectiveness seems necessarily to have come from social characteristics that had developed in the interface itself.

#### E. CONCLUSIONS FROM ANALYSES IN THIS CHAPTER

These analyses examined the influence on interface effectiveness of the four dimensions of social behaviour constituting the second element of the analytical framework (Table 10). These relate to whether, and how, the structural relationships between the parties to an interface permit or encourage participants to:

- \* identify and pursue shared goals;
- \* respect and build on relatively intimate relationships;

- \* respect and react favourably to dealings with people of approximately the same status as themselves; and
- \* recognise, develop and pursue category-independent roles in the interface.

Examination of this set of dimensions, like examination of the set looked at in the preceding chapter, was helpful for understanding processes and events encountered in the case studies and the social structuring of the interfaces. All four dimensions of behaviour were shown to have influenced interface effectiveness.

However here the influence came about through a channel that was completely different from the mode of influence identified in the preceding chapter. Here, the behaviour investigated directly affected the way the interface itself, as a small group, set about its tasks (rather than affecting the way each party approached its involvement in the interface).

Because these dimensions impacted on interface effectiveness through framing the supragroup's collective activities, its priorities and its preferences, these dimensions can be described as having had a *collective mode of influence* on interface effectiveness.

Through these conclusions, these analyses have taken a further step towards answering *the first and the second of the study's research questions*: Behaviour associated with the social structural relationships between the parties to an interface assists in understanding the genesis, growth and persistence of laboratory-company commercialisat-

ion interactions, and helps directly in understanding interface effectiveness.

It would seem to be important for these dimensions of social behaviour to contribute to approaches and techniques that might be developed for analysing and articulating interface effectiveness (like the model to be constructed through this study). It would seem to be equally important for those responsible for establishing, developing and operating commercialisation interfaces, and those participating in interfaces, to give adequate attention to developing insightful inter-party structural relationships that encourage participants to adopt shared or complementary perspectives on important interface aims, issues and events, and to get as close as possible to the other party's representatives.

These conclusions provide another part of the answer to *the study's final research question*, which will be returned to below.

Any effect of the interfaces' cultural and structural contexts in encouraging or reinforcing one of these dimensions of social behaviour - interaction of individuals of approximately equal status - could not be investigated through 'looking backwards' or 'looking sideways' from the interfaces.

*Both* participants' culturally-acquired values, norms, attitudes and preferences *and* implications of the characteristics of the underlying formal administrative commercialisation arrangement acted to encourage or reinforce two of the other dimensions of social behaviour: identification and pursuit of shared goals, and involvement in intimate

relationships.

The interfaces' cultural and structural contexts seemed to have had a generally weak effect in encouraging or reinforcing the remaining dimension of social behaviour: assumption of category-independent roles.

These analyses therefore help further to answer both *the third and the fourth of the study's research questions*: Two of these dimensions of behaviour associated with the social structural relationships between the parties were markedly encouraged or reinforced by the values, norms, attitudes and preferences participants had brought into the venture, and by implications of the characteristics of the underlying formal commercialisation arrangements, but this encouragement/reinforcement effect was absent from one other dimension, and could not be investigated with the final dimension.

So, while these analyses (like those carried out in the preceding chapter) identified dimensions of social behaviour whose influence on interface effectiveness was *context-dependent*, they also identified one dimension whose influence was *context-independent*, as well as another whose influence will have to be assumed to have been context-independent.

The analyses in this chapter together have taken a further important step towards answering *the study's final research question*:

While the model to be constructed through the study should reflect the importance, for understanding, analysing, articulating and managing contributors to interface effectiveness, of this set of influential

dimensions of social behaviour per se, it must also emphasise two other findings bearing centrally on the social structuring of the commercialisation interface. One is the finding that all four of these dimensions influenced the social dynamics of the interface mainly through directly affecting the way the interface itself, as a small group, set about its tasks. The other is the finding that some dimensions' influence on interface effectiveness depends on a high degree of interplay with interfaces' cultural and structural contexts, while the influence of other dimensions does not seem to be related substantially to those contexts of interfaces.

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**Notes to Chapter 7:**

1. On first consideration, it seemed likely that the case studies would provide a range along this dimension. There might be expected to be markedly less opportunity for intimate contact in the arrangements involving overseas companies than in SIROSCOUR or I<sup>2</sup>, where the partners are separated by no more than a few hours' travelling time. However geographic dispersion turns out not to provide a very good measure of intimacy; the geographic proximity in 'local' arrangements tends to be compensated for by intensive contact provided under DUNLENA and MMP through periodic gatherings of representatives of the parties, meetings of boards, evaluation groups and the like, and interchange of people.

Nor was it possible to distinguish among the case studies on the basis of interpersonal relationships above and beyond the



bare minimum encouraged or mandated by management arrangements. All four ventures seemed to involve a similar amount of intimate contact based on visits to each other's homes, social chats in each others' laboratories or offices, golf and tennis matches, and other sorts of relatively intimate contacts.

This is not to say that the data from the case studies must be set aside when it comes to this dimension. Even if *the interfaces* cannot be graded in terms of this dimension, specific relationships between various combinations of participants *can* be. After all, this dimension of intergroup contact theory had its genesis in the quality and depth of contacts between pairs of key opinion-forming individuals from different cultures.

2. Measures of intimacy include the frequency of contact (especially contact above and beyond what is demanded from the formal requirements of the arrangement), the extent to which the partner is taken into one's confidence, and how much one person's ideas and values seem to be influenced by the other's.
3. In *DUNLENA*, the two sets of representatives are the division-level managers of the two parties, and the immediate function managers in the two parties. The Du Pont divisional managers seem to have considerable autonomy for operation of their respective divisions, and to carry much weight not only in developing the company's product strategies but also in determining the use the company is to make of R&D skills bases throughout the world. Notionally, the responsibilities of the Chief of the CSIRO Division seem to be very similar. Likewise with the two

sets of more junior managers: the Du Pont people in charge of the various parts of the company's testing procedures are, as nearly as one can judge, the counterparts of CSIRO's program managers and project leaders (like CSIRO D and CSIRO E).

With  $I^2$  also, as nearly as can be gathered from the data available, the two sets of managers directly involved in the venture have very similar responsibilities. The managers concerned are the Assistant Chief of the CSIRO Division and the manager of OPTUS's Mobilesat Division; and CSIRO B (the officer-in-charge of the research group) and OPTUS A (the business-development project officer responsible for day-to-day handling of OPTUS's interest in the project).

4. Such ready assumption of a category-independent role is not necessarily inconsistent with CSIRO C's 'average' rate of abandoning no-longer-suitable old ways of thinking, described previously. It is possible for a category-independent role to be taken on quite successfully without especially early or especially enthusiastic abandonment of one's old ways. CSIRO C's ready adaptation to a category-independent role is perhaps explained more by his systematic preparation for cultural change - see section B of this chapter - than by any particularly early or enthusiastic abandonment of his old ways of thinking and doing things.

## **CHAPTER 8**

### **ANALYSIS:**

**INFLUENCE OF POTENTIALLY**

**DIVISIVE FORCES**

**ON GROUP DEVELOPMENT:**

**CONFLICT**

## CHAPTER 8

### ANALYSIS:

### INFLUENCE OF POTENTIALLY DIVISIVE FORCES ON GROUP DEVELOPMENT:

### CONFLICT

#### A. INTRODUCTION

This chapter follows the approach of the preceding two chapters at the most general level, to examine the influence on interface effectiveness of the third element of the analytical framework constituting Table 10. The dimensions of social behaviour making up this part of the framework are to do with the potentially divisive influence of conflict. The basic questions are whether the social structuring occurring in a commercialisation interface is affected by dimensions of social behaviour bearing directly on the following conflict processes, and whether - and how - that behaviour influences interface effectiveness:

- \* Development of excessive conflict.
- \* Management of excessive conflict.
- \* Maintenance of conflict at an unhealthily low level.
- \* Control of conflicts that question the 'founding assumptions' on which a relationship is actually based.
- \* Control of conflicts between groups that appeal to group members' personalities in fundamentally different ways.
- \* Control of conflicts focusing to a varying extent on definite objects of contention.
- \* Transfer of conflict-learned behaviour to other, non-conflict, situations.

Unlike the analyses in the two preceding chapters, these analyses cannot focus on each interface per se, because the separate conflicts contained by a single interface can involve different combinations of parties and can have different characteristics. Furthermore some of the conflicts in a particular interface can be much more serious than others.

The analyses here will therefore necessarily concentrate on the individual conflicts and selected characteristics of each. Cultural theory and implications of the characteristics of the formal commercialisation arrangement underlying each interface will still be able to be applied, however, to look 'backwards' and 'sideways' to examine any influence on behaviour associated with conflict processes, coming from the interface's cultural and structural contexts.

Nineteen separate significant conflicts - that is, conflicts based on discernibly different issues - were identified in the four case studies.<sup>1</sup> Two were identified in the DUNLENA interface, ranging up to seven in I<sup>2</sup>. The conflicts and the labels given to them are summarised in the following boxes; there is no significance in the order in which the conflicts in each interface are presented. An expanded description of each conflict and of its significance in the interface is given in Appendix 11. Discussion of the conflicts is also incorporated into the full descriptions of the case studies, at the beginning of Volume 2.

**BOX:****SEPARATE CONFLICTS IN THE MMP INTERFACE***(See Appendix 11 for expanded descriptions)*

**Conflict MMP A:** Between MIM A and more senior MIM management, on company values and priorities.

**Conflict MMP B:** Between MIM and UBE, on a number of questions of demarcation of their respective roles.

**Conflict MMP C:** Between MIM and the other Australian parties, on MIM being 'squeezed out' of a role in cultivating the interface's cultural framework, and in setting the venture's business-development strategy.

**Conflict MMP D:** Between QMC and MIM, on MIM's questionable commitment to playing a team game.

**Conflict MMP E:** Between CSIRO C and the other participants (especially MIM A), on CSIRO C's management approaches and styles.

**BOX:****SEPARATE CONFLICTS IN THE SIROSCOUR INTERFACE***(See Appendix 11 for expanded descriptions)*

**Conflict SIROSCOUR A:** Between Greenfields and CSIRO, on the latter's then policy of selecting only Australian companies as commercial partners.

**Conflict SIROSCOUR B:** Between CSIRO and PD&F, on CSIRO's provision of information and materials.

**Conflict SIROSCOUR C:** Between CSIRO/Greenfields and PD&F, on the latter's insistence on designing everything 'from scratch', rather than buying 'off the shelf' the 'handling' or the 'dry' parts of the scouring line (as distinct from the 'wet' parts), and what led PD&F to adopt this approach.

**Conflict SIROSCOUR D:** Between PD&F and Greenfields, on what constitutes a "turnkey plant".

**Conflict SIROSCOUR E:** Between CSIRO and Greenfields, on the latter's inadequate consultation with the former when 'fine-tuning' SIROSCOUR in their own plant.

**BOX:****SEPARATE CONFLICTS IN THE DUNLENA INTERFACE**

(See Appendix 11 for expanded descriptions)

**Conflict DUNLENA A:** Between CSIRO D and a number of more senior CSIRO managers, on a range of management philosophies and approaches.

**Conflict DUNLENA B:** Between CSIRO and Du Pont, on CSIRO's refusal, for the first two years or so of the interface's lifetime, to provide Du Pont with structural details of compounds.

**BOX:****SEPARATE CONFLICTS IN THE I<sup>2</sup> INTERFACE**

(See Appendix 11 for expanded descriptions)

**Conflict I<sup>2</sup> A:** Between CSIRO and OPTUS, on the lack of the commercial inputs CSIRO expected from OPTUS.

**Conflict I<sup>2</sup> B:** Between CSIRO and OPTUS, on OPTUS frequently slowing things down to match expansion of their satellite capacity.

**Conflict I<sup>2</sup> C:** Between CSIRO and OPTUS, on CSIRO's failure to inject what OPTUS thought would have been adequate resources for development.

**Conflict I<sup>2</sup> D:** Between CSIRO B and a number of other research managers in the Laboratory, on the worth of the I<sup>2</sup> project, and on other groups' continuing access to CSIRO B's group's services.

**Conflict I<sup>2</sup> E:** Between CSIRO and OPTUS, on OPTUS's 'backing out' of the arrangement.

**Conflict I<sup>2</sup> F:** Between CSIRO and OPTUS, on their conceptualisation of the product that was the whole point of the arrangement.

**Conflict I<sup>2</sup> G:** Between CSIRO A/CSIRO B and more senior CSIRO managers, on whether the I<sup>2</sup> project should go forward, and on the resources and other support it should receive.

Four of the 19 interactions were judged to incorporate significantly more conflict than the others. These are conflicts SIROSCOUR C, SIROSCOUR D and SIROSCOUR B, which endured over most of SIROSCOUR's two-year lifetime, and conflict DUNLENA B, which lasted for only the first two years or so of DUNLENA's 11-year lifetime.

It seems clear that the conflict in these four interactions was sufficient to be regarded as excessive in terms of the theories of conflict reviewed in chapter 2. At least at some times, all four of these interactions clearly displayed the characteristics of excessive conflict discussed in chapter 2, like distorted information flows, decisions based on "poor information and one-sided commitments, and continuing tensions that undercut future relations among the parties" (Brown, 1983, pp.7 & 8).

At the other extreme, six of the 19 interactions, although clearly situations of conflict, were assessed to have kept that conflict at what can be argued to be an unhealthily low level. These interactions were conflict MMP C, and all of the CSIRO-OPTUS *inter-party* conflicts: that is, all the  $I^2$  conflicts apart from conflicts  $I^2$  D and  $I^2$  G.

Again, the limited conflict in these interactions seemed clearly to consign them to the 'too little conflict' category described by the theories of conflict reviewed in chapter 2. At some time or other, for example, the low level of conflict in each of them clearly encouraged quite significant inter-party differences to be glossed over.

Conflicts SIROSCOUR C, D and B and DUNLENA B will therefore be turned to in this chapter in investigating effects of more severe conflict,



and conflicts MMP C and I<sup>2</sup> A, B, C, E and F in investigating effects of less severe conflict.

## B. DEVELOPMENT OF EXCESSIVE CONFLICT IN THE CASE STUDIES

Chapter 2 argued that the channels and modes of action said by Brown to drive conflict at intergroup interfaces can help explain conflict processes in commercialisation interfaces, and perhaps ultimately help understand contributors to interface effectiveness. This analysis investigates whether those channels/modes of action can help with understanding the build-up of excessive levels of conflict in the case studies. If they do, several of Brown's ideas could then be brought to bear to examine how conflict levels influence interface effectiveness.

It immediately became clear in the analysis that Brown's pattern of development of conflict to too high a level contributes much to understanding the significance of all four 'excessive-conflict' interactions in the case studies. Chapter 2 articulated Brown's four characteristics of the development of excessive conflict:

- \* the expression of antagonistic, hostile and extremely distrustful attitudes and the exercise of coercive tactics of influence;
- \* distrustful and distorted communications;
- \* the development in each party's mind of an "innocent victim/malignant villain" dichotomy; and
- \* a tendency for these attitudes and behaviours to develop in "escalating cycles".

Antagonistic, hostile and distrusting attitudes were in ready supply in *the three SIROSCOUR excessive-conflict interactions*. Distrust in SIROSCOUR, which was analysed in section E of chapter 6, seemed to go considerably farther than normal business scepticism and due diligence. Much of the information gathered on CSIRO's dealings with PD&F, for instance, was premised on at least cynicism if not outright distrust. As CSIRO B said, in discussing CSIRO's contre'temps with PD&F:

What we had to sell was a know-how package, which is fairly difficult to define exactly what it contains ... We went into quite a bit of detail in trying to explain that. Now whether our two partners fully understood what it was about I really can't answer, but my feeling is that they did ... [interview, CSIRO Geelong, 13 August 1992].

Greenfields' offer to PD&F of a \$0.5 million low-interest loan in exchange for lodging with Greenfields all the technical material on SIROSCOUR (see the description of SIROSCOUR in Volume 2) seems to have been a blatant attempt at another of Brown's manifestations of excessive conflict: coercive influence. It arguably amounted to a half-million-dollar bribe for PD&F to bow out of the arrangement.

Brown's "innocent victim/malignant villain" dichotomy was also clearly evident in SIROSCOUR. Greenfields was so "malignant" (in CSIRO's eyes), for example, as to jeopardise the future of the whole venture. They did this, said CSIRO D (interview, CSIRO Geelong, 18 September 1992), by putting through the SIROSCOUR line types of wool not intended to be handled by the process, and co-operating with PD&F in removing some of the system's control mechanisms. CSIRO D presented these actions as being almost conspiratorial. And so "innocent" was CSIRO, and so "malignant" PD&F, that

We handed them a glorious opportunity on a plate ... They could have captured a substantial part of the market ... [but] they stuffed it up and in many ways CSIRO got the blame [interview with CSIRO B, CSIRO Geelong, 13 August 1992].

Circumstantial evidence is that communication suffered seriously from these sorts of distrust and distortion. The description of SIROSCOUR in Volume 2 features much evidence that conflicts SIROSCOUR B and SIROSCOUR C had their basis in the sorts of communication problems identified by Brown.

Most significantly, all these attitudes and actions showed clear signs of developing in Brown's "escalating cycles". Several interviewees described how PD&F's frustration, distrust and hostility towards CSIRO started with their realisation that a number of things CSIRO had told them about SIROSCOUR's proven efficacy in commercial application and CSIRO's practical SCOURING know-how were incorrect. The frustration, distrust and hostility soon 'rolled over' into the issue of the completeness and accuracy of the engineering drawings CSIRO gave to PD&F. This in turn was caught up in PD&F's views of the CSIRO Division's poor appreciation of engineering development, and in particular the complexities and expense of remedial work.

At each stage, the frustration, distrust and hostility seemed to be amplified, until it largely resulted in breakdown of the interface.

Little point would be served in examining development of the other excessive-conflict interaction - *conflict DUNLENA B* - over DUNLENA's early days in as much detail as development of the SIROSCOUR conflicts. It is clear, though, that Brown's conflict-boosting mechanisms for the most part operated here as well. Distrustful and hostile atti-

tudes and CSIRO's fear of becoming an 'innocent' victim of the 'malignant' Du Pont, were at the heart of the CSIRO group's refusal to provide Du Pont with full compound structural details. These - and other - unmistakable signs of excessive conflict in DUNLENA are discussed in detail in the analysis of the role of symbolic representation of important interface events and processes, in section E of chapter 10, as well as in the description of the case study in Volume 2.

The key difference between conflict DUNLENA B and the three SIROSCOUR conflicts is that in DUNLENA there were no signs of Brown's "escalating cycles" of conflict. As a result, over a period of 18 months to two years the conflict about provision of compound structural details disappeared. This is much different from the later course of conflict in SIROSCOUR. Possible reasons for this difference are discussed later in this chapter and in all four of the other analytical chapters.

It is clear from the descriptions of the case studies in Volume 2 and from a number of the other analyses, just how much the three SIROSCOUR conflicts and conflict DUNLENA B (until it was brought under control) influenced key participants' approaches to their interactions in the interface, and how detrimental these conflicts were for interface openness, flexibility, cohesiveness and focus. The impact of the SIROSCOUR conflicts on interface effectiveness is best illustrated in the analyses of status differences in chapter 7, power relationships in chapter 9, the companies' limited roles in determining the interface's strategy and each party's use of symbolic representations, in chapter 10, and in most of the analyses of participants' approaches to interface relationships in chapter 6. The impact of conflict DUNLENA B in the early days comes through most strongly in the analyses of culture-

construction processes in chapter 10.

This concentration on conflicts SIROSCOUR C, SIROSCOUR D, SIROSCOUR B and DUNLENA B is not to say that the other, markedly less intense, conflicts showed no evidence of Brown's characteristics of development of excessive conflict. A number of them did from time to time.

But the point is that in those other conflicts these characteristics were nowhere near as pervasive or intense as they were in these four conflicts. Comprehensive search of the data on these other conflicts showed much less of the antagonism, hostility and distrust that characterised these conflicts in SIROSCOUR and DUNLENA. Nor was Brown's "innocent victim/malignant villain" dichotomy evident very often in those other conflicts, and where it could be identified it did not last for any more than a brief time.

Most importantly, where significant antagonism, hostility and distrust or Brown's "innocent victim/malignant villain" dichotomy *were* evident from time to time in other conflicts, it was clear that they did not develop in Brown's "escalating cycles". Rather, for reasons investigated in connection with intercultural similarities/differences and trust in chapter 6, power relationships in chapter 9 and acculturation in chapter 10, these attitudes and behaviours dissipated almost as quickly as they had developed, rather than 'rolling over' into related conflicts or into other aspects of the one conflict, as happened with conflicts SIROSCOUR C and B (especially).

So there is good evidence from the case studies that the more intense and extreme conflicts closely followed Brown's pattern for development

of 'excessive conflict' interfaces, and little evidence that the less intense and extreme conflicts did so.

There is also solid evidence that the course of conflict in the 'excessive-conflict' interactions proceeded largely independently of the participants' positions in social space. For example, cultural theory predicts (Table 4) that people from a hierarchist environment will be disinclined to get into, and to contribute to, situations of extreme distrust, coercion and polarisation. Yet most of the people involved in the four 'excessive conflict' interactions (the CSIRO groups in both SIROSCOUR and DUNLENA and the Du Pont group in DUNLENA) came from this environment.

To be sure, cultural theory predicts that individualists (like PD&F and Greenfields in SIROSCOUR) will not be fazed, and might even be attracted, by high levels of conflict. But these individualists were far from being the sole driving forces for conflict in SIROSCOUR. As is demonstrated in the analysis of the parties' willingness to think and behave in the 'public' domain of the interface, in section D of chapter 10, and in the analysis of goal-sharing in section B of chapter 7, the CSIRO group undoubtedly played its part.

Nor is our understanding of the development of excessive conflict helped by 'looking sideways', to implications of the characteristics of the underlying formal commercialisation arrangements. Table 6 identified four arrangement characteristics as being likely to encourage development of conflict to too high a level. An arrangement was reasoned to be more likely to encourage the development of excessive conflict if it was not well defined or planned and not especially

visionary, supported only weakly and/or inconsistently by the management of the parties, complex, and novel and/or sensitive.

The SIROSCOUR commercialisation arrangement (which contained three of the four clearly 'excessive-conflict' interactions) possessed only one and to some extent a second of these characteristics; Table 7 shows SIROSCOUR to have been a quite complex arrangement, which was poorly defined, planned and focused and not especially visionary. The DUNLENA arrangement (which contained the other of the 'excessive-conflict' interactions) possessed none of these characteristics.

It seems most doubtful, then, whether arrangement characteristics could have acted substantially to encourage or reinforce behaviour associated with the development of excessive levels of conflict.

### Conclusions

Like all the preceding analyses, this analysis was helpful for answering the study's research questions, and for illuminating the social effectiveness and endurance of commercialisation interfaces.

The case studies showed that the more intense and extreme conflicts followed Brown's pattern for development of 'excessive' conflict in interfaces, while the less intense and extreme conflicts did not follow that pattern of development. Furthermore the more intense and extreme conflicts were shown to have had a marked detrimental influence on interface effectiveness.

The analysis also showed that behaviour associated with the build-up of excessive conflict influenced the social dynamics of the interface

mainly through affecting the way each party approached its involvement in the interface, rather than through affecting the way the interface itself, as a small group, set about its tasks: although it does need to be noted that both modes of influence were evident in the case studies to a certain extent.

At the same time, the analysis identified no encouragement or reinforcement effect coming from the interfaces' cultural and structural contexts. It is almost as if situations of high conflict placed the parties on a 'war footing', and as a result behaviour based systematically and rationally on the interface's cultural and structural contexts went by the board.

So this behaviour's influence on interface effectiveness (like the influence of some of the dimensions of behaviour investigated in preceding analyses) seems necessarily to have gained its force through social characteristics and processes that had developed in the interface itself (rather than through the participants' values, norms, attitudes and preferences, or through implications of the characteristics of the formal commercialisation arrangement underlying the interface).

### C. CONTROL OF EXCESSIVE LEVELS OF CONFLICT

Perhaps not surprisingly, these same two channels of influence on interface effectiveness evident in behaviour bearing on the build-up of excessive conflict were at work in *controlling* that conflict.

Chapter 2 identified two sets of mechanisms which Brown argues are applied by interface participants and managers to reduce excessive



conflict. One set relates to the very basis of representatives' involvement in the interface: their perceptions, communications and actions. The other set of mechanisms relates to the direction of development of the interface itself: its structure and boundaries, who represents each party, and the context of the interface. These mechanisms were summarised in Table 1.

Chapter 2 proceeded to argue that examining the application of these mechanisms in commercialisation interfaces not only could help illuminate conflict-management, but could also help significantly in understanding contributors to interface effectiveness.

The case studies provide an ideal situation for empirically investigating whether the mechanisms identified by Brown drive the control of excessive conflict, because conflict in one of the four 'excessive conflict' interactions (conflict DUNLENA B) was eventually controlled most effectively, while conflict in the three SIROSCOUR 'excessive conflict' interactions remained throughout at an unhealthily high level. If the mechanisms identified by Brown explain conflict-control in the case studies (and perhaps interface effectiveness), there should be many signs of them at work on conflict DUNLENA B, and few signs of them in the SIROSCOUR conflicts.

Generally speaking this does seem to be the case. Almost all the significant decisions taken by CSIRO and Du Pont management over the first year or 18 months of DUNLENA's lifetime (see the description of DUNLENA in Volume 2), most of which bear on *conflict DUNLENA B*, can be seen to embody Brown's various conflict-control steps. There was, for instance (see the description of DUNLENA in Volume 2):

- \* *Altering CSIRO'S perceptions:* through alerting the CSIRO people to Du Pont management's intentness on capitalising on their different background, attitudes and areas of chemistry (minutes of DUNLENA Technical Committee, 25 March 1988), and to how difficult the task of Du Pont's 'champions committee' is without full compound structural details (interview with CSIRO E, CSIRO Clayton, 17 September 1992).
- \* *Altering the CSIRO group's actions:* through "redefining cultural issues, proposing new alternatives, or altering representatives' tactics", and in particular separating out culturally loaded issues and "posing new alternatives that allow the parties to shift from entrenched positions ..." (Brown, 1983, p.194). These were the thrusts of the whole effort aimed at instilling Du Pont's values and norms into the CSIRO group (see the analysis of DUNLENA's culture-construction processes, in chapter 10).
- \* *Changing the interface:* through Du Pont providing CSIRO with access to their compound data base and other marketing information (reported by most interviewees, but especially emphasised by CSIRO B - interview, CSIRO Clayton, 17 September 1992 - and SIROTECH - interview, SIROTECH Melbourne, 16 September 1992 - and also in minutes of 25 March 1988 meeting of DUNLENA Technical Committee), and through CSIRO management's insistence that *all* the Division's agricultural chemical research, and not just its insecticide research, be encompassed by DUNLENA.
- \* *Altering the interface's context:* through redirecting any of Du Pont's own research that ran the risk of getting into the area

reserved for DUNLENA, and through arranging for Du Pont C, a senior Du Pont manager, to keep a 'fatherly' eye on DUNLENA.

Evidence showing how fundamental these steps towards conflict-reduction were for framing the CSIRO people's (in particular) outlooks on the venture and their approach to interaction with their Du Pont counterparts, and how much they contributed to DUNLENA's rapidly-increasing openness, flexibility, cohesiveness and focus, is quoted continually throughout the analyses. The analyses of power relationships in the following chapter and acculturation in chapter 10 are especially relevant.

This prominent, consistent use in DUNLENA of Brown's conflict-reduction mechanisms contrasts with their very limited use in *SIROSCOUR*.

Certainly there is evidence that they were used in this interface on one occasion: in establishing the task-force to iron out the problems and to finalise commissioning of Greenfields' SIROSCOUR line (see the description of SIROSCOUR in Volume 2). This illustrates a number of Brown's conflict-reduction strategies, like injection of "more moderate" people (in the form of the independent consultant who led the task-force), redefining the interface boundary "around organizational coalitions whose members would ordinarily be in conflict" (Brown, 1983, p.245; this is a good definition of what the task-force was fundamentally about), and restricting the roles at the interface for representatives who feel obliged to "speak for their entire cultural heritage" (Brown, 1983, p.197; PD&F's managing director and the leaders of the CSIRO research team are good examples).

But, despite the deep, long-running conflicts in SIROSCOUR, such conflict-reduction mechanisms were used only at the very end of the interface's lifetime, as a product of desperation. There is no definite evidence of use of Brown's conflict-reduction strategies other than in the somewhat paradoxical situation of the taskforce (which was really about *replacing* the interface, not recasting it).

So there is a strong suggestion that Brown's conflict-reduction mechanisms were associated with the effective control of conflict in DUNLENA, and a clear question about whether failure to deploy those mechanisms early and systematically in SIROSCOUR contributed to that interface's rapid fragmentation.

Here again (as with the initial development of excessive conflict: see the preceding section), there are minimal signs that use of these mechanisms for dealing with conflict was encouraged by values and behavioural preferences resulting from the participants' positions in social space.

Admittedly the SIROSCOUR interface, whose conflicts were never controlled effectively, contained two individualist parties (PD&F and Greenfields), who were predicted (Table 4) to be at ease in situations of high conflict. But, as noted in the preceding analysis, there is no evidence that these parties were overwhelming contributors to the maintenance of excessive levels of conflict, or that they were more relaxed in, or stimulated by, SIROSCOUR's excessive-conflict environment than the (hierarchist) CSIRO people. Indeed there is a suggestion in the analysis in section B of chapter 6 that Greenfields may have been most concerned of all about SIROSCOUR's high-conflict environ-

ment, and may have had something of a *calming* influence.

Nor do implications of the characteristics of the underlying formal commercialisation arrangement cast much light onto whether and how the interface participants call on these conflict-control mechanisms. Table 6 identified two characteristics as being likely to encourage interface participants to adopt Brown's conflict-control mechanisms: the commercialisation arrangement being poorly defined and planned and not visionary, and being a long-term arrangement. Yet Table 7 shows the SIROSCOUR arrangement (which tended *not* to adopt these mechanisms) and the DUNLENA arrangement (which clearly adopted them) each to have possessed one of these characteristics: at least in moderation. SIROSCOUR was quite poorly defined, planned and focused and not especially visionary, while DUNLENA is a long-term arrangement.

To this point, this analysis of the control of excessive levels of conflict in the case studies has been based on Brown's exposition of his conflict-management theory *in general terms*. Chapter 2 noted that many commercialisation interfaces are complex interfaces (as conceptualised by Brown), and argued that Brown's *more specific* ideas on conflict-management in such interfaces have particular potential to assist in understanding the conflict processes in commercialisation: and perhaps thereby interface effectiveness. Brown's reasoning along this line is taken up in the remainder of this section.

Examination of the 19 separate conflicts identified in the case studies and how they fit together reveals outstanding examples of Brown's correlated complex interfaces and crosscutting complex interfaces (see section E of chapter 2).

The best example of a *correlated interface* seems to be SIROSCOUR, which incorporated five separate conflicts, several of which trace back to conflict SIROSCOUR C (rooted in PD&F's insistence on designing and building all components for the SIROSCOUR line 'from scratch'). Furthermore all five of these conflicts are able to be traced to a few more general underlying causes, like limited and confused exchange of technical information, and inadequate and confused communication of expectations and needs among the parties. According to Brown, these are definitive signs of correlated complex interfaces.

It was shown previously that escalation of the SIROSCOUR conflicts was extreme by the standards of the conflicts in the case studies. The question here is whether SIROSCOUR's continuing excessive levels of conflict can be attributed to the absence, or ineffectiveness, of Brown's "interventions that realign[ed] simple interfaces to decrease convergence" in correlated complex interfaces.

In fact, there are some signs that the SIROSCOUR parties attempted to bring conflict under control through what amounts to decreasing convergence. For example, the task force created to attempt to solve the problems (see the description of SIROSCOUR in Volume 2, as well as foregoing analysis in this section) set about its work by involving other parties (the independent consultant and Dysons) in the conflicts, shifting the focus away from the 'design-and-build-everything' issue, improving the exchange of technical information, and clarifying expectations and needs. Most of the steps were at least partly successful: even if the interface proceeded to break down in any event.

But again the key point is that these attempts to decrease the con-

vergence of the conflicts in this correlated complex interface were steps of desperation, taken very late in the piece. By the time they were taken, the conflicts had existed at an unhealthily high level for so long that the interface was well on the way to coming apart.

The best illustration of a *crosscutting complex interface* in the case studies seems to be MMP. The five separate conflicts identified in this interface clearly concentrated on a fundamentally wider range of quite independent issues than did the five SIROSCOUR conflicts. Some of these conflicts were couched in quite abstract terms (like conflict MMP C, concerning the interface's culture-formation processes), and others very much in terms of pragmatic territorial interests. Admittedly this range of issues may have been partly a result of the greater number of partners. But even allowing for this, there seems to be a notable degree of independence among the issues of conflict.

Furthermore there is in MMP evidence of Brown's tendency for one conflict to "suppress or transform" the effects of others. Hence conflict MMP A (centring on MIM's corporate values and priorities), or more accurately the other partners' awareness of that conflict's existence, cut across conflict MMP C (centring on the interface's culture-forming processes). Quite simply, it became more difficult for MIM to play a full part in the interface's culture-formation process because people were aware of MIM's internal debate about values and priorities.

MMP also contains some signs of Brown's "episodic or inconsistent behavioural dynamics" that are characteristic of crosscutting complex interfaces. QMC B and MIM A on more than one occasion remarked on the inconsistent behaviour at different times of their partners (espec-

ially CSIRO C). For instance, MIM A (interview, MIM Brisbane, 22 September 1992) saw CSIRO C's behaviour in connection with reporting to the joint venture partners and providing them with management information, as being somewhat at odds with his other behaviour in the interface; perhaps this was triggered by "episodic" characteristics of the reporting situation, stemming from the sometimes conflicting expectations of the various parties.

The approaches to conflict-control in MMP reflected a number of Brown's 'convergence-increasing' measures. For example, there was a distinct trend over this interface's lifetime for one conflict to assume a dominant role over the others. This is conflict MMP E (centring on CSIRO C's management style and philosophy). While this trend could conceivably be little more than a product of maturation of the interface to the stage where management details become all-important, the 'gravitation' of the separate conflicts onto conflict MMP E seems to have been more extreme than one would associate with the evolution of interest in management detail. In the final analysis, however, it is impossible to be categoric, on the basis of the data available, about which of these two factors contributed more to the increasing focus on conflict MMP E.

There are also good illustrations in MMP of attempts to correct problems at one constituent simple interface, creating or amplifying problems at another. Thus, the gradual straightening out of conflict MMP B (between MIM and UBE, on questions of demarcation of their roles) placed more importance on conflict MMP E (see preceding paragraph). Quite simply, the increasingly united outlook on some issues by MIM and UBE seemed to place more pressure on the interface to get its



management approaches right. Although there is only hearsay evidence to this effect, this resolution of conflict MMP B also seems to have significantly changed conflict MMP C (concerning MIM being 'squeezed out' of MMP's culture-formation and strategy-formation processes). This came about through UBE apparently adding *its* concerns about limitations to the venture's culture-formation processes, to MIM's concerns (interview with MIM A, MIM Brisbane, 22 September 1992).

It seems probable that convergence-increasing conflict-control mechanisms operated to quite good effect in MMP, because none of the five conflicts in this interface showed any sign of running out of control, while only one of the conflicts - conflict MMP C - from time to time showed signs of being too benign a conflict.

It was ultimately concluded that it was not feasible to generate predictions from cultural theory for how people's culturally-acquired behavioural preferences will act to encourage or reinforce this particular dimension of social behaviour. Arguably it would be asking too much of cultural theory to seek to predict that people from a particular segment of social space will prefer convergence-increasing behaviour (for example) more than people from some other segment. Nor can implications of the characteristics of the underlying formal commercialisation arrangements be turned to here; Table 6 did not identify any arrangement characteristics as being likely to encourage or reinforce conflict-adjustment steps in complex interfaces.

## Conclusions<sup>2</sup>

Like the preceding section's analysis of *the development* of excessive levels of conflict, this analysis assists with answering the study's

research questions and with understanding the social dynamics of commercialisation.

Brown's reasoning was shown to provide insights into controlling excessive conflict in the commercialisation interfaces in the case studies. And these insights are helpful for understanding the dynamics of *complex interfaces* (the form taken by many commercialisation interfaces). Adopting the conflict-control measures flagged by Brown (as the DUNLENA and MMP interfaces did) resulted in a healthy level of conflict, with a return to interface effectiveness. Failing to adopt those measures, or adopting them late in the piece (as the SIROSCOUR interface did), had serious consequences for interface effectiveness.

But Brown's model does not offer guidance on whether steps to control 'excessive' conflict will be introduced *sufficiently soon* or *with sufficient vigour* for conflict-control to be successful.

Clearly, Brown's conflict-balance approach helps understand interface effectiveness, but gives a somewhat incomplete picture. This approach will need to be complemented by other perspectives if a more comprehensive picture of the influence of conflict on interface effectiveness is to be obtained.

Here also (as with the build-up of excessive conflict), this dimension seems mainly to have acted through affecting the way each party fundamentally approached its involvement in the interface (rather than through affecting the way the interface itself, as a small group, set about its tasks). And here also, no encouragement or reinforcement effect from the interfaces' cultural and structural contexts was evi-

dent, so once again behaviour's influence on interface effectiveness seems necessarily to have originated in social characteristics and processes that had developed in the interface itself.

#### **D. MAINTENANCE OF CONFLICT AT AN UNHEALTHILY LOW LEVEL**

The first question here concerns whether the channels and modes of action argued by Brown to drive conflict at intergroup interfaces (see chapter 2) can help with understanding restriction of conflict to unhealthy low levels, and with managing low-conflict interactions to increase conflict to a healthier level. Again, if they do, Brown's ideas could be brought to bear to examine how unhealthy low levels of conflict influence commercialisation interface effectiveness.

The mechanisms said by Brown to keep conflict at an unhealthy low level centre on perceptions, actions and communications that deny differences and over-emphasise similarities between the parties. Review of the data on the too-little-conflict interactions identified in section A (because five of these six conflicts were in the I<sup>2</sup> interface, only this interface will be looked at in this analysis) casts doubt onto whether those mechanisms go far towards accounting for the low levels of conflict.

Certainly there were in these I<sup>2</sup> interactions isolated examples of what might be seen as suppression of critical interorganisational differences, over-emphasis of similarities and avoidance of contentious topics. SIROTECH pointed out, for example, that I<sup>2</sup> showed a reluctance to face squarely up to problems: "There was, for example, a reluctance on CSIRO's part to prove that OPTUS wasn't putting as much effort into development as they claimed" (interview, SIROTECH

Melbourne, 14 August 1992). CSIRO A acknowledged (interview, CSIRO Black Mountain, 26 August 1992) CSIRO's reluctance to make an issue of OPTUS's rapidly developing conflict of interest. OPTUS A was inclined (interview, CSIRO Black Mountain, 20 August 1992) to rationalise this reluctance through OPTUS's financing role in the venture.

But these seem to be isolated signs of Brown's mechanisms for developing unhealthily low levels of conflict. Indeed the analysis of respect for a partner's distinguishing features in section C of chapter 6 concluded that the  $I^2$  parties mostly emphasised inter-party *differences*, while the analysis of the CSIRO B-OPTUS A relationship in section B of chapter 7 revealed much frank airing of contentious subjects in some quarters. It would be drawing a long bow indeed to take the few signs of Brown's conflict-minimisation mechanisms in  $I^2$  as evidence that those mechanisms were fundamentally important.

Nevertheless, the fact is that conflict in most of the  $I^2$  interactions did remain at an unhealthily low level, and presumably it should be possible to identify causes of this.

As with the preceding analyses of the development and management of excessive levels of conflict, cultural theory is again not helpful. Certainly there is a prima facie argument that some participants' positions in social space may have made conflict so unpalatable to them that Brown's conflict-adjustment mechanisms simply were not needed. But this argument does not seem to be sustainable. The participants in the  $I^2$  interface are from the individualist (CSIRO) and the fatalist (OPTUS) segments of social space. Table 4 suggested the CSIRO people would not be all that keen on keeping conflict to a

notably low level, while the OPTUS people would prefer conflict to be kept to a low level. But comprehensive review of the  $I^2$  data suggests that there was little to choose between the two groups when it came to steps to suppress conflict. Indeed the conclusion from the analysis of preservation of a partner's most valued differences, in section C of chapter 6, is that the CSIRO people may have contributed more to keeping conflict at a very low level.

Here also, implications of the characteristics of the underlying commercialisation arrangement do not assist much in articulating this conflict process. Table 6 identified one characteristic - the arrangement being routine, non-sensitive, unpoliticised and low-profile - as being likely to encourage or reinforce participants' conflict-avoidance behaviour. Yet Table 7 shows the  $I^2$  arrangement to have possessed this characteristic only to a limited extent, and only as far as one of the groups was concerned.

## Conclusions

Brown's reasoning, complemented by cultural theory and implications of characteristics of the underlying formal commercialisation arrangement, could not illuminate why too-little-conflict interactions in  $I^2$  (which contained almost all of the too-little-conflict interactions) did not develop a higher, arguably healthier level of tension. Guidance needs to be sought elsewhere: perhaps in the close personal relationship between the leaders of the respective teams, CSIRO B and OPTUS A, and the vision they had long shared for a high-volume Australian instrument/software package based on CSIRO's technology. The analysis in section B of chapter 7 found this relationship to have had a positive influence on interface effectiveness.

The evident inability of Brown's theory to illuminate processes and events in commercialisation situations of too little conflict makes it pointless to apply this approach to analyse either the *control* of conflict or the influence of very low levels of conflict *on interface effectiveness*.

#### E. FOCUS OF CONFLICT ON GOALS/VALUES/INTERESTS THAT QUESTION THE FOUNDING ASSUMPTIONS OF THE RELATIONSHIP

Chapter 2 articulated Coser's theory on the crucial role in supra-groups, of conflicts that focus on goals/values/interests that fundamentally question the assumptions on which a relationship was founded. It was concluded that this theoretical perspective was likely to illuminate conflict processes in commercialisation interfaces, and ultimately to assist with identifying influences on interface effectiveness. The specific relationship to be investigated in this section comes from Coser's argument that

not all conflicts are positively functional for the relationship, but only those which concern goals, values or interests that do not contradict the basic assumptions upon which the relationship is founded [1956, p.80].

It is necessary at this point to define the main "basic assumptions" or principles upon which the interface in each of the case studies was founded. Questions relevant to these founding principles were necessarily discussed in each interview. But the author had to draw together these principles, because in no case were they written down and few of the interviewees had even mentally gathered them together as guiding lights for an interface. These founding principles were normally quite widely shared among the partners (see the analysis of the adoption and pursuit of shared over-riding goals, in section B of chapter 6, as well as the description of each interface in Volume 2). But occasion-

ally the partners differed on matters of detail. In such cases, it was necessary for the author to judge what the prevailing founding principles really were. This judgment was guided most by the views of the party which had played the leading part in establishing the arrangement, and the views of the CSIRO/SIROTECH contact (see Appendix 3).

The founding principles of each interface are listed in the following boxes.

**BOX: FOUNDING PRINCIPLES OF THE MMP INTERFACE**

- \* *Creating a new (to Australia) manufacturing industry to capitalise on an Australian resource strength.*
- \* *Gaining a significant share of the worldwide market for magnesium metal.*
- \* *Setting an example for the way downstream value-adding on Australian resources can be established.*
- \* *Creative linking of QMC's resource, CSIRO's research base, the two larger companies' operating and manufacturing experience, and direct public funding.*
- \* *Further elevating the profile and reputation of this part of CSIRO, for creative, profitable work with industry.*
- \* *Long-term commitment by all parties.*

**BOX: FOUNDING PRINCIPLES OF THE I<sup>2</sup> INTERFACE**

- \* *Using for national benefit, high-quality technology developed in the course of a CSIRO basic research program.*
- \* *The single partner being able to inject all the commercial perspectives needed, and the partnership being able itself to undertake all the activities necessary to commercialise I<sup>2</sup>, up to the stage of selling off the venture as a going concern.*
- \* *Gaining a significant share of the worldwide market for instrumentation/software in the area concerned.*
- \* *Providing marketing leverage for OPTUS's communication services.*
- \* *A high degree of involvement of CSIRO in actual 'hands-on' commercial activities.*

**BOX: FOUNDING PRINCIPLES OF THE DUNLENA INTERFACE**

- \* *Identifying and bringing into commercial production at least one major new agricultural chemical.*
- \* *Creative linking of CSIRO's research base and Du Pont's commercial development capability, amounting to the CSIRO group becoming in many ways a research arm of Du Pont.*
- \* *Capturing for Australia as high a proportion as feasible of any manufacturing activity established.*
- \* *Long-term commitment by both parties.*

**BOX: FOUNDING PRINCIPLES OF THE SIROSCOUR INTERFACE**

- \* *Enabling Australia to capture more of the value-adding industrial activity based on Australian commodities.*
- \* *Using the first SIROSCOUR line as a demonstration facility to show the quality of output attainable from SIROSCOUR.*
- \* *Highly complementary inputs from, and a high degree of interaction between, CSIRO's research expertise, PD&F's process design expertise and Greenfields' upgrading of its wool-handling capabilities.*
- \* *Demonstrating the value of the accumulated experience and know-how in the CSIRO Division.*
- \* *Australian companies being the best licensees of CSIRO technology.*

Five of the 19 conflicts identified in the case studies were assessed as striking at the heart of these founding principles. These are conflicts SIROSCOUR C, SIROSCOUR D, I<sup>2</sup> A, I<sup>2</sup> E and DUNLENA B (see section A). Appendix 12 identifies which of the various founding principles were assessed to have been fundamentally threatened by each of these five conflicts.

Coser's theory predicts that these five conflicts should be the most destructive of all the conflicts. They might be expected to have



thrown the venture 'off the rails' at least once, and perhaps even to have directly and seriously threatened the project's progress to a stage that was in any way satisfactory. In fact such disruptions happened to varying degrees:

*Conflict SIROSCOUR C* was largely responsible for holding up the project for almost two years, demanded revocation of the licence and its replacement by licensing arrangements with two other companies, almost sent PD&F broke, and took an inordinate amount of the CSIRO Division's and Greenfields' resources for many months. It also led to involvement of the Australian Wool Corporation in a 'refereeing' capacity: a step reflecting the potential destructiveness of the conflict.

*Conflict SIROSCOUR D* (which directly involved only PD&F and Greenfields), although having marked potential to destroy the interface, did not come as close to doing so as did conflict SIROSCOUR C. It seemed easier to focus the escalating conflict onto what would undoubtedly have become an expensive legal issue between the parties.

*Conflicts I<sup>2</sup> A and I<sup>2</sup> E* both had great potential to destroy the interface; one party's inability to provide the inputs that had been the main basis for its entry to the arrangement and that party's subsequent withdrawal from the arrangement (at least in its initial form) must surely pose potentially most destructive conflicts. In reality, what materialised as it became clear that OPTUS alone could not deliver the necessary commercial inputs and would ultimately have to withdraw from the arrangement, was a mixture of frustration and understanding from the CSIRO group. The understanding overcame the frustration with the help of a number of special circumstances (like the

strong personal relationship between CSIRO B and OPTUS A: see analysis in section B of chapter 7). Conflicts I<sup>2</sup> A and I<sup>2</sup> E eventually contributed to the interface's transformation into a completely different form, with OPTUS working with CSIRO in the capacity of customer/R&D sponsor, rather than partner/collaborator. Unlike the case with SIROSCOUR, there was no quite sudden abandonment of the interface.

*Conflict DUNLENA B* likewise clearly had the capacity to destroy the DUNLENA interface. As it was, it resulted in severe loss of motivation and commitment on the part of the CSIRO people for some 18 months. But the interface persevered through this conflict, and eventually prospered (see the analysis of the parties' use of symbolic representations, in section E of chapter 10, as well as the description of DUNLENA in Volume 2).

It is clear from these summaries that most of these founding principles conflicts at various times came at least reasonably close to destroying the respective interfaces. Examination of the data on the other conflicts reveals few hints that any of them came anywhere near as close to destroying interfaces. Coser's theory tends therefore to be borne out by data from the case studies, insofar as it bears on the destructive *potential* of conflicts that threaten the "basic assumptions upon which the relationship is founded".

But these five conflicts' destructive potential was completely realised in only one case: conflict SIROSCOUR C. The other four conflicts did not result in collapse of the respective interfaces. So the more fundamental question to seek to answer relates to actual manifestation of *responses to* a threat to a relationship's founding principles.

Quite simply: What determines whether a conflict's destructive potential is realised, or largely evaporates?

Unfortunately Coser's reasoning does not help to answer this question. The five conflicts discussed all seem to threaten the respective interfaces' founding principles quite directly and seriously, yet only one of them had an ongoing severe effect on interface effectiveness.

The culturally acquired values, norms, attitudes and preferences the participants had brought with them into the interface did not seem to have a significant effect in encouraging or reinforcing this dimension of social behaviour. Table 4 suggested that founding-principles conflicts will be of greatest concern to hierarchists and fatalists, and will be more disruptive to interfaces in which people from these segments are key participants. Yet it was one SIROSCOUR conflict that ultimately was most disruptive, and two of the three parties to SIROSCOUR were from *individualist* environments.

So the development of founding-principle conflict into full-blown irreconcilable, destructive conflict seemed to take place partly *despite* the participants' social space-acquired preferences and orientations.

Nor did implications of the characteristics of the underlying commercialisation arrangement encourage or reinforce behaviour associated with destructive founding-principles conflicts. Table 6 identified two characteristics as being likely to encourage or reinforce this behaviour: the arrangement being highly articulated, planned, focused and visionary; and initiative and enthusiasm having been shown by both/all

parties at the time the arrangement was being developed. Yet Table 7 shows SIROSCOUR, which experienced most disruption from founding-principles conflicts, to have possessed neither of these characteristics to any significant extent.

## Conclusions

Coser's reasoning on founding principles conflicts, complemented by cultural theory and implications of the characteristics of the underlying formal commercialisation arrangements, could not illuminate why potentially disruptive conflicts stemming from questioning of a relationship's founding principles either come to be activated or remain benign. Other perspectives will have to be relied on to develop our understanding of the influence on interface effectiveness of the build-up and management of conflict.

## F. WAYS IN WHICH GROUPS IN CONFLICT APPEAL TO THEIR MEMBERS' PERSONALITIES

Chapter 2 argued that Coser's theory on the importance of how groups in conflict appeal to their members' personalities, was likely to illuminate conflict processes in commercialisation interfaces, and ultimately to assist with identifying influences on interface effectiveness. The specific relationship to be investigated here comes from Coser's argument that

In groups that appeal only to a peripheral part of their members' personality, ... conflicts are apt to be less sharp and violent than in groups wherein ties are diffuse and affective, engaging the total personality of their members ... [The latter] groups will tend to suppress conflict, but if it occurs nevertheless, it will be intense and passionate [1956, pp.68 & 69].

The following groups in the case studies are clearly in Coser's 'total

personality' category, based on indicators including demonstrated passion for, and devotion to, the group and its activities; the perception of slights against the group as slights against its members; and the extent to which the group members evidently largely 'live for' the stimulation and challenge provided by the group's activities:

- \* the CSIRO group in the I<sup>2</sup> interface;
- \* the CSIRO group in the DUNLENA interface; and
- \* the CSIRO and QMC groups/individuals in the MMP interface.

The indicators described equally clearly place the following groups in Coser's 'peripheral appeal' category:

- \* the CSIRO, PD&F and Greenfields groups in the SIROSCOUR interface;
- \* the OPTUS group in the I<sup>2</sup> interface;
- \* the Du Pont group in the DUNLENA interface; and
- \* the MIM group in the MMP interface.

Coser would predict that the groups/individuals on the former list will tend to act to suppress conflicts with which they are confronted, but will react intensely and passionately to any conflict that develops despite their efforts towards suppression. Those on the latter list, on the other hand, will tend to enter into conflicts "less sharp[ly] and violent[ly]".

The case studies provide little evidence of such a difference.

One of the three groups on the former list - the CSIRO group in

DUNLENA - notably lacked a keenness to suppress conflict. At the same time there was a notable keenness to suppress some of the conflicts involving groups on the latter list (like a number of the  $I^2$  conflicts). Certainly the more intense, passionate and strongly maintained conflicts encountered in the case studies (see section A) included at least one centring on a group on the first list: the CSIRO group in DUNLENA. But some of these most intense conflicts also centred on groups on the second list: the Greenfields group, the PD&F group, the CSIRO group in SIROSCOUR and the Du Pont group. Likewise, the *least* "sharp and violent" conflicts centred on groups on both the lists. And the two parties to the  $I^2$  interface (which contained five of the six very-low-conflict interactions) appear on different lists.

Unfortunately neither 'looking backwards' nor 'looking sideways' from the interfaces can help explain why Coser's predicted different effects of conflicts involving these two fundamentally different types of group-affiliation did not materialise.

Cultural theory cannot profitably be applied because its predictions do not effectively distinguish among the social space segments; according to cultural theory, hierarchists (for instance) can be expected to manifest their social space-derived values and preferences in their engagement in conflicts in 'total personality' interfaces with a similar degree of strength and commitment as do individualists (for example). To predict differences in this respect between those from the different segments would arguably be pushing cultural theory beyond its predictive limits.

Likewise it would arguably be expecting too much to try to identify

characteristics of the underlying formal commercialisation arrangements that will act to encourage or reinforce behaviour associated with either 'total personality' or 'peripheral' group affiliation.

A tempting conclusion is that the 'total personality/peripheral' dimension of group identification does not influence the severity of a particular conflict in commercialisation interfaces. It is just possible, though, that Coser's reasoning *does* hold messages for this situation, but the effect of different types of group-affiliation has been masked by methodological factors.

It is possible, for example, that the case studies provide too limited a spread in terms of 'personality-identification'. It could be, for instance, that most of the groups in this study appeal so strongly to their members' total personality that even the groups in respect of which this is less so (relative to other groups in the case studies) still come close to "engag[ing] the total personality of their members". Perhaps this is particularly likely to be the case here, where the group-affiliation can be a focus for a lifetime's, or at least many years', work and commitment.

Furthermore, just as "it takes two to tango", it also takes two to conflict. Placement of one of the conflicting groups on one or the other of the above lists might mean relatively little in the terms being discussed here if that group's commercial partner is on *the other* list: that is, if the two groups demand a different type of commitment from their members. In fact the parties to a particular interface are often on different lists.

## Conclusions

Application of the approach adopted in this study, to investigate more commercialisation interfaces containing other combinations of partners, would be desirable. Such extensions of the approach should show whether Coser's reasoning on the relationship between the ways in which groups in conflict appeal to their members' personalities and the severity/consequences of conflict, can help with articulating and understanding contributors to interface effectiveness.

For the present, though, this analysis must conclude that Coser's theory, complemented by cultural theory and implications of the characteristics of the underlying formal commercialisation arrangements, does not help understand contributors to interface effectiveness.

## G. CONFLICT KEPT FOCUSED ON A DEFINITE OBJECT OF CONTENTION

Coser and Deutsch both distinguish between conflicts that are focused onto an object of contention and those in which the goal is personal and subjective (see section E of chapter 2). As Deutsch puts it,

... 'here-now-this' conflicts, which are localized in terms of a given time and place and specified in terms of particular, delimited actions and their consequences, are much easier to resolve constructively than conflicts that are defined in terms of principles, precedents, rights, ... [1973, p.370].

This distinction led the discussion in chapter 2 to wonder whether the case studies would demonstrate benefit to an interface's openness, flexibility, cohesiveness and focus as a result of keeping conflict focused on a 'hard', immediate object of contention, so that the underlying issues cannot easily be swept aside.



Two of the conflicts identified in the case studies (described in section A) provide outstanding illustrations of continuing focus of conflict on a specific "object of contention", despite ready availability of alternative "personal and subjective" foci.

*Conflict DUNLENA B*, by definition, maintained its focus on a very specific "object of contention": CSIRO's refusal to provide Du Pont with full compound structural details. This focus was maintained despite the ready availability of various alternative "personal and subjective" or "matters of principle" foci (like scientific freedom, undue commercial pressures on public sector scientists, the rights of companies as Australian taxpayers, and the propriety of publicly-funded laboratories dealing with foreign-owned transnational corporations).

Maintenance of this focus seems to have been distinctly beneficial to the interface, because it encouraged a number of levels of management in both partners to solve the underlying trust-based issue. This was eventually instrumental in DUNLENA becoming a productive and effective interface: see the analyses of development of the interface's cultural base, in chapter 10; and the analysis of goal-sharing in section A of chapter 7.

*Conflict I<sup>2</sup> A* also maintained the focus on a very specific "object of contention": the commercial input which OPTUS proved unable to provide, and which CSIRO had to try to provide instead. Again, this focus was maintained despite the availability of various alternative "personal and subjective" foci (like the limited commercial capacities of companies which - like OPTUS - grew out of the public sector, and the

questionability of strongly market-driven management of research).

Here also, this continuing focus seems to have been beneficial to interface effectiveness: see the analyses of trust, and of parties preserving their partner's most valued differences, in chapter 6.

The case studies also contain conflicts where the focus *was* displaced from an initial 'hard' central issue. A good illustration is *conflict SIROSCOUR B* (again see the description in section A), concerning what information CSIRO had provided to PD&F, and how detailed and complete it had been. Here, the conflict, while initially aimed squarely at the issue described, was soon displaced onto conflict SIROSCOUR C (concerning the need, and correctness, of PD&F designing and building all components of the SIROSCOUR line 'from scratch'). This displacement left the original situation unchanged and still inviting hostile actions. This is precisely what happened after a year or so, with the threat of legal action on the very point of what information CSIRO had provided to PD&F. In Coser's terms, the "clouds regathered" (1956, p.47).

This 'displacement' approach to conflict SIROSCOUR B was unproductive, whereas a direct, 'head-on-tackle' approach could well have resulted in less dysfunction in the long run.<sup>3</sup>

In this same interface there is an illustration of *productive* effects of displacing conflict from its original cause. *Conflict SIROSCOUR C* had reached, and for some time had remained at, a stage of intransigence. Several influences combined to resolve this conflict, a number of which are discussed in other analyses. The one of interest here is

displacement of the PD&F-Greenfields part of the conflict onto conflict SIROSCOUR D (again see the description in section A).

PD&F and Greenfields were getting nowhere with their part of conflict SIROSCOUR C, so their discussion turned to when (and whether) PD&F would deliver to Greenfields a turnkey SIROSCOUR line. A number of interviewees, including Dysons A, PD&F and Greenfields, described this shift in the focus of PD&F-Greenfields debate. Resolution of *conflict SIROSCOUR D* ultimately played a major part in getting the first SIROSCOUR line operational, thereby rescuing something from the whole venture and providing the basis for the second 'loop' of SIROSCOUR.

So this analysis has identified conflicts focused on definite objects of contention that were constructive, and at least one conflict that 'slipped off' the original object of contention (even if onto another definite object of contention) that was *destructive*. But at the same time an instance was identified where displacement of conflict from its initial cause (but here also onto another 'hard' cause) seemed to have been *productive*.

No substantive instances of focus of conflict on *personal/subjective/in-principle issues* were available in the case studies,<sup>4</sup> so it was impossible to use the available data to investigate categorically Coser's and Deutsch's relationship set out at the beginning of this section. It also makes it pointless to turn to cultural theory and implications of the characteristics of the underlying formal commercialisation arrangements to try to investigate further the influence on interface effectiveness of the focus of conflict.

It could be that conflicts on "personal and subjective goals" (Coser) or conflicts of "principle" (Deutsch) do not figure in the case studies because research managers and company executives are aware how futile it is to engage in such conflicts. Or perhaps conflicts that *do* focus on such issues/goals cause an interface to disintegrate almost immediately. Such an interface would not have survived long enough to find its way into the present study.

Investigation of laboratory-company commercial interaction *at an earlier stage* - when commercialisation possibilities are first being discussed - would show which of these explanations is correct. Such a line of study would seem to hold considerable attraction for explaining more of the conflict-based processes underlying commercialisation.

### Conclusions

All that can be said on the basis of this analysis is that there is a suggestion that conflicts strongly focused on definite objects of contention can be constructive and conducive to interface effectiveness. We are left with no more than a suspicion that personal/subjective/in-principle foci could be shown, with the benefit of a greater range of data, to make commercialisation conflicts more entrenched and severe, and to impact detrimentally on interface effectiveness.

This analysis has contributed little to answering the study's research questions; Deutsch's and Coser's reasoning on the importance, for effective interaction, of conflict's focus does not help understand contributors to interface effectiveness. Investigation of laboratory-company commercial interaction *at an earlier stage* - when commercialisation possibilities are first being discussed - might illuminate

more of the conflict-based processes underlying commercialisation.

#### H. TRANSFER OF CONFLICT-LEARNED BEHAVIOUR TO NEW, NON-CONFLICT SITUATIONS

Chapter 2 argued that Coser's theory on conflict as a precursor to other, constructive, social relationships not notably based on conflict was likely to assist with understanding contributors to interface effectiveness. The specific relationship to be investigated here comes from Coser's argument that

By bringing about new situations, which are partly or totally undefined by rules and norms, conflict acts as a stimulus for the establishment of new rules and norms ... [and] brings into the conscious awareness of the contenders and of the community at large, norms and rules that were dormant before the particular conflict [1956, pp.124 & 127].

The case studies contain outstanding illustrations of the transfer of conflict-learned behaviour to other, non-conflict situations. The classical illustration is conflict DUNLENA B (again see section A of the chapter), concerning CSIRO's provision to Du Pont of full structural details of the compounds being provided for testing. What both parties learned through this conflict (give-and-take, trust and sharing, for example) directly provided the basis for the largely conflict-free CSIRO-Du Pont relationship that has now driven DUNLENA successfully for almost 10 years.

Other conflicts also providing a base for subsequent successful conflict-free interaction include the conflicts between

- \* CSIRO and OPTUS in the I<sup>2</sup> interface, which provided a base for OPTUS's new type of involvement in I<sup>2</sup> as a customer rather than as a collaborator/partner;

- \* MIM and UBE in the MMP interface, which facilitated creative sharing of the available roles in MMP; and
- \* MIM and QMC in the MMP interface, which enabled constructive planning for the venture's magnesium metal business.

Indeed, Coser's constructive transfer of conflict-generated skills and know-how to other, non-conflict, interaction among the parties is so widespread in the case studies that the only clear illustrations of this *not* happening are in SIROSCOUR. There the conflicts persisted until the interface broke down. So in SIROSCOUR there was simply no opportunity for the participants to display any such transfer (since it must be assumed that it is not practical for such transfer to be displayed while the parties are still in a state of high conflict).

Hence, here again the case studies did not provide the necessary range of data. They did not permit direct comparison between the conditions under which Coser's transfer of conflict-generated skills and know-how to other forms of interaction takes place, and the conditions under which it does not take place. The generalisation of conflict-learned behaviour must remain an interesting and potentially valuable concept for the analysis of conflict in commercialisation, but not a concept that could be specifically investigated here. It could be investigated only by expanding a study like the present one to include conflicts which (unlike the SIROSCOUR conflicts) have been brought under control, but which (unlike the DUNLENA, MMP and I<sup>2</sup> conflicts) do not virtually universally display Coser's transfer of conflict-generated skills and know-how to other, conflict-free interaction.

## Conclusions

With the data available here, Coser's theory on conflict as a precursor to other, constructive, social relationships not notably based on conflict, does not help understand contributors to commercialisation interface effectiveness. Our understanding of interface effectiveness could well profit from expansion of this sort of study to include conflicts which (unlike the SIROSCOUR conflicts) have been brought under control, but which (unlike the DUNLENA, MMP and I<sup>2</sup> conflicts) do not virtually universally display Coser's transfer of conflict-generated skills and know-how to other, conflict-free interaction.

### J. CONCLUSIONS FROM ANALYSES IN THIS CHAPTER

The case studies provided a limited range of conflicts in terms of the last three of the dimensions of social behaviour constituting the third element of the analytical framework: behaviour associated with the ways groups in conflict appeal to their members' personalities; keeping a conflict focused on a definite 'hard' object of contention; and the transfer of conflict-learned behaviour to other, conflict-free, situations. The most that can be identified from any of these perspectives is a suggestion that conflicts kept focused on definite objects of contention are constructive (and potentially conducive to interface effectiveness).

The suggestion is made at a number of points in the chapter that application of the approach developed in this study to a wider range of commercialisation interfaces could well reveal a number of additional conflict-based contributors to interface effectiveness.

A fourth conflict-based dimension of social behaviour - behaviour

towards conflicts that threaten the "basic assumptions" on which a relationship is based - *was* amply demonstrated in the case studies, but was found not to have influenced interface effectiveness (although it was able to articulate *the potential* of a particular conflict to damage the interface).

Examination of two other dimensions of behaviour in this third element of the analytical framework - behaviour associated with Brown's pattern of *development* and *management* of excessive conflict - *was* helpful for understanding processes and events encountered in the case studies, and the social structuring of the interfaces. The more intense and extreme conflicts were shown to have followed Brown's pattern of development. At the same time, Brown's conflict-management mechanisms had much to do with control of excessive conflict in the one interface where such conflict was successfully controlled, while failure to deploy those mechanisms early and systematically could well have contributed to fragmentation of the other interface in which conflict had developed to a high level.

It was also shown that Brown's convergence-decreasing/convergence-increasing provided the basis for steps towards conflict-control in *complex interfaces* (the form taken by many commercialisation interfaces). Conflict-control through convergence-increasing was successful. Conflict-control through convergence-*decreasing* was not successful, although this could have been because steps to this end were taken too late: essentially as steps of desperation.

So Brown's model cast much light onto means of controlling excessive conflict in commercialisation once control steps have been taken. But



it did not illuminate whether control steps will be introduced *sufficiently soon* or *with sufficient vigour* for conflict-control to be successful, and to flow on to influence interface effectiveness. Other explanations will be needed for what actually initiates or triggers steps to control excessive conflict to the stage where interface effectiveness improves.

Conflict-based behaviour that influenced interface effectiveness was shown to have gained that influence mainly through the channel identified in the analyses in chapter 6: through affecting the way each party and its representatives approached involvement in the interface (rather than through affecting the way the interface itself, as a small group, set about its tasks). However it does need to be noted that both modes of influence were evident here to a certain extent.

Because these dimensions impacted on interface effectiveness mainly through affecting individuals' actions and attitudes, they can be described as having had *an individual mode of influence* on interface effectiveness.

Brown's parallel reasoning on managing conflict through *increasing* the level of tension in interfaces where conflict is at an unhealthily *low* level could not help with illuminating events and processes underlying 'too-little-conflict' interactions in the case studies.

In all, the analyses in this chapter identified only two closely related dimensions of social behaviour, then, that help further to answer *the first and the second of the study's research questions*. Behaviour identified through Brown's conflict-balance theory on the

*build-up* and *control* of excessive conflict assists in understanding the genesis, growth and persistence of the social structure of laboratory-company commercialisation interaction, and helps directly - if incompletely - in understanding interface effectiveness.

It would seem to be important for these dimensions to contribute to approaches that might be developed for analysing and articulating interface effectiveness (like the model to be constructed through this study). It would seem to be equally important for those responsible for establishing, developing and operating commercialisation interfaces, and those participating in interfaces, to give adequate attention to managing excessive levels of conflict.

These conclusions provide another part of the answer to *the study's final research question*, which will be returned to below.

With a number of these dimensions of social behaviour identified through theories of conflict, it did not prove possible to investigate any encouragement or reinforcement effect coming from the interfaces' cultural or structural contexts. Where this *was* possible, a weak effect or no effect at all was discerned.

This provides a further element of the answers to *the third and the fourth of the study's research questions*: None of the conflict-based dimensions of behaviour was encouraged or reinforced by the interfaces' cultural or structural contexts. It was suggested that this might be because when there is a climate of strong conflict in an interface, behaviour based systematically and rationally on the participants' culturally-acquired values, norms, attitudes and preferences,

and on implications of the characteristics of the underlying formal commercialisation arrangements, could go by the board. Perhaps in these circumstances interaction comes to be driven solely by the immediate communications, actions/reactions and feelings of the actual conflict situation.

The two conflict-based dimensions of social behaviour that were shown to have influenced interface effectiveness must be regarded, then, as operating in a *context-independent* fashion.

The conclusions from these analyses permit a further important step towards answering *the study's final research question*:

While the model to be constructed through the study should reflect the importance, for understanding, analysing, articulating and managing contributors to interface effectiveness, of these influential dimensions of social behaviour per se, it must also emphasise two other findings bearing centrally on the social structuring of the commercialisation interface. One is the finding that the dimensions influenced the social dynamics of the interface mainly through affecting the way each party approached its involvement in the interface. The other is the finding that this influence does not seem to depend on these dimensions' interplay with interfaces' cultural and structural contexts.

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#### Notes to Chapter 8:

1. It will be seen that 15 of these 19 conflicts are *between parties*, while the other four are *within a particular party*. A

few more conflicts were identified in SIROSCOUR, but have not been included here, because they essentially concern the early stage of the second 'loop' of SIROSCOUR (see the description in Volume 2), rather than the first 'loop' that is the interface being looked at here. There were, for example, significant conflicts between Dysons and Greenfields, on the latter's continuing unwillingness to engage the former to design and install major scouring facilities, and between Dysons and CSIRO, on the latter's inadequate consideration of Dysons' business position when 'fine-tuning' SIROSCOUR in Greenfields' plant.

2. It was convenient for the analysis to regard the facets of behaviour examined in this section and the preceding one, as constituting two separate dimensions associated respectively with *the development* and *the control* of excessive conflict. The conclusion from the analyses in sections B and C that Brown's theory can explain *the control of excessive conflict* directly in terms of the processes underlying *the build-up of excessive conflict* would seem to make it not only advisable but almost inescapable, when it comes to articulating the study's outcomes in later chapters, to 'roll up' the findings on these two aspects of conflict into a single dimension of social behaviour. After this analysis, these two dimensions of social behaviour will therefore be combined into one dimension, "excessive conflict".
3. Such an approach may well, for example, have led to the simple, cheap and expedient step of engaging a draftsman to spend a few weeks doing what both CSIRO and PD&F claim the other party

should have done.

4. A few *potential* 'in-principle' conflicts clearly existed, but none of them assumed any real importance. For example the issue of how much of any commercial manufacturing activity flowing from DUNLENA would take place in Australia never really reached the stage of being labelled a conflict: so readily did the parties reach agreement (see the description of DUNLENA in Volume 2, as well as the analysis of the identification and pursuit of shared goals, in section A of chapter 7).

## **CHAPTER 9**

### **ANALYSIS:**

**INFLUENCE OF POTENTIALLY**

**DIVISIVE FORCES**

**ON GROUP DEVELOPMENT:**

**POWER**

## CHAPTER 9

### ANALYSIS:

### INFLUENCE OF POTENTIALLY DIVISIVE FORCES ON GROUP DEVELOPMENT:

#### POWER

##### A. INTRODUCTION

This chapter follows the broad approach of the three preceding chapters, to examine the influence on interface effectiveness of the fourth element of the analytical framework constituting Table 10. The dimensions of social behaviour making up this part of the framework are to do with the potentially divisive influence of power relationships on interface effectiveness. The basic questions are whether the social structuring occurring in a commercialisation interface is affected by the following power-related dimensions of behaviour, and whether - and how - that behaviour influences interface effectiveness:

- \* The strategic use of power to pre-emptive ends.
- \* Exercise of power by demonstrating the ability to cope successfully with uncertainty in critical areas within the interface.
- \* Exercise of power in the form of meta-power/relational control.

Two important prerequisites for effective exercise of power in supragroups, and perhaps ultimately for maximising interface openness, flexibility, cohesiveness and focus, were identified in chapter 2. First, power should be exercised properly by those who possess it, in

approximate proportion to the amount of power they really possess. Second, all parties should clearly understand and accept the sources or bases of power, and the interface's power relationships generally.

Of the power bases in the case studies, those in *SIROSCOUR* were the least articulated and understood. This seemed largely to be a result of 'fuzziness' at the edge of each party's collection of expertise and experience. While PD&F (for example) clearly had expertise and experience in engineering design and fabrication, the other parties were always unsure of the precise limits to this expertise/experience (interview with CSIRO B, CSIRO Geelong, 13 August 1992). Likewise, while Greenfields clearly were experienced in wool-handling and wool marketing, their partners were uncertain of their real knowledge of wool *scouring* (interview with Dysons A, CSIRO Geelong, 13 August 1992).

Illustrations of behaviour and thinking resulting, at least in part, from *SIROSCOUR*'s unclear power relationships abound throughout the analyses (see especially chapter 7's analyses of this interface's identification and pursuit of over-riding goals and the importance of status differences between the parties, and chapter 8's analyses of conflict). Only a few illustrations will be drawn together here.

PD&F's role confusion and uncertainty about where they stood with CSIRO inhibited them from tackling CSIRO head-on about the engineering drawings and information CSIRO had (or had not) provided. PD&F virtually cursed themselves after the event for not having taken the issue up with the Chief of the CSIRO Division (telephone interview with PD&F, 21 October 1992). This uncertainty was exacerbated by the fact that they did not have a formal agreement with CSIRO covering this



specific project (see the description of SIROSCOUR in Volume 2).

*Greenfields'* involvement in SIROSCOUR was also conditioned by uncertainty about what they were and were not in a position to do. The uncertainty, which was exacerbated by the company's poor knowledge of wool scouring, was captured in the interviewees' extensive discussion of what really constitutes a "turnkey plant" and what Greenfields were in a position to insist on PD&F providing: interviews with Dysons A (CSIRO Geelong, 13 August 1992), Greenfields (Greenfields Melbourne, 16 September 1992), PD&F (telephone interview, 21 October 1992), and CSIRO D and CSIRO C (CSIRO Geelong, 18 September 1992).

*The CSIRO group* also displayed clear signs of uncertainty about what they were and were not in a position to do. For example they lamented their failure to challenge PD&F about the way that company had handled the SIROSCOUR project. As CSIRO B said,

I wish we had had the foresight to really get into them and say to [PD&F] "Don't do this [that is, try to 'reinvent the wheel'], because you are jeopardising our technology." I wish we had done that ... [interview, CSIRO Geelong, 13 August 1992].

The interface's *overall* confusion and uncertainty on where the power lay and how it could best be exercised was perhaps best captured by CSIRO C and CSIRO A. The former, for instance, described the

acrimony between PD&F and CSIRO, with Greenfields sitting in the middle saying "Someone must be to blame and we're suffering. We've got the experts on one hand and their licensees on the other. Something must be done, and must be done quickly" [interview with CSIRO C, CSIRO Geelong, 18 September 1992].

These uncertain power sources and relationships in SIROSCOUR contrast

starkly with the situation in *DUNLENA*. Notwithstanding debate at certain times about various *manifestations* of power in *DUNLENA*, no-one was ever in doubt about where the various sources of power lay, and what provided that power. Both parties, after the prolonged settling-in period, generally accepted the power balance, which was remarkably even (see the description of *DUNLENA* in Volume 2).

All the participants recognised that the CSIRO group's high-quality synthetic chemistry skills and their unusual ability to synthesise potentially valuable compounds, together with their unique (as far as Du Pont were concerned) perspectives, provided that group with considerable power (interview with SIROTECH, SIROTECH Melbourne, 16 September 1992).

Similarly, everyone knew Du Pont's power derived from their expertise in testing and commercially developing agricultural chemicals, and the position this placed them in to say "yea" or "nay" to those providing the compounds they review (such as the CSIRO group). In short, Du Pont controlled the means through which the CSIRO group could generate worthwhile income from their intellectual property as well as that group's non-financial rewards (observed by a number of interviewees, but most clearly by CSIRO E [interview, CSIRO Clayton, 17 September 1992]).

Indeed the basis of the one significant inter-party conflict in *DUNLENA* (see box in section A of the preceding chapter) was not *uncertainty* about exercise of power, but rather the CSIRO group's *certainty* (unfounded, as it turned out) that Du Pont would exercise its power in a definite, predictable way, to steal CSIRO's intellectual property.

It is clear from the data, then, that SIROSCOUR and DUNLENA were widely separated in terms of definition of their power sources and the parties' acceptance of the associated power relationships. Comparing and contrasting power-related behaviour in DUNLENA and SIROSCOUR as interfaces near the extremes of this continuum, should illuminate the influence of power processes on the effectiveness of the interfaces in the case studies, without the need to resort to data on the I<sup>2</sup> and MMP interfaces' somewhat more equivocal power relationships. The analyses in this chapter therefore are limited to power-related behaviour in *DUNLENA and SIROSCOUR*.

## B. STRATEGIC USE OF POWER TO PRE-EMPTIVE ENDS

The first theoretical perspective on power articulated in chapter 2 came from the reasoning of Blau. Blau argues the importance of the exercise of power through each party improving its strategic position vis-a-vis the other party, with the aim of preventing that other party from exercising *its* power. It was predicted that this means of exercising power in the case studies will clarify the power sources, encourage acceptance of the interface's power relationships, and ultimately increase interface effectiveness. Since DUNLENA was a 'well defined power source' interface and SIROSCOUR a 'poorly defined power source' interface, it was predicted that Blau's means of exercising power would be more evident, and would have more influence on interface effectiveness, in DUNLENA than in SIROSCOUR.

### 1. The DUNLENA Interface

The strategic exercise of power to pre-emptive ends which was widespread in this case study, was most prominent in Du Pont C's 'fatherly oversight' role which is a focus for the description of DUNLENA in

Volume 2, and which contributed greatly to increasing interface effectiveness. Any analysis of Du Pont C's role would have to describe it as pre-emptive. Du Pont C's pursuit of this role is examined, and its positive influence on interface openness, cohesiveness and focus demonstrated, in a number of the analyses: notably in the following chapter's analysis of construction of the interface's cultural system.

Other significant illustrations of strategic application of power in a pre-emptive way centred on

- \* Du Pont's offer to the CSIRO group of access to the company's agricultural chemicals database, its 'computational chemistry' service and its marketing knowledge. This helped Du Pont pre-empt a strengthening of CSIRO's resolve not to provide full compound structural details (interview with CSIRO B, CSIRO Clayton, 17 September 1992; corroborated by others).
- \* The CSIRO Division's decision to eliminate Du Pont from consideration when the partner was originally being selected. This forced Du Pont to 'come back' at them: perhaps as a result becoming more compliant (interview with CSIRO A, University of Melbourne, 16 September 1992; confirmed by the Division's original *summary of responses to advertisement*).
- \* CSIRO's insistence on Australia having 51% ownership of the venture. This counteracted the power balance that otherwise would arguably have been in favour of Du Pont (interview with CSIRO A, University of Melbourne, 16 September 1992).

- \* Du Pont's insistence that the commitment to manufacture in Australia be relatively loose. This anticipated and negated what could be a stronger CSIRO negotiating position when one or more compounds are actually close to commercial manufacture (discussed by a number of interviewees, including CSIRO A, University of Melbourne, 16 September 1992; and Du Pont A, Du Pont North Sydney, 21 August 1992).

There is substantial evidence that the strategic uses of power to preemptive ends in DUNLENA had a fundamental influence on the way both the CSIRO group and Du Pont approached their involvement in the venture, and on DUNLENA's effectiveness.

The influence of Du Pont's more or less spontaneous offers to CSIRO of access to their agricultural chemicals database, their 'computational chemistry' service and their marketing knowledge, for instance, was attested to by a number of interviewees. Du Pont B suggested that these offers together amounted to one of the most valuable binding influences on DUNLENA. He described spontaneous sharing of information as "a major step [Du Pont] would think of taking only in a situation of extreme trust, where [they] have a strong wish to impress [their] partner" (interview, Du Pont North Sydney, 21 August 1992). CSIRO B confirmed this:

We get [spontaneous advice from Du Pont's testing people and patenting people] all the time. ... They don't force us to take it; they're only suggestions. ... This openness was important in making the arrangement work [interview, CSIRO Clayton, 17 September 1992].

However the ultimate evidence that exercise of this form of power influenced interface effectiveness comes with the observation that the

interface probably would never have come into existence, or would not have endured for any more than a short period, without actions taken to this end. If Du Pont had not accepted 51% Australian ownership, for example, there would have been either no DUNLENA or a very unstable and ephemeral DUNLENA.

Table 4 predicted that hierarchists (like both the DUNLENA parties) would avail themselves of opportunities to exercise any power they have in this strategic, pre-emptive fashion. So cultural theory would suggest that the participants' culturally-acquired values, norms, attitudes and preferences could well have acted to strengthen or reinforce this dimension of social behaviour.

'Looking sideways' also helps further understand the importance of DUNLENA's power relationships. Table 6 identified two characteristics as being likely to encourage this mode of exercising power: the arrangement being highly articulated, planned, focused and visionary; and a long-term arrangement. Table 7 shows that DUNLENA possessed both these arrangement characteristics in abundance.

The arrangement's *high degree of articulation, planning, focus and vision* enabled Du Pont management readily to identify and address potentially conflicting in-house Du Pont research. The positive effect on interface cohesiveness and openness of steps to this end is demonstrated in other analyses: notably in the preceding chapter's analyses of conflict, and in the following chapter's analyses of construction of the interface's cultural system.

Another manifestation of articulation, planning and focus of DUNLENA -

documentation and promulgation of the compound-testing procedures to be used - also had a clear positive effect on the interface's cohesiveness and flexibility. CSIRO E emphasised (interview, CSIRO Clayton, 17 September 1992) how important this was for demonstrating to his group that Du Pont's expectations of them were acceptable, and thereby for engendering the group's whole-hearted commitment to DUNLENA. This in turn is repeatedly shown to have been one of the main influences on interface cohesiveness and flexibility: see, for instance, the several analyses of the CSIRO group's ways of viewing its relationship with Du Pont, in chapter 6.

DUNLENA's articulation and vision were also reflected in the sheer scale and ambition of the venture proposed to Du Pont by CSIRO: as embodied (for example) in the CSIRO Institute Director's decision that DUNLENA should encompass *all* the Division's agricultural chemical work, and not just its insecticide work. CSIRO C pointed out (interview, CSIRO Clayton, 17 September 1992) how this had increased interface focus and cohesiveness through convincing Du Pont just how serious CSIRO were about the venture. Du Pont A agreed (interview, Du Pont North Sydney, 21 August 1992) that this had had a major effect on the interface's cohesiveness: and indeed on the interface being established in the first place. Du Pont B believes that without the vision and support "of all levels of CSIRO's management, the venture may not have come through the difficult first year or so" [interview, Du Pont North Sydney, 21 August 1992].

The second characteristic of the DUNLENA arrangement expected to increase interface effectiveness was its *long-term basis*. There seems little doubt that the fact that DUNLENA was always intended to be a

long-term arrangement had a positive effect on interface cohesiveness and focus (and probably on openness and flexibility as well). Arguably there were two key ingredients in DUNLENA's success: the CSIRO group's (eventual) commitment to central elements of Du Pont's business system, and Du Pont's adaptations to their business procedures to cope with DUNLENA's needs. It is hard to see either of these ingredients materialising without such a generous timeframe; commitment to such major changes in thinking and management innovations could be justified only for a large-scale, long-term venture.

SIROTECH pointed to another positive influence of DUNLENA's long-term basis on interface effectiveness. The cohesion evident in successful operation of DUNLENA, said SIROTECH (interview, SIROTECH Melbourne, 16 September 1992), had led CSIRO and Du Pont to enter into a second, broader strategic alliance to tailor polymers for special applications. Creation of this second venture had in turn fed back to increase the feeling of supragroup cohesiveness in DUNLENA. Such a spin-off venture could have been established only after demonstration of DUNLENA's efficacy over a long period.

But surely the ultimate sign of the importance of DUNLENA's long-term basis is again the fact that without commitments for several years, DUNLENA would never even have come into being in the first place.

A number of interviewees noted the necessity for work of this type to be mapped out years ahead; Du Pont B explained (interview, Du Pont North Sydney, 21 August 1992) how development of a single new agricultural chemical to the marketing stage typically takes eight to ten years. Du Pont A pointed out how important it had been for interface



cohesiveness, for both parties to be patient. "If you've one [party] that's looking for a short-term result and one looking for long, it won't work" (interview, Du Pont North Sydney, 21 August 1992). CSIRO A reinforced the importance of long-term investment by pointing to Du Pont's view at the outset that it was essential for CSIRO to have someone (himself) available and motivated to oversee the project "to see it through for 20 or 25 years" (interview, University of Melbourne, 16 September 1992).

## 2. The SIROSCOUR Interface

The use of power in this case study was very different. SIROSCOUR was by no means devoid of 'muscle-flexing' by the participants; indeed it probably contained more marked power plays than DUNLENA. But this seemed mostly to be the tactical, pragmatic exercise of power to cope with conflicts after they were well advanced. Comprehensive review of the data on SIROSCOUR revealed very few instances of what might have been strategic use of power to pre-emptive ends.

Furthermore, instances that *were* located seemed to be ill-advised. For example, the CSIRO Division had a substantial strategic power when it was selecting its licensee: the very allocation of a licence actually creates a new line of potentially lucrative business for the company selected. Certainly the Division attempted to exercise this power strategically: by selecting a company it felt it would be able to control and motivate. But that company's potential for linking its skills into this new (to them) area of engineering was not confirmed. As a result, the exercise of this power was far from positive for the interface's openness, flexibility, cohesiveness or focus: interviews with CSIRO A (CSIRO Geelong, 13 August 1992) and Greenfields (Green-

fields Melbourne, 16 September 1992).

There is evidence that exercise of power in some clearcut way may have made SIROSCOUR a more effective interface. A number of interviewees pointed out how badly a strategy for the venture's development was needed, and at least some of the interviewees seemed to feel that it would not have mattered greatly had this come about through one party taking the lead by exercising power at the expense of other parties. This view is evident in comments about SIROSCOUR's directionless progress, which have previously been quoted a number of times as a detrimental influence on interface effectiveness.

As CSIRO C described it (and the same plea for one of the parties to do something definite can be seen in the interview comments of PD&F and Greenfields), PD&F and CSIRO were bickering while Greenfields were

sitting in the middle saying "someone must be to blame, and we're suffering. We've got the experts on the one hand and their licensee on the other. Something must be done, and must be done quickly" [interview with CSIRO C, CSIRO Geelong, 18 September 1992].

The few, generally unsuccessful, instances of the strategic exercise of power to pre-emptive ends identified in SIROSCOUR mainly hinged on actions of *the CSIRO group*: a hierarchist group. PD&F and Greenfields (both from individualist environments) showed little inclination to exercise the (sometimes not inconsiderable) power they had, in a strategic, pre-emptive way. Retrospective suggestions at the time of the interviews that clearer power relationships, and greater use of those relationships, would have improved the interface in various ways, also came far more often, and far more clearly, from the CSIRO people than from the company people.

These outlooks and behaviours are completely consistent with predictions from cultural theory (Table 4).

SIROSCOUR's arrangement characteristics point to another influence that probably encouraged or reinforced exercise of this form of power. It will be recalled that two characteristics had been identified as being likely to encourage the exercise of power in the mode described by Blau: the arrangement being highly articulated, planned, focused and visionary; and long-term. Table 7 shows that the SIROSCOUR arrangement generally lacked both these characteristics.

There is evidence that SIROSCOUR would have been more effective had the arrangement been more *defined, planned, focused and visionary*. For instance, there are clear signs that under these circumstances at least some of the following strongly detrimental influences on interface flexibility, cohesiveness and focus could have been avoided:

- \* Confusion about PD&F's task. It would have been most unlikely, for example, that PD&F would have believed that "they might be able to shut the technology up if they let nobody else in" (interview with CSIRO C, CSIRO Geelong, 18 September 1992), through making sure that every component was 'theirs' by virtue of having been designed 'from scratch' for this project.
- \* CSIRO's misleading (dishonest?) claims, like the claim that "SIROSCOUR had been shown to be viable in up to commercial-scale operations at a scouring plant in the Riverina" (telephone interview with PD&F, 21 October 1992).

- \* Confusion about precisely what it was that CSIRO was licensing.
- \* Use of the first SIROSCOUR line for ad hoc trial-and-error processing of various unsuitable types of wool, and the resulting accusations of deception.
- \* Debate about what constitutes a "turnkey plant".

Similarly there is evidence - albeit circumstantial - that the interface's openness, cohesiveness and focus suffered as a result of SIROSCOUR's *timeframe* being only a small fraction of DUNLENA's or MMP's. It seems likely that (say) a three-year timeframe rather than what turned out to be only an 18-month timeframe could have permitted, and perhaps even encouraged, PD&F to avoid what CSIRO B identified as a main disruptive force in SIROSCOUR:

One of the first rules of putting in innovation is that you do as few new things as possible in the first instance; you establish yourself in one area, *then* you start the next, then the next ... You don't try to get into all areas in one hit [interview, CSIRO Geelong, 13 August 1992].

Likewise, it seems likely that Greenfields (with their unfamiliarity with wool-processing) would have been more relaxed had the arrangement entailed CSIRO 'overseeing' development of their plant and processes for a longer period than 18 months. Again, this could be expected indirectly to have improved interface cohesiveness, openness and flexibility, through strengthening CSIRO-Greenfields trust and respect.

It is also possible that a longer timeframe would have reduced disruption from the urgent unilateral ad hoc modification of various parameters of the SIROSCOUR process by one party or another (mentioned

earlier in this analysis). This is identified at a number of points - notably in the analyses of conflict in chapter 8, and acculturation in chapter 10 - as a significant source of disruption to the interface.

### **3. Conclusions**

Like many of the preceding analyses, this analysis contributed notably to answering the study's research questions, and to illuminating the social effectiveness and endurance of commercialisation interfaces.

There was clear evidence that both parties' strategic use of power to pre-emptive ends in DUNLENA aided development of interface effectiveness, and that the relative absence of this mode of exercising power from SIROSCOUR retarded development of interface effectiveness.

The analysis suggests that behaviour associated with the strategic use of power to pre-emptive ends influenced the social dynamics of the interfaces in the case studies mainly through affecting the way each party approached its involvement in the interface (rather than through affecting the way the interface itself, as a small group, set about its tasks).

At the same time, the analysis also identified a substantial encouragement or reinforcement effect coming from the interfaces' cultural and structural contexts. Much of this dimension's influence on interface effectiveness seems to have come from the way behaviour embodying this form of exercising power is affected by the values, norms, attitudes and preferences brought into the interface by the participants, and by implications of the characteristics of the underlying formal administrative commercialisation arrangement.

### C. COPING WITH UNCERTAINTY IN CRITICAL ORGANISATIONAL AREAS

Behaviour associated with coping with uncertainty in critical organisational areas gained its influence on interface effectiveness through channels notably different from the channels identified for the behaviour articulated by Blau.

Chapter 2 described Pfeffer and Salancik's reasoning on intraorganisational power. Pfeffer and Salancik argue the importance of the exercise of power in situations of the broad type being discussed here, through parties demonstrating their success in coping with uncertainties in areas that are most critical to an organisation's (in this case the interface's) well-being. It was predicted that this means of exercising power in the case studies will clarify the power sources, encourage acceptance of the interface's power relationships, and ultimately increase interface effectiveness. Since DUNLENA was a 'well defined power source' interface and SIROSCOUR a 'poorly defined power source' interface, Pfeffer and Salancik's means of exercising power was expected to have been more evident, and to have had more influence on interface effectiveness, in DUNLENA than in SIROSCOUR.

With this dimension of social behaviour, it is not possible to gain additional perspectives through 'looking sideways' from the interfaces towards implications of the characteristics of the underlying formal commercialisation arrangements; Table 6 does not identify any arrangement characteristics as being likely to encourage or reinforce this behaviour. To suggest that presence or absence of particular arrangement characteristics will strengthen the participants' ease or unease in situations of high uncertainty would seem to be stretching the predictive power of these characteristics just too far.

## 1. The DUNLENA Interface

The areas of activity most critical to DUNLENA's well-being are the regular, systematic synthesis of compounds with some prospect of commercial viability, and the systematic, comprehensive testing of those compounds. Both areas of activity are uncertain by their very nature; research is necessarily most uncertain, while the testing process is all about seeking out the one compound in 25 000 that will 'come good': surely the ultimate embodiment of uncertainty!

Both the DUNLENA parties coped especially well with the respective uncertainties with which they were faced. On the one hand, the CSIRO group continued to be productive in its esoteric area of research, to the satisfaction of Du Pont. On the other, Du Pont time after time performed their sequence of tests, apparently with almost unqualified confidence from the CSIRO people. This balance in the parties' coping with uncertainties is consistent with the even balance of power in the interface, evident in the description of DUNLENA in Volume 2.

Circumstantial evidence suggests that, even though the data do not point to one party handling uncertainty in important areas better than the other, the interface's overall success in coping with uncertainty probably ultimately positively influenced interface effectiveness.

This conclusion follows from the inherent uncertainty associated with most of the important facets of interaction in DUNLENA (described above), and DUNLENA's high effectiveness according to all the measures being used here (at least after the first 18 months to two years of its lifetime). It is almost inevitable in these circumstances that most participants would have demonstrated the capacity to cope with

uncertainty, that many of these uncertainties would have focused on key areas of activity in the interface, and that much of the behaviour concerned would have positively influenced interface effectiveness.

In Pfeffer and Salancik's terms, then, both parties' successful coping with uncertainty clarified and reinforced the even balance of power. Inevitably at the same time this would have encouraged acceptance of that power balance, and would have directly conditioned the participants' approaches to their ongoing involvement in the venture. The even balance of power has been shown in a number of analyses (notably those in chapter 7) and in the description of DUNLENA in Volume 2 to have been closely associated with many dimensions of social behaviour that had a positive effect on this interface's effectiveness.

Table 4 shows that cultural theory predicts hierarchists (like both DUNLENA parties) to be ill-at-ease in situations of high uncertainty. Yet, as noted above, both groups coped especially well with such situations. So it seems that uncertainties were handled successfully despite culturally-acquired behavioural preferences and predispositions.

## 2. The SIROSCOUR Interface

The one critical broad area of activity in the SIROSCOUR case study is clear: the assortment of tasks going to make up development and commissioning of the first SIROSCOUR scouring line. Sources of uncertainty are also clear; the engineering development task and the commissioning task are both by their very nature uncertain.

But, whereas both the DUNLENA parties coped particularly well with the uncertainties, in SIROSCOUR none of the three parties seemed to cope



very well. One party - PD&F - by any relevant measure coped especially poorly. After all, PD&F (which was only quite a small company) lost a million dollars on the job and nearly went broke as a result, and the project was stalemated for many months, and was eventually finished off by others.

According to Pfeffer and Salancik, this would suggest that it will be difficult to discern strong power sources in SIROSCOUR, and that whatever power PD&F possessed will have been undermined, and will have been seen by the participants to have been undermined, as PD&F progressively demonstrated an inability to cope with uncertainty. These suggestions are confirmed by the data.

The absence of clear power sources was discussed in section A. Evidence of the undermining of PD&F's power base and parties' recognition that this was happening, is readily available. Not the least important signs were the loss of face when PD&F had to advise the consortium to engage a consultant to solve problems they had been unable for months to solve (telephone interview with PD&F, 21 October 1992), and when they had repeatedly to be 'bailed out' by CSIRO (interview with CSIRO D, CSIRO Geelong, 18 September 1992) and by Dysons (interview with Dysons A, CSIRO Geelong, 13 August 1992). Nor do expressions of sympathy from one's partners (which CSIRO C and CSIRO B both reported PD&F had received: interviews, CSIRO Geelong, 18 September 1992) conjure up the impression of a position of great power.

As with DUNLENA, here also there is circumstantial evidence that coping (or in this case failing to cope) with situations of uncertainty influenced interface effectiveness: in this case detrimentally. This

evidence comes from the fact that every one of the conflicts in SIROSCOUR (see box in section A of the preceding chapter), which were shown in chapter 8 to have been so destructive to the interface, hinged on poor coping with situations of high organisational uncertainty - especially by PD&F - and the attitudes and behaviour this encouraged on the part of the other parties.

Cultural theory does not help in understanding the influence on SIROSCOUR's effectiveness of this dimension of social behaviour. Table 4 predicted that individualists (like PD&F) would thrive in the sorts of situations of uncertainty encountered in SIROSCOUR, yet PD&F failed dismally to come to grips with SIROSCOUR's demands. Clearly, SIROSCOUR's problems posed (partly) by uncertainty became insurmountable in spite of this key participant's social space-generated preferences and orientations.

### 3. Conclusions

As with the preceding analysis, this analysis's contributions to answering the research questions and to illuminating the social effectiveness of commercialisation interfaces, were substantial.

On the basis of circumstantial evidence from DUNLENA and SIROSCOUR, success or lack of success in coping with uncertainty was shown to have had a significant influence (positive and negative respectively) on the attainment and clarification of power, and ultimately on interface effectiveness.

The analysis showed that this behaviour, like behaviour bearing on the strategic exercise of power to pre-emptive ends (preceding section),

influenced the social dynamics of the interface mainly through affecting the way each party approached its involvement in the interface.

But in another respect behaviour aimed at coping with uncertainty influenced the social dynamics of the interface in quite a different way from the source of influence identified in the preceding section. Here, there was no benefit of encouragement or reinforcement from the interfaces' cultural contexts (the interfaces' structural contexts could not be investigated). So this behaviour's influence on interface effectiveness seems necessarily to have originated in social characteristics and processes that had developed in the interface itself.

#### D. USE OF META-POWER/RELATIONAL CONTROL

The third and final theoretical perspective on power articulated in chapter 2 came from Baumgartner, Buckley, Burns and Schuster's twin concepts of meta-power and relational control, which were expected to be especially important in the exercise of power in the type of situation being discussed here. It was predicted that exercising power in the case studies through meta-power/relational control would clarify the power sources, encourage acceptance of the interface's power relationships, and ultimately increase interface effectiveness. Since DUNLENA was a 'well defined power source' interface and SIROSCOUR a 'poorly defined power source' interface, the exercise of meta-power/relational control was expected to have been more evident, and to have had more influence on interface effectiveness, in DUNLENA than in SIROSCOUR.

Cultural theory cannot profitably be applied to investigate the effect of participants' positions in social space on their attitudes towards

exercising, or seeking to exercise, meta-power, because cultural theory's predictions do not effectively distinguish among the social space segments. Both hierarchists and individualists (for instance) can be expected to be willing if not keen to avail themselves of opportunities to exercise meta-power: albeit for very different reasons. Hierarchists will seek to structure the very basis of a social relationship because they can thereby get into a stronger position to ensure the orderliness, the role-complementarity, the 'safety-first' approach and the high degree of planning and assessment on which they place such a high value. Individualists will seek to exercise relational control to what is in many ways the very opposite end: to attain a position where they can instil the reactive, risky, 'free-wheeling' approach *they* so highly value.

So here also (as with some earlier analyses), the return from applying cultural theory would be too low to warrant cultural theory's inclusion in the analysis.

#### 1. The DUNLENA Interface

This interface provides outstanding illustrations of the use of meta-power through relational control.

The compound-testing procedure was a central activity in the venture. Inevitably Du Pont played the more prominent part in putting into place the venture's compound-testing system; in fact, Du Pont used their own existing compound-testing system for this purpose (see the description of DUNLENA in Volume 2). Thus it was Du Pont who developed the social/management structure for handling compounds and for feeding back to CSIRO the results of testing (and ultimately for rewarding the

CSIRO people). Clearly this amounted to Du Pont shaping "social relationships and social structures through the manipulation of the components of the interaction system" (Baumgartner et al, 1976, p.224), and "alter[ing] the 'type of game' the actors play" (p.225).

There is little evidence that *the CSIRO group* exercised meta-power/relational control to any substantial extent. Certainly their control of the synthesis of compounds gave them a significant potential for structuring social relationships. But this potential was not realised: except possibly in a limited way during the initial 18 months or so.

Even during that initial period, however, the CSIRO group's attempts to exercise meta-power were somewhat desultory and strategically lacking; for example, their attempts to 'flex their muscles' were very negative, centring quite simply on *refusing* to provide compound structural details, rather than (for instance) providing those details *in exchange for something*. After this initial period, both parties were content to regard CSIRO's output as nothing more than a routine, well-defined and essentially non-negotiable input to Du Pont's testing process. This attitude had the result of strengthening *Du Pont's* position to exercise meta-power.

However there is little evidence that Du Pont's exercise of meta-power had a positive influence on interface effectiveness. The signs are clear: Had meta-power been central to the development of interface cohesiveness and openness, one would expect many specific signs that the CSIRO group, from the beginning, enthusiastically accepted Du Pont's role in the interface and ways of doing things. After all, Du Pont's exercise of meta-power had started very early in the interface's life-

time, when the system for assessing CSIRO's compounds had first been put into place.

But far from enthusiastically, or even willingly, accepting Du Pont's role from the outset, the CSIRO group stoutly resisted some manifestations of Du Pont's meta-power/relational control. Indeed, CSIRO's reaction to Du Pont's exercise of this form of power was at the heart of the only serious conflict in the DUNLENA interface: a conflict that for a time had seriously threatened the interface's continuing being (see the analyses of conflict DUNLENA B in chapter 8).

So while Du Pont's exercise of meta-power/relational control was important in clarifying the interface's power sources, there is a case for arguing that this form of power was, if anything, *detrimental* to interface cohesiveness, openness and focus during the first two years of the interface's lifetime. And this was the period when meta-power/relational control could be expected to be most conducive to development of interface effectiveness.

Table 6 identified one arrangement characteristic as being likely to encourage or reinforce participants' inclination to exercise power in the fashion being discussed here: the arrangement having come into being mainly through unilateral action and enthusiasm from one party. Table 7 shows that DUNLENA did not possess this characteristic; DUNLENA had been developed through collaboration between the partners, with enthusiasm from both parties.

Furthermore there is reasonably strong circumstantial evidence that DUNLENA's possession of this characteristic that is the obverse of the

characteristic predicted to encourage or reinforce the dimension of behaviour being examined here, may well have been significant in strengthening interface cohesiveness and focus. This evidence comes from Du Pont's early acceptance of CSIRO's demand for manufacture in Australia of any compounds taken to the manufacturing stage. It was noted in section A of chapter 7 how soon Du Pont had come to share with CSIRO this goal for the venture; it was described there how CSIRO actually attributed the interface's cohesiveness and effectiveness to Du Pont's identification with CSIRO's goals for the venture *even before the arrangement came into being*.

It would seem most unlikely that this degree of mutual understanding could be present at that early stage unless there was a clear commitment by both parties to develop the arrangement from the outset in a genuinely collaborative fashion. The positive impact of this mutual understanding on interface openness and cohesiveness is demonstrated in section A of chapter 7 (as well as in other analyses).

So although Du Pont clearly exercised meta-power, perhaps the genuinely collaborative basis on which DUNLENA was developed militated against this having the predicted positive influence on interface effectiveness.

If this were the case, it would present quite a paradox. DUNLENA's establishment through collaboration between the partners, with an even balance of enthusiasm, seems to have had a *positive* influence on the interface's effectiveness, whereas the suggestion here is that this same arrangement characteristic could have acted *to mitigate* the influence of behaviour expected to have a positive influence on inter-

face effectiveness.

## 2. The SIROSCOUR Interface

As would be expected for an arrangement whose power bases are so unclear, there was no evidence of exercise of meta-power/relational control in SIROSCOUR. Certainly the CSIRO Division, which initially had held all the strings, was in a position to attempt to exercise meta-power. But the potential for the Division to systematically build the very social processes of the interface was never realised: possibly because of their inadequate knowledge of engineering development and chemical engineering, and the status imbalance between the CSIRO and company representatives in the arrangement (see the analysis in section C of chapter 7).

There is strong evidence that all three parties would have welcomed CSIRO's exercise of any form of power to guide development of the arrangement's operations and interactions: including meta-power/relational control. That evidence was discussed substantively in both the analysis of the parties' reluctance to abandon their old ways, in section D of chapter 6, and the analysis of the strategic exercise of power to pre-emptive ends, in section B of the present chapter.

Important signs from those analyses that stronger exercise of power by CSIRO would have been welcomed by everyone, and would very likely have contributed positively to interface openness, cohesiveness and focus (at least), include laments by

- \* CSIRO, that they had not taken opportunities to 'straighten out' the other parties (notably PD&F) when they had opportunities



(and the power) to do so. As CSIRO B said, "I wish we had had the foresight to really get into them and say to [PD&F] 'Don't do this, because you are jeopardising our technology.' [That is, don't try to 'reinvent the wheel' in-house.] I wish we had done that" (interview, CSIRO Geelong, 13 August 1992).

- \* *PD&F*, that they had not been told in stronger terms by CSIRO to abandon their notion of building all components, including the ancillary ones that could have been obtained 'off-the-shelf' (telephone interview with PD&F, 21 October 1992).
- \* *Greenfields*, on the same subject. As Greenfields said, CSIRO should have said to PD&F, "You're stupid; doing it this way" (interview, Greenfields Melbourne, 16 September 1992).

Implications of the characteristics of the underlying commercialisation arrangement do not seem to have played a part in discouraging the CSIRO group from exercising the meta-power they potentially had. Table 7 shows that the SIROSCOUR arrangement possessed the one characteristic identified as being likely to *encourage* parties to seek out and exercise meta-power and relational control. So the relative absence of meta-power/relational control from SIROSCOUR came about *despite* the implications of this one relevant characteristic of the underlying commercialisation arrangement.

### 3. Conclusions

Baumgartner, Buckley, Burns and Schuster's twin concepts of meta-power and relational control were evident in the one interface whose power sources were clear and readily accepted by the parties (DUNLENA),

while there was no sign of these processes in the one interface whose power bases were obscure and debated by the parties (SIROSCOUR). Only in the latter case, though, was the dimension "[absence of] exercise of meta-power/relational control" shown to be related, as predicted, to interface effectiveness. In DUNLENA, the exercise of meta-power seemed for a period (contrary to predictions from the theory) to have a distinctly *negative* influence on interface effectiveness.

So meta-power/relational control do not help understand contributors to interface effectiveness. And neither the interfaces' cultural contexts nor their structural contexts could help with understanding why meta-power/relational control did not have their predicted influence on interface effectiveness.

#### E. CONCLUSIONS FROM ANALYSES IN THIS CHAPTER

These analyses examined the influence on interface effectiveness of the three dimensions of social behaviour constituting the fourth element of the analytical framework (Table 10). These relate to how power bases and power relationships affect interface dynamics.

Two of the dimensions - the strategic use of power to pre-emptive ends, and coping successfully with uncertainty in critical organisational areas - were shown to have influenced interface effectiveness. The other power-based dimension - exercise of meta-power/relational control - did *not* influence interface effectiveness.

Both the influential dimensions were shown to have impacted on the social dynamics of the interface through affecting the way each party and its representatives approached involvement in the interface

(rather than through directly affecting the way the interface itself, as a small group, set about its tasks). Because these dimensions impacted on interface effectiveness through affecting these individuals' actions and attitudes, they can be described as having had *an individual mode of influence* on interface effectiveness.

These conclusions help further with answering *the first and the second of the research questions*. Two of these power-based dimensions of social behaviour assist in understanding the genesis, growth and persistence of the social structure of laboratory-company commercialisation interaction, and contribute directly to interface effectiveness.

It would seem important for these dimensions of social behaviour to contribute to approaches that might be developed for analysing and articulating interface effectiveness (like the model to be constructed through this study). It would seem to be equally important for those responsible for establishing, developing and operating interfaces, and those participating in interfaces, to give adequate attention to identifying, articulating and capitalising on power relationships between the parties.

These conclusions provide another part of the answer to *the final research question*, which will be returned to below.

As with the analysis of conflict, sometimes it did not prove possible to investigate any encouragement or reinforcement effect coming from the interfaces' cultural or structural contexts. Where this *was* possible, mostly a weak effect or no effect at all was discerned.

Perhaps this should not be surprising, because many of the power relationships examined had unfolded in situations of at least reasonably high conflict. A conclusion from the preceding chapter bears repeating here: Perhaps when it comes to interaction in a climate of conflict, the participants' culturally-acquired values, norms, attitudes and preferences, and implications of the characteristics of the underlying formal commercialisation arrangement, go by the board.

The one power-based dimension of behaviour found to have been markedly encouraged or reinforced by both the participants' culturally-acquired values, norms, attitudes and preferences, and implications of the characteristics of the underlying formal commercialisation arrangements, was the strategic exercise of power to pre-emptive ends. Again perhaps this should not be surprising. Almost by definition, this behaviour can perhaps be drawn out from under the umbrella of high conflict, described in the preceding paragraph. Unlike the other modes of exercising power, the strategic exercise of power to pre-emptive ends will often be taking place before conflict has had much chance to develop. (After all, the whole point of this mode of exercising power is to predict and pre-empt counter points of view and counter-actions.) Perhaps therefore the 'war footing' engendered by states of high conflict does not apply to this behaviour.

So this chapter's analysis contributes to answering *the third and the fourth of the study's research questions* in much the same way as the analyses in the preceding chapter did: Most of these power-based dimensions of social behaviour were not influenced by the values, norms, attitudes and preferences brought into the interface by the participants, or implications of the characteristics of the underlying formal

commercialisation arrangement, and are therefore *context-independent*. However the marked encouragement/reinforcement coming from the interfaces' cultural and structural contexts for one particular dimension - the strategic exercise of power to pre-emptive ends - stamps this dimension as *context-dependent*.

The analyses in this chapter together have taken a further important step towards answering *the study's final research question*:

While the model to be constructed through the study should reflect the importance, for understanding, analysing, articulating and managing contributors to interface effectiveness, of the two influential dimensions of social behaviour per se, it must also emphasise two other findings bearing centrally on the social structuring of the commercialisation interface. One is the finding that both these power-based dimensions of behaviour influenced the social dynamics of the interface through affecting the way each party approached its involvement in the interface. The other is the finding that the influence on interface effectiveness of one of these dimensions depends on a high degree of interplay with interfaces' cultural and structural contexts, while the influence of the other dimension does not seem to be related to those contexts of interfaces.

## **CHAPTER 10**

### **ANALYSIS:**

**INFLUENCE OF DEVELOPMENT OF  
THE INTERFACE'S CULTURAL SYSTEM**

## CHAPTER 10

### ANALYSIS:

#### INFLUENCE OF DEVELOPMENT OF THE INTERFACE'S CULTURAL SYSTEM

This chapter follows the broad approach of the preceding chapters, to examine the influence on interface effectiveness of the final element of the analytical framework constituting Table 10. The dimensions of social behaviour making up this part of the framework are to do with development of the commercialisation interface's cultural system. A cultural system that facilitates each participant's interpretation of interface events and processes is expected to make a major contribution to interface openness, flexibility, cohesiveness and focus. The basic questions are whether behaviour bearing directly on the following culture-construction processes is important for establishing and maintaining an effective commercialisation interface, and what makes that behaviour important:

- \* The basis on which each party's values, norms, attitudes and preferences are incorporated into the interface.
- \* Opportunities the participants have for maintaining links with their 'old' culture.
- \* Whether (and how) the parties and their representatives prepare for, and consolidate, cultural change.
- \* The participants' willingness or keenness to think and act in the 'public' domain constituted by the interface.

- \* How the participants use symbolic representations of significant interface events and processes.

**A. BASIS OF INCORPORATION OF PARTIES' VALUES, NORMS, ATTITUDES AND PREFERENCES INTO THE INTERFACE**

Chapter 3 articulated Smith's reasoning on the basis on which individuals and groups and their values, priorities and preferences are incorporated into pluralistic societies, and the effects the form of pluralism can have on the cohesion and effectiveness of the society. It was argued that Smith's reasoning can usefully be applied to improve our understanding of how the incorporation of people and groups and their values and priorities into a unit (like a commercialisation interface) *within* a society (like the 'society' of the world of technology-based industry-development) influences the social effectiveness of that unit.

The interfaces in the case studies represent at least two of Smith's modes of incorporation. DUNLENA and - to a large extent - MMP are based on *cultural pluralism*; both/all parties have both full 'citizenship' rights and full 'political' rights (as these concepts have been translated to commercialisation interfaces: see chapter 3). SIROSCOUR and I<sup>2</sup>, on the other hand, were at least *socially pluralistic* ventures; while both/all parties were perhaps recognised in many ways as full and 'genuine' interface participants, one of the parties (or two of them in the case of SIROSCOUR) was severely restricted in practical terms in the channels it could use to further the interface's aims.<sup>1</sup>

Smith's reasoning would have SIROSCOUR and I<sup>2</sup> as less effective interfaces as a result of cleavages attributable to the limited incorporation of some parties' values, priorities and preferences. To Smith,



these interfaces would be "examples of structures that have fostered or created ... divisions where these were formerly absent" (Smith, 1986, p.198). DUNLENA and MMP would be more effective supragroups because of their relatively egalitarian constitutional basis.

#### 1. Interfaces Based on Social/Structural Pluralism: SIROSCOUR and I<sup>2</sup>

In *SIROSCOUR*, the 'limited role' partners - PD&F and Greenfields - were most dissatisfied with their limited 'political' role. This prevented them from playing much part in determining the overall direction of the venture or the way the interface would tackle key tasks.

*PD&F's* motivation suffered, for example, from their inability to bring engineering-development perspectives to play a significant part in driving the venture. Many of *SIROSCOUR's* problems could have been avoided, *PD&F* believes (a view shared by other informants), had they been able to arrange for the practicalities of engineering-development to be taken more seriously. Instead, CSIRO took important decisions in this area, according to *PD&F*, "almost as if they thought this was at a laboratory scale" (telephone interview, 21 October 1996).

The impact of *Greenfields'* responses to restrictions imposed by the basis of incorporation is probably most evident in the somewhat chaotic ad hoc modification of the *SIROSCOUR* process after it had started to operate quite effectively (see the description of *SIROSCOUR* in Volume 2). Under a culturally pluralistic basis of incorporation, a company in *Greenfields'* position would surely have been playing a sufficient part in establishing the venture's driving forces as to avoid being coerced into participating in such questionable practices. As it was, a combination of the interface's unclear power relation-

ships (analysed in the preceding chapter) and uncertainty stemming from Greenfields' peripheral place in developing the venture's strategies and priorities, meant that Greenfields had little alternative but to pursue these ad hoc changes.

The impact of these changes on interface effectiveness has repeatedly been demonstrated in earlier analyses: notably the analyses of conflict in chapter 8 and the analysis of the strategic use of power to pre-emptive ends, in section B of chapter 9.

Indeed the basis of incorporation of the parties' values, priorities and preferences into SIROSCOUR had several detrimental impacts on interface openness, flexibility, cohesiveness and focus.

One of the most severe came from the parties feeling obliged to take on roles that really 'belonged' to others. This role-exchange (encouraged by the arrangement's poor definition) did not take place through the strategic definition and pursuit of category-independent roles discussed in section D of chapter 7, but through force of necessity in desperate times. In a culturally pluralistic 'society', this perceived need to step into others' roles should have been mediated, and perhaps obviated, by the integration of values and perspectives and a collaborative responsibility for leadership. But here role-usurpations (like Greenfields' assumption of some of PD&F's equipment-development and commissioning tasks, and PD&F's decisions regarding the strategy for 'fine-tuning' equipment, which really belonged with Greenfields) were mostly unilateral and spontaneous; they amounted to one party 'muscling in' to another's territory. This led to confusion about the interface's priorities, severe conflict and poor decisions.

These role-usurpations essentially marked the end of the interface as an entity for developing and marketing SIROSCOUR; the problems with the first SIROSCOUR line were eventually solved largely despite the interface, rather than through its efforts.

OPTUS's restricted 'political organisation' role in *the I<sup>2</sup> venture*, also the product of an (at least) socially pluralistic basis of incorporation, also practically limited that interface's activities. OPTUS's limited role was arguably significant, for example, in the interface's decision not to adopt an intense, 'no-expense-spared' development effort. OPTUS would have been more relaxed with such an approach, believing that this would have got the product onto the market in the shortest possible time (interview with OPTUS B, OPTUS Sydney, 6 August 1992).

But in *I<sup>2</sup>*, there were few forceful, destructive attempts to overcome one party's restricted opportunities to participate in setting the interface's course of development. OPTUS seemed not only to be aware from the outset of their restricted 'political organisation' role, but also to be resigned to it (interview with OPTUS A, CSIRO Black Mountain, 20 August 1992; corroborated by others). Undoubtedly this acceptance/resignation was encouraged by OPTUS's, and the community's, growing sensitivity to OPTUS's changing role in the community.

The positive impact on interface effectiveness of acknowledgment of OPTUS's evolving role was discussed at length in the analysis of each party's steps to preserve its partner's valued differences, in section C of chapter 6, and in the analysis of the CSIRO B-OPTUS A relationship, in section C of chapter 7. But even before the extent of OPTUS's

changing national role was all that clear, I<sup>2</sup> did not show the forceful, potentially destructive behaviour associated with the basis of incorporation of the interface, that was so significant in SIROSCOUR.

So the case studies suggest that constitution of an interface on an (at least) socially pluralistic basis need not have a detrimental impact on the interface's social effectiveness. Where (as with I<sup>2</sup>) the limited opportunity for one party to contribute to the interface's fundamental values, norms, attitudes, preferences and ways of doing things is transparent to the parties and readily accepted by them, socially pluralistic interfaces perhaps work better.

It also seems likely, based on the case studies, that serious inter-group friction can be encouraged in a socially pluralistic 'society' by significant role-transgression. Surely few things could be more disruptive to the cohesiveness, focus and openness of an interface than a 'limited role' party attempting to exercise forms of power it is not 'entitled' to wield (see analyses in the preceding chapter), or a 'full' member of the 'society' stepping in to cover for perceived non-performance by a 'limited role' member.

This poses the obvious question of what might encourage acceptance of bases of incorporation that fall short of full cultural pluralism.

One likely contributing factor is the culturally-acquired values, norms, attitudes and preferences participants bring with them into a socially-pluralistically restricted role. Table 4 predicted that fatalists (like the participants in a socially-pluralistically restricted role in I<sup>2</sup>: the OPTUS group) will adapt readily to such a

role, while individualists (like those in such roles in SIROSCOUR: PD&F and Greenfields), on the other hand, should resist such roles. So the observed behaviour associated with a basis of incorporation that is less than full cultural pluralism is completely consistent with predictions from cultural theory.

On the other hand, it seems unlikely that implications of the characteristics of the commercialisation arrangements underpinning the I<sup>2</sup> and SIROSCOUR interfaces encouraged the observed attitudes towards socially-pluralistically restricted roles. Table 6 identified three arrangement characteristics as being likely to encourage the relevant parties to accept socially-pluralistically restricted roles: the venture representing a new line of business for the 'limited role' partner, but an existing line of business for the other party; the arrangement being novel and/or sensitive (at least from the point of view of the party with the socially-pluralistically-restricted role); and the arrangement having come into being through unilateral action and enthusiasm from one party. Table 7 shows that the I<sup>2</sup> arrangement possessed only one of these three characteristics, while the SIROSCOUR arrangement possessed two of them.

The arrangement characteristics therefore might have been expected (if anything) to encourage PD&F and Greenfields to accept a socially-pluralistically restricted role more readily than OPTUS. This was not the case.

Perhaps the apparently stronger influence of the participants' culturally-acquired preferences and orientations should not be surprising. Surely few variables could be expected to be more reliant on precon-

ceived preferences/orientations than acceptance of what many would see as a 'second-best', subsidiary role, permitting only limited inputs into determining the interface's main values and priorities.

## 2. Interfaces Based on Cultural Pluralism: DUNLENA and MMP

There is substantial evidence in the case studies that the relatively egalitarian basis of constitution of these two interfaces provided clear, unambiguous guidance for the interface's operations, and ultimately had a marked positive influence on interface effectiveness (see chapter 7's analyses of, for one or the other of these two interfaces, the development and pursuit of shared over-riding goals, status-balance of representatives, and category-independent roles, and chapter 9's analyses of power relationships).

Table 4 predicted that *hierarchists* would be indifferent about whether or not an interface is constituted on a full culturally pluralistic basis; certainly hierarchists were not expected to be 'hung-up' on ensuring culturally pluralistic incorporation. Yet the one hierarchist party whose role in *DUNLENA* looked at various times like being restricted by an inability to play a full part in setting the project's driving values and priorities - the CSIRO group - showed great concern at this prospect.

They were particularly concerned, for example, about having a limited input to Du Pont's 'champions committee' that would be so important in furthering *DUNLENA* compounds (flagged as a concern by CSIRO B, interview, CSIRO Clayton, 17 September 1992; and SIROTECH, interview, SIROTECH Melbourne, 16 September 1992). And CSIRO E graphically described fears about the group possibly being limited to a passive role in *DUN-*

LENA, as a mere 'mechanism' on the receiving end of Du Pont's reports on compound efficacy (interview, CSIRO Clayton, 17 September 1992).

The one hierarchist party in *MMP* from whom data were gathered directly - MIM - showed themselves to be equally concerned about the prospect of a similarly emasculated role. MIM seemed more concerned about this prospect than any of the other parties to *MMP* (whose positions in social space were expected to make them much more concerned about this: see Table 4). MIM A's concerns on these grounds, in the context of establishing the venture's management philosophies, cultural framework and commercial parameters, have been thoroughly described in other analyses: notably the analysis of goodwill trust, in section E of chapter 6.

So the importance apparently attached by hierarchists in *DUNLENA* and *MMP* to what amounts to a fully culturally pluralistic basis of incorporation runs counter to clear predictions from cultural theory. The characteristics of the underlying formal commercialisation arrangements suggest why participants' culturally-acquired values and preferences may not have had the expected effect.

Table 6 identified three arrangement characteristics as being likely to reinforce parties' preference for culturally pluralistic incorporation: the technology not being very highly developed when the arrangement was entered into; the arrangement having come into being through collaboration between the parties, with enthusiasm from both parties; and power and responsibilities being reasonably well balanced. Table 7 shows both the *DUNLENA* and *MMP* arrangements to be at the extreme in terms of the first two of these characteristics. *DUNLENA*

also conformed with the third characteristic, while MMP showed only a relatively minor power imbalance in favour of CSIRO and QMC. The influence on interface effectiveness of these interfaces' general conformity with these characteristics was documented in several of the analyses in chapters 6 and 7.

It seems likely that the challenges of working closely on all phases of the R&D activity, the close collaboration with the partner when the arrangement was established and the even balance of power and responsibilities together pointed to cultural pluralism as the only appropriate basis of incorporation. Perhaps this made it almost inevitable that all the DUNLENA and MMP participants (whatever their culturally-acquired values and preferences) would resist roles based on anything less than full cultural pluralism.

### 3. Conclusions

Like many of the preceding analyses, this analysis contributed markedly to answering the study's research questions, and to understanding the social dynamics of commercialisation.

The fully culturally pluralistic basis of incorporation of two of the interfaces in the case studies (DUNLENA and MMP) contributed to their high effectiveness. Incorporation of some parties into the other two interfaces (SIROSCOUR and I<sup>2</sup>) had been on a basis of less than full cultural pluralism. In the case of SIROSCOUR, this basis of incorporation was shown to have influenced interface effectiveness detrimentally. The less-than-culturally-pluralistic basis of incorporation of the I<sup>2</sup> interface did not have such an effect. This difference seemed to be related to the ready acknowledgment and acceptance of this basis



of incorporation by the 'restricted role' partner in I<sup>2</sup>. By comparison, the 'restricted role' partners in SIROSCOUR resisted this basis of incorporation.

The analysis suggests that behaviour associated with how parties' values, norms, attitudes and preferences were incorporated into the interface, influenced interface dynamics mainly through affecting the way the interface itself, as a small group, set about its tasks (rather than through affecting the way each party approached its involvement in the venture).

At the same time, the analysis also identified a substantial encouragement or reinforcement effect coming from the interfaces' cultural and structural contexts; much of this dimension's influence on interface effectiveness seems to have come from the way behaviour associated with the basis of incorporation was affected by the values, norms, attitudes and preferences brought into the interface by the participants and by implications of the characteristics of the formal administrative commercialisation arrangement underlying the interface.

#### **B. OPPORTUNITIES FOR MAINTAINING LINKS WITH THE 'OLD' CULTURE**

Chapter 3 reviewed the fundamentally different strategies found by structural anthropologists to be used by "agents of change" as they enter supragroups that are broadly similar to commercialisation interfaces and commit themselves to the supragroup's principles, values and norms. It was argued that some of these approaches, more than others, might be expected to encourage smooth acculturation, and perhaps thereby a more effective commercialisation interface.

One such approach centres on the value attached by an interface's management arrangements and cultural system, to a continuing relationship with the 'old' culture. Are agents of change permitted or even encouraged to 'live' simultaneously or alternately in both their old culture and the new culture of the interface? Or is a complete, sudden break with the 'old' culture encouraged? It was argued in chapter 3 that the former approach will be more conducive to interface effectiveness.

The data from the case studies reveal that the CSIRO people in the *DUNLENA*, *MMP* and *I<sup>2</sup>* interfaces (and it is the publicly-funded researchers who generally experienced more cultural change) show different degrees of vacillation between the two cultures, and different attitudes towards 'living' in both cultures simultaneously. (It would be futile to attempt to categorise *SIROSCOUR* people's alternation between the interface's culture and their own 'old' culture, because at no time did that interface develop what could realistically be described as a culture: see the description of *SIROSCOUR* in Volume 2.)

On the one hand, the CSIRO group in *DUNLENA* showed distinct signs of reverting from time to time to their old culture. While it may seem upon cursory observation that these people long ago unconditionally committed themselves to the interface's driving values (like the pragmatic practice of synthetic chemistry) and abandoned 'luxurious' academic 'trimmings', the interview data show otherwise. It is clear that when the "ethnically closed stages" are turned to to "interpret and discuss the idiomatic content of public encounters" (Eidheim, 1969, p.48), conditions are placed on that commitment.

These conditions are perhaps most obvious when it comes to rewards,

publication and 'following one's nose' into challenging (but commercially questionable) channels. The CSIRO people might well be ashamed if the Du Pont people became aware of this equivocation, but it certainly happens. As CSIRO E said, in discussing the limited publication opportunities in this mode of work with a company,

... when assessment time comes round, [his staff] start to worry ... You have to satisfy the outside world as well as yourself. The perpetual question is "If I can't publish, what's going to happen to me?" ... [His people ask] "Am I going to be able to do enough in this area to make a paper I can publish, or do I just take the stuff I want from the reaction and leave the interesting part of it?" That's when it gets rather difficult [to abandon one's old values] [interview, CSIRO Clayton, 17 September 1992].

It is difficult indeed to see the typical Du Pont researcher periodically having misgivings about 'missing out' on publications.

This continual resorting to values from the 'old' culture contrasted with the outlook of the CSIRO groups and individuals in *I*<sup>2</sup> and MMP. These CSIRO people dived headlong into the interface's culture: and indeed in both cases played a major part in developing and establishing that culture. In neither case did a comprehensive search of the data gathered in interviews and elsewhere uncover more than a hint of these people re-entering their old CSIRO culture, or of any wish on their part to do so.<sup>2</sup>

Indeed, in both cases there was strong hostility towards aspects of the 'old' culture: clearly evident in CSIRO B's (in *I*<sup>2</sup>) and CSIRO C's (in MMP) identification of how inadequately the traditional CSIRO culture (and management practices) handle the sort of work they were now doing. The CSIRO group in *I*<sup>2</sup>, for example far from having concerns and doubts about entering the 'mainstream society', welcomed the chall-

enges. CSIRO C, for instance, went out of his way to make clear how much he is 'turned on' by breaking new ground: especially in the commercial world (interview, CSIRO Black Mountain, 28 August 1992).

It seems most doubtful, though, whether these different degrees of vacillation between cultures shown by the CSIRO people could account for a significant part of interface effectiveness. MMP is just as effective an interface as DUNLENA, and even  $I^2$  is a quite effective interface (see Appendix 9 and the descriptions of the interfaces in Volume 2). Even if some of DUNLENA's openness, flexibility, cohesiveness or focus could be traced back to vacillation by agents of change between the two sets of cultural values, MMP's and  $I^2$ 's could not be.

However the anticipated *long-term* dynamics among the CSIRO people, the 'mainstream society' they were entering and their 'old' cultural system permits this analysis to be taken farther. In  $I^2$  and MMP, unlike the situation in most ethnic merging/ethnic integration, the agents of change were not entering the contact situation indefinitely. Rather, the arrangement (in the case of  $I^2$ ) and CSIRO C's involvement in the arrangement (in the case of MMP) had been set out only for the limited period required for the immediate development of the product concerned (see the descriptions of  $I^2$  and MMP, in Volume 2). In both cases there had been specific discussion of the longer term needs, and possible changes in the arrangements.<sup>3</sup>

It seems distinctly possible that the knowledge of certain return to CSIRO after about two years (in the case of  $I^2$ ) and the 'safety valve' of a return to CSIRO after perhaps two or three years (in the case of MMP) met the CSIRO people's need for maintaining contact with their

'old' culture. Perhaps these circumstances enabled the *short-term* cycles of identity-dichotomy (Eidheim, 1969) or dualism/vacillation (Ballis Lal, 1986), often considered to be a crucial part of agents of change entering a very different mainstream society, to be replaced by a *long-term* mechanism for re-entering the 'old' culture.

If, then, all three of the interfaces discussed in this section incorporate some provision for change-agents to 'keep a foot in' the 'old' culture,<sup>4</sup> the question is whether this provision can be shown to have assisted cultural change and smooth acculturation of the interface, and perhaps ultimately to have increased interface openness, flexibility, cohesiveness or focus.

Comprehensive search of the data on *DUNLENA* failed to reveal any signs of interface openness, flexibility, cohesiveness or focus being increased by the CSIRO group's attempts to 'keep a foot in both camps'.

Indeed there were signs that these attempts may actually have temporarily undermined *DUNLENA*'s effectiveness. Both the Du Pont people (interviews, Du Pont North Sydney, 21 August 1992) and CSIRO E (interview, CSIRO Clayton, 17 September 1992) suggested that much of the frustration during *DUNLENA*'s early days (which is thoroughly described in several other analyses, as well as in the description of *DUNLENA* in Volume 2) stemmed from the CSIRO people's insistence on retaining elements of their public sector research culture: notably their circumspection about sharing information, their philosophy on the best way to identify areas in which new compounds with commercial potential are most likely to be found, and their temptation to continue with their "luxurious" (CSIRO E) approach to synthesising compounds, rather than

the less lavish approach dictated by Du Pont's business system.

Comprehensive search of the data on *MMP* also revealed little evidence that CSIRO C's outstanding commitment to the interface, which a number of interviewees described as being beyond what one could reasonably expect from a public sector researcher with limited experience with even broadly similar arrangements, was attributable to the opportunities he had to maintain links with his 'old' culture. Admittedly CSIRO C himself (interview, CSIRO Port Melbourne, 14 August 1992) regularly made reference to his 'lifeline' back to CSIRO, but most of those references came immediately after he had discussed what he saw as unpalatable or difficult aspects of the arrangement, and the pitfalls he could face. CSIRO C seemed to regard this right of return to CSIRO as a form of rationalisation, to be resorted to when he is feeling 'low' about the arrangement.

None of the other interviewees made reference to CSIRO C's right to return to CSIRO after a couple of years. Nor did CSIRO C or anyone else give any indication that this played any real part in increasing interface openness, flexibility, cohesiveness or focus. For instance, none of the interviewees claimed that CSIRO C's right of return had encouraged or enabled him to manage the venture in a more adventurous fashion: perhaps thereby making the interface more effective.

Indeed here also one can perhaps even detect tenuous hints of a *detritmental* influence of this dimension on interface effectiveness. An ongoing criticism of CSIRO C's management of *MMP* (see the description of *MMP*, in Volume 2) centred on his retention of some public sector research practices (reflected in the form of report he provided to the

board and the other parties). These practices at least provided potential for interface conflict. Perhaps CSIRO C would have retained fewer public sector research practices, and the potential for conflict would have been correspondingly less, had he 'burnt his bridges' with his 'old' culture.

With  $I^2$  also, the opportunity for the CSIRO group to maintain links with its 'old' culture seemed not to have a positive influence on interface effectiveness. Again comprehensive search of the data was unable to link interface openness, flexibility, cohesiveness or focus, with the CSIRO group's scheduled return to its 'old' culture after about two years.

### Conclusions

Behaviour associated with maintaining links with the 'old' culture does not help with answering the research questions, or with illuminating what contributes to socially effective, enduring commercialisation interfaces.

Initially, the focus for this analysis was any influence on interface effectiveness coming from participants 'keeping a foot in each camp' through the mechanisms of intercultural vacillation or "identity management". It was then reasoned from the case study data that *any* form of arrangement permitting the relevant group or individual to maintain links with the 'old' culture might be expected to increase commitment to the venture: and perhaps thereby interface effectiveness. It was shown that all three of the relevant interfaces provided such an opportunity.

But in no case did behaviour associated with maintaining links with the 'old' culture influence interface effectiveness: at least in the positive direction predicted. Indeed there were hints that a provision for maintaining contact with the 'old' culture might even in some cases have *detrimentally* influenced interface effectiveness.

### C. ATTENTION TO PREPARING FOR, AND CONSOLIDATING, CULTURAL CHANGE

Chapter 3 drew on theory from organisational studies to identify four important steps towards smoothly merging or integrating different cultures in situations like formation of the supragroup that is the commercialisation interface. These steps are

- \* "strategic and emotional preparation" for entering the interface, and "rehearsal of [the] possible implications";
- \* "early development, where possible, of ground rules for cross cultural contact";
- \* "management of internal processes of polarization, evaluation and ethnocentrism, as well as interface conflicts resulting from differences in philosophy, values and behavior"; and
- \* "scanning of the culture and its reexamination following change" (Sales and Mirvis, 1984, p.131).

It was argued in chapter 3 that adequate attention to these steps will facilitate effective acculturation of commercialisation interfaces, and ultimately increase interface effectiveness, while inadequate attention to them will undermine interface effectiveness. Examining



whether - and how - interface participants prepare for, and consolidate, cultural change can therefore be expected to improve our understanding of contributors to interface effectiveness.

These culture-integration/culture-merging steps cannot have any implications for *the I<sup>2</sup> interface* because its culture was not developed through merging or integrating the cultures of the two parties to the interface, or through adopting the culture of one of the parties. Rather, that interface's culture was essentially the culture of the instrument/software industry, adopted holus-bolus by the partners (and especially by the CSIRO group: see the description of I<sup>2</sup> in Volume 2).

### 1. The DUNLENA Interface

Both parties to DUNLENA seemed to have paid significant attention to culture-merging/integration steps (whether by default or by design).

For example, there was convenient preparation for the CSIRO group's entry to DUNLENA, through a preceding arrangement with a Japanese company for commercialising an earlier compound (see the description of DUNLENA in Volume 2). Although that earlier arrangement was very different from DUNLENA, the broad objectives were similar. This earlier experience served to give the CSIRO people some 'feel' for this broad type of interaction with the specialised agricultural chemicals industry. CSIRO C, for example, noted that

the DUNLENA arrangement [did not] teach us very much. This is because of the steep learning curve we had passed up in the course of the preceding arrangement with [the Japanese company]. As a result of this experience, we were very aware of where Du Pont were coming from [interview, CSIRO Clayton, 17 September 1992].

Also, the ground-rules for what was to become DUNLENA were developed relatively early on. No-one in either the CSIRO group or Du Pont was under any misapprehension about (for example) the period during which the CSIRO group's work would be committed wholly to DUNLENA or the expectations on Du Pont for locating as much of the commercial activity as possible in Australia. CSIRO A (interview, University of Melbourne, 16 September 1992), Du Pont B (interview, Du Pont North Sydney, 21 August 1992) and others noted that the ground-rules had been made abundantly clear in CSIRO's advertisement seeking a commercial partner and in the written material distributed to companies that had expressed interest. In effect, a degree of 'cultural sensitising' had been built into the selection process.

The degree of cultural change needed for the CSIRO group to accommodate the DUNLENA arrangement, while undoubtedly underestimated by some people, was generally understood. This is shown by the extensive early discussion of the danger of 'DuPontisation' of the CSIRO group (interview with CSIRO E, CSIRO Clayton, 17 September 1992; and discussions at a March 1988 meeting of the DUNLENA Technical Committee). Du Pont B observed that while the CSIRO people seemed to be surprised by the timeframe and the level of commitment necessary, "their appreciation of where Du Pont was coming from was quite adequate" (interview, Du Pont North Sydney, 21 August 1992).

There is also evidence that this interface paid attention to Sales and Mirvis's third and fourth steps: active management of culture clashes, and "scanning of the culture and its reexamination following change". The activities of Du Pont C prominently incorporated these steps, as did CSIRO E's unpackaging of his group's left-over attitudinal and

value-based problems in the areas of publication/rewards and thoroughness/corner-cutting. Both these roles are highlighted in the description of DUNLENA in Volume 2.

The crucial importance of this 'culture-audit' and preparation for and consolidation of cultural change is clear from four events/behaviours that are argued in the description of DUNLENA in Volume 2 and in many of the other analyses to have contributed most to DUNLENA's marked increase in openness, flexibility, cohesiveness and focus after the interface's difficult early period. These events/behaviours were

- \* CSIRO's acceptance of the "if economically feasible" clause qualifying Du Pont's intentions for manufacturing in Australia any commercially viable compounds;
- \* Du Pont's 'acts of good faith' demonstrating adaptation of their business procedures in a number of ways (like closing down a line of their in-house research that had accidentally strayed onto DUNLENA's territory);
- \* the CSIRO group's (eventual) decision to provide Du Pont with full structural details of compounds; and
- \* the CSIRO group's commitment to central elements of Du Pont's business system (testing cycles and product focus, for example).

It seems most doubtful whether these events/behaviours could have come about without much monitoring and management of cultural change. There would seem to be no way, for example, the CSIRO group's full integrat-

ion into Du Pont's compound-testing system could have taken place without the 'culture-audit' processes described at length by CSIRO E and others (see the description of DUNLENA in Volume 2). The CSIRO group's suspicions surely would not have allowed this to happen. And it seems equally unlikely that Du Pont would so readily have closed down lines of in-house research unless senior management had already anticipated and thought through the cultural compatibility of their system with the CSIRO group's thinking.

Both parties' attention to 'culture-audit' and preparation for and consolidation of cultural change helps explain how this interface was able to 'ride out' intercultural conflict which in the interface's early days was as severe as any encountered in any of the case studies. This behaviour seemed to condition the way each party approached their involvement in the venture, at a fundamental level.

This attention to 'culture-audit' and preparation for and consolidation of cultural change, and its marked influence on interface effectiveness, are no more than would be expected on the basis of cultural theory. Table 4 suggests that people from hierarchist environments (like both the DUNLENA partners) would enthusiastically practise such activities, and would strongly identify with, and commit themselves to, an interface when such activities are given full rein. This identification/commitment was predicted to flow through to increase interface effectiveness.

It was also expected that implications of the DUNLENA arrangement's characteristics would encourage the parties to place a premium on these activities.

Table 6 identified two characteristics as being likely to strengthen interface participants' keenness to undertake such preparation/planning/consolidation activities: the arrangement being highly articulated, planned, focused and visionary, and having come into being through collaboration between the parties, with enthusiasm from both parties. Table 7 shows that DUNLENA possessed both these characteristics, and there is ample evidence that they contributed significantly to increasing the interface's openness, flexibility, cohesiveness and focus. The first characteristic - the arrangement having been highly articulated, planned, focused and visionary - was examined in section B of the preceding chapter, where strong evidence of its positive influence on interface effectiveness was found. The second characteristic - the arrangement having come into being through collaboration between the parties, with enthusiasm from both parties - was examined in section D of that chapter, where some evidence of a positive influence on interface cohesiveness and focus was found.

## 2. The SIROSCOUR Interface

All the attention to 'culture-audit' and preparing for and consolidating cultural change in DUNLENA contrasts starkly with SIROSCOUR's attention to these matters (see the description of SIROSCOUR in Volume 2). Comprehensive review of the data on SIROSCOUR revealed virtually no evidence of any of Sales and Mirvis's steps to these ends.

Indeed most participants in SIROSCOUR were willing, with hindsight, to attribute some of the interface's problems to the absence of these very processes. PD&F (telephone interview, 21 October 1992) and Dysons A (interview, CSIRO Geelong, 13 August 1992), for instance, were both inclined to attribute PD&F's misunderstanding of precisely how much

practical scouring know-how CSIRO had, and also their misunderstanding of CSIRO's intentions in stipulating development of a fully internationally competitive scouring line, partly to the respective cultures' lack of appreciation of each other's expectations.

Greenfields also attributed some interface misunderstandings to the lack of preparation and 'culture-audit' (interview, Greenfields Melbourne, 16 September 1992). For example, more attention to preparing for, and auditing, cultural change may have guided Greenfields on what to read into (or rather not to read into) CSIRO's assurances that they had satisfied themselves on PD&F's suitability, and that they were keeping a close eye on PD&F's performance.

Similar laments about the lack of preparation and 'culture-audit' were evident in comments by the CSIRO interviewees. CSIRO A, for instance, pointed out (interview, CSIRO Geelong, 13 August 1992) how much of the difficulty in SIROSCOUR could have been avoided if CSIRO had been more sensitive to how engineering-development companies regard engineering drawings and what they mean.

While other factors apart from intercultural differences undoubtedly played important parts in this interface's rapidly reducing openness, flexibility, cohesiveness and focus,<sup>5</sup> intercultural differences certainly played a significant part. Yet at no stage did any party give any real audit/planning/consolidation attention to any intercultural differences that were recognised as being important or likely to become important.

In an interface where two of the three participants came from individ-

ualist environments (as with SIROSCOUR), minimal attention to 'culture-audit' and to managing and consolidating cultural change should not be surprising based on cultural theory: see Table 4. While the company representatives were keen enough to identify the importance of 'culture audits' and managing and consolidating cultural change *at the time of the interviews*, this may well reflect their individualist inclination to mark out their personal unique inputs into the project. At the time the SIROSCOUR interface was actually unfolding, the company representatives seemed to follow their culturally-acquired predilection to let cultural change happen, rather than plan it.

As hierarchists, the CSIRO people were expected to prefer situations where cultural change is planned and discussed (Table 4). Yet they, like PD&F and Greenfields, seemed to be quite prepared to face SIROSCOUR's intercultural problems as they arose. Certainly the CSIRO people (like the company people) were happy enough to discuss intercultural issues retrospectively; this is clear from the analysis of their attitudes towards intercultural similarities/differences, in section B of chapter 6. But comprehensive review of the data on SIROSCOUR reveals little sign that the CSIRO representatives engaged *at the time* in the pre-emptive 'culture-auditing' and continual re-examination of cultural change described by Sales and Mirvis.

SIROSCOUR's minimal attention at the time to 'culture-audit' and to managing and consolidating cultural change should not be surprising based on implications of the characteristics of the underlying commercialisation arrangement.

It will be recalled that two characteristics were predicted to

encourage interface participants to accept or adopt steps to prepare for, rehearse, manage and consolidate cultural change: the arrangement being highly articulated, planned, focused and visionary, and having come into being through collaboration between the parties, with enthusiasm coming from more than one party. Table 7 shows that the SIROSCOUR arrangement possessed neither of these characteristics. Furthermore, the marked negative impact on interface openness, flexibility, cohesiveness and focus of SIROSCOUR's lack of these characteristics was demonstrated in section B of the preceding chapter and in section E of chapter 6 respectively.

It seems quite possible, then, that the combination of a poorly articulated, unplanned arrangement that had been brought into existence mainly by the CSIRO group in a unilateral fashion, may well have led that group to neglect the 'culture-audit'/cultural change-management about which they (as hierarchists) were expected to have been keen. The lack of planning/articulation perhaps encouraged an ad hoc approach to cultural change: and indeed to just about everything else!

At the same time, the CSIRO group's overwhelmingly important role in initiating the venture could have led them to believe that their control over all phases of the venture would be enough to enable them to solve any intercultural issues unilaterally. (As it turned out, the CSIRO group's control was far from sufficient to guarantee this.)

### 3. Conclusions

Like most of the preceding analyses, this analysis contributed markedly to answering the study's research questions and to illuminating the social effectiveness and endurance of commercialisation interfaces.



The attention DUNLENA gave to preparing for, and consolidating, cultural change was shown to have had a marked positive influence on interface effectiveness. SIROSCOUR's *lack of* attention to these processes was shown to have had a marked *detrimental* influence on interface effectiveness.

The analysis suggests that behaviour associated with preparing for, and consolidating, cultural change influenced interface dynamics mainly through affecting the way each party approached its involvement in the venture, rather than through affecting the way the interface itself, as a small group, set about its tasks.

At the same time, the analysis identified an encouragement or reinforcement effect coming from the interfaces' cultural and structural contexts. Much of this dimension's influence on interface effectiveness seems to have come from the way behaviour associated with preparing for, and consolidating, cultural change was affected by the values, norms, attitudes and preferences brought into the interface by the participants, and implications of the characteristics of the underlying formal administrative commercialisation arrangement.

#### D. WILLINGNESS/KEENNESS TO PERFORM IN THE 'PUBLIC' DOMAIN OF THE INTERFACE

These same two channels of influence were also at work in the case studies on behaviour associated with performing in the 'public' domain of the commercialisation interface.

Chapter 3's review of the literature identified orientations and skills demanded of people working in social units in contemporary

society defined by new, more flexible forms of organisational boundaries (as commercialisation interfaces are). Particularly helpful ideas for identifying and articulating contributors to commercialisation interface effectiveness were identified from the work of Habermas.

Habermas's reasoning suggested that people experiencing much cultural change will be more at ease in, and more enthusiastic about, participating in an interface if they have successfully made one adaptation: they should be willing (if not keen) to pursue in the public domain of the interface, tasks and thoughts traditionally pursued in the 'private' domain of their own laboratory, their own research group or their own company group. It was reasoned that this acceptance or enthusiasm will facilitate development of a more transparent and coherent interface culture, and that this in turn could well flow through to have a positive influence on interface effectiveness. Examining whether - and how - people perform and think in the public domain of the interface can therefore be expected to improve our understanding of contributors to interface effectiveness.

The people in the case studies experiencing most cultural change are generally the CSIRO groups or individuals, although in the case of SIROSCOUR the PD&F people also experienced major cultural change, and therefore will also be encompassed by the analysis in this section and the following one.

Unfortunately cultural theory cannot profitably be used to investigate whether participants' culturally-acquired values and preferences encourage or reinforce behaviour associated with functioning in the public domain, because cultural theory's predictions do not effective-

ly distinguish among the groups and individuals in the case studies who experienced most cultural change. Indeed, a strong case can be mounted, using cultural theory, for people from *all four segments of social space* being keen (for very different reasons) to expose their thinking in the public domain of the interface: individualists (for example) to stimulate their catholicism and cosmopolitan outlook, and hierarchists (for example) to reduce risk and to articulate anomalies.

So here also, as with some of the analyses in chapters 7 and 9, the analysis will have to proceed without the benefit of being able to 'look backwards'.

#### 1. The MMP Interface

CSIRO C welcomed the opportunity to expose his intimate thinking frankly to CSIRO's partners in the interface: including thinking that revealed his commercial naivety and inexperience. He was very conscious, for instance, that conspicuously surrounding himself with people expert in the detail of the areas he was to oversee (see the description of MMP in Volume 2) would be seen as an admission of his naivety and inexperience.

But he showed little concern about this. CSIRO C's commitment to open thinking is epitomised in his generation of regular reports for the management group that tend to 'expose his all' to the partners. Rather than present only his conclusions and recommendations, CSIRO C provides "the whole box-and-dice: the good and the bad and the on-time and the out-of-time ... You get [from CSIRO C] the general ledger" (interview with MIM A, MIM Brisbane, 22 September 1992).

MIM A believes that the time is now ripe for CSIRO C to accord more with conventional business practices in this respect. But at the same time MIM A made it clear that CSIRO C's revelation of his 'innermost thoughts' had undoubtedly served to make MIM (and, he believes, at least one of the other partners) more confident of CSIRO C's ability to provide appropriate leadership to the venture. This approach had convinced the other parties that CSIRO C was 'across' issues they had been concerned he may not be able to handle.

And this public thinking by CSIRO C had ultimately increased interface solidarity (said MIM A: interview MIM Brisbane, 22 September 1992) because other parties' fears about CSIRO C's management naivety had posed a distinct threat to the interface's cohesiveness, and perhaps its openness and focus.

Other observations by CSIRO's partners in MMP also attest to how important CSIRO C's open thinking had been in framing his overall approach to involvement in the venture, and ultimately in positively influencing interface cohesiveness and focus (in particular). Indeed CSIRO C's keenness to open up his thinking provided the basis for the CSIRO C-QMC relationship which in turn was a cornerstone of the MMP arrangement (see the analysis of this relationship in section B of chapter 7). QMC had been able to play a part in shaping CSIRO C's thinking, said QMC B (interview, QMC Brisbane, 22 September 1992), for the very reason that CSIRO C had been unusually outgoing in developing his ideas for building an Australian magnesium metal industry.

Table 6 identified two arrangement characteristics expected to encourage sharing of thoughts in the public domain: the technology being at

an early stage of development when the arrangement came into being, and the arrangement having come into being through collaboration between the parties, with enthusiasm from both parties. Table 7 shows that the MMP arrangement possessed both these characteristics. Furthermore there is much evidence that at least the second characteristic contributed significantly to increasing the interface's cohesiveness and focus (especially); this was demonstrated in section E of chapter 6. The situation with the other characteristic - the technology being at an early stage of development when the arrangement came into being - is not so clear-cut: see section B of chapter 6.

## 2. The SIROSCOUR Interface

A comprehensive search of the data on SIROSCOUR revealed few signs that members of *the CSIRO group* were at all inclined to share their thoughts with CSIRO's partners. Indeed, there is significant evidence that the group was *against* sharing its thoughts. Thus we encounter PD&F attributing a large part of the difficulty with the SIROSCOUR venture to "the CSIRO group's lack of an outgoing, proactive approach to dealing with [PD&F]". PD&F would have found such an approach helpful. Instead they "had to drag everything out of CSIRO, piece-by-piece" (telephone interview with PD&F, 21 October 1992).

The CSIRO group's 'private' approach was confirmed by Greenfields. He said that, notwithstanding CSIRO's dismay at PD&F's decision to build 'from scratch' all the SIROSCOUR components, including those that could readily have been bought 'off the shelf', the CSIRO people still would not tell PD&F "You're stupid, doing it this way" (interview with Greenfields, Greenfields Melbourne, 16 September 1992).

The CSIRO group's preference for private domain thinking was confirmed by the CSIRO people's own comments. CSIRO B, for example, virtually cursed his own and CSIRO's behaviour in not dealing more explicitly with the problem posed by PD&F's way of setting about the task:

We should have jumped up and down more. [PD&F] looked at this as agricultural engineering, ... and I think they completely misread the difficulty. ... I wish we had had the foresight to really get into them and say to [PD&F] "Don't do this; you are jeopardising our technology ... [interview with CSIRO B, CSIRO Geelong, 13 August 1992].

The detrimental impact on interface openness, flexibility, cohesiveness and focus of the CSIRO group's private outlook is clear even from the brief views of interviewees quoted in the foregoing discussion.

The data from the case study show that, unlike the CSIRO group, *PD&F* (the other SIROSCOUR party which underwent major cultural change) cannot be criticised for refusing to think and operate in the public domain of the interface. Comprehensive review of the data reveals no sign of PD&F 'playing their cards too close to their chest'. And such was the frankness of discussion of this interface, there can be little doubt that any such sign would have been raised by the other parties.

Admittedly PD&F consistently ignored warnings about the way they were setting about their task (interviews with CSIRO C and CSIRO B, CSIRO Geelong, 18 September and 13 August 1992 respectively), and had difficulty raising problems with CSIRO as they were encountered (telephone interview with PD&F, 21 October 1992).

But one must be careful to avoid attributing this to unwillingness to work and think in the public domain. In fact, it seems possible that

the warnings from the other parties were actually stimulated to a certain extent by a notable *forthrightness* in PD&F's thinking (interview with CSIRO B, CSIRO Geelong, 13 August 1992), while the difficulties in raising problems with CSIRO came largely from the lack of clarity in the arrangement (see the analysis of trust in section E of chapter 6, and the analyses of power relationships in chapter 8).

Conceivably, the reluctance of the CSIRO group to function in the public domain could have been reinforced by implications of the characteristics of the SIROSCOUR commercialisation arrangement, which possessed neither of the characteristics expected to encourage a preparedness to operate in the public domain (the technology being highly developed at the time the arrangement was entered into, or initiation of the arrangement through collaboration between the parties, with enthusiasm from more than one party: Tables 6 and 7). And there is much evidence that absence of these characteristics contributed significantly to reducing the interface's cohesiveness and openness (especially). This was demonstrated in the analyses in chapter 6.

But this should also have discouraged the PD&F people from exposing *their* thinking in the public domain of the interface. Yet the PD&F people were most willing to work in this mode.

Perhaps an explanation for why PD&F (in contrast to the CSIRO group) was not discouraged by absence of these arrangement characteristics from exposing their thinking in the public domain of the interface, is available in the company's recurring experience in most of the engineering design and construction tasks they had undertaken over many years. Virtually all those tasks (see the description of SIROSCOUR in

Volume 2) had entailed taking up relatively highly developed technology through an arrangement initiated and championed by someone else (the owner of the plant commissioning PD&F).

Quite simply, perhaps PD&F had become inured to the effect an arrangement with these characteristics might be expected to have on someone entering a collaborative engineering-development venture like SIRO-SCOUR.

### 3. Conclusions

This dimension of social behaviour also assists markedly with answering the study's research questions, and with illuminating the social effectiveness and endurance of commercialisation interfaces.

The participant in MMP who experienced major cultural change (CSIRO C) was keen to expose his thinking and behaviour to public scrutiny in the interface, and there was clear evidence that this attitude had a marked positive influence on interface effectiveness. There was also evidence that the *reluctance* of the CSIRO group in SIROSCOUR to work in this mode retarded development of interface effectiveness, although the other SIROSCOUR group experiencing major cultural change - PD&F - did not share this reluctance.

The analysis suggests that behaviour associated with performing and thinking in the public domain of the commercialisation interface influenced interface dynamics mainly through affecting the way each party and its representatives approached involvement in the venture (rather than through affecting the way the interface itself, as a small group, set about its tasks).



At the same time, the analysis identified an encouragement or reinforcement effect coming from the interfaces' structural contexts (the interfaces' cultural contexts could not be investigated). Much of the influence on interface effectiveness seems to have come from the way behaviour associated with performing and thinking in the public domain was affected by implications of the characteristics of the formal commercialisation arrangements underlying the interfaces.

## **E. MODE OF USING SYMBOLIC REPRESENTATION**

### **1. Introduction**

Chapter 3 argued the importance, for establishing and operating an effective commercialisation interface, of using symbolism to bridge gaps in meaning and understanding between the cultures involved in commercialisation. Theory articulated by Bourdieu on how participants cope with the culture-shock and cultural dislocation often experienced in 'inter-world' transitions was expected to be especially helpful for understanding interface effectiveness.

The specific notion to be investigated (see section D of chapter 3) is that our understanding of contributors to interface effectiveness will be improved by examining the influence of the way symbolic representations are used to attempt to bridge important intercultural gaps and dislocations. Are they used in a constructive, positive, open-minded and co-operative fashion, to attain smooth acculturation of the interface? Or are they used aggressively, negatively and competitively?

Any analysis of how well people cope with culture-shock/cultural dislocation needs to take into account the severity of the shock or dislocation; presumably it will be easier to react in a constructive,

open-minded, co-operative fashion if the shock/dislocation is less severe. It can reasonably be concluded, though, that all-in-all there was not a great deal of difference in the severity of shock/dislocation experienced by the relevant groups and individuals in the three interfaces to be looked at here: DUNLENA, MMP and SIROSCOUR. Arguments leading to this conclusion are summarised in Appendix 13.

Reliance on people's recollections after the event raises the possibility that the symbolic representations analysed here will be those called up by the informant a few years on, purely to put interface events and processes into words for the investigator. They might not be the constructs actually used *at the time* by the informant in defining and pursuing his part in the interface. This need not necessarily have invalidated perspectives gained through symbol analysis, because arguably valuable insights into the handling of important intercultural events and processes can come from retrospective applications of symbolic representations to explain or rationalise behaviour.

But there are signs that any concern on this score may be misplaced in any event. Often the symbolic representations reported in the interviews seem actually to have been used originally at the time the events and processes were taking place. Often, for example, the interviewee described a particular symbolic construct in terms of his actual responses to behaviour and thinking of the other party, and vice versa. It seems doubtful whether such descriptions would be used had the particular images not been very much part of the actor's prism for viewing the other party's behaviour/thinking *at the time*; they seem for the most part to be enduring and substantial constructs.

Unfortunately, as with analysis of willingness/keenness to think in the 'public' domain (preceding section), cultural theory does not lend itself to investigating whether the participants' culturally acquired values, norms, attitudes and preferences encouraged or reinforced behaviour associated with the use of symbolism to address intercultural gaps. It would be difficult, and ultimately probably not practical, to try to read into cultural theory such detailed implications for the behaviour of those from the different segments of social space: notwithstanding their very different outlooks on intercultural differences (Table 4).

## 2. The SIROSCOUR Interface

It was shown in section B of chapter 6 that the two companies in SIROSCOUR tended to play down the intercultural differences that existed in the interface. There is also evidence that when these companies *did* recognise a difference between the parties based either partly or completely on cultural factors, they tended to address it by invoking symbolic imagery.

Thus, PD&F (one of the two parties experiencing most cultural change) used a number of complementary symbols to describe or explain CSIRO's inadequacies and even deceptions in commercial dealings (telephone interview, 21 October 1992). These included the "myth" (described as such by PD&F) promulgated by the CSIRO group that SIROSCOUR was a completely new concept in commercial terms, and the metaphor of a "dream world" centring on the CSIRO group's ignorance of the real challenges of full-scale engineering-development, and in particular the consequences and costs of reworks.

One embodiment of the latter idealised picture of how commercial engineering proceeds was the engineering drawings CSIRO had provided to PD&F. PD&F had taken these to be authoritative representations of the SIROSCOUR system, but they later found that the CSIRO Division saw them as being only "indicative of what we think should happen; such-and-such a place does it differently" (telephone interview with PD&F, 21 October 1992); they were merely symbols of a thorough understanding of the engineering precepts of the SIROSCOUR process.

PD&F also used a set of symbols for the company's battle against the forces aligned against them. He conjured up an image of the venture as a debilitating force draining the company's resources and crippling the company, with the "turnkey plant" they had contracted to provide being a symbolic focus of their disagreements with Greenfields.

This sample of PD&F's symbolic representations suggests that the company tended to use them in an aggressive, negative and competitive way. PD&F used the symbols of CSIRO's commercial inadequacy, for example, not as a starting point to educate the CSIRO people in order to lubricate the SIROSCOUR project, but virtually to attack the Organisation: see the analysis of status-balance between the parties' representatives, in section C of chapter 7. Likewise, PD&F used the powerful image of the company's losses on the arrangement not to develop a plea for sympathy or assistance, but as the basis for 'digging the trenches deeper' (see the description of SIROSCOUR in Volume 2).

It seems almost inevitable that this sort of aggressive, negative, competitive applications of symbolic representations would have a distinctly detrimental impact on a relationship that was always poorly

defined and tenuous. Review of chapter 8's analyses of the various SIROSCOUR conflicts confirms that applications of symbolism identified in this sub-section - those centring on the CSIRO group's deviousness/dishonesty, for instance - were indeed often influential in SIROSCOUR's rapidly diminishing cohesiveness and openness.

Comprehensive search of the data on SIROSCOUR showed that *the CSIRO group* generally used much less symbolic imagery than PD&F - both in the course of their activities in the interface and in the interviews - to describe what went wrong with the arrangement. When the CSIRO group *did* occasionally use such imagery, they tended to do so in a less aggressive, more neutral way. This was the case, for example, with CSIRO D's story (interview, CSIRO Geelong, 18 September 1992) of how CSIRO had had to 'bail out' PD&F after the project had got into real trouble. While CSIRO D recounted the same broad story as was told by the company people, using the same sorts of images, when it came to the real messages from the story, CSIRO D focused on the learning experience it had provided for CSIRO.

However in the final analysis, the relative paucity of the CSIRO group's use of symbolic representations makes it impossible to identify any definite influence on interface effectiveness of the way in which they were applied.

Not only can cultural theory not be used in this analysis, but nor - in the case of SIROSCOUR - can implications of the characteristics of the underlying commercialisation arrangement. Table 6 did not identify any characteristics expected to have the effect of encouraging aggressive, negative use of symbolic representations.

That one of the SIROSCOUR parties (PD&F) often used symbolic representations in a generally aggressive, negative and competitive way, and another party (CSIRO) occasionally used them in a more benign way, seems to be clear. It also seems clear that the former approach to using symbolic representations had a distinctly detrimental influence on interface effectiveness. But any factors in the participants' 'cultural baggage' and in the characteristics of the underlying formal commercialisation arrangement that encouraged this aggressive/negative/competitive use of symbolism must remain unknown.

This conclusion is all the more frustrating because, other things being equal, one might expect use of symbolism by people who emphasise intercultural *similarities* (as PD&F tends to: see section B of chapter 6) to be positive and constructive.

### 3. The MMP Interface

It is probably significant in connection with this interface's use of symbolic representations, that the whole MMP arrangement was itself presented as a symbol of the nation's and the federal government's vision of an ideal form of industrial development, embodying national competitive strengths, self-images and values. As QMC B said (interview, QMC Brisbane, 22 September 1992), "... at the end of the day, it could have been anything; such was the government's need to be seen to be doing something creative about generating employment"; this project just happened to have been in the right place at the right time to capture the spirit of national development.

CSIRO C, who experienced by far the most cultural change in MMP, was not short of symbolic imagery for himself and his role in the venture.

He sees himself as an island surrounded by the subject-matter experts he had engaged to advise and to protect him (see the description of MMP in Volume 2), and virtually as a martyr, generating invaluable detailed reports that hardly anyone reads. He has had to fight against the other parties' (he believes misguided) views that more targeted, selective reports and management information are what is needed (interview with CSIRO C, CSIRO Port Melbourne, 14 August 1992). Clearly these symbolic representations were very much part-and-parcel of CSIRO C's fundamental approach to involvement in the venture.

These symbolic images of CSIRO C were reinforced by other participants. MIM A (interview, MIM Brisbane, 22 September 1992) also sees CSIRO C as an island, insulated from the other participants by the experts constituting his evaluation group, and as something of a martyr in his commitment to unevaluated omnibus project reports and management information. The 'martyr' image was reinforced by QMC B, who emphasised the risks CSIRO C had taken, and "what he has given up to take on this role" (interview, QMC Brisbane, 22 September 1992).

These other participants also introduced symbolic representations of CSIRO C additional to those put forward by CSIRO C himself.

QMC B, for instance (interview, QMC Brisbane, 22 September 1992), presented CSIRO C as something of a manipulated tool of QMC; QMC had exposed CSIRO C to their fears about Japanese control of Australia's developing magnesium metal industry. They had started this induction of CSIRO C in a bar in Japan. CSIRO C had come "running back" to Australia and sent his now famous October 1990 letter to CSIRO's Chief Executive advocating action by CSIRO and the federal government to

keep control of the industry in Australian hands. QMC B even hinted that QMC had let CSIRO C and others believe that development of such a strategy had largely been CSIRO C's idea.

MIM A, for his part, presented CSIRO C's management approaches as "a great big computer", with CSIRO C using that computer to make the other participants move to his wishes:

It's [the CSIRO C management style]: all about maintaining negotiating positions. ... Everything is on bar-charts and schedules. It's almost like being run by a great big computer. It's very dehumanised [interview with MIM A, MIM Brisbane, 22 September 1992].

In contrast to SIROSCOUR's use of symbolic representations, images focusing on CSIRO C and his role in MMP seem mostly to have been used to attempt to articulate and resolve the interface's intercultural problems in a more positive, constructive, co-operative fashion.

For example, CSIRO C's status as virtually a martyr could have been used by MIM A or QMC B to amplify what had led to attainment of this status in the first place; attainment of martyr status was what one would expect (they could have argued) from a public sector researcher taking on this role; what was being displayed through CSIRO C's 'martyrdom' was 'pig-headedness'. There was little of this view, though. Instead, the emphasis was on how much CSIRO C had risked and sacrificed in taking on this role, and on positive things that had come out of CSIRO C's 'martyrdom': comprehensive project reports and management information, and a high degree of commitment to the venture.

The positive influence on interface effectiveness of a number of the uses of symbolic representation described in this sub-section has been



demonstrated incidentally in earlier analyses. For example, the analysis of willingness/keenness to perform in the 'public' domain of the interface, in the preceding section, showed that MIM A's and QMC B's emphasis on CSIRO C's status as a 'martyr' ultimately had a notable positive influence on interface effectiveness.

Table 6 identified two characteristics of the underlying MMP commercialisation arrangement as being likely to strengthen participants' willingness or keenness to apply symbolic representations in a generally constructive, open-minded, positive and co-operative way: the arrangement being highly articulated, planned, focused and visionary, and novel, sensitive, politicised and/or high-profile.

Table 7 shows that the MMP arrangement possessed both these characteristics in ample quantities. Evidence of the contribution of both these variables to MMP's cohesiveness and focus (especially) is woven through much of the interview data.

MIM A, QMC B and SIROTECH all expressed the view that the project would not have got far without the efforts of "missionaries": notably MIM A and QMC A. Several informants pointed out that one of the most important of these missionaries' several roles was articulating and strategically representing the venture for the benefit of other partners (as distinct from for the benefit of their own company of laboratory). Theirs were major contributions to articulating MMP's form and substance, and to creating a vision for the arrangement.

A number of interviewees explained how critical this mapping out and vision-creation were for establishing the necessary strength of bond-

ing among the partners. SIROTECH, for instance, doubts whether the venture would even have been established, let alone been such a tight and single-minded venture, without the 'teasing out' of "structural, operating and strategic details through the work of [such] missionaries" (interview, SIROTECH Melbourne, 14 August 1992).

The *articulation, planning and focusing* of the MMP arrangement that was bound up with these activities of 'missionaries' seems to have been critical, then, to the interface's effectiveness.

A number of the informants also observed the importance of *novel/sensitive/high profile* aspects of MMP.

SIROTECH noted, for instance (interview, SIROTECH Melbourne, 14 August 1992), that an important motivating factor for CSIRO C was one of the novel aspects of MMP: CSIRO was putting in cash (earmarked by the government for this specific venture) rather than just its normal intellectual property. According to SIROTECH, this feeling that MMP was something special was reflected in CSIRO C's level of commitment. This in turn had the positive influence on interface cohesiveness and focus (and probably also flexibility) identified in the analysis of category-independent roles in section D of chapter 7.

SIROTECH also identified the positive effect on interface cohesiveness and focus that came from another novel and to some degree sensitive factor in the interface: the absence of an existing commercial partner. None of the partners had existing mainstream business in the area of magnesium metal. The joint venture itself (or more accurately the private sector partners in the venture, coming together subsequently

in a different context) is to become the commercial entity to exploit the technology developed. This placed a special reliance on at least the private sector partners becoming, and remaining, a tight, cohesive unit (interview with SIROTECH, SIROTECH Melbourne, 14 August 1992).

Finally, a number of interviewees identified a most marked positive effect on interface cohesiveness and focus coming from QMC's novel role. Here was a small company which, for a start, decided not to sell off its resource to one of the transnational consortia that control worldwide activity for magnesium metal, then insisted on playing a role in the interface equal to the roles of the large powerful multinational companies MIM and UBE. What the partners read into this commitment was a major contributor to the interface's cohesiveness and focus (interviews with both SIROTECH, SIROTECH Melbourne, 14 August 1992; and MIM A, MIM Brisbane, 22 September 1992).

#### 4. The DUNLENA Interface

Several other analyses highlight the dramatic change that came over this interface after it had been in existence for some 18 months to two years. This entailed the build-up of trust and intercultural understanding and respect to the extent that the CSIRO group became prepared to send Du Pont full structural details of the compounds being provided for testing (see the description of DUNLENA in Volume 2).

Those other analyses often had difficulty explaining this change through the dimensions of social behaviour investigated up to this point (although partial explanations were suggested: such as the changing balance between the participants' culturally-acquired values, preferences and priorities and the 'hard' characteristics of the

commercialisation arrangement [section B of chapter 6]). It seems that the use of symbolism in the interface may well provide a more complete explanation of this discontinuity.

It has been pointed out in several of the analyses, as well as in the description of the case study in Volume 2, that from its establishment, DUNLENA was notable for what amounts to one major, sweeping symbolic representation. This centred on CSIRO's portrayal of Du Pont as a 'typical' transnational corporation, which would "steal CSIRO's property, in a devious, commercial multinational, thuggish sort of way" (interview with CSIRO E, CSIRO Clayton, 17 September 1992). This conceptualisation, which by its very nature was applied by the CSIRO group in an aggressive, negative, competitive fashion, was identified by several interviewees as a driving force over the first two years or so of the venture's lifetime. It necessarily prevented DUNLENA from becoming an open interface, and probably also restricted its cohesiveness and focus as well.

But a number of other symbolisations were also drawn on regularly by both the parties, and especially members of the CSIRO group (who experienced far more cultural change than did the Du Pont people). A few of these will be summarised here.

First there was a suite of organisational stories bearing on intercultural reconciliation, most of them told by more than one of the informants. These related to such actions as Du Pont's rectification of the situation when one of their researchers was found to be accidentally working on compounds Du Pont had undertaken to leave to DUNLENA, and Du Pont's testing of a particular DUNLENA compound ahead of many

of Du Pont's own compounds (as a statement of Du Pont's good faith).

Second, there was the "myth" (described as such by CSIRO E: interview, CSIRO Clayton, 17 September 1992) that the CSIRO group's adoption of a so-called "analogue" approach to identifying new chemical compounds (as opposed to a so-called "random" approach) revealed its conservative, risk-averse inclinations (minutes of 23-25 March 1988 *Review of the DUNLENA segment of the Biological Organic Chemistry program*).

Third, there was the CSIRO group's concentration, mentioned by CSIRO E and the Du Pont informants, on the ritual of the receipt from Du Pont of the weekly biological results.

Finally, there was the matter of the CSIRO people's continuing right to publish papers on the DUNLENA work. Various informants' often conflicting views on this were reviewed in earlier chapters. Discussion of this in the interviews often treated the 'right' to publish as a major symbol of CSIRO's continuing independence from Du Pont.

Some of these myths, stories, rituals and metaphors could have been applied by one party or the other to address and explain intercultural differences in either a positive or a negative manner. In fact, most were applied (even in the interface's early days) in a distinctly constructive, open-minded, positive and co-operative fashion.

Thus, for instance, while the CSIRO people could have used the 'weekly ritual' in a hostile way, to challenge Du Pont's values and ways of doing things and to attempt to regain some of CSIRO's lost power of self-determination, this was actually treated as a positive symbol of

collaboration and integration. Even the problematic 'right-to-publish' issue was often turned round by the CSIRO people, through either rationalisation or re-appraisal, to become a positive representation of good understanding between CSIRO and Du Pont.

A number of the earlier analyses have in effect confirmed the generally positive influence on interface openness, cohesiveness and focus, of this fundamentally positive, constructive use of stories, myths, rituals and the like. The analysis of shared over-riding goals, in section A of chapter 7, for instance, showed that the way Du Pont management modified its procedures to accommodate CSIRO's expectations, buoyed by the symbolic representation of those steps described above, had a positive influence on interface cohesiveness.

This discussion has now arrived at the foreshadowed explanation of the reason for the marked improvement in the cultural 'meshing' of the DUNLENA parties after 18 months or two years:

The one instance of aggressive, negative application of symbolic representation, centring on CSIRO's portrayal of Du Pont as a 'typical', thieving, unethical transnational corporation, was broad and sweeping.

Lined up against this was a large number of much more specific symbolic representations all of which were applied in a generally constructive, positive way.

Since these latter symbolisations were so definite and specific, it is reasonable to suggest that they came to be given increasing weight by the CSIRO people as they were progressively legitimised. The initial

*aggressive, negative* symbolisation, on the other hand, was so general as to be likely to weaken rapidly unless it was periodically reinforced through reasonably 'hard' evidence. Such evidence simply was not available, because Du Pont had no intention of stealing CSIRO's property. Accordingly (this reasoning says), the picture of Du Pont as a greedy, thieving transnational corporation faded over a period through lack of reinforcement.

The sudden closing of the intercultural gap in DUNLENA, which can be explained through this change in the balance of symbolic representations, had the direct positive effects on the interface's cohesiveness and openness (at least) that are argued in a number of other parts of the analysis, notably in the analyses of conflict in chapter 8, and in analyses of acculturation, in earlier sections of the present chapter.

It does not seem sensible to investigate how much the implications of the characteristics of the underlying commercialisation arrangement encouraged or reinforced the use of symbolism in DUNLENA. This analysis has hinged on a changing balance between application of symbolism in a negative, hostile fashion, and its application in a positive, constructive fashion. It would seem pointless to 'look sideways' to investigate evidence of an effect on behaviour associated with the latter mode of application of symbolism, when evidence of the former mode of application could not possibly be found. It could not possibly be found because Table 6 identified no arrangement characteristics expected to encourage negative, hostile application of symbols.

## 5. Conclusions

This final analysis also has made major contributions to answering the

research questions and to illuminating the social effectiveness and endurance of commercialisation interfaces.

The MMP and DUNLENA interfaces generally used symbolic representations of important interface events and processes in a positive, constructive way (although in the case of DUNLENA, this mode of using symbols came about only after 18 months or two years of often negative, aggressive use of symbols: and one over-riding symbol in particular). The SIROSCOUR interface used symbolic representations mostly in a negative, aggressive fashion.

There was good evidence that the former mode of using symbolic representations contributed to interface effectiveness, while the latter mode retarded development of interface effectiveness. The change over time in the balance of usage of symbolic representation in these two modes can help explain the change in DUNLENA's effectiveness that took place after the first two years or so of the interface's lifetime.

As with two of the preceding analyses in the chapter, this analysis showed that the behaviour investigated here influenced the social dynamics of the interface mainly through affecting the way each party approached its involvement in the venture (rather than through affecting the way the interface itself, as a small social group, set about its tasks). However, unlike all the preceding analyses in this chapter, this analysis identified no encouragement or reinforcement effect coming from the interfaces' cultural or structural contexts; much of this behaviour's influence on interface effectiveness seems necessarily to have come from social characteristics and processes that had developed in the interface itself.



## F. CONCLUSIONS FROM ANALYSES IN THIS CHAPTER

These analyses showed that four of the five dimensions of social behaviour constituting this final element of the analytical framework (Table 10) contributed markedly to development of interfaces' cultural base, and thereby notably influenced interface effectiveness. These dimensions were

- \* incorporation of parties' values, norms, attitudes and preferences into the interface;
- \* preparing for, and consolidating, cultural change;
- \* willingness/keenness to perform in the 'public' domain of the interface; and
- \* mode of using symbolic representation.

The other dimension constituting this element of the framework - opportunities for maintaining links with the 'old' culture - had an undiscernible influence on interface effectiveness.

The final three of the four influential dimensions of social behaviour influenced the social dynamics of the commercialisation interface through affecting the way each party fundamentally approached its involvement in the venture. By contrast, the other influential dimension - incorporation of parties' values, norms, attitudes and preferences into the interface - influenced the social dynamics of the interface through directly affecting the way the interface itself, as a small group, set about its tasks.

So these culture-construction dimensions of behaviour gain their impact on interface effectiveness through *both* the modes of influence identified through the analyses in the preceding chapters: they have both *individual* and *collective* modes of influence.

Through these conclusions, these analyses have taken a further step towards answering *the first and the second of the study's research questions*: Four of these dimensions bearing on construction of a commercialisation interface's cultural base assist in understanding the genesis, growth and persistence of the social structure of laboratory-company commercialisation interaction, and help directly in understanding interface effectiveness. And they do so through two quite different modes of influencing interface dynamics.

It would seem important for these four dimensions to contribute to approaches that might be developed for analysing and articulating interface effectiveness (like the model to be constructed through this study). It would seem to be equally important for those responsible for establishing, developing and operating interfaces, and those participating in interfaces, to apply

- \* combinations of management, structural and social arrangements likely to encourage the cultural frameworks of the constituent parties (and others) to be drawn upon in the most effective way;
- \* systematic, critical examination of cultural change; and
- \* flexibility and openness in tackling new issues and new challenges.

These conclusions provide another part of the answer to *the study's final research question*, which will be returned to below.

Any effect of the interfaces' cultural and structural contexts in encouraging or reinforcing one of the influential dimensions of social behaviour - mode of using symbolic representation - could not be investigated through 'looking backwards' or 'looking sideways' from the interfaces. A combination of participants' culturally-acquired values, norms, attitudes and preferences and implications of the characteristics of the formal administrative commercialisation arrangements underlying the interfaces was shown to have provided at least a moderate degree of, and sometimes major, encouragement or reinforcement for the other three influential dimensions of behaviour.

These analyses therefore help further to answer both *the third and the fourth of the research questions*: Three of the four influential dimensions of behaviour bearing on construction of a commercialisation interface's cultural base - incorporation of parties' values, norms, attitudes and preferences into the interface; preparing for, and consolidating, cultural change; and willingness/keenness to perform in the 'public' domain of the interface - were encouraged or reinforced by the values, norms, attitudes and preferences brought into the interface by the participants, and by implications of the characteristics of the underlying formal commercialisation arrangement. This encouragement/reinforcement effect could not be investigated with the other dimension.

So these analyses, like earlier analyses, identified some dimensions of social behaviour whose influence on interface effectiveness was

*context-dependent*, and one dimension whose influence will have to be assumed to have been *context-independent*.

The analyses in this chapter together have taken a further important step towards answering *the study's final research question*:

While the model to be constructed through the study should reflect the importance, for understanding, analysing, articulating and managing contributors to interface effectiveness, of this set of influential dimensions of social behaviour per se, it must also emphasise two other findings. One is the finding that some of the dimensions influenced the social dynamics of the interface mainly through affecting the way each party approached its involvement in the venture, and another through directly affecting the way the interface itself, as a small group, set about its tasks. The other is the finding that some dimensions' influence on interface effectiveness depends on a high degree of interplay with interfaces' cultural and structural contexts, while the influence of another dimension does not seem to be related to those contexts of interfaces.

It is these structural relationships within the commercialisation interface that emerged through the analyses, rather than the dimensions of behaviour themselves, that are the focus of the conclusions in the following chapter.

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**Notes to Chapter 10:**

1. Indeed both SIROSCOUR and I<sup>2</sup> may have intruded into the territory of Smith's *structural pluralism*; PD&F, Greenfields and OPTUS may well have been unable to convince people that they were full and 'genuine' members of the respective interfaces, sharing the rights and commitments of their respective CSIRO partners. It is debatable whether SIROSCOUR and I<sup>2</sup> were really socially pluralistic or structurally pluralistic arrangements.
2. This is not to say they completely abandoned all specific *practices* learned in, and associated with, their 'old' culture; a notable instance of CSIRO C in the MMP interface continuing to apply a practice from his CSIRO 'life' is discussed later in this chapter. It means simply that the underlying values and ways of viewing technology-based product-development rapidly became quite different from those previously subscribed to.
3. In the case of I<sup>2</sup>, later work would entail the product being licensed under an arm's length arrangement that would take it out of the interface, and indeed would terminate the interface; the I<sup>2</sup> arrangement would last for only perhaps 18 months or two years. The CSIRO group would then go back into its research-service mode, working on another instrument/software product, in much the same way as it had started with I<sup>2</sup> some three years previously. It would then re-enter the commercial world through an interface with a (presumably) different partner perhaps a year or 18 months later. It would go through cycles of commerc-

ialisation activities.

In the case of MMP, there was always a distinct possibility that CSIRO C's involvement in the interface would not extend beyond a couple of years. As CSIRO C said,

There are so many different facets to this that it's unlikely I'll last the four years. That's why I have this bridge; one of the conditions when I took on this job was that CSIRO would guarantee me a position when I was no longer required on this project [interview, CSIRO Port Melbourne, 14 August 1992].

4. It is unfortunate that the case studies did not include, as 'control' cases, commercialisation arrangements that do not provide *any* opportunity for agents of change to 'keep a foot in' their 'old' culture. This is a price to be paid for using a case study approach involving relatively few cases.
5. Earlier analyses have suggested that factors like the status imbalance among the parties' representatives and policies imposed on the CSIRO group from on high, may have had a big influence.

## **CHAPTER 11**

### **CONCLUSIONS:**

**ESTABLISHING AND DEVELOPING**

**SOCIALLY EFFECTIVE**

**COMMERCIALISATION INTERFACES**

## CHAPTER 11

### CONCLUSIONS:

#### ESTABLISHING AND DEVELOPING SOCIALLY EFFECTIVE COMMERCIALISATION INTERFACES

The commercialisation interfaces in four case studies were examined in the preceding five chapters to investigate what contributes to the social effectiveness of the commercialisation process. Particular attention was given to the role of the dimensions of social behaviour constituting the analytical framework (Table 10). All the analyses were aimed ultimately at addressing the study's first, over-arching research question:

*How does the social structure of laboratory-company commercialisation interaction take root, grow and endure?*

The study showed, at a general level, that analysis from social/inter-cultural perspectives does help markedly in understanding what makes commercialisation effective. More specifically, the analyses concentrated on answering the study's four subsidiary research questions.

#### A. RESULTS OF THE ANALYSES: DIMENSIONS OF SOCIAL BEHAVIOUR THAT INFLUENCE INTERFACE EFFECTIVENESS IN THEIR OWN RIGHT

*The study's second research question: Which dimensions of social behaviour contribute in their own right to effectiveness of commercialisation interfaces? How does that contribution come about?*

Table 11 lists all the dimensions of behaviour investigated in the analyses in chapters 6 to 10.<sup>1</sup> Opposite each dimension, a tick or a



cross summarises whether the analysis showed that dimension to have influenced interface effectiveness. For a few dimensions, the tick is qualified by a question mark. This indicates that the concluded influence was somewhat less clear-cut than the influence of other dimensions. The important point, though, is that ultimately all the ticked dimensions of behaviour contributed to the social effectiveness of the interfaces in the case studies: although, as will be seen, their contribution took a variety of forms.

TABLE 11  
INFLUENCE ON INTERFACE EFFECTIVENESS OF  
EACH DIMENSION OF SOCIAL BEHAVIOUR

Dimension of social behaviour:	Influence on interface effectiveness?
Dimensions constituting the first element of the analytical framework (relating to how participants approach key interface relationships: from the analysis in chapter 6):	
* Recognition of, and respect for, intercultural similarities/differences	✓
* Adaptive, flexible thinking, to cope with the new situation being encountered	✓
* Demonstration of goodwill trust between interface participants	✓
Dimensions constituting the second element of the analytical framework (relating to the interface's intergroup social structure: from the analysis in chapter 7):	
* Identification and pursuit of shared over-riding goals and a shared sense of purpose	✓
* Intimacy of contact	✓
* Approximate status balance between the parties' main representatives	✓(?)
* Assumption of category-independent roles	✓(?)

[Table 11 continued on following page]

TABLE 11 (continued)

Dimension of social behaviour:	Influence on interface effectiveness?
<b>Dimensions constituting the third element of the analytical framework (relating to conflict in interfaces: from the analysis in chapter 8):</b>	
* Excessive conflict	✓
* Handling interactions with unhealthily low levels of conflict	x
* Focus of conflict on goals/values/interests that question founding assumptions of the relationship	x
* Ways in which groups in conflict appeal to their members' personalities	x
* Conflict kept focused on definite object of contention	Unable to be assessed
* Transfer of conflict-learned behaviour to new, non-conflict, situations	Unable to be assessed
<b>Dimensions constituting the fourth element of the analytical framework (relating to power relationships in interfaces: from the analysis in chapter 9):</b>	
* Strategic use of power to pre-emptive ends	✓
* Coping with uncertainty in critical organisational areas	✓(?)
* Use of meta-power/relational control	x
<b>Dimensions constituting the fifth element of the analytical framework (relating to development of the interface's cultural base: from the analysis in chapter 10):</b>	
* Basis of incorporation of parties into the interface	✓
* Opportunities for maintaining links with 'old' culture	x
* Attention to preparing for, and consolidating, cultural change	✓
* Willingness/keenness to perform in the 'public' domain of the interface	✓(?)
* Mode of using symbolic representation	✓

Table 11 shows that of the 19 dimensions of social behaviour whose influence on interface effectiveness could be assessed, 14 had either an unqualified or a qualified influence. Only five dimensions did not influence interface effectiveness. All the dimensions constituting the first two elements of the analytical framework influenced interface effectiveness. The other three elements of the framework varied in their influence; each contained broadly similar numbers of influential and uninfluential dimensions. Clearly, the first two elements of the framework must contribute prominently to the model to be constructed pursuant to the study's final research question (chapter 1), with dimensions from the other three elements being taken up selectively.

A key question is why various dimensions of social behaviour have very different influences on interface effectiveness. One answer to this question is suggested by the structural interpretation of interface dynamics developed in this thesis. Specifically, the analyses suggest that dimensions of behaviour ultimately gain their influence on interface effectiveness through having one of two types of impact on the social dynamics of the interface.

On the one hand, some dimensions mainly influence the way each party and its representatives and managers fundamentally approach involvement in the commercialisation venture. These people can be positive and supportive (perhaps even enthusiastic) about the forthcoming experience, or negative and reserved (perhaps even foreboding) about it. These dimensions of behaviour seem to be bound up with these outlooks.

For example, the very first analysis, in chapter 6 - the analysis of the influence on interface effectiveness of behaviour bearing on

recognition of, and respect for, intercultural similarities/differences - found good evidence in the DUNLENA case study that the CSIRO group's discrediting of common myths about intercultural differences between research and industry was an important part of their whole approach to the venture. There were also clear signs that behaviour and thinking based on these attitudes and outlooks contributed significantly to development of interface cohesiveness and focus (at least).

Chapters 6 to 10 show that many other dimensions of behaviour also influenced interface effectiveness through impacting on the social dynamics in this way, in all four case studies.

Since the impact of these dimensions of social behaviour is closely associated with individuals' actions and attitudes, these dimensions are described as having an *individual* mode of influence on interface effectiveness.

On the other hand, the analyses showed that other dimensions of behaviour gain their impact on the social structuring of the commercialisation interface mainly through influencing the way the interface, as a social entity in its own right, approaches its tasks: how it corporately sets out its priorities, ways of working, expectations and needs, and how it structures its social relationships.

The first analysis in chapter 7 - the analysis of the influence on interface effectiveness of behaviour associated with identification and pursuit of shared over-riding goals and a shared sense of purpose - illustrates this very different mode of influence. That analysis explained, for instance, how the puzzlement and frustration

occasioned by OPTUS's entry into the I<sup>2</sup> venture on questionable, undefined grounds with few real goals, inevitably obscured what the interface needed to do to achieve its objectives (and how it might do it). This helped make the interface less effective: probably less open, cohesive and focused, and perhaps less flexible as well.

Here also, the analytical chapters illustrate how several other dimensions of behaviour also influenced interface effectiveness through impacting on the social dynamics in this way, in all four case studies.

Since the impact of these latter dimensions is closely associated with the framing of the supragroup's collective activities, priorities and preferences, these dimensions are described as having a *collective* mode of influence on interface effectiveness.

These two modes of influence are not completely mutually exclusive; sometimes there can be overlap. The dimension "excessive conflict", for instance, had mainly an individual mode of influence, but clearly behaviour reflecting and embodying excessive conflict also influenced the way the interfaces, as collectivities, approached their tasks. The point is that the impact on interface effectiveness of any dimension of behaviour comes *mainly* through one or the other mode of influence.

Such a simple distinction amid the complicated interplay of variables in these intergroup and intragroup processes has much to offer (vide Douglas, 1982[a], p.2). Such a distinction among the dimensions of social behaviour at work here should provide clear guidance for those planning, establishing and managing commercialisation arrangements. Interface management should be improved if managers seek answers to

the two separate questions framed by these two modes of influence:

- \* How can my, and my group's, attitudes, thinking and behaviour be improved to prepare us for approaching and working in this venture?
- \* How can the arrangements for the venture and the basis of interaction help the interface as an entity effectively pursue its tasks?

This distinction between behaviour's two modes of influence provides the foundation for the model referred to in the study's fifth research question.

The conclusions from the analyses in chapters 6 to 10 indicated which dimensions of social behaviour influenced interface effectiveness in each of these two different ways. Table 12 presents the 14 influential dimensions of behaviour from Table 11 within these two categories.

#### **B. RESULTS OF THE ANALYSES: ENCOURAGEMENT OR REINFORCEMENT PROVIDED FOR THESE DIMENSIONS OF SOCIAL BEHAVIOUR**

The study's research questions (chapter 1) emphasise influences on interface effectiveness in addition to the dimensions of behaviour themselves:

*The third research question: Which dimensions of social behaviour are encouraged or reinforced by culturally-acquired values, norms, attitudes and preferences brought into the research-company interaction by the participants?*

*The fourth research question: Which dimensions of social behaviour are encouraged or reinforced by implications of characteristics of the underlying formal administrative commercialisation arrangement?*

TABLE 12

**TWO INFLUENTIAL GROUPS OF DIMENSIONS OF SOCIAL BEHAVIOUR  
SELECTED FROM TABLE 11 ON THE BASIS OF  
THEIR MODE OF INFLUENCE ON INTERFACE EFFECTIVENESS**

**Dimensions having their main effect through influencing the way each party to an interface and its representatives and managers fundamentally approach involvement in the interface:**

- \* Recognition of, and respect for, intercultural similarities/differences
- \* Adaptive, flexible thinking, to cope with the new situation being encountered
- \* Demonstration of goodwill trust between interface participants
- \* Excessive conflict
- \* Strategic use of power to pre-emptive ends
- \* Coping with uncertainty in critical organisational areas
- \* Attention to preparing for, and consolidating, cultural change
- \* Willingness/keenness to perform in the 'public' domain of the interface
- \* Mode of using symbolic representation

**Dimensions having their main effect through influencing the way the interface, as a social entity in its own right, approaches its tasks:**

- \* Identification and pursuit of shared over-riding goals and a shared sense of purpose
- \* Intimacy of contact
- \* Approximate status balance between the parties' main representatives
- \* Assumption of category-independent roles
- \* Basis of incorporation of parties into the interface

At a general level, the analyses demonstrated the value of the approach adopted to investigate these two questions. The richness of interpretation and understanding resulting from the analyses confirmed how useful it can be to investigate the influence on interface effectiveness of a dimension of social behaviour in its own right, *then* to 'look backwards' and 'sideways' for signs of whether that behaviour was encouraged or reinforced by interfaces' cultural and/or structural contexts.

Overall, the analyses suggested that more influential dimensions of social behaviour are often associated with contextual factors that themselves have a major influence on interface effectiveness. Generally speaking, the *less influential* dimensions were not so often associated with contextual factors that themselves had a major influence on interface effectiveness.

This suggests that interfaces' cultural and structural contexts may have exercised a substantial accentuation effect on many of the dimensions of behaviour in Table 12. But not all those dimensions were strongly encouraged or reinforced by the contextual factors. Table 13 summarises the conclusions from the analyses in chapters 6 to 10, on the encouragement/reinforcement each dimension of behaviour received from participants' 'cultural baggage' (which constitutes each interface's cultural context) and/or from the characteristics of the underlying formal commercialisation arrangement (which constitute each interface's structural context).



TABLE 13

ENCOURAGEMENT/REINFORCEMENT OF THE DIMENSIONS OF SOCIAL BEHAVIOUR  
IN TABLE 12, BY PARTICIPANTS' 'CULTURAL BAGGAGE' AND/OR  
BY ARRANGEMENT CHARACTERISTICS

Dimension of social behaviour:	Assessed encouragement/ reinforcement of this dimen- sion of behaviour by these contextual factors:
Dimensions having their main effect through influencing the way each party to an interface and its representatives and managers fundamentally approach involvement in the interface:	
* Recognition of, and respect for, inter-cultural similarities/differences	Major
* Adaptive, flexible thinking, to cope with the new situation	Major
* Demonstration of goodwill trust between interface participants	Major
* Excessive conflict	Undiscernible
* Strategic use of power to pre-emptive ends	Major
* Coping with uncertainty in critical organisational areas	Undiscernible for participants' 'cultural baggage'; effect of arrangement characteristics unable to be determined
* Attention to preparing for, and consolidating, cultural change	Moderate to major
* Willingness/keenness to perform in the 'public' domain of the interface	Moderate to major
* Mode of using symbolic representation	Unable to be determined
Dimensions having their main effect through influencing the way the interface, as a social entity in its own right, approaches its tasks:	
* Identification/pursuit of shared overriding goals & a shared sense of purpose	Major, but with only limited data
* Intimacy of contact	Moderate to major
* Approximate status balance between the parties' main representatives	Unable to be determined
* Assumption of category-independent roles	Undiscernible
* Basis of incorporation of parties into the interface	Moderate to major

Table 13 shows that nine of the influential dimensions of behaviour were encouraged or reinforced by the contextual variables. These dimensions are described as *context-dependent*. By contrast, three dimensions experienced undiscernible encouragement/reinforcement from one or both sets of contextual factors, while the encouragement/reinforcement effect on the remaining two dimensions was unable to be determined. These latter five dimensions, described as *context-independent*,<sup>2</sup> necessarily obtained much of their force from sources rooted in social characteristics and processes that had developed in the interface itself, as it evolved and set its own ways of operating and its own ways of tackling the challenges to smooth commercialisation.

The analyses therefore identified a second important underlying structural feature of influences on interface effectiveness. In addition to their two different *modes of influence* on interface effectiveness, dimensions of social behaviour have these two very different *sources of influence*.

#### C. THE THEORETICAL MODEL FOR ILLUMINATING CONTRIBUTORS TO INTERFACE EFFECTIVENESS, AND FOR GUIDING THE PLANNING, ESTABLISHMENT AND MANAGEMENT OF EFFECTIVE COMMERCIALISATION VENTURES

The thesis is now in a position to address *the final research question* (chapter 1):

*How do the dimensions of social behaviour and their cultural and structural contexts interact? How is this interaction best represented in a paradigm or model for analysing and articulating contributors to interface effectiveness, and for guiding the construction of effective commercialisation interfaces in the future?*

The structural analysis identified two different channels through which the various dimensions of social behaviour gained their influ-

ence on the effectiveness of the interfaces in the case studies. Behaviour's *source of influence* ranged from highly *context-dependent* to largely *context-independent*. The former behaviour was directly affected by the values, norms, attitudes and preferences brought into the interface by participants and/or by implications of the characteristics of the formal commercialisation arrangement underlying the interface, while the latter behaviour showed no discernible effect from these cultural and structural contexts. Behaviour's *mode of influence* on interface effectiveness ranged from a distinctly *individual* influence (where the behaviour's impact came from its effect on individual participants' actions and attitudes), to a distinctly *collective* influence (where the impact came from behaviour's effect on the activities, priorities and preferences of the supragroup that is the interface itself).

Furthermore comparison of Tables 12 and 13 shows these two channels of influence to be largely mutually independent. The influence on interface effectiveness of a particular context-dependent dimension of behaviour (for example) can be mainly gained through *either* an individual *or* a collective mode of impact on the interfaces' social dynamics.

Because of the independence of these two channels through which behaviour impacts on interface dynamics, a two-dimensional matrix is called for to describe influences on the social effectiveness of commercialisation. Such a matrix, with axes representing the two channels of influence, readily accommodates the patterns of influence on interface effectiveness identified in the analyses:

\* The impact of all three influential dimensions constituting *the*

*first element of the analytical framework* (to do with participants' ways of approaching key interface relationships: see chapter 6) was *context-dependent*. Furthermore (not surprisingly), all three of these dimensions gained their impact on interface effectiveness mainly through *an individual mode of influence*. Clearly all three of these dimensions belong in the "context-dependent/individual mode of influence" cell of the matrix.

- \* The impact of two of the four dimensions of behaviour constituting *the second element of the analytical framework* (to do with intergroup structural relationships: see chapter 7) was *context-dependent*. So these two dimensions - "identification and pursuit of over-riding goals and a shared sense of purpose", and "intimacy of contact" - belong in the "context-dependent" zone of the matrix, and the other two dimensions in the "context-independent" zone. All four of these dimensions gained their impact on interface effectiveness mainly through *a collective mode of influence*; clearly all four dimensions belong in the "collective mode of influence" zone. So when the two axes of the matrix are brought together to combine the two structurally different channels of influence, the two dimensions "identification and pursuit of over-riding goals and a shared sense of purpose", and "intimacy of contact" belong in the "context-dependent/collective mode of influence" cell of the matrix, and the other two dimensions - "status balance between parties' representatives", and "willingness/keenness to develop and pursue category-independent roles" - belong in the "context-independent/collective mode of influence" cell.

- \* The impact of the only influential dimension within *the third element of the analytical framework* (to do with the build-up and management of conflict: see chapter 8) - behaviour associated with "excessive conflict" - was *context-independent*. And this dimension gained its impact on interface effectiveness mainly through *an individual mode of influence*. So the dimension "excessive conflict" belongs in the "context-independent/individual mode of influence" cell in the matrix.
  
- \* The impact of one of the two influential dimensions within *the fourth element of the analytical framework* (to do with the potentially divisive influence of power relationships: see chapter 9) was *context-dependent*. So this dimension - "strategic use of power to pre-emptive ends" - belongs in the "context-dependent" zone of the matrix. Both these influential power-based dimensions of social behaviour gained their impact on interface effectiveness mainly through *an individual mode of influence*, so both belong in the "individual mode of influence" zone. So again when the two axes of the matrix are brought together to combine the two structurally different channels of influence, the dimension "strategic use of power to pre-emptive ends" belongs in the "context-dependent/individual mode of influence" cell in the matrix, and the dimension "exercise of power by demonstrating the ability to cope with uncertainty in critical organisational areas" belongs in the "context-independent/individual mode of influence" cell.
  
- \* The impact of three of the four influential dimensions within *the final element of the analytical framework* (to do with devel-

opment of the cultural system of the interface, as a supragroup: see chapter 10) was *context-dependent*. So these three dimensions - "basis of incorporation of the interface", "preparing for and consolidating cultural change" and "willingness/keenness to perform in the 'public' domain" - belong in the "context-dependent" zone of the matrix, and the other dimension in the "context-independent" zone. Only one of these dimensions - "basis of incorporation of the interface" - gained its impact on interface effectiveness mainly through a *collective mode of influence*, so it belongs in the "collective mode of influence" zone of the matrix, and the other three influential dimensions belong in the "individual mode of influence" zone. So when the two axes are again brought together, the four influential "culture-construction" dimensions belong in three different cells of the matrix. The dimensions "preparing for and consolidating cultural change", and "willingness/keenness to perform in the 'public' domain" belong in the "context-dependent/individual mode of influence" cell, the dimension "mode of using symbolic representations" in the "context-independent/individual mode of influence" cell, and the dimension "basis of incorporation of the interface" in the "context-dependent/collective mode of influence" cell.

This reasoning defines the first form of the study's model (Figure 1), in which the matrix accommodates the actual influential dimensions of social behaviour. This form of the model has potential to directly inform decisions on the management of commercialisation ventures. However because of the importance of the interplay of any one dimension's mode and source of influence on interface effectiveness, it will be

helpful to have the model available also in a second, more general form. The substance of this second form of the model is not the individual dimensions of social behaviour found to have influenced interface effectiveness, but rather the very patterns of influence of different *types of dimensions*. This form of the model constitutes Figure 2,

FIGURE 1

## THE INDICATIVE FORM OF THE THEORETICAL MODEL:

SOCIAL INFLUENCES ON EFFECTIVENESS  
OF COMMERCIALISATION INTERFACES

## Mode of Influence on Interface Effectiveness:

		Individual:	Collective:
Source of Influence on Inter- face Eff- ective- ness:	Con- text Depend- ent	Recognition of, and re- spect for, intercultural similarities/differences	Shared over-riding goals
		Adaptive, flexible think- ing	Intimacy of contact
		Goodwill trust	Basis of incorporation of the interface
		Strategic use of power to pre-emptive ends	
		Preparing for and consol- idating cultural change	
		Performing in the public domain	
		(A)	(B)
		(C)	(D)
	Con- text- Inde- pend- ent:	Excessive conflict	Status balance between parties' representatives
		Coping with uncertainty in critical areas	Category-independent roles
		Mode of using symbolic representations	

FIGURE 2

THE GENERAL FORM OF THE THEORETICAL MODEL:

SOCIAL INFLUENCES ON EFFECTIVENESS  
OF COMMERCIALISATION INTERFACES

Mode of Influence on Interface Effectiveness:

Source of Influence on Inter- face Eff- ective- ness:	Individual:	Collective:
	Dimensions of social be- haviour that have their main impact through in- fluencing the way:	Dimensions of social be- haviour that have their main impact through in- fluencing the way:
	<div>Con- text- Depend- ent:</div> <ul style="list-style-type: none"><li>* each party &amp; its re- presentatives &amp; man- agers fundamentally approach involvement in the interface, with</li><li>* the dimension of be- haviour being encour- aged or reinforced significantly by the interface's cultural/ structural contexts</li></ul>	<ul style="list-style-type: none"><li>* the interface as a social entity in its own right approaches its tasks, with</li><li>* the dimension of be- haviour being encour- aged or reinforced significantly by the interface's cultural/ structural contexts</li></ul>
	(A)	(B)
	(C)	(D)
	Dimensions of social be- haviour that have their main impact through in- fluencing the way:	Dimensions of social be- haviour that have their main impact through in- fluencing the way:
	<div>Con- text- Inde- pend- ent:</div> <ul style="list-style-type: none"><li>* each party &amp; its re- presentatives &amp; man- agers fundamentally approach involvement in the interface, with</li><li>* the dimension of be- haviour <i>not</i> being en- couraged or reinforced by the interface's cultural/structural contexts</li></ul>	<ul style="list-style-type: none"><li>* the interface as a social entity in its own right approaches its tasks, with</li><li>* the dimension of be- haviour <i>not</i> being en- couraged or reinforced by the interface's cultural/structural contexts</li></ul>



#### D. USE OF THE MODEL, AND ITS IMPLICATIONS

The model described in Figures 1 and 2 hinges on the distinctions between behaviour's

- \* *individual mode of effect* through influencing the way each party and its representatives and managers fundamentally approach involvement in the interface, and *collective effect* through influencing the way the interface, as a small group, approaches its tasks; and
- \* *context-dependent source of influence* through a high degree of interplay with the interface's cultural and/or structural contexts, and *context-independent influence* entailing little interplay with the interface's contexts.

Through making these distinctions and focusing on the interplay between the channels of impact, the model identifies key factors in establishing and maintaining a socially effective commercialisation interface. What really counts for effective commercialisation is the interplay between behaviour's mode and source of influence on interface effectiveness, rather than an actual list of influential dimensions of behaviour.

This interplay between different types of behaviour and the interface's contexts amounts to a 'structuring' process. This helps generate the interface's social dynamics. The analyses showed the social dynamics of commercialisation to be much more than the sum of the social action brought into the interface. Clearly the commercialisation interface is very much the product of social adaptation: adaptation of individuals to the social forces generated in the interface

itself and elsewhere, and adaptation of the interface as a small group to the cultural and other forces bearing on it. The thesis shows that these processes of adaptation can readily be understood in terms of the interplay of behaviour's mode and source of influence.

The model can readily be applied and further articulated in two directions.

First, the model could take up lines of theory from sociology, anthropology, psychology, management studies and other disciplines (in addition to the theoretical perspectives reviewed in this study), to articulate and analyse a wider range of research-business interfaces.

Second, the insights provided by the model suggest practical improvements to day-to-day management of the commercialisation process. The four groups of dimensions of social behaviour in Figure 1 (together with any other dimensions added to them as a result of further study) could serve, in effect, as check-lists for those responsible for planning, establishing and managing commercialisation ventures. Encouraging interface managers to give separate attention to the four groups of dimensions should lead to more practical and better targeted interface management techniques and approaches.

How this should come about is clear from consideration of the first dimension of behaviour in Figure 1: recognition of, and respect for, intercultural similarities/differences.

The fact that this dimension is in the "individual mode of influence" zone of the matrix suggests that interface managers aiming to improve

understanding of, and responses to, intercultural similarities/differences would be well advised to focus closely on their own and their group's intercultural behaviour and thinking as they become involved in a venture.

And because this dimension is in the "context-dependent" zone, this introspective examination certainly should encompass the interface's cultural and structural contexts. So examination of managers' and participants' behaviour and thinking could profitably be cast against both deeper, well-established signs of these people's and their (proposed) partner's outlooks on intercultural similarities/differences and relevant 'hard' characteristics of the (proposed) formal commercialisation arrangement.

Thus (for example) if a research laboratory's proposed partner has shown a reluctance to acknowledge intercultural similarities - perhaps through its behaviour in earlier commercialisation arrangements, or through its handling of negotiations leading up to the proposed arrangement - the interaction might need some form of serious ongoing attention. Perhaps the underlying commercialisation arrangement will need to have certain structure or certain timing, to encourage recognition of, and respect for, intercultural similarities.

Appendix 14 draws on the case studies to illustrate practical improvements to social processes in commercialisation that can actually come about when ventures incorporate features pointed to by the model.

At least with some dimensions of social behaviour, the interface/arrangement characteristics and the partner capabilities/interests

driving the reasoning set out in Appendix 14 would need elucidation through the types of theoretical perspectives identified in the thesis. For instance, Sako's ideas on the systematic development of "studied trust", Brown's methods for controlling the level of conflict in interfaces, and Sales and Mirvis's means of preparing for and consolidating cultural change all would seem to be germane to this sort of reasoning. The importance of insightful, effective commercialisation arrangements for Australia's continuing industrial development suggests that providing interface managers with the wherewithal to apply such perspectives could be a valuable national strategy.<sup>3</sup>

#### **E. WHAT THE THESIS HAS ACCOMPLISHED**

The study has developed an analytical framework for examining the nature of the research-business commercialisation interface. Application of the framework was able to identify and articulate contributors to interface effectiveness. 'Looking backwards' and 'looking sideways' to link influences on interface effectiveness to key historical and contemporary facts, events and experiences, helped with applying social/intercultural perspectives to analyse the commercialisation process.

The study showed that the interplay of individual and collective influences on interface effectiveness is clearly at the heart of the commercialisation process. The distinction between context-dependent and context-independent sources of influence also provides fundamental insights into commercialisation. These insights take us a step beyond the understanding of the commercialisation process available through previous studies. They suggest both initiatives for improving interface management and additional social/intercultural perspectives that

could extend our understanding even further. Additional investigations along the lines of this study could profitably extend beyond CSIRO-company interaction, and perhaps outside the Australian context as well.

Further applications of the approach developed here could help explain the location of some dimensions of social behaviour in the bottom half of the model: in cells C and D (Figure 1). These (context-independent) dimensions of behaviour often seemed to have the effect of 'over-ruling' behaviour clearly predictable from the participants' cultural orientations and/or characteristics of the underlying commercialisation arrangement. While the study demonstrated that the social forces in the interface are much more than the sum of the social action brought into it by the participants, clearly we need to know much more about how these forces actually develop. Investigation of commercialisation interfaces from theoretical perspectives likely to provide this additional knowledge would be most worthwhile. It seems quite possible that theories of group leadership and theories of power (going beyond the selected theories of power taken up in the present study) could help provide such perspectives.

By demonstrating insights that can be gained through applying social/intercultural perspectives, the thesis has taken a significant step towards instilling the balance that chapter 1 showed to be missing from previous studies of commercialisation/innovation. However the thesis's synthesis of social/intercultural perspectives has not been at the expense of more discrete lines of study (like economics-oriented study). Because of the way it was constructed, the theoretical model developed here provides for the influence of structural/con-

tractual factors as well as cultural/historical factors; the study's approach is *integrative*, rather than *exclusive*. There is potential for applying the approach in conjunction with perspectives from a range of disciplines that should complement social/intercultural insights.

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#### Notes to chapter 11:

1. It must be recalled that, following the analyses in chapter 6, two dimensions were combined into one for the purpose of chapter 11's consolidation of findings: the dimensions "emphasising intercultural similarities, and playing down intercultural differences" and "preserving partners' most valued and cherished differences" were combined into a single dimension "recognition of, and respect for, intercultural similarities/differences". Likewise, following the analyses in chapter 8, two dimensions were combined into one for the purpose of the present chapter's consolidation of findings: the dimensions "development of excessive conflict" and "management of excessive conflict" were combined into a single dimension "excessive conflict".
  
2. The "context-independent" category therefore includes the two dimensions where it was not possible to generate predictions for how the participants' 'cultural baggage' and/or the characteristics of the underlying arrangement would act to encourage or reinforce the relevant behaviour. The reasoning was that if it had not proved possible to articulate such predictions, it would seem to be most improbable that ultimately these dimensions could be shown to be influenced very much by the

impact of their cultural or structural contexts.

3. This study does not extend to the practicalities of how interface managers can best be provided with this wherewithal. It can be observed, though, that some of the training, education, management-development and organisation-development resources and mechanisms that together could help attain this end seem already to be in existence. Appendix 14 demonstrates some of them at work in the case studies. Definition of Du Pont C's role in DUNLENA, for example, is an outstanding illustration of the sort of practical organisation-development step demanded. Likewise, the way the CSIRO group in I<sup>2</sup> set about developing its commercial knowledge and skills confirms that suitable staff training/education channels are sometimes available. Similarly, the perspectives and knowledge CSIRO C in the MMP interface picked up from QMC through what amounted to a long-term, informal, part-time attachment to the company prior to establishment of the interface shows just what staff exchange can achieve.

However the large number of commercialisation arrangements the author observed and analysed over many years (described in the preamble), and to a certain extent some of the case studies, suggest that these resources and mechanisms are thinly spread, seldom called upon, often called upon too late, and not widely known. And of course interface managers' inclination to rely on the formal legal-administrative arrangements for fine-tuning the commercialisation process, identified early in the thesis, discourages them from seeking out these resources/mechanisms.

**VOLUME 2:**

**DESCRIPTION OF THE CASE STUDIES,  
BIBLIOGRAPHY AND APPENDICES**



## THE CASE STUDIES

## THE CASE STUDIES

The four case studies - DUNLENA, MMP, I<sup>2</sup> and SIROSCOUR - are described here. For each case study, the description discusses

- \* the formal legal-administrative commercialisation arrangement and its evolution;
- \* the broad course of development of the associated social interface;
- \* the interface's occupants, and their behaviour in important interactive events and processes; and
- \* key events and processes in the construction of the interface's system of values, priorities and preferred ways of behaving.

## DUNLENA

Over a period of several years up to the early 1980s, CSIRO's (then) Division of Applied Organic Chemistry had synthesised a number of promising chemical compounds for controlling agricultural pests. A licensing arrangement had been entered into in 1982 with a Japanese company to produce and market one of these products. This had been generally successful in commercial terms. It had also taught the Division a lot about working with large international corporations (interview with CSIRO C, CSIRO Clayton, 17 September 1992 - see list of those interviewed, at the end of this description - and confirmed by other informants).

But the view had developed in the minds of senior CSIRO managers that Australia was not getting enough economic return from either this particular arrangement or the Division's outstanding synthetic organic chemistry expertise generally. There was particular concern about whether adequate return (and especially manufacture in Australia) would be gained from one of the Division's potentially valuable family of compounds based on a new chemical concept articulated by CSIRO D (again see list of those interviewed, at the end of this description).

A lot of debate and discussion took place on the best strategies for applying the Division's technology and skills to greatest advantage for Australia (documented in a 13 May 1983 letter from the Division's Technical Secretary to CSIRO's [then] Commercial Group). Eventually a broad outline was plotted for a major R&D joint venture to commercialise the family of compounds referred to in the preceding paragraph. An advertisement was issued in 1983, seeking a commercial partner for further developing the compounds, as well as others synthesised in the

future by the research group concerned, and ultimately for producing and marketing any compounds shown to be commercially viable.

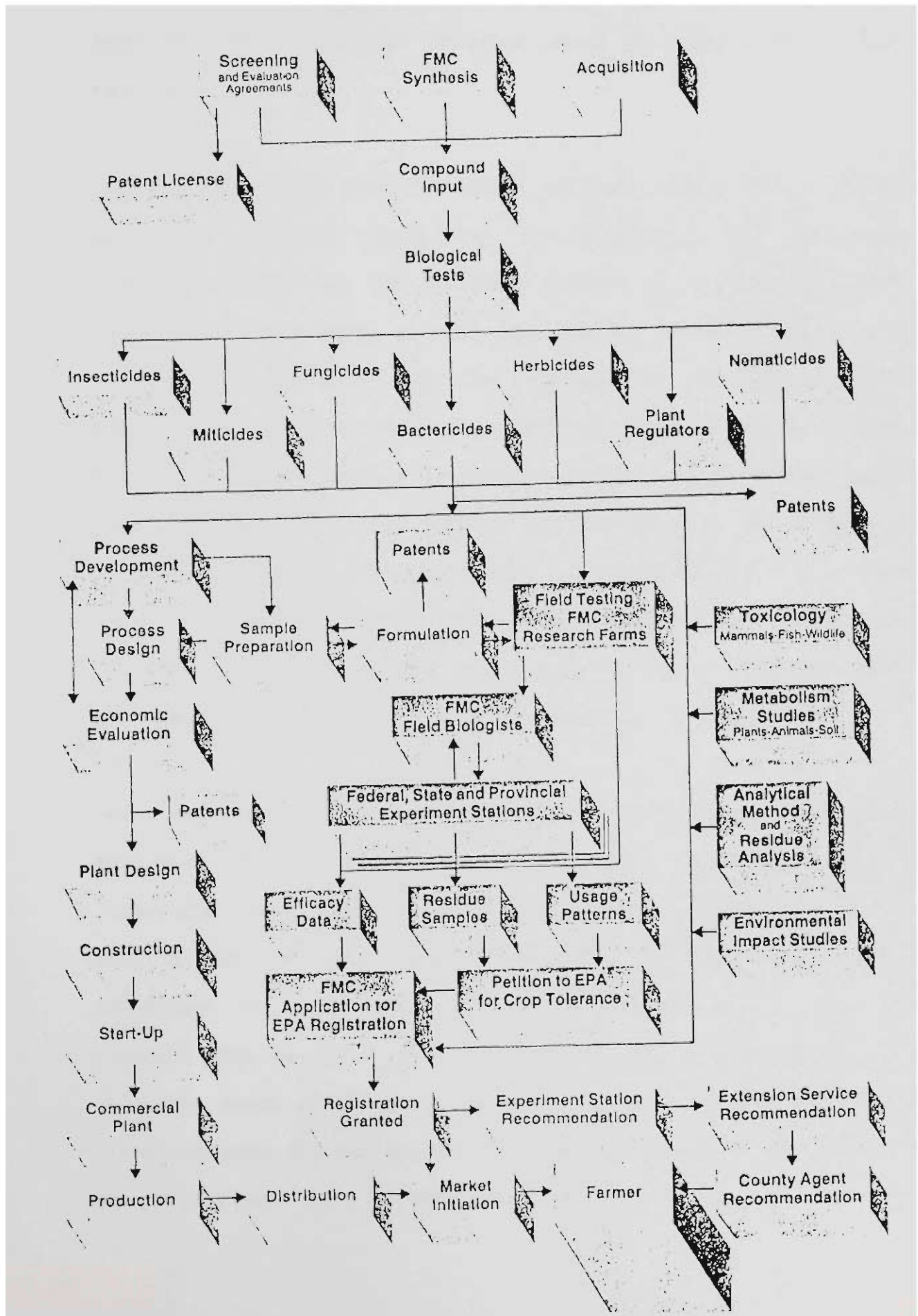
At that stage the arrangement was still partly open to negotiation: as can be seen from the highly philosophical questions posed in CSIRO's August 1983 handout to the companies that had expressed an interest. One non-negotiable aspect, though, was pursuit of the maximum possible amount of any ultimate commercial activity in Australia (although precisely what this meant in practice was open to interpretation).

Following a drawn-out selection process from a strong field of candidates, in the course of which Du Pont was deleted from the short-list, then reinstated, Du Pont was selected as CSIRO's partner. Du Pont agreed that production of any commercially viable compounds would take place in Australia "if economically feasible".

From that point on, development of the joint venture was a highly collaborative task. A company - DUNLENA - was incorporated in 1985, with Du Pont owning 49% and Australian partners 51%. Initially the sole Australian partner was CSIRO, but the Australian Industry Development Corporation eventually became a partner, taking up 16% of the equity (with CSIRO retaining the balance of 35%), in return for investing in CSIRO's research.

Conceptually, the arrangement was that the CSIRO group would apply its specialised chemical expertise to produce a flow of compounds with potential for controlling agricultural insect, weed and fungal pests, and Du Pont would feed the compounds through its complex and time-consuming existing procedures for testing compounds: biologically, toxic-

ologically, environmentally and for manufacturing practicability. A Du Pont document - Design for product success - illustrating the complexity of that testing/development process is reproduced below.



The day-to-day activities of each party's representatives in the venture would be managed by the party itself. DUNLENA would be the umbrella body bringing together the two sets of inputs. DUNLENA as an entity would be overseen by a company board and a corresponding technical committee, both of which would be constituted by the two parties.

It was acknowledged from the outset that the chance of a commercially successful compound coming from the arrangement was not high; an accepted probability for ultimate commercial production among the compounds Du Pont looks at (and they examine around 10 000 in a year) is one in 20 000 to 25 000. The timeframe for the venture, until it became known whether the first promising compounds going through the process would be 'winners', would be several years. Total investment over this period would be several million dollars; the venture would account for all the time and effort of the CSIRO Division's agricultural chemicals researchers, which represented between one-quarter and one-third of the Division's total research effort. DUNLENA would own any compounds successfully coming through the testing program.

The arrangement was well planned and well understood by both parties. Each party had a good appreciation of where its partner was coming from, what each party was offering to the venture and what each party's stake and power depended on. There was from the outset a high commitment to *identifying and pursuing a shared set of aims*, and a complete *sharing of a vision* for the project. CSIRO A described the "palpable sense of relief in the Division when the venture was established because the Division at last had a commercial partner prepared to align itself with CSIRO's real goals" (interview, University of

Melbourne, 16 September 1992). And as Du Pont A said,

what the parties expect to put into and get out of the arrangement are genuinely complementary. These are win-win, rather than win-lose situations. We weren't carving up a cake; we were working out how to make a bigger cake ... [This] is an example of two parties with the same sort of overall mission [interview, Du Pont North Sydney, 21 August 1992].

Development of a shared vision was facilitated by *the way the parties' roles fitted together*. Both parties' roles at the micro-level were essentially unchanged from what they had been (in other contexts) for many years. "We each contributed our own strengths, and ... they weren't fighting each other" (interview with Du Pont B, Du Pont North Sydney, 21 August 1992). It was not an arrangement of necessity, but one of genuine convenience.

Nevertheless the venture still experienced major teething problems, especially as a result of the CSIRO group refusing to provide Du Pont with full details of the structures of compounds they had synthesised and provided. During an initial period of close to two years, CSIRO provided only the unembellished compounds, because it was clear that they were obliged to do this. Their refusal to provide structural details came down quite blatantly to a combination of *resistance to cultural change* and *distrust*. Withholding these details was a step towards preventing both the things the CSIRO group feared most (interview with CSIRO E, CSIRO Clayton, 17 September 1992):

- \* the CSIRO group becoming "Dupontised" (that is, being forced to think and behave like Du Pont people, and to abandon completely their own values and identity); and

- \* Du Pont "stealing" their compounds, giving them no credit or little credit for them.

This initial stage was also characterised by slow (several weeks) turn-round times from Du Pont. This heightened the CSIRO group's suspicions about what the Du Pont people were doing with the compounds before they reported the results of their testing.

The non-disclosure of structural details undermined an important feature of Du Pont's management arrangements for the compound-testing/compound-development process, because the executive responsible for advocating a particular compound in Du Pont's "champions committee" simply did not have the wherewithal to do what he was supposed to. Non-disclosure also complicated Du Pont's day-to-day testing job immensely. As the minutes of the 25 March 1988 meeting of the DUNLENA Technical Committee blandly observe,

... if Dupont biologists had access to the structures they could make more meaningful evaluations and suggestions both in regards to the [level of biological] activity and the likely market segments.

From the outset Du Pont attempted to change CSIRO's stance on this issue. This initial stage of the venture was a situation of major *conflict*, focused directly on CSIRO's suspicion. The interface showed many of the classical signs of excessive conflict; for example, a number of the informants described what clearly amounted to the CSIRO group's conceptualisation of itself as an "innocent victim" of Du Pont's "malignant villain" (Brown, 1983, p.48). Clearly, this conflict had a distinctly detrimental influence on the interface's effectiveness. Poor communication and second thoughts about the wisdom of



entering the arrangement (together with the distrust already discussed) were widely reported in the interviews.

Evolution, over a period of some two years, of this initial distrust and conflict into a remarkably high degree of trust, mutual respect and co-operation provides one of the most interesting social/intercultural processes in this interface. Eventually (and quite likely even in the earlier stages as well?), "most of the CSIRO personnel ... saw advantages in disclosing structures of their compounds to the Du Pont biologists" (summary of review of the DUNLENA segment of the Division's Biological Organic Chemistry program, 23-25 March 1988). Several informants described how over this initial period the CSIRO people came to realise the sincerity of Du Pont's undertakings and actions protecting CSIRO's information and ownership rights. CSIRO's increasing acceptance of Du Pont's sincerity and openness eventually resulted in reversal of the 'no structural details' philosophy. At the same time, turn-round times improved (27 July 1987 letter to Du Pont [Australia] from a manager of Du Pont's biological testing program), further reducing CSIRO's suspicions.

With these changes, the arrangement moved into its second phase, which continues today. This is characterised by smooth working relations, a strong focus on commercial needs, each party's outstanding appreciation of the partner's needs and expectations, and a remarkable absence of conflict.

The distrust that was so prominent in the interface's early days seems to have had a lot to do with a misjudgment on Du Pont's part at the outset. A number of the informants described how Du Pont had thought

that the formality and institutionalisation of their system for testing compounds would alone be sufficient to convince CSIRO that all would be well if they trusted Du Pont. Above and beyond this, however, Du Pont really had needed to tailor their operating procedures to the needs of their (then) new form of arrangement with CSIRO. They proceeded to amend their operating procedures, as described below.

The CSIRO group's increasing respect for Du Pont's honour and ethics was reflected in a second area, centring on the 'manufacture in Australia if economically feasible' clause, flagged previously. None of the CSIRO interviewees had any doubt that Du Pont will fully honour this clause when the time comes for a compound to be produced commercially. They seemed to reason that it would be almost impossible for a company that had behaved as properly as Du Pont had in the domain of R&D interaction, to behave in any other way when it comes to commercial production. CSIRO A (interview, University of Melbourne, 16 September 1992; corroborated by other informants) attributed much of the interface's solidarity and focus to this one symbol of understanding.

A major contributor to building the necessary trust and respect was both parties' *management attitudes and values*. The contributions of only one centrally important manager will be discussed here, to illustrate how crucial management attitudes and values were. This is Du Pont C, Du Pont's Manager (Chemical Discovery),<sup>1</sup> who was respons-

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<sup>1</sup> Although this is a Du Pont role, it is emphasised that strong management support was received from both parties. CSIRO B, CSIRO C and Du Pont B (first two interviews CSIRO Clayton, 17 September 1992; the third Du Pont North Sydney, 21 August 1992) all noted how much Du Pont was impressed by the strength of

ible for keeping a 'fatherly' eye on DUNLENA on behalf of Du Pont's corporate management. Du Pont C went out of his way to 'sell' to a number of the CSIRO people, the compartmentalisation and security of Du Pont's testing system. He strove to convince CSIRO that there could be no chance of Du Pont's synthetic chemists acquainting themselves with the CSIRO compounds, because access to structural details was restricted on a 'need-to-know' basis to people in the biological testing areas.

There is an abundance of organisational stories within both the CSIRO group and Du Pont, describing Du Pont C's setting about his task and the profound effect his activities had on the interface's openness, flexibility, cohesiveness and focus. For example, various informants reported how Du Pont C had identified a few areas in which Du Pont's own research was coming near the areas CSIRO was working in, and steered the former away from the latter. Du Pont C had also looked in detail at a specific Du Pont research area identified by CSIRO as impinging on DUNLENA's territory. He discovered that this was the work of a single unsupervised researcher who had been in the area for years; he even sent CSIRO copies of complete laboratory books to

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support for the venture from all levels of CSIRO management, and the positive impact this had had on interface cohesion. Indeed Du Pont B drew a direct connection between this support from CSIRO management, and the venture's very survival in its "difficult first year or so". Du Pont seems to have been especially struck by CSIRO top management's decision when the arrangement was being developed, that it should encompass all the Division's agricultural chemicals research, not only its insecticide research (as had been intended at one stage).

demonstrate this. Du Pont immediately undertook to assign to DUNLENA any patents from this work. This was seen as evidence of Du Pont's ethics (which were flagged by almost all interviewees). This was a concession CSIRO did not expect. As CSIRO E said (interview, CSIRO Clayton, 17 September 1992),

CSIRO would have been happy enough for Du Pont to have sought dispensation from CSIRO to continue for the time being their work in this area, even though it was coming close to CSIRO's. So Du Pont offered far more by way of accommodation than CSIRO would have asked.

The combination of shared aims/visions and ready commitment to ironing out territorial conflict did not obviate the need for *compromise and 'principle-bending'*. The interface's success depended on a high degree of compromise, especially on the part of the CSIRO scientists, who had to abandon much of the fundamental value system they had developed over the whole of their professional lives. If the DUNLENA arrangement was to get anywhere the CSIRO group had to undergo major acculturation, to bring their outlooks, values and norms to correspond closely to Du Pont's. Specifically, the CSIRO people had to come to grips with three lines of cultural change:

- \* A much greater degree of discipline, and a different form of discipline, in bringing their work to finality, including abandoning their commitment to yield-increasing chemistry. As CSIRO E said (interview, CSIRO Clayton, 17 September 1992), in "academic science", in which most of the people concerned had spent their entire training and professional lives,

you do a reaction or synthesis with particular care, and you examine the products very carefully and you also characterise them in an absolutely thorough way. ... a very hidebound way. ... [In working with

Du Pont}, you rapidly realise that investing a lot of work in any one compound is essentially wasteful. To do all the various degrees of characterisation ... is a luxury you can't afford. [You have to] leave it at that, and go on to the next compound. That caused a great deal of angst in the group. Some individuals were barely able to cope with it. ... They felt it was shoddy. ... Some [still] have not got over it. ... It took some people quite a while to realise that the only thing that matters was getting enough compound out of your reaction ... for testing.

- \* A different form of assessment of success, based on the acclaim associated with getting a compound accepted for commercial development, or well along that track. Du Pont's view is that the CSIRO people rapidly came to realise the significance of this acclaim. As Du Pont B said (interview, Du Pont North Sydney, 21 August 1992), "The CSIRO people's morale is boosted by interaction with another group of scientists" (Du Pont's biological testing people); "refreshing" was the adjective he used. There was little agreement, though, on the interplay between this form of reward and the traditional form of reward through peer acknowledgment after public exposure of research findings; this is taken up later in this description.

- \* A switch to a "product-driven culture". CSIRO E sees the views on the weekly receipt of biological testing results from Du Pont as indicating a major shift in this direction. He described this weekly event as being similar to the weekly lottery draw:

People get very toey if they don't get their biological results [on time].... Me too; we all need our kicks [interview, CSIRO Clayton, 17 September 1992].

Over a period of around two years (the period needed for the CSIRO

group to develop the confidence and trust to start providing Du Pont with compound structural details), the interface did successfully adopt Du Pont's corporate culture as its own culture. Much of the analysis of this interface in chapters 6 to 10 is devoted to the detail of the re-acculturation of the CSIRO group to this end. CSIRO E described the striking influence his group's cultural change had on interface effectiveness. He sees the biggest single contributor to interface effectiveness as being the realisation of "just how successful the group has been in doing things seldom, if ever, expected from public sector research people" (interview, CSIRO Clayton, 17 September 1992).

A number of informants described a single symbolic event illustrating the extent of this cultural change: the group's frantic round-the-clock industry-like effort to produce the quantity of a particular compound urgently needed by Du Pont for a particular phase of the testing process. CSIRO C was one who described (interview, CSIRO Clayton, 17 September 1992) how mounting this effort was taken to signify that the CSIRO people had become 'full' members of the industry-oriented team; he attributed to this one symbolic event a major part in reversing the CSIRO group's initial refusal to provide Du Pont with compound structural details.

CSIRO E, CSIRO C and Du Pont A all noted that this emerging 'full' membership of the Du Pont family led to a sense of stimulation for the CSIRO people. CSIRO E (interview, CSIRO Clayton, 17 September 1992) described one manifestation of this: the challenges and excitement they felt in sharing a reward system with Du Pont's research chemists. He noted only two reservations.

First, the CSIRO people were aware that they still needed to "satisfy the outside world, as well as yourself". That is, they were aware that at staff promotion time the traditional reward system tended still to come into play: even though they did not need to resort to it to satisfy their own needs for reward.

Second, there was a degree of concern that "indications of interest from Du Pont are pretty rare": by contrast with the researchers' 'traditional' system, where 'pats on the back' can be sought out.

At the same time both parties had always wanted to avoid what was identified above as a main fear of the CSIRO group: the group becoming so "Dupontised" (a term actually used in the minutes of the DUNLENA Board and its Technical Committee) as to lose the essence of what Du Pont saw them as providing. What seems eventually to have been arrived at was the 'best-of-both-worlds'; the CSIRO group was re-aculturated to Du Pont's commercial culture, but retained certain of their more specific skills and approaches.

This hybrid end-point is reflected in the CSIRO group's approach to abandoning its 'old' (research) culture and taking up its 'new' (commercially sound) culture. There were many signs that the CSIRO people continually resorted to their 'old' culture to "interpret and discuss the idiomatic content of public encounters" in the new culture (Eidheim, 1969, p.48). This is perhaps most obvious when it comes to rewards, publication and 'following one's nose' into challenging (but commercially questionable) channels. The CSIRO people might well be ashamed if the Du Pont people became aware of this equivocation, but it certainly happens. As CSIRO E said, in discussing the limited

publication opportunities in this mode of work with a company (interview, CSIRO Clayton, 17 September 1992),

... when assessment time comes round, [his staff] start to worry ... You have to satisfy the outside world as well as yourself. The perpetual question is "If I can't publish, what's going to happen to me?" ... [His people ask] "Am I going to be able to do enough in this area to make a paper I can publish, or do I just take the stuff I want from the reaction and leave the interesting part of it?" That's when it gets rather difficult [to abandon one's old values].

The Du Pont people and CSIRO E suggested that much of the frustration during DUNLENA's early days came from the CSIRO people's insistence on clinging to part of their public sector research culture. In addition to their reluctance to share information, there were signs of this 'cultural conservativeness' in their philosophy on the best way to identify areas in which new commercially valuable compounds are most likely to be found, and in their persistence with their "luxurious" (CSIRO E) approach to synthesising compounds, as opposed to the less lavish approach dictated by the Du Pont system.

Quite apart from compromises and principle-bending in the course of the CSIRO group's re-acculturation, there was also much pragmatic *give-and-take in the establishment and operation of the venture per se*. This centred on the 'venue-for-manufacture' issue already discussed, but it also encompassed issues that contributed significantly to resolution of the 'compound structural details' conflict.

For example, CSIRO B (interview, CSIRO Clayton, 17 September 1992) and other informants described how much certain concessions by Du Pont (quite apart from those initiated by Du Pont C, discussed above) contributed to the CSIRO group's development of the trust required for



resolution of this conflict. These concessions entailed CSIRO's access (although there is disagreement about how open and autonomous this access is) to Du Pont's agricultural chemicals database, its 'computational chemistry' service and its marketing knowledge.

This widespread give-and-take serves to raise a further important factor in the interface's progress: *the very even balance of power*. Power seemed to be much more evenly balanced in DUNLENA than in any of the other case studies. While this is reflected in the respective shareholdings, voting rights and other arrangements for the company, it is also clear from each party's interest and investment in the arrangement. DUNLENA's importance to the CSIRO Division is clear, not the least from the amount of the Division's resources going into this work. In terms of the figures, the arrangement would seem at face value to be of much less significance to Du Pont. However, a number of the informants pointed out how keen Du Pont had been to establish and maintain access to CSIRO's high-quality skills. As Du Pont B said (interview, Du Pont North Sydney, 21 August 1992),

The world-class status of CSIRO's research is a power balance. The realisation of this status [by Du Pont] was a major outcome of the early stages of the arrangement.

This even balance of power, together with the collaborative basis of development of the arrangement, seemed to help make the DUNLENA interface a flexible, well balanced supragroup. It seems that each party was able to contribute substantially to determining the venture's priorities and direction of development. When there were signs of the CSIRO group being cut off from contributing at this level - for example, when they perceived barriers to their access to Du Pont's 'champions committee' - both the CSIRO group and Du Pont took immed-

iate steps to rectify the situation.

*Views on DUNLENA from elsewhere in the CSIRO Division* are also significant. As with I<sup>2</sup> (see later description), these views hinge on the project's implications for resources available to the rest of the Division. Prior to the advent of DUNLENA, this group was the most threatened in the Division; both group members and the rest of the Division recognised that its future was most uncertain. Since establishment of DUNLENA, the group has been the most secure. As CSIRO E pointed out (interview, CSIRO Clayton, 17 September 1992), the rest of the Division viewed the group as

originally being overloaded with money (when other groups were struggling to attract the odd \$10 000 or \$20 000 sponsorship). Nowadays this attitude is less marked because there are more large-scale sponsorship arrangements in the Division. Also, when the Division was short of funds, DUNLENA was able through indirect means to ease the burden on other projects.

#### Those Interviewed:

- CSIRO A:** The former Chief of the CSIRO Division concerned. (He was Chief at the time the arrangement was negotiated and put into place; he left CSIRO a few years prior to the interview.)
- CSIRO B:** The Assistant Chief of the CSIRO Division.
- CSIRO C:** The Industrial Property Manager in the Division.
- CSIRO D:** The senior CSIRO scientist whose chemical compounds and expertise had provided the impetus for initiation of the arrangement. He has since moved for a large part of his time onto other research interests, although he maintains a part-time interest in DUNLENA, with occasional active inputs.
- CSIRO E:** The project leader for CSIRO's part of DUNLENA.
- SIROTECH:** The SIROTECH person who was that company's relevant project director for much of DUNLENA's lifetime. (Shortly before the interview he had reverted to his former role of SIROTECH's corporate lawyer, which includes sharing with a Du Pont person the role of DUNLENA's company secretary.)

He was *not*, however, involved in the initial negotiations; the SIROTECH project director responsible for this has since left the company.

DU PONT A: The Deputy Chief Executive of Du Pont (Australia).

DU PONT B: A senior technical person in Du Pont (Australia), acting as a channel for Du Pont's corporate people's inputs into DUNLENA.

The key character Du Pont C was *not* interviewed, although detailed perspectives on his role and contributions were received from all informants.

## MAGNESIUM METAL PROJECT (MMP)<sup>2</sup>

In 1986, a small company, Queensland Metals Corporation (QMC), discovered a rich lode of accessible magnesite near the central Queensland coast and near existing interdependent industry (13 November 1990 memorandum from CSIRO C to CSIRO B: see list of those interviewed, at the end of this description). This opened an opportunity for Australia to develop a world-competitive presence in the rapidly growing magnes-

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<sup>2</sup> After the data for this study had been collected, reports appeared in the press (for instance, Canberra Times, 3 July 1994, p.1) that the MMP venture had broken down, to the extent that the two large companies - MIM and UBE - had withdrawn, and that the remaining partners - QMC and CSIRO - were looking for replacement joint venturers to continue to carry the venture forward. This was subsequently confirmed by CSIRO, who tried to rescue the project's and CSIRO's image by pointing out that "relationships with [MIM and UBE] was [sic] most cordial", and that the companies' withdrawal resulted solely from their "move back to their core business" (letter to the Editor, Canberra Times, 19 July 1994 from W J Land, Commercialisation Manager, CSIRO Institute of Minerals, Energy and Construction). This breakdown came after what the thesis clearly describes as very promising developments over the couple of years examined in the analysis, and just nine months after a glowing report on the venture to the Australian government. Investigating details of the breakdown and the extent to which it really did stem from nothing more than MIM's and UBE's reconsideration of their business priorities, would be a most worthwhile extension of the analysis in this thesis.

ium metal industry;<sup>3</sup> QMC are also developing, through different R&D/technology-acquisition channels, other value-added applications for magnesium, in areas like pharmaceuticals, environmental processes and manufacturing processes.

One reason magnesium has not previously found wider use is the inconvenient and expensive paths for producing the metal to high levels of purity from the several different feedstocks. QMC's possession of an accessible, uniform, high-quality supply of magnesite would be a powerful point of leverage. QMC's investigations showed the cost of metal production would compare favourably with that for other sources.

QMC was faced with the choice of whether to exploit this resource through selling it outright, entering into a joint venture with one of the three main international conglomerates in the magnesium metal industry, or taking steps to establish a major magnesium metal industry in Australia, independent of the present major conglomerates.

The company never seriously contemplated the first of these routes, which would have been incompatible with the philosophies of the company's founder (and continuing leader), QMC A. As he put it,

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<sup>3</sup> Much of the drive for growth of this industry comes from the car industry's resolve to save energy and reduce emissions through reducing vehicle weight. Magnesium metal is strong but a third the mass of than aluminium and much lighter than steel. "By the end of this century, ... the annual demand for magnesium will be equal to 5 times the currently installed Western World production capacity" (QMC's February 1991 Proposal To Establish a Magnesium Metal Industry for Australia).

It's the easy way to go - to dig it (raw magnesite) up and flog it around the world. We think we can do better and get the industry here [feature article in Brisbane Courier-Mail newspaper, 26 June 1991, quoting QMC A].

For about three years QMC examined possibilities for the second route (a joint venture with one of the existing conglomerates). However it eventually became clear that, at least for the next several years, none of these groups' plans for developing their worldwide magnesium business would come together with QMC's aims.

So QMC set about planning strategic development of an Australian magnesium-processing industry. Technology for handling the special processing needs of QMC's resource would be needed, especially in view of Australia's then "virtually unknown" acquaintance with "[m]agnesite processing ... for the production of high-grade refractory magnesite or the production of magnesium metal" (QMC A's address to Industries Assistance Commission conference on value-added mineral processing, Sydney, 22 March 1991). CSIRO's services would be required to develop such technology. QMC had already commissioned research from CSIRO even while they were negotiating with the existing players, on the basis that at very least this would strengthen their negotiating position.

QMC sounded out Japanese companies interested in collaborating in development of the requisite technology and of the industry. But QMC were concerned about Australia's loss of control of this potentially strategically invaluable resource. Unless Australia agreed to take certain action, involvement of Japanese companies would "lead to the ultimate techno economic control of the project passing to Japanese industry" (29 November 1990 letter from QMC A to CSIRO A). Accordingly QMC, in partnership with their contacts in CSIRO, took two steps.

First, they approached Australian mining/mineral companies with the capacity to participate in developing the resource. MIM Holdings became a member of the joint R&D venture, and will become one of the two main players in the intended production joint venture from the mid-1990s.

Second, they won over CSIRO's then Chief Executive and a number of key Ministers, obtaining their support for a concerted national effort to develop the necessary technology and the industry. Much of the advocacy to this end was carried out by QMC and three CSIRO/SIROTECH people: CSIRO B, CSIRO C<sup>4</sup> and the SIROTECH project director whose responsibilities were the commercial dealings of this CSIRO Institute (see list of those interviewed, at the end of this description). The federal government agreed in late 1991 to inject \$20 million directly into the venture, through CSIRO. The Queensland State government had previously agreed to invest \$5 million, also through CSIRO.

It was evident from the outset that a company (necessarily a foreign company) with experience relevant to the downstream magnesium metal industry must also be involved: even if this could not be one of the three main existing players in this industry. All the Australian partners wanted the Japanese company UBE Industries involved in this capacity; their knowledge of magnesium casting, gained initially

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<sup>4</sup> Strictly speaking it is incorrect to term CSIRO C a *CSIRO* character, because he had become something else shortly before the interview. But this terminology is probably close enough in the interest of simplicity, and in any event CSIRO C's social and cultural experiences and orientations derive largely from his long employment in CSIRO.

through the production of casting and related machinery, would be invaluable. UBE is "regarded as somewhat of a guru in the magnesium field by a number of major Japanese companies including Nippon Steel, Kobe Steel, and Toyota" (3 June 1991 file note by SIROTECH). Negotiations with UBE, which had begun in the late 1980s, firmed up over 1990 and early 1991.

Out of these negotiations, there emerged an unincorporated R&D joint venture, which will in due course provide the basis for a production joint venture. The R&D venture involves QMC, CSIRO, MIM and UBE, who had agreed to enter the venture when the Australian government's support and funding became known. The arrangement hinges on CSIRO C as the research manager, an overseeing management committee, and an "evaluation group" providing guidance to CSIRO C. The management committee and the evaluation group consist of representatives of the parties. CSIRO C and the evaluation group are the day-to-day guiding forces on the venture. The commercial entity which will later exploit the technology and know-how in the production-stage venture will be 45% owned/controlled by UBE, 45% by MIM and 10% by QMC.

The partners all had their own distinctive inputs to offer and all lacked, for the most part, the skills and experience the others could offer. QMC had the mineral resource and the motivation and entrepreneurial skill to initiate the arrangement. CSIRO had the capacity to develop the platform of technology for the project, as well as a product champion (CSIRO C) committed to working with QMC to develop the arrangement. MIM had the requisite experience building, commissioning and operating mineral-processing plants. UBE had the downstream industrial and marketing experience.



R&D valued at \$50 million, including construction of a \$37 million semi-commercial-scale pilot plant due to be operating in mid-1996, was to be undertaken over six years. Half the funding was to come from government (see above), and the other half from the commercial partners. Most of the research would be done by CSIRO. Initially four research contracts were awarded, two of them to two different CSIRO divisions, another to MIM's laboratories, and the third to a university group. By mid-1993 40 scientists/engineers were working on the project, and 44 contracts of various types had been entered into (interim report to Australian government by CSIRO C and SIROTECH, 20 August 1993).

The consortium had high hopes indeed for the mark it would make on the worldwide magnesium metal scene. As SIROTECH said,

Reflecting upon the resources which the CSIRO/QMC/MIM/UBE association can harness, I felt that the other players in the world magnesium industry will be quite shaken because our grouping will be strategically strongly positioned [file note written soon after SIROTECH's September 1991 visit, with QMC and MIM, to UBE].

The preceding discussion flags one key source of stimulation for establishing and developing the MMP arrangement: *a strong and clear, unified, collaborative Australian approach*. This was highlighted by a number of the participants, who attributed it to various factors. Political Staffer, for instance, attributed it in large measure to the values of the key players: in particular the QMC people's commitment not to sell off their property at the maximum profit, but to maximise national benefit. He traced this to an emergence in Australia over the past few years of

a group of business executives ... looking beyond simple commercial parameters ... [They], as well as being businessmen, are parents of young Australian children, and want to ensure there's something left for their kids in this country. ... As the problems get worse ... there are more businessmen who are thinking [beyond] the immediate short-term return on the dollar [interview with Political Staffer, Parliament House Canberra, 11 September 1992].

Within this strong national approach, undoubtedly *the support of the Australian government* was most influential. A number of considerations contributed to the government's enthusiasm. These included the then Minister for Industry, Technology and Commerce's respect for such an influential and respected Japanese company as UBE and for the creative cultural mix that was the very basis of the arrangement (reported by SIROTECH and MIM A, interviews, SIROTECH Melbourne, 14 August 1992, and MIM Brisbane, 22 September 1992 respectively), and the government's respect for MIM's opinion. A number of the informants and the written material described how the government, being aware that MIM had not been involved in the preliminary work on magnesium metal in the late 1980s, used MIM as a sounding board on how worthwhile the project really was. This is reflected in government officials' stated views on the project at the time:

I feel confident that the best technology will be chosen for Australia. MIM have been undertaking their due diligence investigations independent of QMC/CSIRO. They will not be putting their money on a process that is not in their best interests [August 1991 letter from assistant Secretary, Resource Processing Branch, Department of Industry, Technology and Commerce, to Assistant National Secretary of the Metals and Engineering Workers' Union].

SIROTECH and the QMC people explained how important it had been for the political circumstances to be 'just right' for MMP. SIROTECH described the expectations the government has of CSIRO in connection with major industry-development ventures like this one. While the

partners were seeking the government's go-ahead, the government was at the same time seeking this sort of input from CSIRO/industry; in essence they were asking "Where's the next one?" (interview with SIRO-TECH, SIROTECH Melbourne, 14 August 1992). QMC B, in discussing the government's decision to inject \$20 million, observed that this project just happened to have been in the right place at the right time:

At the end of the day, it could have been anything; such was the government's need to be seen to be doing something creative about generating employment. There was nothing intrinsic about this project.

The timing of the government's decision to fund the venture also played an important part vis-a-vis UBE's involvement. As MIM A said (interview, MIM Brisbane, 22 September 1992), "UBE felt that this thing was moving away and were trying to do a catch-up just as we were trying to catch them ... Sometimes you get lucky".

Within this favourable climate, co-incidence and fate were all-important: certainly they were important in attracting MIM to the venture. This is shown by MIM A's experience (reported in interview, MIM Brisbane, 22 September 1992). When he arrived at MIM with a business-development responsibility in late 1990 he had decided to go back through four new-business possibilities all of which had been rejected prior to his arrival; one of these was the magnesium metal project. Had MIM A not thus revived it and subsequently pushed it hard, it is unlikely that the project would have reached its present status.

Notwithstanding the well defined, discrete domains of each partner and the excuse two of the parties (UBE and MIM) might have for regarding themselves as outsiders, all four partners seem to take pride in their

*approximately equal status, role and involvement in determining the arrangement's direction and priorities.* And a number of informants described steps taken by the one party whose status as a 'full' contributing member of the interface seems to have been threatened from time to time (MIM), to guard against this coming about; these steps are discussed below.

This pluralistic basis of the interface is complemented by a widespread *understanding of the other parties' aims and expectations.* A good understanding between CSIRO and QMC, for instance, had been encouraged by the intimate contact between these two parties over several years, which had taken place in the course of extensive international contact with potential partners, CSIRO's performance of contract research for QMC, and CSIRO's shareholding in QMC and membership of the company's board (interviews with QMC A and B, QMC Brisbane, 22 September 1992; CSIRO B, CSIRO Corporate Centre, 4 November 1992; and SIROTECH, SIROTECH Melbourne, 14 August 1992).

But at the same time MMP featured serious misunderstandings between pairs of participants. MIM A described misunderstandings between MIM and UBE, for instance (interview, MIM Brisbane, 22 September 1992), about UBE's involvement. These centred on UBE's understandings early on that they were entering only a production joint venture, not a marketing joint venture, and that they were gaining at least part of the action as operator of the production activity. UBE, in MIM A's words, originally had wanted "somewhere to go and get metal from, somewhere cheap; Japan was their market. If we wanted to come in there, we would have to fight them for a share of the market place." UBE had understood that they could have the Japanese market.

But according to MIM A, this was intended to connote "in partnership with the Australian partners"; UBE had not understood this. The Australian partners told UBE

For every ton of metal you sell, 45% of that is going to be yours, 45% MIM's and 10% QMC's. ... They went into shock. ... They said "But we've got it already. We own the market; why should we give it away for nothing?" [interview with MIM A, MIM Brisbane, 22 September 1992].

As persuasion, the Australian partners undertook to help UBE in other parts of the world: in particular through MIM's business links with Europe and QMC's with North America. According to MIM A, UBE at first resisted this, still on the ground that their market was Japan and Japan alone, but they are now well on the way to thinking globally.

MIM A discussed the original misunderstanding about UBE's involvement in operating MMP's production activities: "UBE also had the view that they were a bloody good operator", said MIM A (interview, MIM Brisbane, 22 September 1992). But MIM had been identified by the Australian partners as the operator. This impasse was resolved by MIM conceding some role for UBE in the operating arrangements. "They are in there [in this capacity]. ... The trade-off is the global marketing." It is interesting that it was not only MIM who misread UBE's understandings; they were misread in exactly the same way by QMC as well (interview with MIM A, MIM Brisbane, 22 September 1992; corroborated by a number of other interviewees).

Resolution of these misunderstandings between MIM and UBE is an outstanding example of the *compromises, trade-offs and sacrifices* that were a feature of MMP. UBE were prepared to sacrifice something they highly valued (their position of strength in the Japanese magnesium

market) for a 'slice of the action' in operating the Australian production activities. MIM were likewise prepared to sacrifice part of their main role in the arrangement (operator of the production activities) in order to gain the joint venture a genuine role in the Japanese market. As SIROTECH said,

It was evident in all activities that the atmosphere of mutual trust and goodwill promoted by QMC was yielding returns. Both MIM and UBE expressed and demonstrated willingness to understand and accommodate the intent of the other ..., and to explain their own intent [16 April 1992 memorandum from SIROTECH to CSIRO B].

At the same time other parties were compromising and sacrificing things through participating in the venture. A number of informants, including CSIRO C himself (interview, CSIRO Port Melbourne, 14 August 1992), pointed to what CSIRO C was risking by taking on his role in this venture, while a number of informants including SIROTECH and Political Staffer (interviews, SIROTECH Melbourne, 14 August 1992; and Parliament House Canberra, 11 September 1992 respectively) highlighted the massive immediate financial return QMC was sacrificing.

These compromises, trade-offs and sacrifices in turn reflect both MMP's rapid development of a 'bullet-biting' spirit through *addressing problems* as they arise, and a *spirit of helpfulness*. SIROTECH identified these (interview, SIROTECH Melbourne, 14 August 1992) as two of the main ingredients in the arrangement's success. He noted that for some partners (notably UBE), this problem-solving spirit required abandonment of a strong traditional dogmatic approach to conflicts.

This 'give-and-take' and the open attention to problems as they arose seem to have been encouraged by the QMC people's resolve to *reconcile*

*the diverse cultures* in MMP. QMC's 'culture-brokerage' role was described by a number of informants, including QMC B. This role contrasted with the attitudes of both MIM and CSIRO C who, according to a number of informants, were both inclined to emphasise intercultural differences. Evidence already quoted suggests that this outlook held back the interface's development at various times.

As with DUNLENA (see preceding description), *trust and distrust* were important in MMP, and were addressed by most participants. MIM A, for instance, gave a lengthy account of circumstances surrounding his information-gathering trip to the USA in March 1991. MIM's intention was simply to get completely up to date with international developments in the magnesium industry. QMC showed their distrust by contriving to get one of their people to accompany the MIM people. According to MIM A, QMC became "very jittery"; they displayed "a hustle and bustle of energy ... to try to secure a negotiating position". After the team returned to Australia,

I got a very curt phone call ... on this due diligence North American thing, from [QMC B], saying "We believe you guys are not serious ... you're not interested, we don't want to be messed around." I said "No; you've misheard all of that ... We are interested; we're just taking due diligence. We're just looking at all alternatives and all opportunities" [interview with MIM A, MIM Brisbane, 22 September 1992].

Distrust was far from restricted to the MIM/QMC relationship. MIM A explained its impact on the UBE/MIM relationship.

Things have now settled down. UBE really trusts MIM now, but we are very sensitive to this balance thing all the time in the trust. ... [UBE] sees that MIM should not take a predominant role; and nor should UBE. They actually prefer CSIRO to have a predominant role, because that means there's a counter-balance to MIM. They're fearful of MIM grabbing this thing. ... Even as a second string, they

prefer QMC to have a role [interview with MIM A, MIM Brisbane, 22 September 1992].

The secondment of technical people from each of MIM and UBE onto CSIRO C's evaluation group also initially raised questions of distrust, with a lot of speculation and accusations about "spies" and "mistrust" (as reported by a number of interviewees, including CSIRO C, MIM A and QMC B, interviews, CSIRO Port Melbourne, 14 August 1992; MIM Brisbane, 22 September 1992; and QMC Brisbane, 22 September 1992 respectively). Eventually, however, all parties claimed to accept that these secondments were aimed mainly at helping to achieve the joint venture's aims and openly developing the interface.

Ultimately trust seemed to feature in MMP more than distrust. And often this trust seemed to be embodied in quite extreme sacrifices of the type already referred to. Both MIM A and SIROTECH described concessions by UBE, for instance, which went far beyond actions they strictly needed to take. MIM A described how UBE "are well on the way to thinking globally ... and have told Ford Detroit [for instance] that if they are interested in learning more about casting magnesium they should go and talk to UBE's Australian partners" (interview, MIM Brisbane, 22 September 1992), while SIROTECH also described a classical extra-contractual offer from UBE:

UBE made it clear [in the course of meetings in Japan in April 1992] that it was expecting to disclose to us all its knowledge on the major commercial alloys. While we were not surprised at the substance of this, we were delighted at the frankness and willingness to cooperate this implied [interview, SIROTECH Melbourne, 14 August 1992].

A number of interviewees cast trust/distrust against the arrangement's development of strong *dyadic attraction and repulsion* between various



participants. The MIM/QMC pairing was much addressed. As implied in preceding discussion, the best description of these parties' outlook on each other is probably 'wary'. As MIM A said (interview, MIM Brisbane, 22 September 1992),

MIM's outlook towards QMC is driven by the question "If we are paying all the money, why is all the action and control sitting with them?" The culture is getting inundated with QMC thinking ... [The joint venture's] strong relationship building at the moment is with QMC, not with MIM or UBE. That's a very big risk we are taking. ... Maybe when we are up at Gladstone with an operation ... MIM will have a more prominent role.

QMC have their own views on MIM's outlook towards them. QMC A fears (interview, QMC Brisbane, 22 September 1992) that at some point in the future, MIM will "start to regard QMC as not a 'real' partner" (because they have only a 10% interest), and will start to ignore their views. This was contrasted with UBE's approach; UBE "regard a partner as being a partner: irrespective of whether you're a 10% partner or a 50% partner" (interview with QMC B, QMC Brisbane, 22 September 1992).

*The CSIRO/QMC pairing's* influence on development of the joint venture's approaches, values and norms was also discussed by a number of interviewees. MIM A described the very close and long-standing relationship between CSIRO as an entity and QMC, and between CSIRO C and QMC, and questioned how healthy these strong bonds were for the well-being of the interface as a whole:

There's almost a club within a club. You've got to guard against that ... QMC quite often say "Unless MIM and UBE develop a close relationship, this thing will never work." It's not going to work commercially with any relationship with CSIRO. That's got a limited life. At the end of the day the people who are going to have to be very confident and happy with this thing are going to be the people who are going to fund it. ... Even UBE are sitting back. It's a funny thing ... At the moment, this whole deal is really

being driven very strongly by CSIRO and QMC, because of the personalities and the stage it's at. That's going to have to change [interview, MIM A, MIM Brisbane, 22 September 1992].

QMC B (interview, QMC Brisbane, 22 September 1992) explained how QMC regard CSIRO as a family member, not a partner. He attributed this closeness largely to CSIRO's shareholding in QMC, QMC's remuneration of CSIRO's work for QMC in shares, and the Organisation's membership of QMC's board. He went on to describe the axis with CSIRO as "secure", "known", "trusting" and "safe".

Beyond this, undoubtedly QMC B sees QMC as holding a significant degree of control over CSIRO C; he laid claim in the interview to having 'educated' CSIRO C through taking him on visits to Japan and inducting him into the ways of the commercial world. He placed particular weight on a heart-to-heart talk he and QMC A had had with CSIRO C in a bar in Japan. From this talk had grown CSIRO's corporate support for concentrated national action to prevent the magnesium metal opportunity being lost to Australia. The implication was that QMC B regards CSIRO C as almost a manipulated tool of QMC, for use when it suits their strategic needs.

QMC B (interview, QMC Brisbane, 22 September 1992) described a "safe" axis being developed *between QMC and UBE*. He attributed this largely to his 20 years' experience in dealing with the Japanese. He is proud of UBE's evolving recognition of QMC's importance in creating the whole thing. "This is important to the Japanese."

The dyadic bonds between the partners flowed through to influence the physical location of CSIRO C and his evaluation group. MIM A described

the tug-o'-war that went on in deciding whether they should be located at MIM's, QMC's or CSIRO's premises in Brisbane. He was worried "that you [could] have a whole heap of engineers and scientists altogether out there, with no commercial influence" (interview, MIM Brisbane, 22 September 1992). Eventually QMC won out; CSIRO C and his team are located in the same building as QMC.

Various other important 'people links' were identified. CSIRO C (interview, CSIRO Port Melbourne, 14 August 1992) described the long-standing links between QMC B and Political Staffer, for example; they had been at university together, and as students had travelled the world together. SIROTECH referred repeatedly in his interview (SIROTECH Melbourne, 14 August 1992) to the strength of the team consisting of himself, QMC B and MIM A. A number of interviewees mentioned the successful partnership between QMC A and QMC B: the consummate salesman and the consummate strategic thinker/networker respectively.

Several of the informants pointed to the important part played by strong and influential *missionaries* for the venture, in all four partners and elsewhere. The importance of missionaries in key places *outside* the joint venture was identified by CSIRO C, among others (interview, CSIRO Port Melbourne, 14 August 1992). He pointed in particular to the reputed role of Political Staffer in engendering interest among politicians.

SIROTECH described (interview, SIROTECH Melbourne, 14 August 1992) how the effect of a missionary often extended beyond his company or agency. Missionaries sometimes had needed to approach other parties for material to support their arguments within their own company/

agency. This sometimes assisted markedly in giving the participants a sense of unity and in clarifying expectations.

Various informants described the internal corporate values and attitudes missionaries sometimes had had to fight against; often the missionary had not been able to set about mounting his arguments until he had developed the very strategy within which those arguments were to be presented and analysed. QMC B illustrated this using the challenges MIM A had encountered within MIM:

This process of [MIM and UBE] coming closer together oscillates, because of corporate changes in MIM's management. ... this oscillation is between wanting to put on the safety boots and kick [UBE] ... and "Let's be a little more sophisticated than that; these are wonderful people, and let's try to develop a strategic relationship" [interview with QMC B, QMC Brisbane, 22 September 1992].

For this reason and others, a number of informants noted how important it was that the MMP missionaries had started their work early on in the interface's lifetime, and had pursued a long-term strategy of 'conversion'.

One final factor accounts for the remainder of this description of MMP, because it is a hinge for many of the social/management/intercultural processes and events already described and for many of the processes and events to be analysed in chapters 6 to 10. This is CSIRO C's approach to managing the venture. There were very significant differences in the key participants' perceptions of *the management 'flavour' and philosophies* that came to characterise the venture, and in particular of *how effective CSIRO C's approaches to management and his interactions with the other players are*.

CSIRO C's management style places a great reliance on systems and planning. In discussing problems he had encountered, or felt he was likely to encounter, and his achievements in establishing the venture's management framework, CSIRO C continually resorted to systems-based or planning-based perspectives:

A real problem is managing the participants ... getting the participants to allow this plan to be executed. ... These guys don't realise that everything must be done at the right time; otherwise the whole thing will fall in a heap. Because they are not aware of the grand design. ... I communicate these things, but people haven't got the time [interview with CSIRO C, CSIRO Port Melbourne, 14 August 1992].

MIM has problems with the "too wooden" outlooks resulting from this emphasis; "it's all about maintaining negotiating positions. ... Everything is on bar-charts and schedules. It's almost like being run by a great big computer. It's very dehumanised" (interview with MIM A, MIM Brisbane, 22 September 1992). MIM has problems too with CSIRO C's obviously broad definition of his management responsibilities. CSIRO C adopts a "more active" role as research manager:

CSIRO's traditional role is to be controlled by industry. Industry sets the objectives, CSIRO does the research, and industry takes the results. But in this case, our role should be one that involves the responsibility of the execution *and the direction* of the R&D program [13 May 1991 letter from CSIRO C to CSIRO B].

MIM A sees a proposed restructuring of the arrangement aimed at eventually creating 'Australian Magnesium Project' as an incorporated joint venture as being all about "ensur[ing] that [CSIRO C] sticks to his research, and doesn't start running around with a vision ... looking at blocks of land and evaluating where we should put the plant ..." (interview with MIM A, MIM Brisbane, 22 September 1992).

CSIRO C's approach to management also places a great reliance on communication; time and time again in his interview (CSIRO Port Melbourne, 14 August 1992) CSIRO C resorted to better communication as the answer to real or potential management problems, including problems tied up with cost over-runs, the difficulties inherent in joint ventures, and how to implement more rigorous planning systems. Against this background, CSIRO C is disappointed with the reception given to the reports and management information he supplies. Only one participant - UBE - really reads, analyses, uses and feeds back on his detailed monthly reports to the management committee. CSIRO C appreciates the value of UBE doing this. He took great pride in the steps the president of UBE took to ensure that all his divisional heads are aware of MMP's activities and co-operating with MMP. CSIRO C emphasised the rapidity with which UBE translated, circulated and evaluated one of his proposals (for a 'front-end' pilot plant).

MIM A has an explanation for the Australian parties' lack of response to CSIRO C's reports:

We [in MIM] are used to reporting [in terms of] variances. We get [from CSIRO C] the whole box-and-dice: the good and the bad and the on-time and the out-of-time ... You get the general ledger ... You don't get a report that says "These are the exceptions to the general ledger" ... The Japanese can cope with that; ... they just read it all and ask questions [interview, MIM Brisbane, 22 September 1992].

CSIRO C's feelings about his management role and how he - with limited management experience and knowledge - moved into it, also seem to be significant in development of this interface. CSIRO C is obviously very pleased with his selection for this demanding role. While showing much doubt about whether he has the necessary experience and knowledge

to handle management of the whole venture (interview, CSIRO Port Melbourne, 14 August 1992), he showed a clear pride in the responsibility that had been given to him: a humble 'raw' research manager who gained all his research management knowledge over the preceding couple of years through 'book learning'. He seemed to see this as reflecting on his research standing and in particular on his standing as a highly focussed, industrially-aware researcher.

CSIRO C has a generally optimistic outlook on the likely long-term course of the work he is directing. He is confident that the system he had set up and the pool of knowledge possessed by the people with whom he had surrounded himself will overcome any barriers that arise. At one stage CSIRO C presented himself as an island, surrounded by (and implicitly protected by) these experts. As long as they are there to protect and guide him, he believes it would be hard for too much to go wrong with his management of the venture:

The participants knew I was floundering [early on]. As soon as I started hiring the right guys, then the right kind of signals were going out to the participants, and they all started to be pleased with my performance ... Maybe I'm being arrogant now, and maybe it will all fall in a heap, but at the moment I don't have to worry about technical details ... don't have to worry about tools of the trade to do all this ... [interview, CSIRO Port Melbourne, 14 August 1992].

Yet at the same time CSIRO C obviously feels very vulnerable. This is reflected in the emphasis he places on the availability of his 'bridge' back to CSIRO:

If I put a step wrong, they'll chuck me out. ... I take it day-by-day. ... There are all sorts of pitfalls for me. There are political ones ... There's lots of reasons I won't be here next ... I'll be back in the Division: not because of my ability but because of politics and the way things go. ... There are so many different facets to this

that it's unlikely I'll last the four years. That's why I have this bridge: one of the conditions when I took on this job was that CSIRO would guarantee me a position when I was no longer required on the project [interview, CSIRO Port Melbourne, 14 August 1992].

CSIRO C displayed a particular inclination to assess himself against the key values and norms of the completely different culture he had only recently entered. He went out of his way (interview, CSIRO Port Melbourne, 14 August 1992) to stress how rapidly he had 'slipped into' his role as an agent of the joint venture, out of his CSIRO role. He claimed that within three months, when dealing with CSIRO on behalf of the joint venture, he felt as if he had never had any personal involvement with CSIRO. Such, CSIRO C claims, is his objectivity: or rather the objectivity of his systems.

Other participants illustrated the extent of CSIRO C's shift in both activities and values/norms as he took on this role in MMP. QMC B (interview, QMC Brisbane, 22 September 1992) emphasised that when QMC had first come across CSIRO C in 1986, he had been "well and truly in the CSIRO mould". But so successfully did he take on his new role that for some years now QMC have viewed the CSIRO people, and especially CSIRO C, "as part of QMC's family ... as an extension of our organisation". SIROTECH, for his part (interview, SIROTECH Melbourne, 14 August 1992), described CSIRO C's

range of duties [as being] quite unusual for a CSIRO person in that the tasks require a range of skills normally found in commercial activities, not research activities confined to a Government laboratory. In particular I had in mind support for the in-licensing of Alcan technology, and managing the finances of the project in accordance with commercial standards ...



## Those Interviewed:

- CSIRO A:** CSIRO's Chief Executive.
- CSIRO B:** The Director of the relevant CSIRO Institute.
- CSIRO C:** A former CSIRO program manager who had recently transferred to the role of manager of the whole of this major collaborative R&D project.
- CSIRO D:** The project leader of one of the two CSIRO lines of research that were part of the joint venture's initial R&D program.
- SIROTECH:** The SIROTECH project director responsible for the commercial dealings of the relevant CSIRO Institute. He works very closely on this project with CSIRO B and CSIRO C.
- QMC A:** The Managing Director and founder of QMC.
- QMC B:** The General Manager of QMC, who has formed a team with QMC A for many years.
- MIM A:** MIM Holdings' new-business manager who was responsible for MIM's inputs to developing this project.
- MIM B:** MIM Laboratories' research director for MIM's part of the joint venture's initial R&D program (telephone interview).
- POLITICAL STAFFER:** Principal adviser to one of the Australian government Ministers whose support was crucial to attracting government interest and funding.

## INTELLIGENT INTERFACE ("I<sup>2</sup>")<sup>5</sup>

I<sup>2</sup> is a spin-off invention (also know as the "MODAC system") generated through long-standing environmental research in one Laboratory of CSIRO's Division of Water Resources. The product is an interface having many potential applications in connecting data logging equipment (measuring a range of environmental and other parameters) with the office or laboratory of the person using the data. Its use obviates the need for regular (often expensive) field trips to record data and check the status of the data loggers.

Apparently the technology is top-class, and superior to that of I<sup>2</sup>'s

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<sup>5</sup> It will be seen from this description that when most of the interview data were collected in late 1992, action was under way to sell the I<sup>2</sup> business as a going concern. While this still may eventuate, difficulties have been encountered in attracting interest from companies whose mainstream business is sufficiently close to I<sup>2</sup> to guarantee (at least in CSIRO's view) the required level of investment and commitment. Nevertheless, attempts to this end have continued and as at mid-1995 the Laboratory was still hopeful of selling the business. On more than one occasion over the previous two years or so, according to CSIRO B (see list of those interviewed, at the end of this description), CSIRO felt that nothing would be got from the I<sup>2</sup> venture, and were inclined to write it off. This was tempting since so much of the CSIRO group's effort was by then being devoted to a remotely related product that was showing even more commercial promise than I<sup>2</sup> had shown in its early life. But CSIRO persevered, and kept alive the possibility of a worthwhile scale of manufacture/marketing.

competitors; the term "years ahead" was often used by those interviewed. The system was designed to use solely satellite technology, but the facility to use the cellular telephone network later materialised; some interviewees believe that that medium will ultimately account for most applications. There is a potential worldwide market of a few thousand units for the product, which sells for just under \$2000.<sup>6</sup>

The I<sup>2</sup> venture had its genesis in a chance encounter at a conference in 1988, between the leader of the CSIRO group that had invented I<sup>2</sup> and the relevant business-development person in what was to become the Mobilesat division of OPTUS (then AUSSAT).<sup>7</sup> The personal relationship

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<sup>6</sup> As described internally within AUSSAT/OPTUS, I<sup>2</sup>:

allow[s] the transparent interface of a range of INMARSAT-C transceivers ... and major brands of data loggers used in the Australian water resources industry [12 June 1990 memorandum from OPTUS A to his superior].

As described to the public, I<sup>2</sup>

is unique because it provides connection of INMARSAT-C satellite communications to existing equipment. Cost savings are obvious with users adding satellite communications to their current systems without having to replace or modify existing field equipment. The package will service many requirements for data communications worldwide and has strong potential for overseas markets. ... [I<sup>2</sup>] can be applied to a wide range of industries, including use in disaster warning, water and energy management, river gauging, environmental monitoring, and oil and gas pipeline applications [July 1990 press release from CSIRO Division of Water Resources].

<sup>7</sup> Henceforth in this description, as well as in the analytical chapters, in the interest of simplicity, AUSSAT/OPTUS will be referred to only as "OPTUS": irrespective of which period is being discussed.

established then between CSIRO B and OPTUS A (see list of those interviewed, at the end of this description) was one of the driving forces on the I<sup>2</sup> interface over its lifetime. So was the virtual personal 'ownership' of the I<sup>2</sup> product and the venture by these individuals from the Laboratory and the company (and, to less an extent, by CSIRO B's group). The project was seen very much as the 'baby' of these people; other groups in the company/Laboratory and more senior management did not identify very strongly with the project.

This relative isolation of the I<sup>2</sup> project seemed to have much to do with not only the limited resources and other support it received, but also fundamental attitudes towards the project by participants and their colleagues and superiors; these are described below.

Commercialisation of I<sup>2</sup> was based on a memorandum of understanding entered into by CSIRO and OPTUS in 1990. A management committee with representatives from both parties would oversee the work, which would aim at developing the product to a stage suitable for it to be taken over by a licensee. This would take the product out of the interface, and indeed would terminate the interface. It was intended that this would be done within two years. The CSIRO group would then go back into its research-service mode, working on another instrument/software product, in much the same way as it had started with I<sup>2</sup> a few years previously. It would then re-enter the commercial world in perhaps one to two years' time, to commercialise *that* product through an interface with a (presumably) different partner; the group would go through cycles of commercialisation activity.

Under the I<sup>2</sup> agreement, CSIRO would contribute the R&D inputs (as well

as the original technology), which would account for about one-third of the time of the relevant CSIRO group. OPTUS would pay cash to CSIRO for some of that R&D. OPTUS would also inject the commercial skills required.

The initiative for actually getting the arrangement under way was reported to have been more OPTUS's than CSIRO's. OPTUS were interested in a product like I<sup>2</sup> as leverage for marketing their communication services, including their own satellite which had been programmed for launching a couple of years after the initial contact with CSIRO.

This flags a social/intercultural factor that was germane to development of the I<sup>2</sup> interface: *differing understandings of the project and its basis*. CSIRO always saw I<sup>2</sup> as a free-standing product; many of the I<sup>2</sup>s sold would be used on the INMARSAT satellite that was a rival to OPTUS's own forthcoming satellite. OPTUS, though, always looked to I<sup>2</sup>'s marketing-leverage value; OPTUS's involvement in the arrangement was always driven largely by the timing of its OPTUS B satellite. As CSIRO C said (interview, CSIRO Black Mountain, 28 August 1992),

Any application identified is being either slowed down or speeded up so that its introduction will coincide with the early operation of the satellite. Every time we sell a MODAC in Australia, OPTUS sees that as a potential customer they've lost because it's gone to INMARSAT ... .

This led to marked differences between CSIRO's and OPTUS's marketing priorities. As SIROTECH said (interview, SIROTECH Melbourne, 14 August 1992), "We [that is, CSIRO] got our money from the sale of the device; [OPTUS] got their money from the sale of traffic *and* the device." The dilemma this posed was described by CSIRO A. CSIRO

would wish that I<sup>2</sup> achieve the greatest degree of market penetration and the widest distribution ... [W]e see it as desirable that there be no limitations as to who might have access to the technology; nor would we desire to see any restrictions on the communications systems to which it might be applied. ... However we recognise that [OPTUS] has some sensitivities in this area and also some justifiable reservations in terms of having the technology readily available to a direct competitor [30 August 1991 letter from CSIRO A to a senior OPTUS manager].

CSIRO C graphically described the effect of the differing comprehensions on motivation and drive for the project:

It's a strange situation where you're always putting in something for a demonstration and you think "This could really go", and then OPTUS say "All right: [just] another demo" [interview, CSIRO Black Mountain, 28 August 1992].

Coming on top of these differing comprehensions of the project was *OPTUS's inability to inject the manufacturing and product-marketing expertise expected*: as opposed to commercial skills and know-how about communications systems (especially satellite systems), which the company *was* able to supply. This inability resulted partly from a waning in OPTUS's motivation for the product, with their assumption of the role of Australia's second national communications carrier, and with political pressure on the company to concentrate on that role.

Consideration was given to involving a third party to inject the missing commercial skills and perspectives. But eventually CSIRO concluded there was no alternative to the CSIRO group itself developing and applying the commercial expertise that in a more traditional situation would be provided by the commercial partner, and to develop and make the first few I<sup>2</sup>s. This they did in early 1991. A manufacturer was engaged to manufacture the first few dozen I<sup>2</sup>s under contract in late 1991. At the same time agents were engaged by CSIRO in various parts

of the world. All this was aimed at developing not only the product but also the I<sup>2</sup> business, for sale as a going concern in late 1992/early 1993 (after most of the data for this study were gathered).<sup>8</sup>

A number of the informants noted how readily the CSIRO group had acknowledged that the combination of OPTUS's conflicts of interest and changing role prevented OPTUS from meeting its obligations under the arrangement. The feeling reported by CSIRO B, supported by other informants, was a combination of frustration and challenge, with the latter rapidly overcoming the former. The CSIRO group just got on with things in the face of OPTUS's inability to deliver.

OPTUS A reported (interview, CSIRO Black Mountain, 20 August 1992) that OPTUS's senior management had been struck by the additional tasks the CSIRO group had taken on to cover what OPTUS proved unable to do. CSIRO B reported (interview, CSIRO Black Mountain, 26 August 1992) that CSIRO management, for its part, was surprised by how prepared OPTUS management were to place OPTUS's interests in the project in CSIRO's hands. OPTUS A attributed the interface's flexibility which had enabled it to remain in existence in difficult times, to this degree of understanding and trust.

This discussion serves to identify another important factor in the development of the I<sup>2</sup> interface as a social group: the CSIRO group's *attitudes* towards the venture, and in particular towards the mode in which CSIRO was to contribute. The CSIRO group had a strong wish itself to take its products a long way along the commercialisation road;

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<sup>8</sup> For update, see the footnote attached to the sub-heading of this description.

undoubtedly this would have happened to a large extent even had OPTUS been able to provide, and committed to providing, commercial inputs. This was clear from CSIRO A's description of the Laboratory's philosophy when it comes to developing products like I<sup>2</sup> for commercial use:

There's only one way ....: to carry the thing further forward and put it into a situation where [full commercial] assessment can be made in a reasonably objective fashion ... CSIRO divisions will have to face up to this and act accordingly [interview, CSIRO Black Mountain, 26 August 1992].

So although CSIRO had limited knowledge of the commercial side of instrument/software development they were most keen to learn, develop and apply the best approach available. The OPTUS group had neither much knowledge of the area nor any great desire to develop the interface's knowledge or its ways of operating. Under these circumstances it should not be surprising that the system of values, norms and ways of behaving adopted by the interface owed little to either the Laboratory's or OPTUS's cultures.

Rather (as reported by OPTUS A and CSIRO B, interviews, CSIRO Black Mountain, 20 August and 26 August 1992 respectively), the interface (and this largely meant the CSIRO group, with moral support from OPTUS) used SIROTECH's advice and the group's contacts in the instrument/software industry, to gain not only the commercial/manufacturing/marketing know-how needed, but also the accompanying system of values, priorities and norms, *from best-practice instrument/software industry*. The consensus is that the interface succeeded in establishing in this way at least a rudimentary cultural base suitable for pursuing commercial activities.



The readiness with which the CSIRO group had been able to develop and apply the necessary product-development perspectives and know-how was seen by the CSIRO informants as denying commonly perceived differences between the research and the commercial product-development cultures. All three CSIRO interviewees asserted that CSIRO people *can* perform as well as business people when it comes to commercial R&D activities.

Thus CSIRO C downplayed differences in the ways business people and CSIRO people think and behave. CSIRO people are as able and willing as the next person, said CSIRO C (interview, CSIRO Black Mountain, 28 August 1992), to adopt common business ploys like making one's business appear larger, more important and better established than it is, masking product shortcomings, and compromising in the interest of commercial necessity.

CSIRO B similarly undermined claimed distinguishing features of technology-using industry (interview, CSIRO Black Mountain, 26 August 1992), describing many business people as "not very adventurous", "frightened of getting into overseas marketing", suffering from a "cringe mentality" and "retreating from a situation".

Notwithstanding OPTUS's limited contribution, the  $I^2$  interface remained in existence through 1991 and 1992, partly to continue to exercise oversight of  $I^2$ , but also to oversee CSIRO's work for OPTUS on developing other applications for the technology underlying the  $I^2$  product. But because of both OPTUS's limited inputs and the implications of the company's changing role at the national level, OPTUS's part in the interface changed over this period from a collaborator and active partner to an arm's length customer of CSIRO. OPTUS gave its

half of the I<sup>2</sup> business to CSIRO (although OPTUS still own 50% of the industrial property generated through the venture).

These observations highlight the *flexibility* of the I<sup>2</sup> interface, and in particular the string of *compromises or principle-bending* by both parties, but especially the CSIRO group. These were described by both CSIRO B and CSIRO C. CSIRO B sees the ability to bend one's principles in a sensible way as the hallmark of "someone who is good at making the transition from research to industry". But

It's a balancing act: you must get [the industrial partner's] needs met without compromising significantly the product. You then have to work through what is meant by "compromising the product" [interview, CSIRO Black Mountain, 26 August 1992].

CSIRO C showed himself to have a much more liberal outlook on compromise than CSIRO B:

I'm the sort of person if you ask me to do something, I'll do it. I don't have too many principles. ... There are certain things ... in private industry ... if you want to make it, you've got to do ... You can't get a new product on the market and say "It won't quite do this", [or] the word will get around that it's not reliable ... Even though you are working for a research organisation, you have to think of yourself as a business ... There are times you're out in the field using the equipment and it locks up. You think "Useless bloody thing". But you can't ever let on to the person out there ... If you want to sell them, you want to make the money, you've got to make it look ... good [interview, CSIRO Black Mountain, 28 August 1992].

Underpinning the compromises and concessions were the twin factors of *power and knowledge*, interplay of which was especially significant in this interface. The CSIRO group initially did not have the knowledge necessary for effective performance of the role they were forced to play (although not all that reluctantly) when OPTUS's limited contri-

butions became clear. But they soon set about locating sources of that knowledge and acquiring it: from their observations, through instruction by SIROTECH and otherwise. All three CSIRO interviewees pointed out with much pride how fast and how thoroughly the CSIRO group had acquired the requisite level of commercial know-how and thinking.

This breadth of contribution by the CSIRO group inevitably gave the whole arrangement a power imbalance in favour of CSIRO. Previously, the power balance had probably been towards OPTUS. OPTUS had originally been assumed by both parties to have unique knowledge that was to play an important part in driving the venture. They also largely controlled the purse strings; as OPTUS A said, however frustrated CSIRO might have been about OPTUS's failure to contribute what they were supposed to, that frustration could result in little action "because of OPTUS's power as the provider of significant research funding. Under these circumstances, you don't chide your partner" (interview, CSIRO Black Mountain, 20 August 1992).

Under this changing balance in power and knowledge, it is not surprising that OPTUS had a diminishing say in how the venture was to operate and the direction it should take. OPTUS was not able (for example) to convince the interface to pursue the intense 'no-expense-spared' approach to developing the product which OPTUS B described (interview, OPTUS Sydney, 6 August 1992) as OPTUS's preferred approach. By the time most of the data for the study were collected in late 1992, the OPTUS group had been marginalised so much that its main involvement was in collaboration to develop alternative applications for the technology on which I<sup>2</sup> was based.

This is not to say that the OPTUS group resisted their relatively limited role over most of the interface's lifetime. They, as much as CSIRO, accepted that OPTUS's conflicts of interest and evolving role at the national level dictated that they assume a secondary role in I<sup>2</sup>. This flexibility and willingness to compromise seems to have been encouraged by *the unusually low commitment to the project by at least some levels of the respective parties' management.*

*OPTUS management's* approach (and it must be understood that the I<sup>2</sup> project was a responsibility of OPTUS's Mobilesat Division which at that time was concerned about carving out its own future and its mainstream products) was described by OPTUS A (interview, CSIRO Black Mountain, 20 August 1992). OPTUS management tended to put someone to work on something and then forget about it; according to OPTUS A, management tended to show an interest, and implicitly to add its value to OPTUS's work, only "when the revenue stream comes in". OPTUS's management was therefore remote from actual product-development activities, and took virtually no responsibility for furthering the project at more senior levels in the company. As OPTUS A said (interview, CSIRO Black Mountain, 20 August 1992),

It was all like "Go and play in the yard and see what comes out of it"... Accountability is still non-existent; they just don't want to take decisions on certain things ... It was bureaucracy; it was all reporting, and consensus and recommendations, suggestions to the next level up. There was never any decision-making exercised at the various levels ... The place was full of 'yes-men'; because it was a real 'God-hierarchy'... through to my superior ... he was always manoeuvring certain aspects of the program in the hope that it would meet with his boss's approval. It was never "I'm taking responsibility for this ...".

It was suggested by both CSIRO B and CSIRO C (interviews, CSIRO Black

Mountain, 26 August and 28 August 1992 respectively) that this limited management support, while perhaps encouraging flexibility and compromise, reduced trust and understanding between the partners, and probably ultimately had a significant detrimental impact on the interface's effectiveness.

OPTUS management's limited support was exacerbated by the OPTUS team members' generally conservative approach to the venture. Not only was OPTUS A (the main manager through whom OPTUS's inputs were channelled) incapable of engendering any real enthusiasm for the venture in OPTUS, but he was also devoid of initiatives that might have helped the interface cope even better than it did with OPTUS's changing role in the venture and its failure to deliver what was expected. All the initiative to redress the void in commercial inputs, for instance, had to come from CSIRO (interview with OPTUS B, OPTUS Sydney, 6 August 1992). It almost seemed as if OPTUS's initiatives in the venture both started and finished with inauguration of the arrangement.

*CSIRO's senior management's* variable support for the project was described by CSIRO A (interview, CSIRO Black Mountain, 26 August 1992):

There is a conflict in divisional approach to what the group is doing. There isn't a clear-cut acceptance or acknowledgment of the role ... While the Division management is keen to get a nice warm glow from being associated with success in the marketplace ..., they are not convinced that [commercialisation] is an appropriate activity. I think that applies to [the Institute director] as well. ... they are nervous about the degree of resources that have to be committed to it, and I'm sure that if they could get out of it they wouldn't do it. ... On the one hand the Board and the government says that CSIRO has to be out there doing more development and more commercialisation ..., not necessarily knowing what it is that they're saying has to be done. ... Yet we don't seem to be quite going all the way.

By contrast, one manager/leader in CSIRO whose support was unswerving is the group leader, CSIRO B. His leadership of the group and his provision of the climate necessary for pursuit of what was undoubtedly a most unusual role for CSIRO played a definitive part in the venture's achievements. All the CSIRO informants described CSIRO B's philosophy in managing the group as the provision of *opportunity* to allow individuals to show their *initiative*. CSIRO B himself described his

basic belief that most people have the capacity; it's the opportunity that's missing. ... If the opportunity is given, most people ... produce more than they thought they were capable of doing [interview, CSIRO Black Mountain, 26 August 1992].

CSIRO B made it clear that he believes that this philosophy extends to moving into new areas: not just to becoming more expert in one's existing area. CSIRO C attributed most of the group's success and cohesiveness to CSIRO B's provision of this initiative and opportunity for everyone in his group. CSIRO C described CSIRO B as "a rare manager", and attributed this to the fact that "He's like us: he's been where we are" (interview, CSIRO Black Mountain, 28 August 1992). CSIRO B amplified this observation by describing his experience in CSIRO. He noted (interview, CSIRO Black Mountain, 26 August 1992) that he is one of few people (if not the only one) ever to have progressed through every one of CSIRO's tradesman, technical assistant, technical officer, senior technical officer and experimental officer classifications.

Complementing the attitudes and approaches by the various levels of CSIRO management described above, were attitudes of frustration, jealousy and selfishness towards the venture from *the group's fellow groups in the Laboratory*. These were described by CSIRO B (interview, CSIRO Black Mountain, 26 August 1992):

Nothing we do here - no matter how well we do it - does anything for those people [in and leading other programs/projects] ... other than perhaps take resources from their work. Any success in CSIRO which attracts funds ... tends to get a negative reaction from all non-participating staff ... This is undeniable; it will stand any test ... [This leads to] more than a bit of hostility and jealousy. ... We've had to do what we've done despite our colleagues to a large extent. When they're put in a corner, you might get them to express some good things, but it's mostly snide, smart remarks ... There has [also] been some frustration because people perceive - probably correctly - that they can't get their work started because [the group concerned] is committed to I<sup>2</sup>. ...

#### Those Interviewed:

- CSIRO A:** The then Assistant Chief of the Division concerned. (He was also Officer-in-Charge of the Laboratory concerned, which is located in a different city from the Division's headquarters.)
- CSIRO B:** The leader of the group responsible for I<sup>2</sup>, which is an instrument-development group serving the whole Laboratory.
- CSIRO C:** A senior member of the group: an electronics engineer.
- SIROTECH:** The SIROTECH project director responsible for the commercial dealings of the CSIRO Institute in which this Division is located.
- OPTUS A:** OPTUS's main person working on the project with CSIRO; a business-development/marketing person located in the Mobilesat division of OPTUS.
- OPTUS B:** An OPTUS technical person advising OPTUS A on I<sup>2</sup> on a part-time basis.
- OPTUS C:** OPTUS A's and OPTUS B's boss, who arrived at OPTUS only within the several months prior to the data-collection for this study, and who was able to provide few relevant perspectives.

## SIROSCOUR

Over many years up to the mid-1980s, CSIRO's Division of Wool Technology had developed outstanding technological know-how on multi-stage wool scouring. The technology was not, and arguably could not have been, patented. In 1987, the Division advertised for a licensee to commercialise the product based on this know-how: SIROSCOUR. SIROSCOUR is a major piece of industrial engineering; each SIROSCOUR line would cost around \$2 million to install.

The many expressions of interest received were narrowed down to 20, one of which was from the New Zealand company Annett & Darling (A&D), which has a proven international track record in the area. Another was from a small Australian scouring equipment manufacturer, Dysons. Dysons was in the process of being taken over by three former CSIRO people who at the time either had recently left the CSIRO Division (in two cases) or were about to leave (in the other case). Most expressions of interest were, however, from small Australian engineering companies inexperienced in this industry.

The choice of licensee was made on a systematic and apparently professional basis. At the time, CSIRO's move towards more direct and more forthright support for Australian industry (see the preamble of the thesis) was in full flight, and various relevant policy edicts had been issued by the CSIRO Corporate Centre. This Division interpreted these as meaning that at almost any cost they should choose an Australian company as their commercial partner for this project, so A&D were not included on the short-list. Dysons also missed out, apparently because of their limited record in engineering design and installation of *whole equipment systems*: even though they possessed much



scouring know-how and experience, and a solid record of designing and building components for scouring lines.

Process Design & Fabrication (PD&F) came successfully through this selection process. This company had a record of success in relevant engineering design, installation and commissioning jobs; most of the projects they had handled had been between about \$3 million and \$5 million in value. They had shortly before earned plaudits for their work on a new production line at a confectionery plant. But PD&F had little experience in taking technology from a pilot or laboratory scale, rather than from a prototype stage, *and* no experience in the wool-processing industry.

In 1989, PD&F entered an agreement to develop and install the first SIROSCOUR line in the plant of a scouring operator, Greenfields. Greenfields was based on the experienced wool-handling (but not wool-processing) company Bloch & Behrens. The Australian Wool Corporation (AWC) had taken a minority but very substantial shareholding in Greenfields. This placed AWC in the unusual if not unique position of an industry/government research-funding body with a shareholding in a commercial 'partner' of CSIRO (see following discussion) that was playing a central role in commercialising technology the generation of which AWC had funded.

The SIROSCOUR arrangement was poorly documented by the standard of CSIRO commercialisation ventures. This was partly attributable to absence of an agreement between CSIRO and PD&F covering this specific venture (although there was, of course, the more general licensing agreement between the two), and absence of an agreement between CSIRO

and Greenfields. The only formal agreement immediately driving this arrangement was between Greenfields and PD&F.

But even allowing for this unusual triangular arrangement, SIROSCOUR was notable for its relative lack of specification of responsibilities, obligations, expectations and procedures for resolving differences. This looseness perhaps reached its extreme in the failure to document even what it was that was being licensed to PD&F. As CSIRO B (see list of those interviewed, at the end of this description) said (interview, CSIRO Geelong, 13 August 1992),

What we had to sell was a know-how package, which is fairly difficult to define exactly what it contains ... We went into quite a bit of detail in trying to explain that. Now whether our two partners fully understood what it was about I really can't answer, but my feeling was that they did...

Over a period of some 18 months PD&F failed to put into place an effectively operating scouring facility for Greenfields, mainly because of ineffectual tackling of development and installation of the ancillary equipment (driers, feeders, separators, openers). Although this equipment was critical for operation of the whole scouring line, it was not a central part of the scouring process per se, and not really part of SIROSCOUR. It could have been bought 'off the shelf', but PD&F wished, as a strategic move, to develop the whole line 'from scratch'.

This directs attention to one notable feature of this interface: *the parties' widely differing conceptions of the project, and of what needed to be got from it.*

While the goal of the venture at the broadest level - to develop, install and commission an effective SIROSCOUR line in Greenfields' plant - was shared between the parties, the next level of goals reveals important differences. CSIRO's aim at this level was to have a scouring line that demonstrated as clearly as possible SIROSCOUR's capacity and quality. Greenfields' aim was to have a line that produced the highest quality scoured wool; to Greenfields, the 'generalisability' of the technology and the discreteness of the SIROSCOUR technology on which it was based were of little importance. PD&F's aim at this level was to build a line that would be seen as a successful PD&F product. Their name should appear on every piece of equipment: not only the equipment that constituted the central scouring process, but also the driers, separators, openers, feeders and similar ancillary equipment, mentioned previously.

All informants discussed determinants and consequences of PD&F's approach to the overall job. There were widely differing views on what had conditioned this approach.

PD&F claimed (telephone interview, 21 October 1992) that CSIRO forced them to design all components (including the ancillary ones) 'from scratch' through insisting that SIROSCOUR had to be competitive with A&D's pace-setting products *in all respects*. In PD&F's judgment this could be achieved only if everything was completely newly designed.

The CSIRO people, though, attributed this approach partly to the arrogance of PD&F and its managing director. CSIRO D (see list of those interviewed, at the end of this description) felt that PD&F's hope to be able to completely "shut the technology up if they let

nobody else in" was unrealistic, and that if they had not tried to do this, "they would probably have still been in there" (interview, CSIRO Geelong, 18 September 1992).

But the CSIRO people also saw this 'design-and-build-it-all' approach as bigger than the arrogance of one individual in the company. CSIRO D (interview, CSIRO Geelong, 18 September 1992) felt that an unrealistic degree of commercial drive and consequent narrow thinking (deriving largely from the culture of the engineering design industry) was a large part of the explanation. This view was supported by CSIRO A (interview, CSIRO Geelong, 13 August 1992).

There were also other differences in understanding between PD&F and CSIRO. PD&F saw their task as making the handling process more sophisticated and reliable: precisely the role they had played in many engineering-development jobs. They did not expect to have to develop the process per se. They thought they had been given full engineering drawings for the parts of the system "after the wool dropped into the scour" (telephone interview with PD&F, 21 October 1992).

But far from turning an existing process into an industrial reality, PD&F found that they had been given inadequate drawings by CSIRO, that SIROSCOUR had not been applied at anything more than pilot scale, and that they had to do a full developmental job, with all its attendant challenges and pitfalls (quite apart from the problems associated with building and putting together the ancillary equipment).

CSIRO, on the other hand, tended to see little difference between these two types of job. According to PD&F, the main CSIRO contacts'

"understanding of the consequences of having to rework a major piece of engineering was inadequate. It was almost as if they thought this was at a laboratory scale" (telephone interview, 21 October 1992).

A further differing understanding of the aims of the project centred on the agreement for PD&F to install the first SIROSCOUR line for Greenfields. This agreement hinged on development/installation of a *turnkey line*. Most of the interviewees described the debate about precisely what constituted "a turnkey line". This revolved on whether the developer/installer or the commissioner was to be responsible for 'fine-tuning' the line after it was installed, to bring it up to full operational status.

The parties varied in their concern and frustration about these differences in goals. The CSIRO group seemed to be most concerned and frustrated. CSIRO C and CSIRO D, for example, both spent a lot of interview time (interviews, CSIRO Geelong, 18 September 1992) discussing the goal of providing Greenfields with a "turnkey plant"; they felt that differences between PD&F's and Greenfields' comprehensions of this concept explained much of the venture's failure. Likewise with PD&F's goal of trying to 'reinvent the wheel' with the ancillary parts of the scouring line. CSIRO B also attributed many of the interface's problems to differences in goals:

I wish we had had the foresight to really get into them and say to [PD&F] "Don't do this because you are jeopardising our technology." I wish we had done that ... [interview, CSIRO Geelong, 13 August 1992].

Clearly, the CSIRO people's attempts to draw the parties' goals together were often thwarted by the two companies, who clearly showed a

greater interest in various other issues. They seemed to be more concerned, for example, with strategically positioning themselves, and with apportioning blame. There was less evidence of PD&F or Greenfields airing concerns about, or awareness of, divergence in the parties' goals: either at the time or in the course of the interviews.

Underlying these conflicting understandings and aims, and indeed underlying most of the key events and processes in this interface, were a number of *attitudes* that were hardly conducive to the sorts of interactions on which the interface should have been based.

One of these attitudinal problems centred on PD&F's approach to working with wool. According to their partners, PD&F clearly saw wool as a simple, easy-to-work-with material, and those who worked with it as perhaps inferior people (interview with Greenfields, Greenfields Melbourne, 16 September 1992). Apparently PD&F disregarded repeated warnings about wool's complexities and difficulties. CSIRO D described this as "a classic case of high-tech. chemical engineers seeing a low-tech. agricultural industry, and saying 'It's easy'" (interview, CSIRO Geelong, 1 September 1992). All this is denied by PD&F (that is, the company's managing director), however. He claims they knew at the outset "that scouring wool was not an easy thing owing to the variability of the raw material" (telephone interview, 21 October 1992).

Attitudes held by some of the CSIRO people were also antithetic to working in the interactive mode demanded. These were captured by CSIRO A, who described CSIRO people's sometimes unreasonably possessive attitude towards the technology they have developed, and the immature view that commercial exploitation of that technology cannot be in the

best interests of the whole industry:

You [the Chief] are sometimes the meat in the sandwich ... the staff is really worried that you're going to blow this up so that their technology will never go anywhere by asking for money [interview, CSIRO Geelong, 13 August 1992].

Dysons A and Dysons B (who, it will be recalled, had worked for CSIRO for many years) described another attitudinal problem of some in the CSIRO Division: a fear of failure. According to the Dysons people, CSIRO researchers often perceive a need to 'dot all the i's and cross all the t's' before there is any move whatsoever to interact with the outside world on the application of research results.

This CSIRO Division also tended unreasonably, according to Dysons B (interview, Dysons Geelong, 18 September 1992), to be always after the 'big bang', rather than realising "the amount of know-how they have available and how competitive the incremental approach [to innovation] can be". At the same time, Dysons A acknowledged (interview, CSIRO Geelong, 13 August 1992) that this has changed considerably of late.

Not surprisingly, especially bearing in mind the complexity of the arrangement and the relatively low definition of roles and responsibilities, the differing understandings and attitudes led to *trust and distrust* becoming significant in SIROSCOUR. Misplaced trust is clearly illustrated in the contre'temps between CSIRO and PD&F on the questions of the drawings CSIRO had supplied to PD&F, and how much they could be relied on by PD&F, and whether the SIROSCOUR technology had been demonstrated in full commercial scale operation at a scouring plant in the Riverina (as PD&F claims they were told).

A primary contributing factor to the contre'temps between CSIRO and PD&F was PD&F's late arrival on the scene. PD&F said that while more conventional arrangements in which they have been involved often presented them with a process that had been developed to an advanced level, they would also provide PD&F with effective access to details of development of that process (like design details and details of testing that had been carried out).

In SIROSCOUR, by contrast, it was as if a wall had been built at the time PD&F arrived on the scene. They were expected to take on trust CSIRO's account of what had happened with SIROSCOUR before then. PD&F later found their trust had been misplaced; CSIRO's drawings were not based on normal engineering precepts and standards, while the "full commercial scale operation" apparently had no substance (telephone interview with PD&F, 21 October 1992; supported by other informants, including Dysons A).

Partly as a result of PD&F's late arrival and limited knowledge, but also as a result of CSIRO's power in the arrangement (discussed below), PD&F found themselves with little say in the venture's priorities and direction of development. Almost inevitably (and to a certain extent the same thing happened to Greenfields as well), PD&F found themselves regarded in some ways as a 'second-class citizen' in SIROSCOUR (telephone interview with PD&F, 21 October 1992).

The relationship *between CSIRO and Greenfields* also hinged on trust. Greenfields had trusted CSIRO to thoroughly vet PD&F and certify them as a suitably qualified and experienced licensee. As a result of this confidence, Greenfields had had no hesitation in commissioning PD&F.



Indeed Greenfields did not even think it necessary to appoint their own project manager for the SIROSCOUR installation (interview with Greenfields, Greenfields Melbourne, 16 September 1992). Here also the trust was later found to have been misplaced.

The role of (misplaced) trust is also well illustrated through what amounts to further development of the SIROSCOUR technology after the line in Greenfields' plant was eventually operating successfully. This entailed progressively changing the SIROSCOUR process's operating parameters or machinery specifications. Activities to these ends were undertaken on occasions by Greenfields alone or in consultation with PD&F without telling CSIRO, and by Greenfields and CSIRO without telling Dysons (who by that time were a licensee: see below).

To take the second of these situations as an illustration of the forces at work: When Dysons raised the subject, CSIRO excused themselves on the basis that they can't tell everyone about what one of the users of SIROSCOUR are doing in their plant. In effect, though, this unilateral action directly undermined some \$140 000 worth of Dysons' marketing effort (interview with Dysons A, CSIRO Geelong, 13 August 1992). CSIRO's puzzlement at Dysons' objections is significant, and comes back to the attitudinal problems discussed earlier: according to Dysons A, the CSIRO people simply could not understand what the fuss was about, even though the issue resulted in a major loss of confidence between Dysons and CSIRO.

This interface is an excellent illustration of the breakdown of trust from the level present at an interface's inception. The initial trust (which had necessarily been at a high level, because of both the low

level of documentation and each party's unfamiliarity with some of the tasks they were expected to handle) rapidly transformed into the marked distrust, cynicism, suspicion and poor communication already described. Most informants described this transformation, but PD&F's, Greenfields' and CSIRO B's descriptions (telephone interview, 21 October 1992, and interviews at Greenfields Melbourne and CSIRO Geelong on 16 September and 13 August 1992 respectively) were clearest.

Not surprisingly in the circumstances described, *communication* among the parties was stilted and often ill-considered. One important communication channel was summarised by PD&F (telephone interview, 21 October 1992): PD&F would have found it of inestimable value had CSIRO adopted an outgoing, proactive approach to their dealings with PD&F. Instead, PD&F "had to drag everything out of CSIRO piece-by-piece".

Another illustration of the always at least ordinary and often poor communication centres on the ad hoc modifications of Greenfields' SIROSCOUR line after it was operating successfully (described above). Each party was ignorant of changes the other parties were effecting, and was then caught up by consequences of those changes; this almost conjured up images of the Keystone Kops!

In this climate of conflict, *compromises and bending principles* played a significant part. Only one major illustration will be given in this description; others are taken up in the analyses in chapters 6 to 10.

As the graveness of the problems with the Greenfields scouring line became evident, PD&F were forced to bend virtually every one of their

principles as a sound contract engineering design and construction company. They progressively abandoned their working rules and principles on (for example) taking investment decisions, 'go/no-go' decisions and decisions on reworks: so much so that the SIROSCOUR job eventually lost them an amount "running into seven figures" and very nearly bankrupted them (telephone interview with PD&F, 21 October 1992).

The effect of this was removal of what had been PD&F's main distinguishing feature. They were no longer the authoritative engineering contractors who could come into any plant and apply their skills and training to handle any material in any sort of process. Steps towards retrieving the functional SIROSCOUR line which PD&F had not been able to provide, directly corresponded to PD&F's progressive loss of its main distinguishing feature.

Clearly PD&F were forced into abandoning their principles and ways of working. In this respect (and most others), PD&F showed themselves to be reluctant to change their old, well established ways of doing things; this is well illustrated in their adherence to the very end, to designing and building all the ancillary equipment 'from scratch'.

Indeed *conservative thinking and reluctance to abandon no-longer-suitable ways of doing things* seemed to permeate the whole SIROSCOUR interface. This seemed, for example, to underlie CSIRO's doubt about tackling problems head-on. The attitude of the CSIRO informants seemed to be: If the Division in various earlier arrangements had not had to intervene in its partners' ways of doing things, why should they do so with SIROSCOUR: even if things were running off the rails? Greenfields' and CSIRO's regrets that CSIRO never chastised PD&F for the

way they were tackling their task (quoted earlier in this description) clearly amounted to laments that the CSIRO Division was not more adventurous and outgoing, and prepared to move with the times.

Failure of the arrangement to produce an operational scouring line resulted in various *reactions and retributions*, like a threat of legal action by Greenfields. There was also discussion of money having changed hands in order to avoid legal action; the Australian Wool Corporation's shareholding in Greenfields was a focus in this discussion. PD&F insists (telephone interview, 21 October 1992) that no money did change hands. PD&F's frustration resulted in their decision to refer the whole exercise to the AWC, virtually asking them to referee on who had been at fault. Greenfields' frustration with PD&F's non-performance led them to take the extreme step of offering PD&F a \$0.5 million low-interest loan in exchange for all the technical information they had at that time on the SIROSCOUR process (interview with Greenfields, Greenfields Melbourne, 16 September 1992). Greenfields' idea was to remove PD&F permanently from work on SIROSCOUR. In effect Greenfields had offered PD&F what amounted to a bribe, to cut their losses and depart.

A pair of factors that also featured prominently in the other interfaces has been left to last in this description of SIROSCOUR, because they cast their shadows over all the other processes and events mentioned up to this point. These are the knowledge possessed (or not possessed, as the case may be) by key players, and the power structures resulting, in large part, from these knowledge bases.

Arguably this case is unusual by the standards of commercialisation

interfaces for the extent to which all participants lacked any real *knowledge of key parts of the arrangement.*

Thus, not only did PD&F have no knowledge of wool scouring or wool handling/processing of any type, but they also lacked experience and capability in the areas in which they were expected play the main part: scaling-up and actually developing the SIROSCOUR equipment from what was little more than laboratory scale. Greenfields had had no experience in operating a scouring process (or any other stage of wool processing). The CSIRO Division, while very experienced and knowledgeable in the area, by their own admission lacked the engineering knowledge that would have enabled them to 'bail out' PD&F from the difficulties they encountered (interview with CSIRO D, CSIRO Geelong, 18 September 1992).

SIROSCOUR also featured a significant misalignment of *power and responsibilities*. Probably only one of the main parties (the CSIRO group) really had the power necessary to accomplish the tasks expected of them. But (see preceding paragraph) they had insufficient subject knowledge to exercise that power really effectively. PD&F may have had almost enough knowledge to accomplish its tasks (had they been more flexible and open-minded), but they did not have the power to apply that knowledge effectively. PD&F were unusually, and arguably unduly, dependent on CSIRO's power as the mastermind of the arrangement.

Greenfields were dependent not only on *PD&F's* performance (as is inevitable in an arrangement of this type), but also on *CSIRO's* knowledge and power. CSIRO C described Greenfields' helplessness: they were "sitting in the middle" (between CSIRO and PD&D), saying

Someone must be to blame, and we're suffering. We've got the experts on one hand and their licensees on the other. Something must be done, and must be done quickly [interview, CSIRO Geelong, 18 September 1992].

This reliance was exacerbated by absence of any formal agreement between Greenfields and CSIRO. But at the same time Greenfields themselves potentially had great power, because they were closest to the inaugural SIROSCOUR line. They could ultimately control access to the plant and to the results of its performance: had they had the necessary knowledge to exercise this power.

These misalignments of power, knowledge and responsibilities made for many problems in SIROSCOUR. Inevitably, uncertainty developed in the minds of all participants. The interview data revealed much important behaviour resulting, at least in part, from this uncertainty.

PD&F, for instance, did not tackle CSIRO head-on on the issue of the engineering drawings and information CSIRO had (or had not) provided: partly because of their uncertainty about where they stood with CSIRO (telephone interview with PD&F, 21 October 1992). PD&F virtually cursed themselves after the event for not having taken the issue up with the Chief of the CSIRO Division.

Greenfields' uncertainty about what they were and were not in a position to do, exacerbated by the company's poor knowledge of wool scouring, is epitomised in their somewhat bumbling attempts to insist that PD&F provide them with a genuine "turnkey plant" (interviews with Dysons A, CSIRO Geelong, 13 August 1992; Greenfields, Greenfields Melbourne, 16 September 1992; PD&F [telephone interview], 21 October 1992; and CSIRO D and CSIRO C, CSIRO Geelong, 18 September 1992).

The CSIRO group also displayed clear signs of uncertainty about what they were and were not in a position to do; their lament about their failure to challenge PD&F about the way that company was handling the SIROSCOUR project was quoted earlier.

This uncertainty was associated with much ad hoc interchange of roles among the parties. PD&F took some decisions that really belonged with Greenfields, regarding the strategy for 'fine-tuning' equipment, and also took on some tasks CSIRO should have been doing, associated with tracking down more scouring know-how. At the same time, both the other parties took over tasks that should have 'belonged' to PD&F; Greenfields took over some equipment-development and commissioning tasks, while CSIRO (with advice from consultants and others like Dysons) took over a number of commissioning tasks. All of this 'muscling in' on the territory of others seemed to accentuate the SIROSCOUR interface's rapidly reducing effectiveness.

The factors discussed in this description made it virtually impossible for the interface itself, in its original form, to overcome the difficulties with Greenfields' SIROSCOUR line. When the magnitude of the difficulties was realised, Greenfields engineers (and those from an affiliated scouring plant in New Zealand) started to work with PD&F's people to try to overcome the problems. CSIRO's experts were also called in, and they in turn commissioned Dysons to assist them to get the line up and running.

The parties established an emergency task-force to sort out the problems. The task-force, led by an experienced consultant from the industry, supported by PD&F, CSIRO and Dysons, did just this, through

several months of intensive effort. It did so largely through redefining the problems and realigning the activities of the parties who had been working in the interface for almost two years. The SIROSCOUR line then started producing, and is still producing, top-quality scoured wool. This taskforce is one of the few examples of successful teamwork in SIROSCOUR: albeit from a team that had been forced upon the parties by the problems encountered.

Failure of the arrangement itself to produce an operational scouring line, and the consequent inability of PD&F to sell more than the one initial SIROSCOUR line, resulted in CSIRO in effect starting a second phase (or 'loop') of SIROSCOUR, by revoking the PD&F licence in 1990, and issuing two new licences in late 1991/early 1992 (not long before the data were gathered for this study). One of these licences went to A&D, and the other to Dysons.

The decision to issue two licences was seen by most of the informants to reflect the CSIRO Division's unwillingness to run solely with a foreign company which arguably was clearly the best applicant, because of the fear of criticism for not selecting an Australian company. It also reflected CSIRO's unsavoury experience with a small Australian company during the first 'loop'.

The second 'loop' of SIROSCOUR is not examined per se in the present study because it had not proceeded far enough at the time the data were gathered. Study of this second 'loop' and its relationship to the first 'loop' would seem to offer prospects of further worthwhile insights into the social/intercultural dynamics of commercialisation.



**Those Interviewed:**

- CSIRO A:** The Chief of the CSIRO Division concerned.
- CSIRO B:** An Assistant Chief of the Division.
- CSIRO C:** A program manager in the Division, responsible for the area of research concerned.
- CSIRO D:** Another program manager in the Division, also working on this research (although having responsibility for other programs as well).
- PD&F:** The Managing Director of PD&F, the small engineering design and installation company that was CSIRO's licensee in the first 'loop' of SIROSCOUR (telephone interview).
- GREEN-FIELDS:** The Managing Director of Greenfields, the company whose plant in Geelong provided the test bed for the first SIRO-SCOUR line. Greenfields is a joint venture of Bloch & Behrens, a well-established wool commodity company which wished to get into value-adding for wool, and the Australian Wool Corporation.
- DYSONS A:** The Managing Director of Dysons Ltd, a wool scouring equipment manufacturer in Geelong; a former CSIRO employee, until he and one other person left CSIRO, initially to go to another company. Both of these people, together with Dysons B, took over Dysons in 1989.
- DYSONS B:** Another former CSIRO people who left CSIRO in 1989 and, together with Dysons A and the third former CSIRO employee, took over Dysons.

Despite all efforts, it did not prove possible to interview either the managing director of A&D (based in New Zealand) or the SIROTECH project director whose responsibilities included the commercial dealings of the CSIRO Institute in which this Division is located.

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## APPENDICES

## BEHAVIOUR PREDICTED BY CULTURAL THEORY TO BE IMPORTANT IN COMMERCIALISATION INTERFACES

It was concluded in chapter 3 that cultural theory's manifestation in commercialisation interfaces can best be captured in three aspects of the behaviour and thinking of the participants: their behaviour and thinking bearing on

- \* interpersonal relations;
- \* approaching the unfamiliar and the unknown; and
- \* science and technology and their effective use.

Important behavioural preferences and orientations for people from each segment of social space are identified in this appendix, under these three headings.

### 1. PEOPLE FROM A LOW GRID/LOW GROUP ENVIRONMENT (INDIVIDUALISTS)

#### (a) Interpersonal Relations

The fundamental orientation of people from this segment of social space in their employment and professional situations (as indeed in other situations) is towards 'bartering' with the people who really count, in a market-type environment. Attention-seeking behaviour will be evident (Bloor & Bloor, 1982, p.91); "where individual flair is at a premium, individual differences make for disproportionate returns" (Mars, 1982, p.28). The individualist's own area of responsibility/expertise must keep a reasonably central place in a commercialisation arrangement. The individualist

is a pragmatic materialist; he will build networks by persuading others he is a good risk; the world, he believes, is a tough place and if he doesn't get there first, somebody else will [Thompson, Ellis & Wildavsky, 1990, p.8].

Individualists' preferred 'every-man-for-himself' approach must sometimes fail, in which case teamwork can act as a backstop; otherwise teamwork is not all that important. Relatively long-term commitments are regarded as dangerous, because the future is so uncertain. What is important is "what [individualists] care for, not the rational niceties of the people who happen to have come together to achieve [a] result" (Schwarz and Thompson, 1990, p.6).

The individualist expands his network in all promising directions; he has no interest in the maintenance of permanent transactional boundaries ... anything is negotiable in the pursuit of personal rewards in a competitive environment [Schwarz & Thompson, 1990, p.75].

So teamwork will be regarded as a viable option only if it offers a potential immediate return to the person and his/her work and reputation, or if it facilitates development of a self-centred network (Bloor & Bloor, 1982, p.89). Dyadic alliances will normally be more significant than group membership (Handelman, 1982, p.165), as will the 'old-boy' network (Schwarz & Thompson, 1990, p.134). Any discussion of or thinking about interpersonal factors will be relatively self-centred, although individualists certainly realise that "wherever there are 'big men' (those at the center of personal networks) there must also be 'rubbish men' (those at the peripheries of other people's networks)" (Thompson et al, 1990, p.96).

Individualists often show an underlying 'loner' predilection, even if they work in a team for much of the time. However they often see value

in working with fellow-experts, not only to attempt to maximise "the number of followers a person controls", which measures success (Mars, 1982, p.28), but also to avoid the need to waste their strictly limited time inducting or training others (Rudwick, 1982, p.234).

There is a pathway for each person's optimal performance, say individualists, and this pathway should not be obstructed by others. The most important task for management is freeing up the system to allow effective 'market-based' transactions. Management centred on planning, reporting and regular assessment against objectives will be resisted.

#### **(b) Approaches to the Unfamiliar/Unknown**

Since trial-and-error is their preferred way of life (Schwarz & Thompson, 1990, p.64), individualists tend to be relaxed about the unfamiliar/unknown. Nature generally takes care of things; "nature benign is most hospitable to individualists. As long as we all do our individualistic, exuberant things, a 'hidden hand' ... will lead us to the best possible outcome" (Schwarz & Thompson, 1990, p.8).

Because all life is uncertain, new situations are often seen as not all that different from the familiar. New skills and perspectives are part-and-parcel of mastering nature; individualists' networks will already be focused, or will rapidly become focused, on tackling new situations. "Rewards here go to those who find better ways of doing things ..." (Mars, 1982, p.28). Bold originality demands risk-taking. Individualists are normally highly capable of learning (and willing to learn) from their mistakes (Bloor & Bloor, 1982, p.91).

Because of these adventurous outlooks, individualists will often be at

or near the forefront of inter-organisational dealings in novel ventures, and will lead the way in early adoption of values and the associated symbols from other cultures.

These people (monster assimilators: see the discussion in chapter 3) doubt whether many traditional conceptual distinctions have any basis in reality. They look again and again at any new behaviour or values they are expected to adopt, to discern ways in which their own standards and values can be stretched to make anomalies non-anomalous. They work on convincing themselves that neither their standards/values nor their status at or near the centre of a significant network would be damaged by their standards/values being 'massaged' in this fashion. This opens them to accepting readily the other party's standards and values at least as complements to their own, and where necessary in place of their own.

But this is a conscious process, often amounting to hard intellectual work. There is nothing automatic about individualists' acceptance of the other party's standards and values; acceptance must be earned.

In commercialisation interfaces, these people will often:

- \* have thought spontaneously about the commonality between the 'old' and the 'new' sets of standards/values;
- \* show a significant degree of self-criticism of their own standards, values and parochialism, and explain any differences between the two sets of standards/values in terms of their own naivety in the ways of the commercial world or the research

world (as the case may be);

- \* have eagerly and actively involved themselves in aspects of the technology-development process outside their traditional domain; and
- \* adopt a cosmopolitan outlook on rewards and on setting the context for their work.

### **(c) Place of Science/Technology**

Individualists' attention-seeking approach to life dictates that the more parts of the overall R&D process that can be drawn into their self-centred networks, the better. Accordingly these people choose their friends and associates catholically, rather than through immediate structural or disciplinary affiliations. This catholicism is encouraged by their views that all classifications are provisional and negotiable (Handelman, 1982, p.165), that things must at all costs be progressed urgently, because of the chronic shortage of time (Rudwick, 1982, p.234), and that secrecy, priority and reward must go to the people due for it (Rudwick, 1982, p.234).

Individualists regard it as important to be able to deliver a free-standing product, even if it is relatively unembellished or unsophisticated. They believe it important to be able to demonstrate viability or efficacy of their 'product' - be it technology or some other specialised input to the commercialisation process - early on. As Schwarz & Thompson say,

Individualists, being pragmatic materialists - bottom-liners - are not much interested in whether knowledge is complete or incomplete, divided up or knitted together.



They are interested in results; in knowledge that works. If it is explicit (like the hierarchists' science) and works, that is all right, but if it is implicit (like the green-fingered skill of the grower of prize vegetables, or the esoteric techniques of the management consultant with a good track record) they do not mind. Knowledge, for the individualist, has only to be sufficient and timely [1990, pp.64 & 65].

These preferences make for open, outgoing views on the place of science/technology (and indeed on the place of any other relevant specialised inputs) in the overall product-development process. Individualist researchers (for example) will be at least willing, and often keen, about involvement in not only the broader science and technology system, but also the broader business system associated with their work.

This pattern of thinking suggests that individualists will be more comfortable with an 'organic' commercialisation interface: one where the details can 'grow' around them, without formal restriction through strong definition of "do's and don't's".

## 2. PEOPLE FROM A HIGH GRID/LOW GROUP ENVIRONMENT (FATALISTS)

- (a) Interpersonal Relations )
- (b) Approaches to the Unfamiliar/Unknown )
- (c) Place of Science/Technology )

These people, working in an isolated environment in compliant conformity and with little say in how things are done, are tied inextricably into organisational policy and practices. They move with the corporate tide, with a feeling of helplessness and insecurity. "Good times and bad times come to [the fatalist], or so he thinks, regardless of his skill, character and diligence" (Thompson, Ellis & Wildavsky, 1990, p.8). Their aim is no more than personal survival (Thompson et al,

1990, p.9); blame for anything that goes wrong is "diffused onto that amorphous entity 'fate'" (p.60).

Fatalists' isolation means that more of the experiences potentially available are in effect unfamiliar or unknown. Entry into the unknown is one of few potential excitements. Indeed the high value fatalists often place on uncertainty is highlighted in the literature. Schwarz and Thompson, for example, develop an analogy with a lottery (p.10).<sup>1</sup>

These people (monster embracers) enthusiastically, or at least willingly, 'take monsters on board'. They are more than willing to reformat their personal values and stances to rationalise new experiences dictated by their organisation's/corporation's policies. They eclectically and catholically build their world views by adding new perspectives to their pre-existing collection of theories and perspectives. They call haphazardly on their old and their new, recently-supplemented collection of perspectives, and use them speculatively: often in tandem with other irreconcilable perspectives.

In a commercialisation interface, in the process of this catholic gathering of theories and perspectives, in their isolation and exclusion from corporate decision-taking and power (Thompson et al,

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<sup>1</sup> A contrary view is put forward by Thompson, Ellis and Wildavsky (1990, p.63): Fatalists "do not knowingly take risks. What would be the point?" But the preparedness of fatalists to take risks would seem a more plausible prediction. If life is a lottery, then by buying a ticket the fatalist has shown preparedness to take risks; after all, fatalists do not completely withdraw from society.

1990, p.7)), and against the background of their inability to glean any consistent understanding of 'the big picture', these people will almost subconsciously assimilate the standards and values of the other party. Perhaps they will even start applying these standards and values virtually as 'second nature', without appreciating what they are committing themselves to. This might be reflected, for example, in early adoption and application of the symbols of the other party in a trial-and-error fashion, in parallel with the use of the fatalist's own pre-existing standards, values and symbols.

Sometimes this will be on the basis for a sound worldview, on the strength of which commercialisation tasks can be taken on confidently. More often, though, fatalists will approach a commercialisation interface with diffidence and insecurity.

Fatalists' outlook on the place of science/technology reflects this resignation. Fatalists will tend to work with a commercialisation partner in whatever mode the partner expects or demands. It matters little whether this dictates (for example) a broad role for the fatalist across the science/technology/industry system or a highly segmented role, or whether it dictates relatively early or relatively late definition of how the respective skills are to be brought together.

### **3. PEOPLE FROM A HIGH GRID/HIGH GROUP ENVIRONMENT (HIERARCHISTS)**

#### **(a) Interpersonal Relations**

Hierarchists focus on roles, rather than individuals, and on methods, formulae and 'the system'. There is "a pious belief that the right methods and formulas, properly followed, will automatically produce the desired results" (Bloor & Bloor, 1982, p.86). Role specialisation

is most important (Handelman, 1982, p.164; Rudwick, 1982, p.235). "Different roles for different people enable people to live together more harmoniously than alternative arrangements" (Thompson, Ellis & Wildavsky, 1990, p.6). Hierarchists are happy to receive credit for their contributions to a small corner of knowledge (Rudwick, 1982, p.235), and to adopt a 'local' (c.f. a cosmopolitan) approach to rewards and to setting the context for their work.

Those working in 'the system' are regarded to a large extent as interchangeable blocks. Complementarity of skills and 'value-adding' by those from different areas and backgrounds, and the evolution of networks for the benefit of all (or most), are important. Intercultural differences will always be in mind, and can be expected to surface at times of strain. At such times "an armoury of different solutions to internal conflicts [is available, including] ... upgrading, shifting sideways, downgrading, resegregating, redefining" (Douglas, 1982[b], p.206; see also Handelman, 1982, p.164), although hierarchists are conservative in initially identifying problems and issues.

Hierarchists concentrate on "keeping things in their places, ... and parts subservient to the whole" (Schwarz & Thompson, 1990, p.75). Schwarz and Thompson observe that hierarchists are "... more concerned with the proprieties of who does what than with trying to evaluate the outcome (if there is one)" (1990, pp.6 & 7). Hierarchists become especially concerned about "unconventional modes of participation in which individuals [are] acting outside the sphere of competence assigned to them" (Thompson et al, 1990, p.65). Nevertheless 'underground' networks will often play a major part in controlling things for hierarchists (Schwarz & Thompson, 1990, p.134).

These people prefer a 'jig-saw' approach to management: all the pieces must be in their right place before the effect can be maximised. This is, as Schwarz and Thompson say, an outlook centred on "... hierarchy: sober, expert and, above all, enduring ... an orderly solution matched to the time scales and complexities of the problem" (p.10). Hierarchists will normally prefer systems-based management, with the emphasis on planning, reporting and regular, detailed assessment.

**(b) Approaches to the Unfamiliar/Unknown**

Hierarchists' systematic outlook and preference for the traditional, safe ways of doing things mean that they invariably thoroughly sound out the ground before entering unknown territory. There will be a great deal of talk about intercultural dealings before action, and a great confidence that 'the system' will take care of any unsatisfactory consequences of dealing with other cultures. Often hierarchists will seek experience 'at the edges' before serious intercultural dealings are entered into; as Schwarz and Thompson say, these people "push their knowledge out ahead of their actions. They prefer, wherever possible, to look before they leap. Anticipation is their preferred way of learning" (1990, p.64).

At the same time, hierarchists are not necessarily completely risk-averse; they are sometimes prepared to accept higher levels of risk, "as long as the decision is made by experts: ... the right people in the right place" (Thompson et al, 1990, p.63).

For these people (monster adjusters), "an attempt to keep even the most paradoxical novelty within earlier existing analogies is always to be approved" (Caneva, 1981, p.111). They conclude that "in the end

all the phenomena fit very simply into the known natural laws" (Caneva, 1981, p.112). They will persevere with explaining anomalies in terms of their existing categories/conceptualisations: even at the expense of being accused of rationalisation.

In commercialisation interfaces, hierarchists will 'bend over backwards' to see the other party's standards and values as really boiling down to the same as their own. They will often:

- \* obviously play down differences between the parties' standards and values, and explain any differences in terms of the partner's naivety in the ways of research or in the ways of business (as the case may be);
- \* readily identify analogies in their own standards/values systems for the observed standards/values of the other party; and
- \* turn to intermediaries for assistance with developing the partner's research and research-using capabilities.

### **(c) Place of Science/Technology**

Hierarchists have a generally discontinuous view of the R&D/commercialisation process. The researchers among them will try to insulate the ('orderly') science from the ('disorderly') manufacturing, marketing and related functions. For this reason they will prefer commercialisation arrangements to be defined as clearly and as early as possible, and intercultural dealings to be confined as much as possible to R&D, and not extended to broader business arrangements.

Researchers will often foresee difficulties in working in a market-driven mode, and company people difficulties in working closely with publicly-funded researchers. Such activities go against the 'everything-in-its-place' philosophy. Often hierarchists will be happy with intercultural dealings only when 'quality control' and as much as possible of the overall control of a venture rests with them.

#### 4. PEOPLE FROM A LOW GRID/HIGH GROUP ENVIRONMENT (MEMBERS OF EGALITARIAN GROUPS)

##### (a) Interpersonal Relations

Egalitarians' interpersonal dealings are driven clearly and directly by their fundamental distorted and distrustful view of those outside the group. Expert knowledge of those outside can in some circumstances threaten these people; "egalitarians worry that coercive hierarchical means may pervert voluntary egalitarian ends" (Thompson, Ellis & Wildavsky, 1990, p.89). This worry is combined with a perpetual criticism of the way things are done in other groups, and a perpetual fear of the likely effects these different ways of doing things might have on their own group.

At the same time, egalitarians can "try to make up for their deficiencies by reaching out to individualists. This alliance enables both partners to live a life of only minimal intervention by authority" (Thompson et al, 1990, p.90).

Interpersonal dealings *within* the group are also characterised by distrust and ambivalent feelings towards leaders and colleagues - despite the normal high philosophical commitment to the group's principles - and by confusion and dissonance (Owen, 1982, p.245), and ambiguous relations with colleagues (Thompson et al, 1990, p.6).

Conflict resulting from this mistrust and ambivalence tends to be difficult to resolve (Thompson et al, 1990, p.6) and to be driven underground to smoulder (Owen, 1982, p.280; Thompson et al, 1990, p.6). Blame for the issues concerned is often diverted to people outside (Handelman, 1982, p.164), and invariably "the system" has much to do with anything going wrong (Thompson et al, 1990, p.59).

Egalitarians often have an inconsistent cultural orientation. They might well prefer "arm's length" dealings and an ultra-conservative approach to working with those from other cultures, but at the same time they acknowledge that cumulative additions to knowledge by those from different areas or backgrounds can often be valuable.

This confusion and inconsistency will often result in the adoption of somewhat simplistic and perhaps naive explanations of events and relationships. It can also result in a strong preference for management arrangements that are open and transparent, and in a "require[ment that] everyone participates in (nearly) every decision" (Thompson et al, 1990, p.96). There will be a tendency to force as many transactions as possible into the public sphere (Thompson et al, 1990, p.216).

Egalitarians will prefer various other leadership styles over strong overt leadership; one often preferred style of leadership is a "dissembling behind-the-scenes leadership" (Thompson et al, 1990, p.272).

#### **(b) Approaches to the Unfamiliar/Unknown**

Egalitarians' keenness to protect their ideal world from disruption, and their frequent insistence that new angles and approaches should be tried only if there are guarantees of error-minimisation, lead to



major difficulties in coping with unfamiliar or unknown territory. They are members of a "community strongly undispensed even to consider phenomena or points of view which clash with its cherished beliefs" (Caneva, 1981, p.115). Often these people distort information they receive on the 'outside' society (Douglas, 1982[a], p.245). Often also, egalitarians will insist on straightening out, sometimes at great length, the real aims, agenda and modus operandi of other cultural groups before they deal with them.

These people (monster-barrers) can be expected to be hostile towards pressure to 'bend' their standards and values for the purpose of carrying out and applying collaborative R&D in the mode now often expected of publicly-funded researchers or company executives (as the case may be). They will often:

- \* openly express at least scepticism towards other ways of doing things, and clearly and overtly object to these approaches as unsuitable, risky, improper and a threat to the "ideal" approach to creative and profitable technology-creation and development;
- \* stick with their own way of doing things as long as possible;
- \* actively seek to reinstate their own (the one correct) approach to science/technology, through rear-guard actions; and
- \* adopt variable and internally inconsistent approaches to working with companies or laboratories (as the case may be).

### (c) Place of Science/Technology

Egalitarians' predilection to place simple interpretations and explanations on complex data in order to rationalise the internally inconsistent values continually surfacing (Rudwick, 1982, p.237), allied with their 'witchcraft' predilection and their scepticism towards role-differentiation and formal classification, often lead to fears of takeovers and/or unwarranted intrusions. This will be the case especially for those in the 'minority' group (Rudwick, 1982, p.237); that is, the group more likely to be seen as being drawn into the mainstream by a particular commercialisation arrangement.

Furthermore, these people believe that "... knowledge has to be accessible to all ..." (Schwarz & Thompson, 1990, p.63).

This combination of views will complicate immensely working in market-driven modes with people from other cultures. Egalitarian researchers will be particularly wary about close *research* relationships, where there is potential for one of the research units to undermine the other. Often the only option they can be happy with will be what amounts to a one-way contract relationship (which should prevent the threat of undermining from materialising).

PREDICTIONS FROM CULTURAL THEORY, ON THE INFLUENCE OF PARTICIPANTS'  
CULTURALLY-ACQUIRED VALUES, NORMS, ATTITUDES AND PREFERENCES,  
ON INDIVIDUAL DIMENSIONS OF SOCIAL BEHAVIOUR

This appendix draws on Appendix 1's reasoning from cultural theory about behaviour and attitudes that will be important in commercialisation interfaces (the main themes from which were consolidated in Table 3). Those patterns of behaviour and thinking are used here to generate specific predictions for how culturally-acquired values, norms, attitudes and preferences of interface participants from the different segments of social space will influence *individual dimensions of social behaviour* identified in chapter 2 and the first half of chapter 3.

As noted in chapter 3, it would not be sensible to generate these predictions for those dimensions of behaviour that will be shown through the preliminary analysis of influence on interface effectiveness that is formulated and carried out in chapters 4 and 5, to be unlikely to fundamentally influence interface effectiveness. Furthermore, it was not possible to articulate such predictions for some other dimensions of social behaviour. That is, it did not prove possible to reason that people from an individualist environment (for example) should behave, against some dimensions of social behaviour, in a fundamentally different way from people from a hierarchist environment (for example). This argument is presented at several points in the analyses in later chapters of the thesis.

In addition, only those segments of social space occupied by participants in interfaces drawn on in the relevant analyses in those later

chapters are addressed in this appendix. Even where a particular segment offers clear predictions for encouragement or reinforcement of a particular dimension of social behaviour, that segment is not addressed here unless at least one person from that segment plays a significant part in the relevant analyses in those later chapters.

#### PREDICTED INFLUENCE ON WILLINGNESS TO IDENTIFY AND PURSUE SHARED GOALS

- \* *Hierarchists'* high orientation to 'the system', their preference for early definition of the interface, their contentment with gaining recognition in a small niche and working in a mode that is complementary to the roles of people from other areas, and their keenness on planning so as to reduce their exposure to unnecessary risk (see Appendix 1), all point to hierarchists having the interest and the motivation at least to accept, and probably also to actively encourage and formulate, shared goals.
- \* *Individualists'* cynicism about long-term commitments, their preference for trial-and-error behaviour, their preference for ad hoc networks rather than formal structured systems and their contentment with facing the unknown (again see Appendix 1), all point to a preference for delaying goal-setting as long as possible, and perhaps even avoiding it altogether.
- \* The attitudes of *fatalists* towards developing and pursuing shared goals is difficult to determine. On the one hand they might regard clearly-defined goals as one of the few concrete aids available to lift them out of their malaise of insecurity and indifference. On the other hand, it was noted in Appendix 1 that fatalists can strive for enlivenment of their otherwise un-

distinguished lives through viewing the unknown as a stimulating challenge, in which case they would prefer no goals or rudimentary goals. There seems to be no alternative but to regard the fatalist as unable to be reliably placed against this dimension.

So a dichotomy can be expected between interface participants from hierarchist environments, who can be expected to recognise the importance of shared goals and a shared sense of purpose, and to work towards attaining and using them; and participants from individualist environments, who can be expected to be at least indifferent towards goal-setting, and often against too much, or too overt, goal-setting.

#### PREDICTED INFLUENCE ON THE INTIMACY OF THE CONTACT ENTAILED IN AN INTERFACE

- \* *Individualists* should not be averse to intimate contacts with those from other cultures, if this mode of interaction is best for facilitating their work with fellow-experts in the market-bartering situation and for strengthening their self-centred networks. Intimate contacts can be compatible with individualists' keenness on 'organic' arrangements that grow in parallel with their knowledge, their essentially cosmopolitan outlooks, their preference for the 'old-boy' network, and their catholic identification of friends. More positively, such intimate contacts could well facilitate early, market-centred demonstration of the excellence of what the individualist has to offer.
  
- \* *A member of an egalitarian group*, by definition, will see close, intimate contact with people from another culture as threatening his or her very existence and beliefs.

- \* If *fatalists* find themselves (for example, as a result of a decision of management) in a situation hinging on intimate contact with people from another culture, they will go along with, and may even actively develop, the relationship, which could well facilitate more rapid development of their problematic world-view. The excitement and guidance coming with such contact may be the only sources of excitement/guidance in the fatalist's existence.

So a dichotomy can be expected between interface participants from individualist and fatalist environments, who can be expected to be willing, and perhaps even keen, to work in intimate relationships with those from other cultures, and participants from egalitarian group environments, who can be expected to be wary about such relationships.

#### **PREDICTED INFLUENCE ON WILLINGNESS TO EMPHASISE INTERCULTURAL SIMILARITIES AND TO EXPLODE INTERCULTURAL MYTHS**

- \* *Individualists'* emphasis on market bartering, with the focus on outcomes rather than methods, their keenness to work in dyadic relations with others who share their own degree of specialised expertise, their cosmopolitan outlook on rewards and their catholic identification of friends/preferred colleagues, all point to a keenness to explode myths about intercultural differences.
- \* *Members of egalitarian groups* can be expected to steer clear of doing anything that contributes to breaking down their segregation and protection from other cultures. They fear the effects new ways of doing things might have on them, they are threatened by outsiders' expert knowledge and they are fearful of takeovers of their area by those from other cultures. They want to have

available someone different to blame for problems. So members of egalitarian groups would be the last people to try to explode myths about intercultural differences.

- \* *Hierarchists'* philosophy of 'a place for everything and everything in its place', their commitment to role-specialisation, their contentment with receiving credit in a small specialised corner of endeavour and their intentness on keeping their own 'orderly' part of an activity separate from the other 'disorderly' parts 'belonging to' other cultures, all point to a reluctance to explode myths about intercultural differences.

So a dichotomy can be expected between interface participants from hierarchist and egalitarian group environments, who can be expected to respect intercultural differences, and those from individualist environments, who can be expected to be keen to explode myths about intercultural differences, and to emphasise intercultural similarities.

#### **PREDICTED INFLUENCE ON WILLINGNESS TO ACT IN WAYS THAT PRESERVE PARTNER'S MOST VALUED DIFFERENCES**

- \* *Hierarchists'* orientation towards teamwork and complementarity, their intentness on keeping their own 'orderly' part of an activity separate from the other 'disorderly' parts 'belonging to' other cultures, and their contentment with receiving credit in a small specialised corner of endeavour, all suggest a willingness to pay a particular respect to their partner's distinguishing features, and perhaps even to act to preserve the partner's most valued differences.

- \* *Individualists'* self-centred approach to life, their determinat-

ion to get the most personal return from an encounter, their 'loner' predilection and their determination to see their own area attain (and retain) a central position in an arrangement, all point to an unwillingness to go out of their way to recognise their partner's valued differences.

#### **PREDICTED INFLUENCE ON WILLINGNESS TO ABANDON NO-LONGER-SUITABLE OLD WAYS**

- \* *Individualists'* preference for trial-and-error behaviour and for adapting their standards to cope with new situations, their willingness to push their effort out in any direction necessary to elevate their personal profile, and their preference for working in 'organic' arrangements that are modified in line with ongoing developments, all point to an open-mindedness and a willingness to abandon no-longer-suitable ways.
- \* *Hierarchists'* risk-aversiveness, their keenness to sound out the ground at length before they change their approaches, their reliance on 'the system' to accommodate changes, and their preference for defining an arrangement early on then sticking with it, all point towards a reluctance to move with the times.

#### **PREDICTED INFLUENCE ON ATTITUDES TOWARDS GOODWILL TRUST**

- \* *Members of egalitarian groups* are fundamentally distrustful of other groups; this is a main characteristic of people from this segment of social space.
- \* *Individualists'* over-riding concern with their personal profile, their attention-seeking and intentness on ensuring they receive rewards due to them, their 'loner' predilection, their willing-



ness to bend their standards to accommodate anomalies, their preference for 'organic' arrangements that can be developed to accommodate a situation as it evolves, and their intentness on getting as much as possible out of market bartering, add up to two things. First, a low likelihood that others will confidently place much trust in individualists. Second, an equally low likelihood that individualists will trust others all that much.

- \* *Fatalists* are inherently trusting, gullible people; this is a main characteristic of people from this segment of social space.
- \* Little can be drawn from cultural theory about the levels of trust likely to be preferred by *hierarchists*. On the one hand, hierarchists' systems-oriented outlook on life can work successfully only if trust is at least at a certain minimum level. On the other hand their high degree of focus on risk-aversion surely makes it unlikely that hierarchists will trust their partners very much: except perhaps in special circumstance where the partner has an overwhelmingly greater amount of experience and wisdom on the key issues (which does not apply in the commercialisation interfaces examined in this study).

So a *trichotomy* can be expected among:

- \* members of egalitarian groups, who can be expected to show little trust;
- \* fatalists, who can be expected to be keen to work in situations of reasonably high levels of trust; and

- \* individualists, who can be expected to promote feelings of distrust in their partners *and at the same time* to distrust others.

PREDICTED INFLUENCE ON KEENNESS TO ENCOURAGE OR AVOID CONFLICT, AND TO ESCALATE OR 'HOSE DOWN' ANY CONFLICT THAT DOES ARISE<sup>1</sup>

- \* *Individualists* can be expected to attach little importance to the behaviours associated by Brown with the limiting of conflict to low levels, and the reduction or management of conflict that *does* become excessive. Far from failing or refusing to acknowledge differences between themselves and the other party and avoiding communication on controversial subjects and compromising excessively, individualists are *keen* to distinguish their own style, contributions and profile from others'. This is a way of elevating their personal profile and strengthening their network. If this results in high levels of conflict, individualists' attitude will be "So be it".
- \* *Hierarchists* can be expected to be encouraged by their team-orientation, their search for complementarity, their preference for 'neatness' and a sound, smooth system, and their proneness to rationalise, to avoid conflict, and to control any conflict that *does* develop.

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<sup>1</sup> It was convenient to draw together in this section cultural theory's predictions for how participants' positions in social space will encourage or reinforce behaviour associated with *three different dimensions*: "development of excessive conflict", "management of excessive conflict", and "maintenance of conflict at an unhealthily low level".

- \* *Fatalists*, who by definition float with the tide, can be expected to avoid excessive levels of conflict, and to prefer rapid reduction of any serious conflict that *does* arise.

So a dichotomy can be expected between interface participants from hierarchist and fatalist environments, who can be expected to avoid excessive levels of conflict, and to prefer rapid reduction of any serious conflict that does arise, and individualists, who will be relaxed in situations of relatively high conflict.

#### PREDICTED INFLUENCE ON ATTITUDES TOWARDS CONFLICTS THAT THREATEN THE FOUNDING ASSUMPTIONS OF THE RELATIONSHIP

- \* *Individualists* can be expected to be completely indifferent about finding themselves in a conflict the basis of which goes to the heart of the founding assumptions of the interface. To them, it matters not that the basis for the long-term arrangement might be threatened. What counts to the individualist - his or her profile and self-centred network, ability to barter in market-based situations, opportunity for trial-and-error behaviour, and so forth - depends on factors other than the long-term survival of an arrangement in an unchanged form.
- \* *Hierarchists* can be expected to be most concerned to find themselves in a conflict the basis of which goes to the heart of the founding assumptions of the interface. They will see as a likely outcome of such a conflict, the undermining of much of what they stand for: long-term, safe, team-based, neat, well-defined approaches to the job at hand. Hierarchists engaged in 'founding assumptions' conflicts can be expected to show marked signs of concern, frustration and aggression about the conflict. Other

things being equal, this might well exacerbate the conflict.

- \* *Fatalists'* frequent sense of insecurity, confusion and lethargy can be expected to be amplified in 'founding assumptions' conflicts they are engaged in, because such conflicts will provide them with less of the guidance they require to plot their course through corporate life. Like hierarchists, fatalists engaged in 'founding assumptions' conflicts can be expected to show concern, frustration and aggression about the conflict, and this may well exacerbate the conflict.

So a dichotomy can be expected between interface participants from hierarchist and fatalist environments, whose outlooks can be expected to exacerbate the effects of 'founding assumptions' conflicts, and those from individualist environments, whose outlooks can be expected not to influence the effects of such conflicts in either direction.

#### PREDICTED INFLUENCE ON STRATEGIC USE OF POWER TO PRE-EMPTIVE ENDS

- \* *Hierarchists'* systems orientation, their commitment to ventures for the long term, and their intentness on clearly mapping out the future as soon as possible, should lead these people to be keen to exercise whatever power they have in the interest of reducing uncertainty and increasing predictability. The strategic use of power to pre-emptive ends is one way of achieving this.
- \* *Individualists* can be expected to apply whatever power they have in a more impulsive way. This is in the spirit of their risk-taking propensity, but additionally it is consistent with their preference for focusing on the immediate challenges and their

keenness on 'organic' arrangements that grow up around them.

#### PREDICTED INFLUENCE ON COPING WITH ORGANISATIONAL UNCERTAINTY IN CRITICAL AREAS

- \* *Hierarchists* can be expected to be ill-at-ease in situations of high uncertainty, which run counter to their preferred high degree of role definition, planning and sounding out the ground from a solid base before acting. Such situations are also at odds with hierarchists' preference for neatness and for keeping the 'orderly' separate from the 'disorderly'.
- \* *Individualists* can be expected to thrive in situations of high uncertainty. Such situations necessarily embody the risk-taking, the boldness and the tackling of the unknown that are the hallmarks of the individualist's preferred behaviour. It can be expected that this keenness will be amplified by the fact that the area concerned is critical to the venture; this should meet the individualist's frequent craving for attention.

#### PREDICTED INFLUENCE ON PARTICIPANTS' ATTITUDES TOWARDS CONSTITUTION OF THE INTERFACE ON A BASIS OF LESS THAN CULTURAL PLURALISM

- \* *Individualists* can be expected to see a role off centre-stage (which can be associated with a basis of constitution less than full cultural pluralism) as violently at odds with many of their basic values and aims, including elevating their personal profile and strengthening their self-centred networks, their intentness on entering and controlling 'market-bartering' situations and their preference for a cosmopolitan environment.
- \* *Fatalists* should readily accept a role off centre-stage, even if only because such a restriction and the associated limitations

to their power and to the expectations placed on them, should go much of the way towards removing them from the limelight, thereby partly meeting their need for security.

- \* *Hierarchists*, with their emphasis on granting those from other cultures their due place in a venture and acknowledging the special contributions others can often make, can be expected to be quite relaxed about whether or not the venture is based on cultural pluralism or a lesser form of pluralism.

So a dichotomy can be expected between participants from individualist environments, who can be expected to demand incorporation into the interface on nothing short of full cultural pluralism, and those from fatalist and hierarchist environments, who should be quite relaxed about whether or not the venture is based on cultural pluralism.

#### **PREDICTED INFLUENCE ON ATTITUDES TOWARDS PREPARATION AND PLANNING FOR, AND MANAGEMENT AND CONSOLIDATION OF, CULTURAL CHANGE**

- \* *Hierarchists* will welcome all of Sales and Mirvis's steps towards preparation, planning, management and re-assessment of cultural change, as indeed they welcome any moves towards planning, more thorough management and systematisation.
- \* *Individualists*, who prefer minimal planning, and maximal risk-taking and opportunity for trial-and-error behaviour, will tend to prefer cultural change to materialise with little announcement or planning.

### IDENTIFYING THE CASE STUDIES TO BE INVESTIGATED

Once it had been decided that a case study approach should be adopted, it was necessary to identify the types of interfaces likely to generate the most helpful data.

One key question was where the interfaces were to come from. There were strong arguments for restricting the study to arrangements based on technologies from a single research agency. Holding constant researchers' broad institutional context seemed likely to enable that context to be better understood. This in turn should facilitate the depth of study already identified as important.<sup>1</sup>

One could be confident that a range of innovative commercialisation ventures would be available from one agency - CSIRO - since that Organisation has played such a prominent part in the movement of publicly-funded research into close commercial relationships with companies. The preamble highlights the attention CSIRO has given to developing its approach to commercialisation, while Appendix 3(A) shows just how many different types of commercialisation ventures that Organisation regularly uses.

Concentration on CSIRO-based case studies would also capitalise on the author's prior knowledge of many CSIRO commercialisation arrangements (described in the preamble). In addition, CSIRO/SIROTECH people involved in, or in charge of, many projects that were possibilities for inclusion were known to the author; indeed prior offers had been received from some of these people to co-operate in the study if their ventures turned out to be suitable. The author's prior knowledge

seemed likely to facilitate collection of data on what could turn out to be sensitive subjects.

In the light of these considerations, it was decided to select the case studies from ventures involving CSIRO.

The same line of argument could not be applied to the *company* partners; it was not practical to concentrate on case studies involving only companies likely to share a cultural framework: even at the broadest level. The population of business-development executives in small Australia-owned companies, for instance, would seem unlikely to share as many culturally-acquired predispositions and ways of thinking and institutional norms as the population of researchers in CSIRO divisions seem to share. It therefore seemed sensible to broaden the study's conclusions by seeking to include as many fundamentally different types of company as possible: foreign-owned and Australia-owned transnational corporations, other large Australian companies, and small Australian companies.

Case studies selected had to be at or near a particular stage of evolution. The ventures had to have been in existence long enough to permit reliable assessment of their efficacy and effectiveness; this generally meant at least 18 months to two years. At the same time, it was necessary for each case study to be 'new' enough to guarantee that the information gathered was reliable; key people had to be still available, and their recollections of happenings as the parties first came together had to be still clear. For the most part this seemed to require arrangements that had been in existence for no more than three or four years. However exception could be made where there were part-



icular grounds for believing data would be reliable.<sup>2</sup>

Most importantly, the ventures included in the investigation would have to be readily accessible to the author on a number of pragmatic grounds. Some of CSIRO's commercial partners were known to be very 'touchy' about how much they could rely on CSIRO to protect commercially confidential information, while some arrangements flagged for possible inclusion were approaching critical decision-points or review-points. It is unlikely that the author's attention to such arrangements would have been welcome.

It was also important to resist the temptation to avoid more 'difficult' cases. Limiting the study to a few unqualified *successful* interfaces would have limited the usefulness of the model of important contributors to interface effectiveness, that is to be constructed through the study. As it eventuated, surprisingly little difficulty was encountered in encompassing one distinctly 'unsuccessful' interface (SIROSCOUR). Indeed all four interfaces selected had their low spots (see chapter 5 and the descriptions of the case studies at the beginning of this volume).

These considerations resulted in identification of some 20 candidate case studies, selected from more than one hundred CSIRO-based commercialisation cases potentially available. All of these short-listed cases were articulated through discussion with CSIRO's top management (including the Organisation's Chief Executive and a number of institute directors), to a point where it became clear whether each potential case did indeed hold the prospect of unambiguous reliable data on the commercialisation process. Most of the short-listed cases were

readily eliminated on grounds including the stage of development they were then at, their likely sensitivity, the assessed availability of people in a position to provide good data, and the assessed availability of people in a position to act as a champion for the study. (It was felt that this final consideration might well be important for getting people to participate. As it turned out, this factor was perhaps over-emphasised, because it will be seen from Appendix 5 that people's participation in the case studies chosen was readily forthcoming.)

In the end, the four case studies constituting the investigation (DUNLENA, MMP, I<sup>2</sup> and SIROSCOUR: see chapter 5 and the descriptions at the beginning of this volume) were selected through a further application of the combination of filters described above, from a 'short short-list' of seven ventures. All four cases eventually chosen provided extensive data readily interpretable against the dimensions of behaviour constituting the analytical framework. There is every reason for believing that the three cases not eventually chosen from the 'short short-list' would also have been most helpful.

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**Notes to Appendix 3:**

1. On the other hand, encompassing technologies from more than one publicly-funded research agency would also have had some value. This could have assisted to make the conclusions from the investigation and the theoretical model that is being developed, more general. But this would have required the investigation of each interface to devote considerable effort at the outset to trying to come to grips

with agency-specific factors.

2. Three of the arrangements eventually chosen as case studies had been in existence, at the time most of the data were collected, for between 18 months and three years. The other had actually been in existence for about seven years. The scale and profile of this particular arrangement (DUNLENA: see the descriptions in chapter 5 and at the beginning of this volume), the richness of written material available on it (especially when it was being established and when it was moving through its various phases), and the continuity of several levels of management in the CSIRO Division and the company involved together made it probable that reconstruction of the social conditions in that interface's early days would be accurate. All indications available suggest that this was the case.

THE DIFFERENT FORMS OF COMMERCIALISATION ARRANGEMENTS USED BY CSIRO<sup>1</sup>

The author's extensive participant observation of CSIRO's commercialisation arrangements over the 1980s, described in the preamble, together with examination of documents describing those arrangements at a more general level (see, for instance, Commercial Relationships with CSIRO, CSIRO, 1988), identified a dozen fundamentally different forms of commercialisation arrangement used by the Organisation. They are described below.

1. Collaborative research with a single company, with the company and the laboratory sharing ownership of intellectual property, and with the company paying the laboratory a lower level of royalty than the 'going rate'. This can, in some cases, involve an umbrella memorandum of understanding.
2. Contract research carried out by the laboratory on a full or almost full commercial basis, for a single company.
3. Collaborative research carried out by a 'club' of companies and one or more laboratories, with the latter tending to be the hub of the arrangement.

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<sup>1</sup> Other categorisations of research-industry commercialisation arrangements are available. See, for example, Geisler and Rubenstein, 1989, pp.51 & 52; and Roessner and Bean, 1993.

4. Contract research carried out by the laboratory on a commercial basis, for a group of companies: grouped either formally as a research association or rural industry R&D corporation, or ad hoc. The group's technology interests can range from very narrow (a specific process of interest to only two or three companies), to very wide (many of the technologies needed by a quite broad industry).
5. Contract research carried out by a laboratory on a full commercial basis for a syndicate of research funders. This differs from 4 in that none of the syndicate members is potentially a manufacturer or other user of the technology concerned.
6. Contract R&D carried out by a company under contract to a laboratory: for example, to develop a piece of equipment from the bench scale.
7. Licensing to one or more companies: other than arrangements already described. That is, the laboratory alone has until this stage funded and carried out the research.
8. The company's hiring a laboratory's staff.
9. Open publication and other information-dissemination to stimulate end-user demand for the technology.
10. The laboratory directly becoming a business partner of the company: for example, through taking up equity in the company.

11. Establishment of a new company specifically or mainly to commercialise the technology concerned. Formation of the company can be mainly the result of the laboratory's initiative, or one or more existing companies' initiative. The laboratory may or may not hold equity in the company (see 10, above).
12. Formation of a new company specifically or mainly to commercialise the technology concerned, *by one or more former employees of the laboratory.*

### METHODOLOGY FOR COLLECTING DATA

The first formal contact on each of the four case studies was a letter to a senior CSIRO or SIROTECH person responsible for the commercialisation project concerned. Each of these people had previously been involved informally in reviewing the case's suitability. Two of these people were CSIRO divisional chiefs, another was a CSIRO institute director, while the fourth was SIROTECH's project director for the area of science/technology in CSIRO that included the project concerned. All four of the people were personally known to the author beforehand.

A sample of these letters constitutes Appendix 4(A). The letters were followed up by telephone contact, in the course of which each of these people agreed to endorse the study, to nominate a local contact person (or to confirm the author's suggested contact person), and to pass a copy of the investigator's letter on to that contact person.

All four contact people were middle-to-senior level CSIRO or SIROTECH managers with a prominent role in developing and operating the commercialisation venture. (One of these people was actually the senior person described in the first paragraph of this appendix; in this case the two roles described were combined.)

Through an initial interview each contact person provided the author with a detailed, critical 'scene-setting' historical summary of the venture; this encompassed many aspects of the venture's social/intercultural base. These briefings were supplemented by selections of

written material, some of it sensitive and/or confidential. The contacts also identified potential interviewees, advised the author on final selection of interviewees, arranged the interviews on behalf of the author, and later arranged access to extensive file material.

The contact's request to potential interviewees (in the company/ies involved, as well as in CSIRO/SIROTECH) asked them to participate by spending about an hour talking with the author about the commercialisation interface concerned. One of the contacts wrote formally to the proposed participants with this request, others used a hand-written note across the top of a copy of the investigator's letter, while one visited (in the case of the on-site CSIRO people) or telephoned (in the case of the company people) all the proposed participants.

The interviewees knew little in advance about the sorts of issues to be investigated through the interview, knowing only that the study was a social science-based investigation of their group's and the partner's or partners' work together in this venture.

The contacts reported no significant difficulties in getting the people approached to participate, and none of the interviewees subsequently showed to the author any sign of unwillingness or coercion. How much the interviewees sensed pressure to co-operate is uncertain, but probably varies from case to case. The contacts issuing the invitations on behalf of the investigator varied in their position and status in CSIRO or SIROTECH, their intimacy with the commercialisation arrangement and their degree of responsibility for it, their closeness to the proposed interviewees, and their degree of personal acquaintance with the author. They may have differed accordingly in their



inclination to press people to participate.

With two exceptions,<sup>1</sup> all people approached were interviewed. Those interviewed are listed in the descriptions of the case studies, at the beginning of this volume. The interviewees represent a reasonably comprehensive range of informants. While it would have been possible to interview more people in any of the interfaces, it became clear that the average of about eight interviewees per case provided an adequate sample of generally consistent representative views and perspectives. 'The law of diminishing returns' was starting to show up towards the end of some sets of interviews.

The sorts of issues to be covered (listed comprehensively in Appendix 4(B)) were summarised at the beginning of each interview in whatever detail seemed to retain the interviewee's interest. All interviewees were assured that the investigator would be punctilious about protecting information imparted in the interview: particularly about protecting it across the boundary with the partner laboratory/company. This undertaking was given only in connection with the investigator's discussions with other interviewees; no undertaking was given about restrictions on *publication*.<sup>2</sup> All CSIRO interviewees were reminded that the investigator was no longer on the staff of CSIRO's Corporate Centre, and was unlikely to return there at the end of the study. The distrust long attached by many CSIRO researchers to people from the Corporate Centre made this a potentially important step towards boosting informants' trust in the investigator. This news clearly impressed at least two or three of the interviewees.

Each interviewee was 'started off' on one or two of the broader issues

in Appendix 4(B) in which he had shown an interest in preliminary discussion, and was invited to talk about points of interest or concern flowing from those issues, bearing on the interface's functioning as a supragroup. Follow-up or focusing questions/observations kept each interviewee on relevant subjects. With the exception of two cases where the interviewee turned out not to have the knowledge or the perspectives expected, no difficulty was encountered in getting interviewees to cover a reasonable amount of the territory expected to be germane to the social and cultural dynamics of commercialisation.

Most interviews lasted an hour or a little longer. The longest was over two hours; the shortest (apart from the two "no-go's" identified in the preceding paragraph) was close to one hour. There were occasional signs of boredom towards the end of only a few of the interviews. A number of the interviewees seemed to warm to the task as it proceeded. Around half indicated interest in seeing any publications from the study. In some cases this was actually a request, rather than acceptance of an offer from the author.

The interviewer-as-a-participant flavour of the approach was reflected in the informality interviewees were encouraged to (and most did) bring to bear. Sometimes the interviews were interrupted by the interviewee's colleagues, and a larger discussion about some aspect of the arrangement developed. Often the investigator was passed on from one interviewee to the next by medium of a chat about the study and/or latest developments in the commercialisation arrangement.

The interviewees provided surprisingly frank comments and assessments; mostly they were happy to leave it to the investigator to decide which

of their views should be quoted publicly. In the case of all but one of the interviews, most of the discussion was tape recorded.<sup>3</sup> Occasionally, in a number of the interviews, either at the request of the interviewee or at the suggestion of the investigator, the tape recorder was temporarily turned off and an undertaking given that material provided during this period would be described in general terms only, and not attributed.

The tapes were not transcribed in their entirety. Rather, each tape was played at least three times over a period of two months, with the first time being within two days of the interview, and successively detailed and targeted summary notes were set down. These notes, which included direct quotations on the more significant points, were a main basis for the descriptions of each of the cases set out at the beginning of this volume. The tapes were also repeatedly turned to during the analysis to track down interviewees' specific points which had escaped inclusion in the summary notes, and to validate information provided by other interviewees.

The informality and use of the interviewee's day-to-day work setting as the venue meant that additional discussion about the interface often took place during a stroll through the laboratory, a visit to or from one of the interviewee's colleagues, or a visit to the tearoom. In a few cases further comments were gathered informally when an interviewee was 'caught up with' a second time elsewhere in the laboratory/company. Additional data gathered in these ways were documented in reasonably detailed notes written as soon as possible after this 'extension' of the interview (but always on the same day). These notes contributed to the summaries already referred to.

Data from each interview were validated against the file material accessed for three of the four cases, the briefings provided by the contact persons and data from other interviews. Commonsense guides to interviewees' credibility and sincerity (Becker, 1970, p.29) were used throughout the whole period of analysis of the data. The approach to data-collection incorporated several specific precautions guarding against the widely discussed dangers of field studies of this type.

First, the investigation contained intrinsic guards against distorted views from the informants. The adversarial nature of the commercialisation interface made it likely that each 'side' would report important attitudes and behaviour of 'the other side', while the range of participants, onlookers and hybrid participants/onlookers interviewed (managers at various levels in each party, bench-level researchers, first-line business-development executives, SIROTECH people) further increased the cross-checks available. Becker explains (1970, p.32) the importance of using data accumulated through such diverse sources.

Second, the informal, non-directive form of interview meant that much information was volunteered by the informants, rather than being 'dragged out'. Again Becker argues (1970, p.30) that such data are likely to be especially valid.

Third, with three of the case studies, separation by up to a year of the collection of the interview-derived and the written data facilitated the search for invalid material, by enabling the author to take 'cross-sights' on information provided, from vastly different stages of evolution of his thinking. Becker identifies also the importance of these varying perspectives (1970, pp.36, 47 and 56).

Fourth, the likelihood of interview material being coloured by discussion of issues among informants (Hill, 1970, p.328) was minimised by conducting as many as possible of the interviews with the CSIRO people in a particular interface, or those with the company people, on the one day. No informants gave any indication of having 'compared notes' with colleagues before their interview. Such happenings would probably have surfaced in the course of such deep discussions. Far from presenting homogenised views, a number of interviewees went out of their way to articulate their own views by contrasting them with known views of some of their colleagues.

Next, Hill notes the often helpful step of emphasising particular uses envisaged for the data being gathered, that are unlikely to threaten the interviewee. He gives the example of pointing out that data would be used "more to look at management than the group" (Hill, 1970, p.329). The present study had a ready-made focus of this type: the focus on the interface, rather than on the laboratory or company groups. This focus was resorted to repeatedly. To the author's observation, this was a most significant factor in eliciting forthright, critical comments.

Finally, the integrative nature of the case study approach itself guards against biased material from any one interview distorting the overall picture. The case study approach necessarily takes investigation to the heart of the patterns discerned from *all* the data (Becker, 1970, p.83).

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**Notes to Appendix 4:**

1. One person in one of the arrangements who is based in New Zealand ultimately could not be interviewed (as was intended) during one of his periodic visits to Australia, while one SIROTECH project director could not be interviewed because of his prolonged absence from Australia around the time the interviews were carried out. His availability was subsequently complicated by the disbandment of SIROTECH.
2. Except that a non-disclosure agreement was entered into with one of the CSIRO divisions concerned. However this relates to publication of information on the technology on which the arrangement concerned was based: not to findings from the study.
3. The one interview not tape-recorded was with a CSIRO scientist renowned as a difficult and suspicious character who, it had been predicted by the contact person, would refuse to have his interview recorded. It had also been predicted that he would refuse to participate, but he did not; for the most part he was co-operative and certainly civil. He among all the informants seemed to welcome the opportunity to 'complain' to the investigator about several aspects of his treatment in the course of the commercialisation arrangement concerned: and more generally!

SAMPLE OF LETTERS OF INTRODUCTION TO  
SENIOR CSIRO AND SIROTECH MANAGERS

Dr Ken Whiteley  
Chief, CSIRO Division of Wool Technology  
(7 pages)

Dear Ken

Thanks again for the time and attention you gave today to discussing SIROSCOUR as a possible case study for my doctoral research on the commercialisation by Australian industry of technology from publicly-funded research laboratories.

As we agreed, this project/product would seem hard to beat as an example of extended interaction to this end by a laboratory and a number of companies, in the course of which at least some of the participants went through a number of the learning and opinion-forming experiences we have all talked about for years. The product seems, what's more, to be at an ideal stage for me to look at. Furthermore, study of the stages that SIROSCOUR went through offers the opportunity for what my supervisor has been encouraging me to try to pick up in the course of my work (but which until now I had written off as being too hard): study of a commercialisation case's trials and tribulations over a period of time (rather than study of what amounts to a 'snapshot' at the present time).

I am pleased that you have agreed to take the possibility further through raising it with both the companies now involved and with a company that had been involved earlier on. I have written this letter in a form that might enable you to forward it to the companies for the purpose of raising the possibility with them; in a week or so I shall make direct contact with the relevant people in the companies.

Although I didn't specifically mention it this morning, I feel that it is now also appropriate to mention my wish to look at SIROSCOUR to the key CSIRO people involved; you may already have done so.

For the benefit of the people in the companies (as well as your people), I need to give a little background to my research, and I suppose to myself as well. I worked for 20 years in CSIRO, the last 10 years in the areas of research/industry/commercialisation policy, and a couple of years elsewhere on related subjects. At the beginning of this year I started full-time research for a doctorate, with Professor Stephen Hill at the Centre for Research Policy at the University of Wollongong. I am including, as Attachment 1, a brief c.v.

I am looking at the behavioural/social dynamics of the commercialisation<sup>1</sup> by Australian industry of technology from publicly-funded research laboratories: the processes that go on within, and between, the laboratory and the company. My particular interest is unravelling the coming together of different cultures: those of the laboratory, the company and any other parties, as well as any notable subgroups within any party. The concepts I am using therefore address subjects like social space, boundary processes, relationships between social and

cultural experiences, communication, power relationships, and group dynamics and unifying concepts. (I would be glad to acquaint you and the relevant people in the companies with details of the underlying sociological constructs if you are interested.)

My ultimate aim is to identify cultural/behavioural factors that make for effective commercialisation<sup>1</sup> arrangements. The study will extend to the history of development of the laboratory's and the companies' outlooks, strategies and interaction with each other, as well as the relationship of this 'soft' side of the arrangements to the 'hard' side: the actual (legal) commercialisation<sup>1</sup> vehicle and the operating arrangements it dictates.

I believe that nationally we have a woeful knowledge of how the process of commercialising technology from publicly-funded laboratories takes place. There have been some policy and economic studies, but I am aware of no comprehensive behavioural studies, at least in Australia, despite the arguable importance of the subject to our national industrial future. I am sure my work is a notable step towards furthering our knowledge on the subject, and that it will be of immediate interest and help to management of publicly-funded research laboratories and management of technology-using industries. I am also sure that inclusion of cases in resource-processing areas will be particularly valuable.

Over the next six months or so, I intend to look closely at about 10 case studies involving CSIRO, other government agencies and university departments, various types of arrangements and different types of companies. The first stage is a pilot study of probably three cases, which I hope to get under way within a couple of weeks. I would like to see SIROSCOUR in this pilot phase.

Although I am interested in receiving a broad range of views, and shall be encouraging those I'll be seeing to talk broadly about the subject, I intend to circulate a list along the lines of Attachment 2, so that those I hope to be speaking with can think in advance about the subject. Attachment 2 should give the companies a feel for the sorts of questions I would be interested in raising with them. I would be glad to amplify these for the management of the companies.

I shall be gathering observations from people representing the Organisation and the companies in the commercialisation<sup>1</sup> process and participating in the interface<sup>2</sup>, and those looking on. You will see that these observations include both the people's own beliefs, feelings, expectations and behaviour and their observations on those of others, and of CSIRO and the company as organisations.

I would need to speak with enough people in each of the Division and the companies (and possibly one or two 'third parties': SIROTECH, perhaps, and AWC) to get the necessary range of views on these issues. Unfortunately I would not be able to progress the study very far through written questionnaires or other techniques not entailing face-to-face contact. Rest assured that I will be keeping contact time to the absolute minimum; this probably means between one and two hours with each person. It will probably turn out that for each case I will need to interview perhaps half a dozen people in CSIRO and a few people in each company.



A number of practical factors are going to be important in my selection of case studies and in being granted access to cases and key people.

Commercial confidentiality is perhaps the most significant of these factors, and I should underline my commitment not only to respecting any actual commercial data I might happen to come by (and I had direct access to much such material over many years in CSIRO), but also to carefully considering the terms in which I identify my cases. I hope to get by wherever possible with describing cases only in terms such as "an arrangement involving a CSIRO division and the Australian subsidiary of a transnational manufacturing company". Of course I shall need to discuss the Division's and the companies' philosophies, values and history of dealing with industry/public research agencies, but I am confident that this can be done in a way everyone can be relaxed about.

I should also point out how conscious I am of the delicacy of many relations between CSIRO divisions and companies. Accordingly, I shall be scrupulous about avoiding reporting to the 'other' party what I have already learned from the first party. Likewise with relations between the members/managers of the CSIRO and company teams.

However I have always been aware of the possible need to take steps beyond these, in order to protect confidentialities. This might be necessary, for example, to protect any strongly-expressed views on any party's performance in the commercialisation process. As I mentioned, I am quite willing, if the circumstances demand it, to prepare a two-part thesis, with one part being reserved for the examiners alone to see.

Best wishes,

Yours sincerely

Ron Murnain

15 July 1992

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**Notes:**

1. By "commercialisation", I mean the whole suite of activities - often taking place over a period of years - necessary to get a product, process or access to a publicly-funded laboratory's services and skills into commercial use. This includes the steps all the way from collaborative R&D, through prototyping and scaling-up, to working on the technical problems associated with bringing the manufacture or other full-scale application of the technology into its final form.
2. I am conceptualising the interface formed by the two parties coming together for this purpose as a social entity in its own right, even though it may be quite different from many more common forms of group; for example, the occupants of the interface may not work side-by-side as do members of more conventional work groups, and may come into contact only mainly through periodic meetings and telephone contact.

## COMPREHENSIVE LIST OF POTENTIAL AREAS FOR INTERVIEWS TO COVER

[In practice, only three or four of the areas were raised in specific questions in each interview, although ultimately most of the areas were covered to some extent in most interviews. Only one interviewee showed any predilection to discuss the subject matter at the outset: other than to the extent dictated by courtesy and very general interest. Most interviewees said, though, that the study seemed to be in an important area and to be worthwhile, and they seemed to express this view sincerely and reasonably spontaneously.]

- \* Common view between parties on what the exercise is all about, and where it's heading?
- \* What was sought/expected from the arrangement v's what was gained.
- \* Management commitment/consistency/guidance? Strength of commitment to interface?
- \* Management/leadership styles: Risk-taking? Conservative? Devolution?
- \* Social/management arrangements?
- \* Any outstanding example of teamwork? Why outstanding?

- \* Outstanding 'catch points'/misunderstandings/misinterpretations/conflict/surprise with the behaviour or expectations of the other party? Why?
- \* Each party's views of the other. Changes in these views over time?
- \* Each party willing to face up to problems and nip them in the bud?
- \* Each party's coping with the other culture? Why? Learning experience? Changes in individuals' behaviour following work in this mode with the other party? Consistency in changes in behaviour?
- \* Any principles for getting most out of cultural complementarity? Any evident confusion from working in different cultural frameworks?
- \* Power relationships; who was 'driving', and why? Did other party understand the reasons for each party's actions?
- \* Consistency of the arrangement with the company's or the agency's mainstream business? Group's relationship with other groups as a result of this arrangement?
- \* Relevant third parties? External environment. Effects on company's or agency's other relationships? Views on arrangement from within each party?

- \* Particular times and reasons for special doubts/confidence? Key punctuation points? Evolution over time.
- \* Public/private domain. Fears and concerns? Challenges?
- \* Credit/sources of reward that count?
- \* Trade-offs/compromises? For example, sacrificing control for support.
- \* Appropriateness of the 'hard' commercialisation arrangement?
- \* How well each party 'handled itself' in the arrangement?

**INTERFACES' CULTURAL 'SHAPES', AND THE PATTERNS OF  
COMMUNICATION, UNDERSTANDING, COLLABORATION AND COMMITMENT  
ASSOCIATED WITH EACH**

The diagrams in this appendix portray the 10 main cultural 'shapes' identified from the CSIRO commercialisation ventures monitored and analysed over the 1980s in the fashion described in the preamble. The patterns of communication, understanding, collaboration and commitment most likely to be associated with each are also set out. In the interest of simplicity, the diagrams are restricted to two parties.

In all, somewhat more than the 10 different cultural 'shapes' presented here were identified. These 10 'shapes' seemed to be most common, and it was thought that they were likely to cover the actual interfaces in the case studies. (In fact, it turned out to be a simple task to associate each of the four interfaces in the case studies, at each stage of its evolution, with one or another of these 'shapes'; this is done in chapter 5 and Appendix 8.)

*The circles in the diagrams* are intended to encompass all the values, norms, attitudes, and behavioural and institutional preferences constituting *each party's* cultural base. These include values, norms, attitudes, etc. injected by all relevant people: including people in other parts of the company or other parts of CSIRO, and elsewhere in the relevant industry. They also include values, norms, attitudes, etc. developed through commercialisation arrangements the party has been involved in previously.

It follows that values, norms, attitudes, and behavioural and institutional preferences that have *not* come to be part of that party's

cultural base are located *outside* that party's circle.

*The rectangular boxes in the diagrams* are intended to encompass all the values, norms, attitudes, etc. that constitute *the interface's* own cultural base. The area *outside* the rectangular box constitutes the sum total of values, norms, attitudes, etc. that have *not* been incorporated into the interface's cultural base; this 'external' cultural environment of the interface can contain some of each party's values, norms, attitudes, etc.

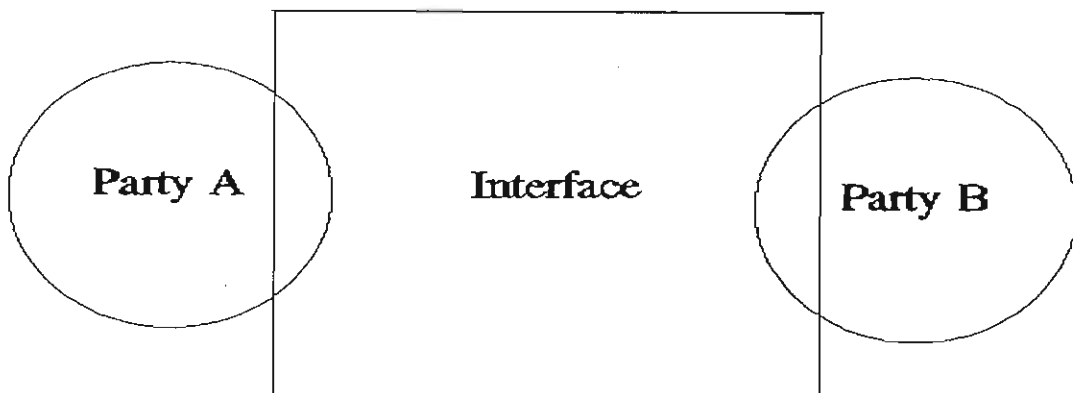
*Boundary variables* forming the basis of these diagrams, then, are each party's cultural boundary and the interface's cultural boundary. In addition, the diagrams capture *inter-party* culture *balance, or symmetry*. The amount of overlap among the parts of a diagram, the distances between those different parts and their relative areas show how much a particular set of values, norms, attitudes, behavioural preferences and institutional preferences are shared by the parties, or are compatible between the parties. These characteristics also show how much that value set has come to contribute to the interface's own set of values, norms, attitudes and preferences.

*Permeability* of cultural boundaries is not defined explicitly in the diagrams. But the shape of a diagram goes a long way towards defining permeability implicitly. Diagram 1, for instance, implies zero permeability between the cultures of the parties, and very low permeability between the culture of each party and that of the interface. Diagram 7, on the other hand, implies a high degree of permeability between the cultures of both parties and between the culture of each party and that of the interface.

Boundaries' permeability is also clarified by a dynamic dimension taken up in chapter 4. Movement of an interface over time from the situation represented in one diagram to the situation represented in another often has implications for the interpenetration of values, norms, expectations, preferences and behavioural orientations between the parties' cultural bases.

The boundary permeability least defined through such reasoning is the interface's boundary with the 'external' cultural world. But even this boundary's permeability is partly defined by the shape of the diagram. The larger the 'interface culture' box relative to the 'party culture' circles, the more permeable the interface/environment boundary will be (because it will have absorbed proportionally more values, norms, attitudes, etc. from the larger world).

**Diagram 1**

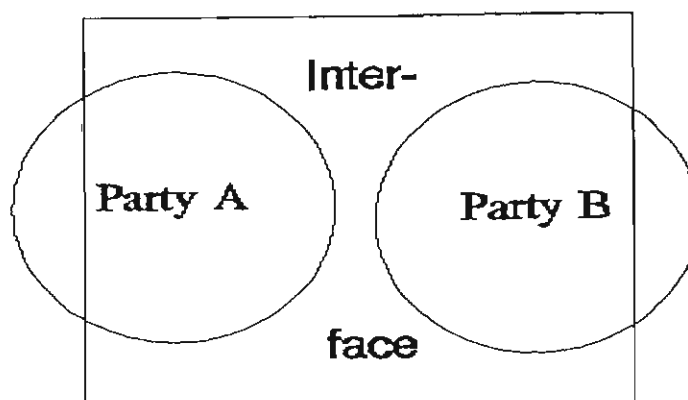


<b>Summary</b>	Parties share no significant values, norms, expectations,
<b>Interpret-</b>	preferences or behavioural orientations, and indeed the
<b>ation:</b>	two sets of values/norms/etc. are likely to be incompat-
	ible to some extent. Interface draws most of its essential
	values, norms, expectations and rules from the environment
	external to each party: perhaps from the values, norms,
	attitudes, etc. of the parties' commercial advisers, the

parties' 'head offices' (bearing in mind that "the party" is the particular part of CSIRO or the company that 'owns' the venture: this can be as small a part as a research group or a small business group within the company) or the industry within which the venture resides, or on the basis of what was thought 'right' for a venture of this type.

- Prognosis \* Fragmented, incoherent interface.
- If Situation Remains \* Misunderstandings, cross-purposes, conflict.
- Unchanged: \* Difficulties in goal-setting.
- \* Low commitment.
- \* Lack of direction, uncertainty, leadership difficulties.
- \* Lack of control for both parties' management.
- \* Shallow communications.
- \* Intercultural 'blindness' and amorphism, 'separate development'.
- \* Few learning opportunities, narrow role-definition.
- \* Likelihood of competitive approach to problem-solving.
- \* 'Comfortable complacency'.
- \* Likely excessive outside influences.

## Diagram 2





**Summary** Parties share no significant values, norms, expectations, preferences or behavioural orientations, and indeed the two sets of values/norms/etc. are likely to be incompatible to some extent. Interface draws most of its essential values, norms, expectations and rules from one or another (but not both) parties.

**Prognosis** As for diagram 1, but probably with greater degree of:

**If Situation Remains Unchanged:** \* misunderstandings, cross-purposes, conflict;

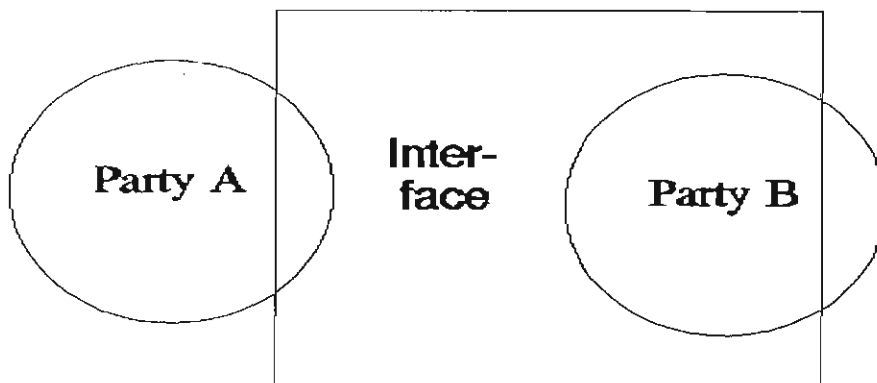
\* difficulties in goal-setting;

\* leadership difficulties; and

\* competitive approach to problem-solving,

because the interface's essential values, norms, expectations and rules include more from each party's cultural base that will probably be incompatible with, or at least different from, the other party's. Perhaps lower likelihood of excessive outside influences.

### Diagram 3



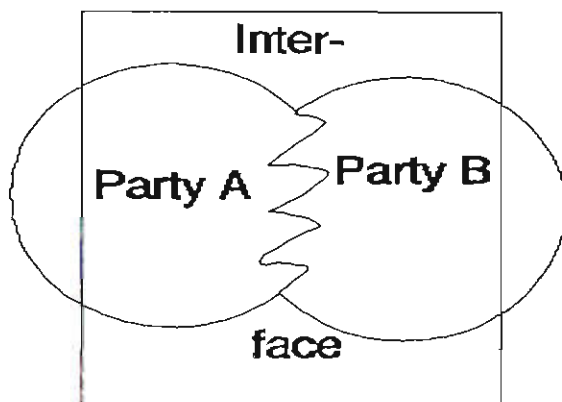
**Summary** Parties share no significant values, norms, expectations, preferences or behavioural orientations, and indeed the two sets of values/norms/etc. are likely to be incompatible to some extent. Interface draws far more of its

essential values, norms, expectations and rules from one party than the other.

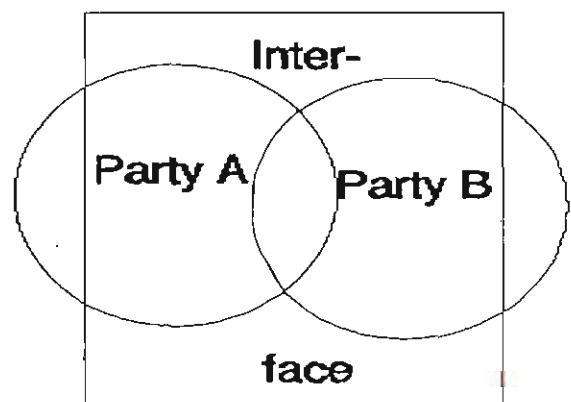
**Prognosis** As for diagrams 1 and 2, but probably with greater chance  
**If Situation Remains Unchanged:** of:

- \* low commitment;
  - \* uncertainty;
  - \* management, control and leadership difficulties; and
  - \* restrictions on learning,
- on the part of party A.*

**Diagram 4(A)**



**Diagram 4(B)**



**Summary** Although parties share few, if any, values, norms, expectations, preferences or behavioural orientations, the respective sets are closer to being compatible, and are certainly not highly incompatible.

**Prognosis** Less chance than with diagrams 1, 2 and 3 of serious:  
**If Situation Remains Unchanged:**

- \* fragmentation, incoherence;
- \* misunderstanding, cross-purposes, conflict;
- \* management, control and leadership difficulties;
- \* communication difficulties; or
- \* cultural 'blindness', 'separate development',

but still danger of less extreme problems in these and the other areas because the interface still draws many of its essential values, norms, expectations and rules from those of the other party's values/norms/etc. that are not shared.

Diagram 5(A)

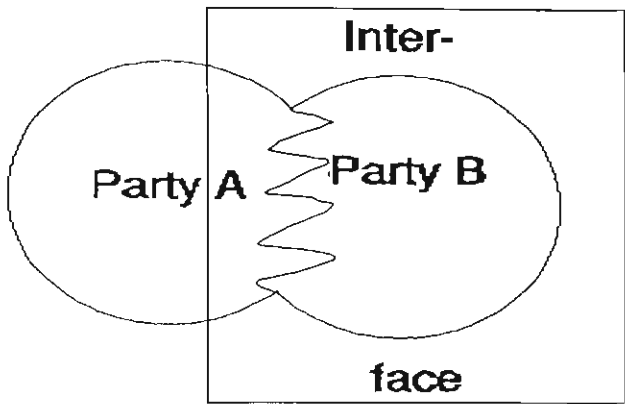
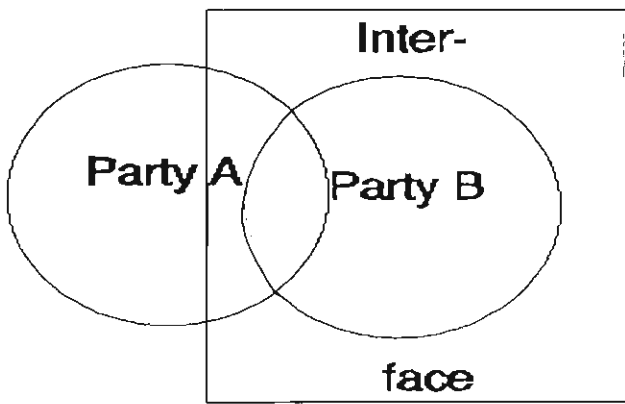


Diagram 5(B)



**Summary** Although parties share few, if any, values, norms, expectations, preferences or behavioural orientations, the relationship: respective sets are closer to being compatible, and are certainly not highly incompatible. Interface draws far more of its essential values, norms, expectations and rules from one party than the other.

**Prognosis** As for diagram 4, but probably with greater chance of:

**If Situation Remains Unchanged:**

- \* low commitment;
- \* uncertainty;
- \* management, control and leadership difficulties; and
- \* restrictions on learning,

*on the part of party A.*

Diagram 6(A)

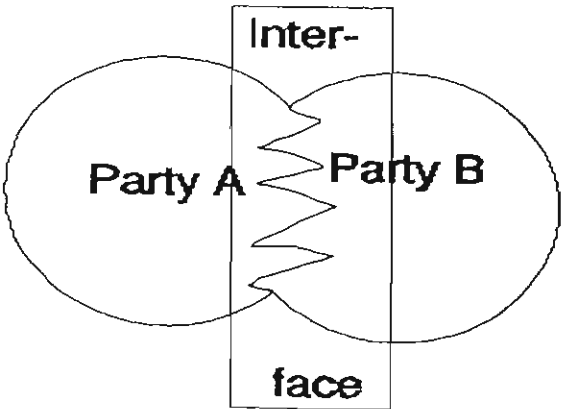
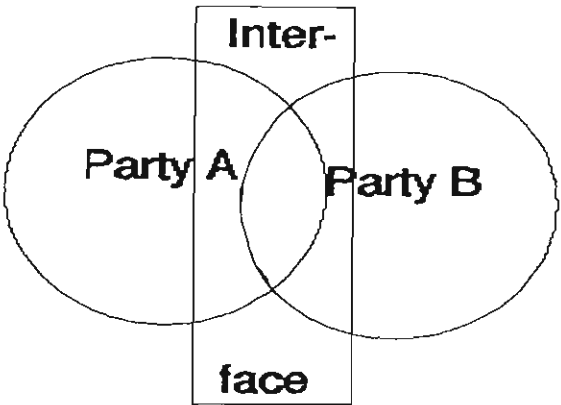


Diagram 6(B)

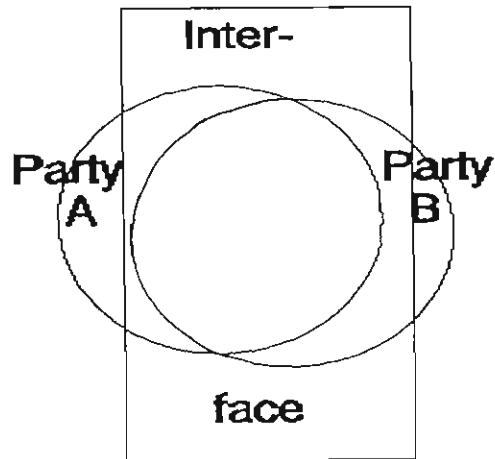


**Summary** Although parties share few, if any, values, norms, expect-  
**Interpret-** ations, preferences or behavioural orientations, the re-  
**ation:** spective sets are closer to being compatible, and are cer-  
tainly not highly incompatible. Higher proportion of  
interface's essential values, norms, expectations and  
rules are drawn from those of the parties' values/norms/  
etc. that are either shared or compatible. Little of the  
interface's cultural system has been derived either from  
'external' sources or from one or the other party's val-  
ues, norms, attitudes, etc. that are far from being shared  
with the other party.

**Prognosis** Much less chance than with diagrams 1, 2 and 3, and signi-  
**If Situat-** ficantly less chance than with diagrams 4 and 5, of  
**ion Remains** serious:

- Unchanged:**
- \* fragmentation, incoherence;
  - \* communication difficulties;
  - \* cultural 'blindness', 'separate development';
  - \* misunderstanding, cross-purposes, conflict; or
  - \* management, control and leadership difficulties.

Diagram 7



**Summary** Parties share many values, norms, expectations, preferences and behavioural orientations. The interface's values, norms, attitudes, etc. have been derived almost entirely from the values, norms, attitudes, etc. that are shared by the parties.

<b>Prognosis</b>	* Integrated, coherent interface.
<b>If Situation Remains Unchanged:</b>	* Shared meanings and understandings, healthy degree of conflict. * Shared goals. * High commitment. * High direction, focus, vision. * Good communications. * Good intercultural perceptiveness and understanding. * Many learning opportunities, healthy integration of roles. * Likelihood of co-operative approach to problem-solving.

THE FUNDAMENTALLY DIFFERENT WAYS IN WHICH COMMERCIALISATION OF  
TECHNOLOGY GENERATED THROUGH PUBLICLY FUNDED RESEARCH CAN COME ABOUT

The author's extensive participant observation of CSIRO's commercialisation arrangements over the 1980s, described in the preamble, identified seven fundamentally different ways in which CSIRO's commercialisation of technology can come about. They are described below.

A. 'WE WANT TO BUY'

1. 'The Plaintive Plea': "Our company has a production/quality/operational/etc. problem; please help us fix it."
2. 'Do Us and Yourself a Favour': "Our company has identified a market opportunity for a new (or different) product; sell us what's necessary to develop it."
3. As in 2, but from more than one company: "Our industry has a need for a better way of producing a product; sell us what's necessary to find and develop it." OR "Our research-funding syndicate is in the market for new technology in area 'X'; work for us in developing it."

B. 'WE WANT TO SELL'

1. 'The Plaintive Plea': "Our laboratory has developed the basis for a new product/process; please buy it from us." OR "Please work with us in developing it further."
2. 'Do Us and Yourself a Favour': "Our laboratory has a skills base that is relevant to your industry; buy its contents from us, so that you can develop new (or different) products."

C. 'LET'S DEVELOP OUR BUSINESS TOGETHER'

1. "Our company/laboratory and your laboratory/company, through working together, have jointly identified a market opportunity for a new (or different) product; let's continue to work together to capitalise on that opportunity."
2. "The nation has identified a market opportunity for a new (or different) product; let our company/laboratory and your laboratory/company work together to capitalise on that opportunity."

## THE MAIN CHARACTERISTICS OF THE COMMERCIALISATION ARRANGEMENTS IN THE CASE STUDIES

This appendix identifies the main characteristics of each of the arrangements in the case studies, in the terms used in chapter 4. It illustrates only extreme positions on the dimension that defines each characteristic; *all* arrangements are positioned against each characteristic in Table 7, in chapter 5. The content characteristics are dealt with here in a different order from the order in which they were introduced in chapter 4, because interspersing the characteristics relating to the type of technology with those relating to the technology's role in each party's business and plans will be more helpful for the analyses in later chapters.

It may be necessary at some points in this appendix to refer back to the descriptions of the case studies at the beginning of this volume.

### 1. CONTENT CHARACTERISTICS

#### **The Stage of Development the Technology Had Reached At the Time the Arrangement Came into Being**

DUNLENA works with virtually 'raw' research results. Indeed, some of DUNLENA's responsibilities stretch back into the actual *performance* of research. At the other extreme is SIROSCOUR, which was established to engineer a largely pre-existing process into a commercial plant.

#### **How Central the Arrangement Is To Each Party's Future**

The variation against this characteristic can be illustrated through one venture: DUNLENA. If DUNLENA should turn out to be a disaster, Du Pont would be unlikely to suffer fundamentally. Failure could have implications for the company's future work with publicly-funded labor-



atories and other outside research groups, and perhaps ultimately could have some impact on its competitiveness. But the company, even its agricultural chemicals division and perhaps even its Australian operation, would be unlikely to suffer more than passing embarrassment. The CSIRO Division, by contrast, would be dealt a long-term, perhaps mortal, blow by such a failure. Between one-quarter and one-third of the Division's resources have gone into the work for DUNLENA over 11 years. CSIRO management (at a number of levels) and stakeholders, many of the Division's prospective commercial partners and the industry at large would undoubtedly take a grim view of what they could well see as wanton commitment of so many resources and skills to a failed venture: with a large transnational corporation at that!

#### **Relationship of the Arrangement to the Company's and the Laboratory's Existing Lines of Business**

Again, a single venture - SIROSCOUR - illustrates the variation against this characteristic. For the CSIRO Division, this venture was intended to strengthen an existing line of business: demonstrating and implementing technology and know-how it has developed to support the wool textiles industry. For both the companies, it was intended to provide the basis of a completely new line of business: for PD&F, designing, building and installing *wool processing* equipment; and for Greenfields, *processing* (rather than only handling) wool.

#### **Whether the Technology Is Aimed at 'Big Bang' or Incremental Innovation**

SIROSCOUR is perhaps the ultimate example of a technology aimed at incremental innovation, through gradually improving scouring efficiency. DUNLENA is intended to result in the ultimate 'big bang' innovation: a product that would be an important new hundreds-of-million-

dollar product of the Du Pont family, making a real mark in the agricultural chemicals industry for a decade or so.

#### **Whether the Technology Is Aimed at Product Innovation or Process Innovation**

I<sup>2</sup> is an ultimate illustration of a new product based on research-generated technology, while SIROSCOUR is an ultimate example of using technology to improve processes for handling existing products. Interestingly, the case studies contain an example of a technology that has *both* aims. MMP, according to many measures is focused on process innovation: a new, improved process for manufacturing magnesium metal. But it also has the aim of developing high-quality magnesium metal as a new (to Australian industry) product.

## **2. FORM CHARACTERISTICS**

### **Type of Arrangement**

The ventures in the four case studies are very different types of arrangements (see Appendix 3(A)): I<sup>2</sup> is a relatively informal development joint venture. SIROSCOUR is a multi-party collaborative development arrangement based on licensing. DUNLENA is a formal, incorporated R&D joint venture. MMP is a formal, unincorporated multi-party R&D joint venture.

### **Definition and Formality of the Arrangement; Planning of the Arrangement; the Arrangement's Focus or Vision**

In terms of degree of definition, formality and focus: SIROSCOUR was loosely defined at the outset, and when disputes arose, no-one was sure what expectations and responsibilities existed. At the other extreme, no-one could have been under any doubt as to the expectations and responsibilities of each party in DUNLENA, which had been well

documented at the outset.

In terms of degree of planning: I<sup>2</sup> was unashamedly a 'spin-off' from a CSIRO environmental research program, and therefore necessarily had had the benefit of little strategic planning. At the other extreme, both MMP and DUNLENA were planned to the greatest detail against the background of the companies', the CSIRO divisions' (or in the case of MMP, the whole CSIRO Institute's) and the nation's place in the world.

#### **Unanimity and Consistency of Support for the Arrangement from Relevant Levels of Management in Each Party**

In each party to I<sup>2</sup>, management at at least one level was at least indifferent and in one case somewhat hostile towards the project. At the other extreme is CSIRO's involvement in MMP, where, despite the novel and potentially controversial aspects, most levels of management not only were enthusiastic about the venture, but indeed played an active, high-profile part in negotiating it with government and politicians.

#### **Identification of the Arrangement with One Person (or a Small Number of People) from One or Both Parties**

I<sup>2</sup> is the 'baby' of both the small CSIRO group involved and its leader and OPTUS A. At the other extreme, DUNLENA is a clear case of corporate 'ownership' by the CSIRO Division and the company, rather than by one employee or small group. A sure sign of this corporate 'ownership' is the fact that CSIRO D, whose family of compounds provided the basis of DUNLENA, is now involved only tangentially in the arrangement.

#### **Duration of the Arrangement**

I<sup>2</sup> was never intended to be in existence for more than a couple of years, while DUNLENA has already been in existence for 11 years, and

shows no sign of reaching the end of its useful life.

### **Complexity of the Arrangement**

I<sup>2</sup> was a simple, two-party venture with few legal complexities and with clear, simple definition of each party's role (even if one party never really came close to playing its role). Both SIROSCOUR and MMP are more complicated arrangements. The first 'loop' of SIROSCOUR involved three parties, and various types of agreements or understandings between the various pairs of parties, while MMP involves four parties from remarkably different backgrounds, each of which again had fundamentally different types of relationships with the others.

### **Novelty, Sensitivity, Politicisation and Profile of the Arrangement**

MMP breaks new ground and is sensitive in a number of respects. For example, it is what many would see as a blatant case of the government and a government agency 'picking winners', and it was the first case of the federal government injecting a substantial sum of money earmarked for the actual process of developing CSIRO research into a new, high-value-added industry. MMP also has quite a high profile.

At the other extreme, I<sup>2</sup> was a straight-forward, generally uncontroversial and low profile example of CSIRO joining with a company to develop a product that was a 'spin-off' from a division's research, while SIROSCOUR was a classical example of accessing CSIRO's research-based industrial know-how through a complicated and poorly defined but essentially conventional, low profile arrangement with companies. The one (minor) factor in SIROSCOUR that injected an element of sensitivity and politicisation was the Australian Wool Corporation's shareholding in Greenfields.

### **How the Arrangement Came About**

I<sup>2</sup> apparently came about through the "plaintive plea" route described in Appendix 6, with the plea having come from OPTUS. At the other extreme, MMP came about through the "Let's develop our business together" route. While initiation and early-stage development of MMP therefore by definition involved most parties, the very first action came from QMC.

The ventures also vary widely in terms of the parties' relative strength and passion in establishing the arrangement: from QMC's conviction and passion about MMP, to the CSIRO Division's businesslike but relatively dispassionate approach to establishing SIROSCOUR.

### **The Balance Between the Parties' Power and Responsibilities**

In DUNLENA, power and responsibilities are, and are generally seen to be, extremely well-balanced. At the other extreme, on the whole power and responsibilities in I<sup>2</sup> were weighted towards the CSIRO group, which for most of the venture's lifetime was regarded as the 'senior partner', the 'working partner' and the main energising source: despite OPTUS's prominence in creating the arrangement.

## INDIVIDUALS' AND GROUPS' POSITIONS IN SOCIAL SPACE

## THE DUNLENA INTERFACE

## The CSIRO Group

These people clearly reside in *the high grid/high group segment*; they are hierarchists.

The *high-group* placement follows, at the broadest level, from the well-known team orientation in synthetic organic chemistry: a field traditionally characterised by a great deal of joint authorship of papers, and structured, strongly hierarchical research groups. Indeed CSIRO E (the group's leader), was overtly hostile towards low-group ideas. He was most critical (interview, CSIRO Clayton, 17 September 1992) of the "possessive" attitude underlying much public sector research; he sees this as being "disastrous" for the sort of work the group undertakes in DUNLENA.

This group's work also clearly demonstrates another strong correlate of high-group (Bloor & Bloor, 1982, p.85): it is relatively long-term. CSIRO A emphasised how long-term the work really is: "It is important to have someone motivated enough and otherwise suitable - for example, in terms of age - to see it through for 20 or 25 years" (interview, University of Melbourne, 16 September 1992).

Indeed this group reflects most of Mars' four signifiers of high-group (Mars, 1982, pp.27 & 28): *frequent* intragroup contact, within a *mutually interconnecting* network, over a reasonably wide (and increasing) *scope* of activities, within an increasingly strong *boundary*.

While these high-group characteristics to a significant extent follow from the traditional working arrangements in this discipline (already referred to), a number of interviewees in effect identified how some of these characteristics had become more marked over the course of the DUNLENA project. CSIRO E, for instance, remarked (interview, CSIRO Clayton, 17 September 1992) on the more tightly drawn boundary around the group within the Division as the DUNLENA work progressed.

*High-grid* is indicated by the group members' strong focus on tasks, and relatively few manipulative transactions with other people. Life for the members of this group tends to be all about organising *themselves* and their functions, within a structured, hierarchical group. This militates against the independence, self-determination, discretion and competition that are flagged by Mars (1982, pp.25 & 26) as signifiers of *low-grid*.

Indeed, the group is so far up-grid that neither the group leader nor his immediate superior - the program manager - was involved in the initial negotiations with Du Pont about DUNLENA; all this was handled by the Division's Chief and Assistant Chief. As CSIRO B said (interview, CSIRO Clayton, 17 September 1992), "This is the only program in the Division, and perhaps the whole Organisation, where the program manager [to say nothing of the project leader: that is, the group's immediate leader] doesn't get involved in such negotiations".

There is, in the CSIRO group's outlooks and day-to-day work organisation, much evidence of the sorts of worldviews predicted by cultural theory for people in the *high grid/high group segment*.

There is the characteristic high valuation placed on the systematic articulation and clarification of minute detail, centring on distinctions between broadly similar compounds differing in one or two small but vitally important respects. This is accompanied by the group's preference for the 'analogue' approach to developing new compounds (referred to by a number of interviewees), as opposed to the 'random' approach. This seems to display the "key-in-the-lock" view of science characteristic of scientists in this segment (Bloor & Bloor, 1982, p.86).

To be added to this is the synthetic chemist's traditional disciplined approach to his or her work, and a ready acknowledgment - and indeed often an active seeking-out - of contributions by colleagues in highly specialised areas.

The group also showed the predicted tendency to deal with conflict relatively openly. And early on in DUNLENA they demonstrated also the predicted 'local' (as opposed to cosmopolitan) approach to rewards and to setting the context for their research; it was quite a long time before the group became relaxed about sharing their work and output with Du Pont in a cosmopolitan mode. As noted by CSIRO E (interview, CSIRO Clayton, 17 September 1992), there is still considerable yearning in the group for the traditional intra-CSIRO form of reward.

Furthermore this group displays a hallmark of the hierarchist's approach to entering an unknown or unfamiliar realm: the ground is thoroughly sounded out before action, and development of the skills and systems necessary to cope with the new situation predates commencement of any significant work in the new area. The author has



encountered few, if any, other instances of such thorough, systematic preparation of the ground and teasing out of scenarios as were engaged in by a number of levels of CSIRO management during preparation for what became the DUNLENA arrangement (see the description of DUNLENA at the beginning of this volume).

The group's reliance on 'the system' to help overcome problems encountered in the transition into unknown or unfamiliar situations is also notable. The group tends to imbue 'the system' with a number of powerful qualities; interviewees placed a lot of weight on the time being right for DUNLENA; that is, 'the system' being well-tuned.

As far as the place of science and technology is concerned, the group demonstrates classically the predicted separation of science from the other product-development functions. A number of the CSIRO interviewees drew attention with what almost amounted to pride, to the fact that DUNLENA is solely an *R&D* joint venture: not a broader business joint venture. This distinction also probably had something to do with the CSIRO people's refusal for two years to provide Du Pont with full structural details of the compounds they were supplying (see the description of DUNLENA at the beginning of this volume).

Finally, and most significantly, the group members, in the situations examined through the interviews, to greater or lesser degree displayed most of the hierarchist's 'monster-adjusting' behaviour flagged in chapter 3. 'Monsters' were 'adjusted' to make them less incompatible with these people's own standards and value system, and differences between the group's and Du Pont's standards and values were attributed to Du Pont's naivety in this particular type of research.

'Monster-adjusting' is nowhere better illustrated than in the group's preparedness to reformat the 'monster' constituted by the expectation that they would provide Du Pont with full compound structural details for Du Pont to use as they wished. This was transformed by the group into something much less monstrous: providing this information in return for access to Du Pont's 'champions committee' and market information from Du Pont's database. The group's focus on Du Pont's naivety in this type of research is illustrated through CSIRO C's almost arrogant statement of CSIRO's superior knowledge and wisdom:

The DUNLENA arrangement did not teach the Division's people very much ... [They] were [already] very aware of where Du Pont were coming from ... The Du Pont people had more to learn from this arrangement than the CSIRO people ... [interview, CSIRO Clayton, 17 September 1992].

### The Du Pont People<sup>1</sup>

There are clear signs that the Du Pont people involved in DUNLENA come from a distinctly *high grid/high group* environment; these people, like

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<sup>1</sup> Only two Du Pont executives were interviewed (see list of those interviewed, in the description at the beginning of this volume), and both were in Du Pont (Australia). Du Pont (Australia) played an important part in establishing and operating DUNLENA, but so too did a number of new business and international operations, agricultural chemical product, and agricultural chemical testing/evaluation executives from Du Pont's corporate office in the USA. These included the crucially important character of Du Pont C. The orientations, outlooks, values and motivations of the Du Pont people involved with DUNLENA as a *group* therefore can be assessed only through the many quite comprehensive word-pictures composed by the two Australian executives and the CSIRO people interviewed.

their CSIRO counterparts, are hierarchists. Indeed, it would be surprising if people in the mainstream management of a large, hierarchical, well-established, traditional American manufacturing company were not occupants of the high grid/high group segment. Arguably, both the freedom and the extroversion of low-grid and the isolation of low-group would find it difficult to survive in many parts of this environment.

Certainly the data collected identify many of the outlooks and institutional preferences predicted by cultural theory for people from the high grid/high group segment. These include:

- \* The very long timeframe that 'drives' each component of the Du Pont empire.
- \* Highly segmented operating arrangements, characterised by 'Chinese walls' clearly separating research from the testing of agricultural chemicals. As Du Pont A said (interview, Du Pont North Sydney, 21 August 1992), much of DUNLENA's success is due to "the fact that it's a *research* joint venture; the complications of sharing business plans, etc. aren't there."
- \* Ready acceptance of the CSIRO group and its expertise as a 'module' that is practically interchangeable with one of Du Pont's own research cells.
- \* A corporate philosophy of stability and strategic (rather than arbitrary) transfer and promotion of staff. Both Du Pont and CSIRO interviewees contrasted this with the practices of many

other large companies.

- \* A high degree of formality and institutionalisation - almost ritual - surrounding many corporate functions (like the operation of their 'champions committee').
- \* Prominent 'underground' networks that strengthen the overlay of hierarchical, formal management (with the role of Du Pont C being a classical illustration).
- \* Thorough sounding out of the ground before entering unknown or unfamiliar territory (including the DUNLENA arrangement).
- \* Attributing differences between Du Pont's and CSIRO's standards and values to CSIRO's commercial naivety. As Du Pont A said (interview, Du Pont North Sydney, 21 August 1992), the problem of a several-week turn-round time for compounds sent by CSIRO to Du Pont "became of less concern [to CSIRO] with their realisation that this is the way of life in this environment". In Du Pont A's view, it was this realisation as much as a reduction in the turn-round time, that set the CSIRO group at ease.

So even the relatively limited data available on the social/management orientations and preferences of the Du Pont people as a larger group stamp them as high grid/high group orientations/preferences.

#### THE MMP INTERFACE

##### The Key CSIRO Person

CSIRO C (see list of those interviewed, in the description of MMP at

the beginning of this volume) is the key not only to CSIRO's involvement in the MMP project, but indeed to the whole project. The social space environment from which he comes, and what this implies for cultural adaptation in MMP and for the likely success of the project, are therefore critical.

CSIRO C clearly comes from *the low grid/high group segment*; he is a member of an egalitarian group.

His *high-group* position is evident from his fundamental commitment to a strongly group-based attack on the R&D and industry-development tasks. After all, he accepted the appointment specifically to establish and lead a group-oriented attack on the problem, with members of the group to be drawn from several quarters. In short, one of CSIRO C's main tasks was actually to establish one of Mars' (1982, p.27) "mutually interconnecting networks", the scope of which is outstandingly broad by the standards of other groups managed by publicly-funded researchers (interview with SIROTECH, SIROTECH Melbourne, 14 August 1992). CSIRO C is clearly aware of the need to draw into that network people who are at present at the margins; for example, key managers from MIM and UBE. This seems to have been at the heart of his receptivity to secondments from UBE and MIM to his evaluation group.

Furthermore CSIRO C had spent much of his professional life (and as nearly as could be judged, spent it comfortably and profitably) in what was clearly, according to most measures of social space (and specifically those identified by Mars, 1982, pp.27 & 28, identified on the first page of this appendix), a high-group environment in CSIRO.

*Low-grid* preferences are evident in CSIRO C's attempts to free his group from control by various other parties. MMP was a completely new venture, and CSIRO C was appointed specifically with a strong charter to establish the group's operating arrangements 'from scratch'. The description of MMP at the beginning of this volume shows that he was single-minded about doing this in his own way. And there are strong signs that his transactions to this end centred on manipulating social/management arrangements to his advantage: for example, through the constitution of his evaluation group, previously referred to.

Furthermore, CSIRO C's previous long-standing environment in the CSIRO Division concerned was clearly a low-grid environment. The ultimate sign of this is CSIRO C's ability to control and manipulate his activities over many years to such an extent that he could 'carve out' the niche he now occupies. Clearly this was more likely to happen (and perhaps could only have happened) in a low-grid environment.

Bloor and Bloor's application of cultural theory provides a basis for identifying in CSIRO C's outlooks and day-to-day work organisation, worldviews predicted for people from *the low grid/high group segment*. Indeed, it would be difficult to find a better illustration than CSIRO C, of the low grid/high group worldview summarised by Bloor and Bloor:

... the inhabitants of small, unstructured groups ... will be subject to contradictory goals and conflicting duties, such as loyalty and competition. Whilst the outsider represents the unknown, there will also be reason to fear the malicious intentions of one's neighbours. Experience will thrust upon them the dichotomy between the inside and the outside, good and evil, the proper and the perverted or inverted. They will respond by finding representatives of the outside in their midst to explain their misfortunes ... [1982, p.93].

First, much evidence from the interviews with CSIRO C and others points to the confusion and uncertainty resulting from what CSIRO C saw as contradictory goals and responsibilities. There is also evidence that blame for internal group problems is sometimes diverted to people outside the group. This has led directly to CSIRO C's development of marked feelings of vulnerability:

... if I put a step wrong, they'll chuck me out ... I take it day by day ... There are all sorts of pitfalls for me. There are political ones ... There's lots of reasons I won't be here next ... I'll be back in the Division, not because of my ability but because of politics and the way things go ... There are so many different facets to this that it's unlikely I'll last the four years [interview with CSIRO C, CSIRO Port Melbourne, 14 August 1992].

CSIRO C seems to be well along the classical egalitarian path, then, of "portraying external forces as monstrous, and ... accusing deviants of secretly importing evil ways ..." (Thompson et al, 1990, p.60).

Second, there is the perpetual fear that other groups' ways of doing things may come to prevail in the management of MMP, and that the partners will intrude too much. CSIRO C is perpetually on his guard against this. His approach of surrounding himself with specialists in each of the management fields he could not hope himself to master (see the description of MMP at the beginning of this volume) seemed to be as much protection against other people's ways of doing things, as a vehicle for learning how to do things.

In addition, CSIRO C's approach to entering new territory shows very clearly the predicted error-minimisation and protection of fundamental beliefs: for example, he resisted any 'bending' of his standards and values. A number of the interviewees believed that CSIRO C's 'over-

kill' approach to reports and management information has much to do with avoiding errors and moving decision points elsewhere. CSIRO C's behaviour seems to be a good illustration of egalitarians' tendency to "shunt off ... risks by bringing them forcibly to the attention of the people they see as having generated them" (Thompson et al, 1990, p.64).

### The QMC People

QMC is a small, entrepreneurial company in the marketplace, trading its resource base for investment in a joint venture (or more accurately a number of joint ventures, one of which is MMP). According to QMC A, the company's chief executive and founder (interview, QMC Brisbane, 22 September 1992), QMC is a "broker of opportunities". It is run by its founder and his general manager who has also been with the company since its early days. Both have the reputation of being the ultimate entrepreneurs.

Under these circumstances, QMC almost inevitably provides a *low grid/low group environment*; QMC A and QMC B are individualists.

Again most of the information obtained about these people's outlooks and values and their behaviour in relevant situations conforms very closely with the patterns predicted for those from this segment. In this instance, rather than identifying evidence of predicted low grid/low group preferences and orientations in these people's behaviour *in the broad*, it might be more instructive to focus more closely on just one aspect of their behaviour which epitomises a high degree of low grid/low group behaviour and thinking: their outlook towards, and handling of, the 'product' they had available to sell (an unusually



rich, accessible mineral deposit).

QMC could have sold off this 'product' on very favourable terms, and 'taken the money and run', but they decided instead (see the description of MMP at the beginning of this volume) to develop the asset through MMP and other joint ventures.

This is an outstanding illustration of bargaining in the marketplace and an obvious step towards both demonstrating the viability of the specialised input the QMC people had to offer, and developing self-centred networks. A single transaction (by contrast) would not, ultimately, have played much part in furthering QMC's *future* transactions with the real world. Undoubtedly entry into these joint ventures also incorporated the attention-seeking behaviour that often characterises low grid/low group people, maintained the QMC people's area of expertise at the centre of the arrangement, and enabled QMC to deal largely in the dyadic relationships flagged by Handelman as a centrepiece of low grid/low group behaviour (1982, p.165). Dyadic relationships were a more prominent part of this interface than the others; three important dyadic relationships involved QMC B (see the description of MMP at the beginning of this volume).

Admittedly, one or two elements of QMC A's and QMC B's behaviour and outlook towards exploitation of their product do not sit all that readily with pure low grid/low group outlooks and preferences. For example, selling off the product would have been a much quicker and 'cleaner' end-point (something often craved by individualists) than establishing, cultivating and manipulating joint ventures. But such contra examples fade into insignificance by comparison with the over-

all pattern of classical individualist behaviour and orientation.

### **The People from the Two Large Companies (MIM and UBE)**

Both these companies, being large traditional companies with an evident emphasis on hierarchical forms of control and management, are most likely to provide a hierarchical (*high grid/high group*) environment. In the case of UBE, this had to be left as an assumption - albeit a relatively safe one - because no-one from the company was interviewed. There was nothing, though, in the many observations by others about UBE's outlooks, values, history and behaviour that cast much doubt onto this. In the case of MIM, there is ample interview material to confirm that the company's outlooks and preferences are indeed classical high grid/high group. Again, it may be most instructive to call on just one line of this evidence to illustrate this: evidence on the company's conservativeness in breaking new ground.

MIM were so reluctant to take on new lines of business that MIM A found it very difficult to convince senior management to consider seriously availing themselves of what was by any standard a worthwhile opportunity for entering a downstream metal processing business (interview with MIM A, MIM Brisbane, 22 September 1992). It is probably significant that this conservativeness on MIM's part was the very first factor MIM A raised in his interview when he was asked to discuss important social/management and intercultural factors in MMP. It was only by adopting an unashamed 'missionary' role within the company that MIM A had been able to get senior management interested.

So widely acknowledged was MIM's conservativeness in entering new territory that several people from outside the company spontaneously

pointed out how critical MIM A's missionary role had been for getting MIM involved in MMP.

MIM A explained MIM's reluctance to take up the new business opportunity represented by the MMP project in terms of two factors: the risk the project entailed and the company's lack of knowledge about the technology (interview, MIM Brisbane, 22 September 1992). Both of these, it will be noted, are classical hierarchist concerns.

## THE I<sup>2</sup> INTERFACE

### The CSIRO People

These people clearly reside in *the low grid/low group segment*; they are individualists.

A *low-group* position is virtually inevitable, notwithstanding their shared membership of the strongly-bounded research group itself, for people working as highly focused experts providing a service. This is exactly the role of this group; for that part of their time they are not working on I<sup>2</sup>, they provide an expert instrumentation service for the whole of the Laboratory: a role they will soon be going back to full time (see the description of I<sup>2</sup> at the beginning of this volume). This role is described by Bloor and Bloor, using the words of their low grid/low group scientist:

I don't have to work with them [those for whom he is providing his service] all the time. I'm working with them quite intensively say for a couple of months and then I drop out of their lives completely ... I find this a nice level to keep industrial friendships at - not living in each other's pockets, but at the same time if you see each other in the labs, you say 'hello' [1982, p.88].

Few roles could be more certain of being low-group. This group's role

virtually guaranteed absence of Mars' (1982, pp.27 & 28) signifiers of high-group: frequent intragroup contact, within a mutually interconnecting network, over a reasonably wide (and increasing) scope of activities, within an increasingly strong boundary.

Likewise a *low-grid* position is also virtually inevitable for people working in such an expert service-providing capacity. Their relationship with their 'clients' boils down to one-on-one transactions that inevitably end up with each party manipulating the other for what amounts to personal gain. There can be no doubting that this group "allow[s] [its] people to carry out tasks in ways they can define for themselves" (Mars, 1982, p.25).

Again this low-grid orientation is described well by Bloor and Bloor; the person working in this service-providing capacity

thinks of his clients as forming a sort of following and the greater the following, the more his credit ... [A service-provider is] a person actively benefiting from each exchange, increasing his stock of goodwill, prestige and success in the eyes of his clients and supervisors ... [H]e insists on the hard bargaining that is necessary - he is not dealing with men who are easily satisfied, so his suggestions and ideas have to be good ones [1982, p.89].

There is, in the CSIRO group's outlooks and day-to-day work organisation, much evidence of the sorts of worldviews predicted by cultural theory for people in *the low grid/low group segment*. Indeed, the outlooks and work arrangements of this group embody so many of the classical characteristics of individualists articulated in chapter 3 and in Appendix 1, that it is practical to identify here only a few main manifestations.

First, there is the hallmark 'monster-assimilation' behaviour. The CSIRO people in I<sup>2</sup> were keen to 'massage' their standards and values into a shape to accommodate unfamiliar behaviour and practices. Indeed CSIRO B identified the ability to bend one's principles as the hallmark of

someone who is good at making the transition from research to industry ... It is a balancing act: you must be able to get [the industrial partner's] needs met without compromising significantly the product [interview, CSIRO Black Mountain, 28 August 1992].

A degree of rationalisation helped with CSIRO B's 'monster-assimilation'. He downplayed the business world's commercial skills (interview, CSIRO Black Mountain, 26 August 1992), thereby making it easier to claim that there is nothing wrong with the CSIRO group taking on more of a commercial slant; nothing special is involved. CSIRO B was hostile towards criticism of CSIRO for not being willing to adopt sufficiently flexible views of the world: that is, for not being sufficiently 'monster-assimilating'.

Second, this group showed the classical individualist keenness to learn from their mistakes, and to be adventurous in doing so. CSIRO C believes one has to be able "to get on the treadmill when it's travelling fast". He described doing this as "fun" (interview, CSIRO Black Mountain, 28 August 1992).

Third, the group showed the classical preoccupation with urgency. CSIRO C's comments on "getting on the treadmill while it's travelling fast" are typical of the CSIRO interviewees' speech which is peppered with "running quickly", "time advantages" and "timetables".

Fourth, the CSIRO group also showed the classical individualist keenness to draw as many parts of the overall product-development process as possible into their self-centred networks. Indeed, the Laboratory was committed to doing much of the development of I<sup>2</sup> internally even had OPTUS been able to perform the tasks they had undertaken to perform (see the description of I<sup>2</sup> at the beginning of this volume). Anyone spending even a short period in the Laboratory would have to conclude that managers at several levels always have in the back of their minds a 'keep-it-in-CSIRO-as-long-as-possible' philosophy.

Finally, the group showed the views on 'good management' predicted for those from this segment. Clearly they regard management's most worthwhile role as being to free up the system to allow effective market transactions. CSIRO B and CSIRO A (interviews, CSIRO Black Mountain, 26 August 1992) both spent a significant part of their interviews identifying shortcomings of CSIRO's management, in these terms.

### **The OPTUS People**

There are reasonably clear signs that the OPTUS people in I<sup>2</sup> reside in *the high grid/low group segment*; they are fatalists.

*Low group* is indicated by their isolation from the mainstream of OPTUS's management and business strategy. OPTUS A described OPTUS management's views of his work on I<sup>2</sup>: "They put somebody to work on something and then forget about it. Management tended to show an interest ... only when the revenue stream comes in" (interview, CSIRO Black Mountain, 20 August 1992). OPTUS A's superiors took virtually no responsibility for furthering the project at more senior levels in the company. It was a matter of "Go and play in the yard and see what

comes out of it".

It was quite clear that while OPTUS A welcomed this freedom (for a number of reasons), at the same time he yearned to be better informed about OPTUS's policies and strategies, and to be better supported by OPTUS. It was not so much that OPTUS A did not interact with his superiors at OPTUS. Rather, what interaction there was focused on what the more senior managers wanted it to focus on; this did not include I<sup>2</sup>. It seems likely that had OPTUS's social/management environment been higher-group, OPTUS A could well have behaved very differently in a number of ways in the dealings with CSIRO, perhaps avoiding some of the problems with I<sup>2</sup>. As it was, OPTUS A, and thereby OPTUS's involvement in I<sup>2</sup>, was left devoid of guidance and leadership in the classical low-group manner.

While such low group characteristics might often also be a sign of a low grid environment, this did not seem to be the case here, because despite this apparent freedom, the OPTUS people associated with I<sup>2</sup> (notably OPTUS A) had no opportunity to use that freedom in effective transactions with either the company's more senior management or CSIRO. Both these sets of transactions were *one-way*; transactions with senior OPTUS management, for instance, had to go through the classical *high-grid* filter described by Bloor and Bloor (1982, p.95): "the degree of insulation between [these high-grid people] and other people defined by the pattern of authority, status, age ...".

In short, the OPTUS people associated with I<sup>2</sup> manifested classically two of Mars' signifiers of high-grid: the existence of what amounted to rules controlling their behaviour, and relative insulation from

their counterparts and other colleagues in OPTUS.

Only limited information about the  $I^2$  project's status in OPTUS was gathered from the OPTUS people (largely because more senior managers did not know enough about  $I^2$  to talk meaningfully about the project; and this is itself most significant). The information that *is* available is consistent with the worldviews predicted by cultural theory for people in *the high grid/low group segment*.

Bloor and Bloor note that this segment "encourage[s] a bias towards mere conformity - it is an impoverished location, devoid of significant experience out of which to build a cosmology" (1982, p.96). There is in OPTUS A's situation more than a hint of coerced conformity. Bloor and Bloor graphically describe their 'prototype' high grid/low group scientist in his classical fatalist situation, and a slight rewrite of their description (1982, p.96) in terms of OPTUS A's work with the CSIRO group captures OPTUS A's situation perfectly:

So sitting at his desk with information coming in from CSIRO, limited resources available to use on the work with CSIRO, hardly anyone else around but scientists with whom to hold stilted, slightly frustrating conversations, we have a marketing/new business executive trapped in high grid/low group. ... [He] feels rather empty, helpless and powerless ... [He] obviously feels controlled by the company, rather resents it, but feels powerless to change it.

These observations go some of the way towards explaining OPTUS's corporate decision to go into the  $I^2$  arrangement in the first place despite its questionable strategic soundness (see the description of  $I^2$  at the beginning of this volume). Once someone in the company (OPTUS A?) had decided, for reasons that might have much to do with the "lottery" Schwarz and Thompson associate with fatalists' incoher-



ent worldview (1990, p.10), that participation in  $I^2$  would be a good thing, the ebbing and flowing corporate tide did nothing either to reverse or to reinforce the view. Participation by OPTUS just 'came about', and even people then close to the scene have difficulty now explaining *how* it was able to 'come about'. This is the classical channel for high grid/low group groups taking on new ventures.

## THE SIROSCOUR INTERFACE

### The CSIRO People

This CSIRO group rests most readily in *the high grid/high group segment*; these people are hierarchists.

*High-group* is indicated by a number of orientations/preferences. Bloor and Bloor note one indicator of high-group as being a laboratory's status as "just one big happy club" (p.85). Mars concurs: "... group will be strong among workers who habitually associate together off the job" (p.28).

The author's extensive experience over 25 years in interacting with and visiting all CSIRO divisions many times, identifies this CSIRO Division as probably the "biggest club" of them all; there is a relatively high outside-work interaction of most people from the Division, which is located in a large provincial city. The people from the Division have a large number of overlapping social roles. The Division plays a significant part in life in the city; for example, through its social club it has built and plays a major part in operating a number of old-people's units.

Also indicating high-group is the strong focus all parts of the Divis-

ion have, and have had for several decades, on a single industry; this encourages a real team spirit. But at the same time, members of the group indicated that, 'when it came to the crunch', their ultimate allegiance would not be to the industry, but to the CSIRO Division and their group within the Division. CSIRO C, for instance, said (interview, CSIRO Geelong, 18 September 1992) that, if he saw something the wool industry was doing that was wrong, he "would not condone it or turn a blind eye to it". Rather, he would draw on his CSIRO allegiance; "national benefit is definitely number one."

Additionally, there is the long-term basis of the projects of the group that developed SIROSCOUR. CSIRO A noted this longevity (interview, CSIRO Geelong, 13 August 1992), as well as the fact that the group is staying intact even as the work it has been engaged in for years runs down. The group is now moving - as a unit - onto work on the environmental effects of wool processing.

Finally there is the fact that some members of the group repeatedly resorted to relationships with their colleagues to describe their own outlooks and working style. CSIRO D, for instance, continually compared and contrasted his own approaches with CSIRO C's (interview, CSIRO Geelong, 18 September 1992). This high inwards orientation also is indicative of high-group.

The group's *high-grid* position is suggested by its highly hierarchical, structured, organised environment. This is reflected (see the description of SIROSCOUR at the beginning of this volume) in

\* the group paying more attention to organising, planning and

ordering things, than to contractual bargaining (hence its reluctance to patent its technology);

- \* the Division's reputation as one of the two or three most conservative and hierarchical divisions of CSIRO; and
- \* allocation of leadership of the SIROSCOUR venture to not one but two of the Division's program managers. This seemed to be aimed at avoiding structure-based conflict. The Division seemed to lack the (low-grid) flexibility to cope with leadership through other, less hidebound, arrangements.

There is, in the CSIRO group's outlooks and day-to-day work organisation, significant evidence of the sorts of worldviews predicted by cultural theory for people in *the high grid/high group segment*.

Hanging over all the group's behaviour and outlooks is their low-risk - almost meek - approach to their research and to their work with industry on commercialising their research.

Dysons A, for instance, attributed what he sees as a reluctance of this CSIRO Division to capitalise on their excellent contacts with, and understanding of, the wool textiles industry, to the complete absence of a risk-taking ethos. He claimed (interview, CSIRO Geelong, 13 August 1992) that this had been at the heart of the Division's ignoring some very attractive and potentially valuable research leads identified by the industry. Dysons B (interview, Dysons Geelong, 18 September 1992) saw this risk-aversion as being reflected in the CSIRO people's undue insistence on "dotting all the i's and crossing all the

t's" before research is discussed with or revealed to industry. While this is by no means an uncommon criticism of publicly-funded research by those in industry, Dysons B's description seemed to go beyond the normal level of criticism.

Perhaps the clearest reflection of the group's risk-aversion, though, is the granting of two licences for the second 'loop' of SIROSCOUR. As Dysons B said, this amounted to an "insurance policy: if all else fails, the international player will sell [the SIROSCOUR system]".

Dysons A suggested (interview, CSIRO Geelong, 13 August 1992) that this risk-averse approach is also evident in the Division's excessive preoccupation with incremental, process research, rather than the generally more adventurous new product research. It is probably also evident in the reliance the group placed on SIROTECH's expert negotiating advice as they entered commercial dealings in the late 1980s. This was not unique at the time, as SIROTECH developed its role and CSIRO ventured into new territory. But, even so, this group seemed to go to exceptional lengths to seek out SIROTECH's assurances.

In short, this group is an excellent illustration of Schwarz and Thompson's conceptualisation of people from a high grid/high group environment, who "push their knowledge out ahead of their actions. They prefer, wherever possible, to look before they leap. Anticipation is their preferred way of learning" (Schwarz & Thompson, 1990, p.64).

Schwarz and Thompson also note (p.134) that despite a strongly hierarchical philosophy, high grid/high group cultures are often driven by underground networks. To the present author's observation, this Divis-

ion of CSIRO is notable for this. Perhaps with one exception, it is the CSIRO division that is most riddled with 'old-boy' networks. These are not dormant or relevant only to social, extra-mural activities, but rather seem to be an integral part of the day-to-day work situation. This observation was confirmed by some interviewees, notably CSIRO A (interview, CSIRO Geelong, 13 August 1992).

This CSIRO group is also notable for its adherence to the distinctive high grid/high group view that those injecting particular skills to a project are interchangeable with others in a position to inject the same skills; one needs only to locate the skills and 'the system' will take care of fitting them together. (As is demonstrated in the description of SIROSCOUR at the beginning of this volume and in chapters 6 to 10, it did not.)

CSIRO A addressed this at length (interview, CSIRO Geelong, 13 August 1992) in describing the way PD&F had been licensed in the first 'loop' of SIROSCOUR; selection of PD&F had resulted from CSIRO's:

tendency to focus, in selecting licensees, on specialised disciplinary skills and track record, without necessarily putting into place the necessary bridging arrangements. [CSIRO had sought mechanical engineering expertise] without taking into account experience and know-how in applying mechanical engineering in the wool industry.

Finally, this group showed in classical form hierarchists' "monster-adjustment". The best illustration of this was given by Dysons A. CSIRO had at various stages of the SIROSCOUR project, displayed commercially naive behaviour, by endorsing with one commercial partner changes to the basic SIROSCOUR process and not telling another partner that, in effect, SIROSCOUR had thereby become a different process. The

second partner was therefore in the invidious position of marketing SIROSCOUR without knowing the latest product specifications.

When approached about this, CSIRO "could not understand what all the fuss was about" (interview with Dysons A, CSIRO Geelong, 13 August 1992). The CSIRO people made the 'monster' of unsound commercial dealings into something other than a 'monster', by adjusting it to fit into *their* comprehension of proper commercial dealings: even if it did not accord with the comprehension of anyone else.

#### The People from the Two Small Companies (PD&F and Greenfields)

Only one person from each company was interviewed. However in each case that person - each company's managing director (see list of those interviewed, in the description of SIROSCOUR at the beginning of this volume) - had led the company into SIROSCOUR, and was extremely forthcoming and thoughtful in the interview. Also, both companies' outlooks and behaviour were commented upon by many people from all the other parties and observers (like the people from Dysons). One can be reasonably confident about assessing where both PD&F's and Greenfields' management environments reside in social space, notwithstanding the availability of only the one informant in each company.

It is quite clear that both PD&F's and Greenfields' are *low grid/low group* (individualist) environments.

In the case of PD&F, this conclusion follows from the reasons given in connection with the CSIRO group in I<sup>2</sup> (above): it is almost inevitable that someone whose whole being is devoted to provision of an expert service (like the engineering design/fabrication service in which PD&F

specialises) will be comfortable only in the low grid/low group segment. Above and beyond this, there are several additional specific reasons for locating PD&F's environment in this segment. Only one will be mentioned here:

PD&F's managing director displayed the classical low grid/low group self-criticism of PD&F's own standards, values and parochialism, and explained differences between PD&F's and their partners' standards and values in terms of their own naivety in the ways of the research world. PD&F was quite prepared, for example, to bow to CSIRO's superior wisdom which, according to PD&F's interpretation, insisted on PD&F building all the SIROSCOUR components (including the ancillary ones) 'from scratch' (telephone interview with PD&F, 21 October 1992). According to PD&F, they saw this as an irrational aim, but they felt obliged to go along with it.

*Greenfields* equally clearly revealed classical individualist outlooks and preferences. Indeed, Greenfields is the classical illustration of an individualist group 'bartering' in a market situation. Mars says that "rewards here go to those who find new and better ways of doing things and ... the drive for successful innovation is paramount" (1992, p.28), and this was precisely Greenfields' motivation for going into the SIROSCOUR arrangement.

They had approached CSIRO in the first place to bargain to obtain CSIRO's assistance in a market situation; all along they viewed CSIRO pragmatically as a source of expertise offering the prospect of accelerated attainment of a competitive position in a new field of business (interview with Greenfields, Greenfields Melbourne, 16 September

1992). There was no hint of the sorts of lofty or rationalised considerations that would inevitably loom large in the corporate minds of high grid/high group or low grid/high group companies entering this sort of arrangement.

Among Greenfields' many other classical individualist outlooks and preferences was a predilection for intuitive, urgent and risky approaches. Greenfields did not sound out the ground at all before entering the SIROSCOUR arrangement, for example. Rather, the initial approach to CSIRO, which had been 'on spec.', was converted into a business arrangement as soon as they appreciated what CSIRO really offered (interview with Greenfields, Greenfields Melbourne, 16 September 1992). Although the arrangement with CSIRO addressed areas new to Greenfields, the company had no qualms about creating a whole new framework for their work 'overnight'.

And others of Greenfields' actions in SIROSCOUR, like the offer of an interest-free loan to PD&F in exchange for all the technical material on the SIROSCOUR process (see the description of SIROSCOUR at the beginning of this volume) were equally intuitive and bold.

At the same time, the company's approach to business is quite obviously network-oriented, with a cynical attitude towards management via red-tape and 'proper channels'.

Finally, and very significantly, Greenfields evidently 'bent over backwards' to work within the parameters they were confronted with by PD&F. Greenfields had never before encountered such unusual business practices, and in particular such blatant disregard for what was in a



contract. Yet it seems they tried sincerely to adapt their thinking and values in an attempt (ultimately unsuccessful) to 'live with' what PD&F were insisting on. This is of course the individualist's classical 'monster-assimilation'.

### CHANGES IN EACH INTERFACE'S CULTURAL 'SHAPE' OVER TIME

This appendix summarises the cultural 'shape' of each interface soon after the arrangement came into being, and then at the time most of the data on each interface were collected (in late 1992/1993). By the latter time, the SIROSCOUR interface had been terminated (see the description at the beginning of this volume), so the 'after acculturation' data on SIROSCOUR relate to immediately before the interface's termination, about a year before data-collection.

The 'snapshot' of each interface's cultural 'shape' at each of these times, formulated in the way described in chapter 4 and Appendix 5, was compiled by simply extracting from the interview data and the other material available, information on the interface's overall 'cultural condition' at each time. Such information was readily available. Most interviewees had covered most of the relevant variables: like those relating to the consistency between the interface's norms, values and priorities and the party's own norms, values and priorities; the parties' shared/conflicting understandings of the interface and its aims and priorities; each party's understanding of its partner's expectations; the parties' views on the interface's relationship with the outside world; and any particular 'catch-points' between the parties and their representatives (see Appendix 4(B)).

Substantiation of the assessments made here, including full attribution of the information provided, is available in the description of each arrangement and its associated interface at the beginning of this volume, and in the analyses in chapters 6 to 10.

#### A. THE 'BEFORE ACCULTURATION' CULTURAL 'SHAPE' OF EACH INTERFACE

Assessment of each interface's cultural 'shape' shortly after the interface came into being relied mainly on reconstruction from participants' recollections. Despite efflux of a typical period of two to three years, and in one case seven years, this task proved to be not all that difficult. In all cases access was available to product champions and senior managers at various levels in the laboratory and the company/ies who had been directly responsible for the project early on. Access was also available to critical onlookers and 'middle men'. Substantial written material was also available on the formation and early development of three of the four ventures (see chapter 4).

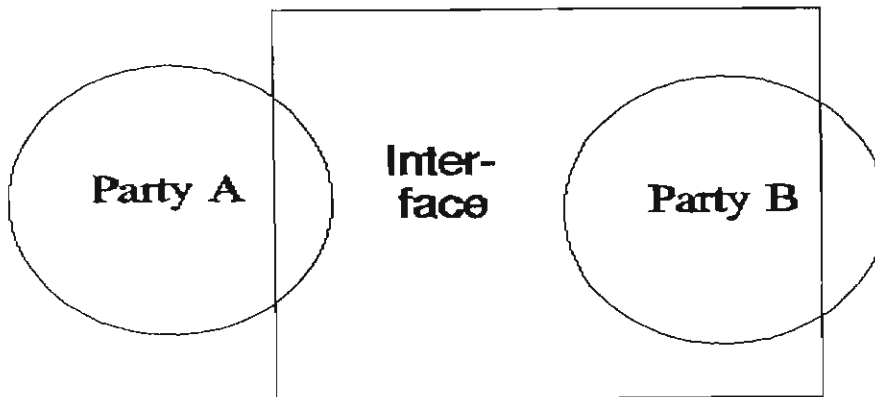
A consistent, apparently reliable picture of each interface's cultural 'shape' shortly after its establishment was obtained from this combination of sources. No violently inconsistent messages were gained; rather, mostly there was remarkable agreement on the interface's cultural structure. This was the case even where the parties had been divided (in some cases passionately) by culture-based differences. There seems no reason to doubt that the description of each interface's cultural 'shape' shortly after its establishment is close enough for the purpose intended here: to provide an approximate baseline for identifying changes over time in the interface's cultural condition, as the foundation for the preliminary analysis of whether each dimension of social behaviour is likely ultimately to have influenced interface effectiveness.

#### DUNLENA

This interface at the outset lacked overlap between the parties' cultural zones (as with diagrams 1, 2 and 3 in Appendix 5). It probably

came closest to the situation in *diagram 3*; namely

### Diagram 3



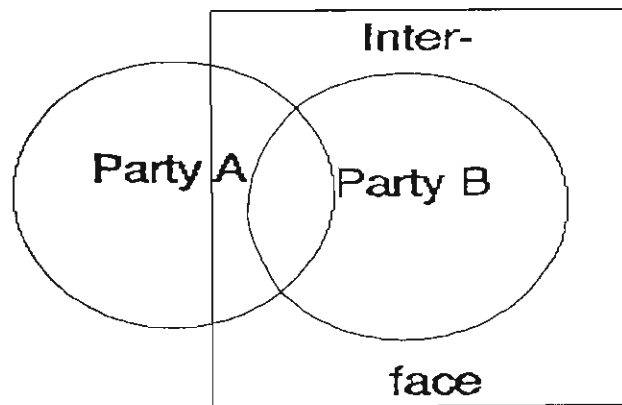
From the very beginning, a clash of cultures was evident. But this was mainly the CSIRO group's culture grating against the interface's; the Du Pont people were at ease with the interface. Indeed it would have been surprising had this not been the case, because the interface was based closely on Du Pont's values, norms, expectations and behavioural orientations (see the description at the beginning of this volume).

Distrust characterised the CSIRO group's interaction with Du Pont, as did limited communication, cultural 'blindness' and the CSIRO group's wish for 'separate development'. The interface took a long time to develop an identity (even though the parties shared a clear conception of the project from the outset). It is difficult to discern much sharing of values or priorities between the parties at that stage. The CSIRO group showed low commitment, uncertainty, a competitive approach to problem-solving, and a keenness to work in its own way. They shared little of Du Pont's focus on international business systems and values, and little of Du Pont's product focus. Second thoughts about the wisdom of entering the arrangement abounded in the CSIRO group.

**MMP**

This interface at the outset seems clearly to have been in one of the 'mid-way' situations portrayed in diagrams 4, 5 and 6 in Appendix 5: probably that in *diagram 5(B)* (although of course with four parties, rather than the two shown in the diagrams). Hence:

**Diagram 5(B)**



There were certainly shared goals and visions (for example, centring on the venture as a freestanding major player in the world magnesium metal scene), and a reasonably high degree of commitment from all four parties. The interface was reasonably coherent and unified from the start, with some shared values and some common outlooks on key aspects of the venture (like the project's necessary timeframe and the sequence of steps it had to go through). The cultural backgrounds of some of the parties (such as UBE's less hidebound outlooks than might be expected from a middle-sized Japanese company) facilitated this cultural compatibility. The interface was also quite self-contained; once the financial inputs from the federal and state governments had been made there was little opportunity for, and no unnecessary seeking of, values or principles from the outside environment.

At the same time, some of MIM's and UBE's main values, norms and

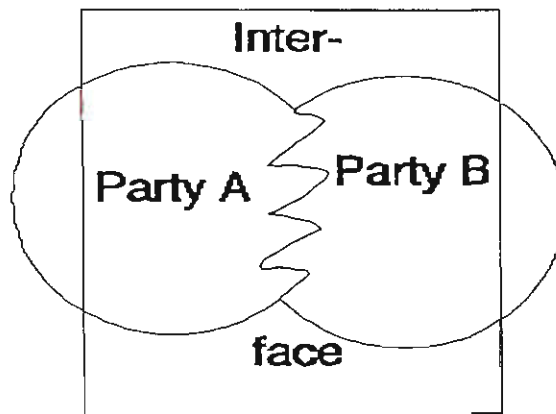
expectations were not encompassed by the interface early on (see the description of MMP at the beginning of this volume). This applied particularly to MIM's business-management and business-development culture and to UBE's marketing culture. And there was some communication at cross purposes, some misunderstanding and some uncertainty, with consequent difficulties for some parties' management.

These difficulties, which became focused onto a few symbols that drove some parties' behaviour and thinking in the early stages (like MIM's [over?]-comprehensive practice of due diligence), meant that the interface started off with an incoherent value system and poorly defined approaches to important issues (like management information needs). Also, there was evidence of significant role uncertainty. For example, even after MIM had, in essence, become a full member of the venture, they were still advising the federal government in an 'honest broker' capacity, as if they were not directly associated with it.

There was also a distinct lack of team spirit on the part of some parties. Significantly, there was an intentionally introduced element of competition among research teams, which contributed to the divergent aims, priorities and perspectives.

## I<sup>2</sup>

The I<sup>2</sup> interface at the outset clearly can best be associated with diagram 4 in Appendix 5: probably *diagram 4(A)*. Hence

**Diagram 4(A)**

This was certainly a reasonably coherent and unified interface, with good understanding and communication between the parties. Each party had a sound appreciation of the other's expectations and concerns. The interface's culture was reasonably well balanced between commercial and technical values and norms. Each party's attitude towards the other (and what they could offer) seemed to be based on fact rather than prejudice.

At the same time, the parties' goals for the venture were always at odds, one party's commitment was always questionable, and one party's management was always at best indifferent to the arrangement and often unsupportive (see the description of I<sup>2</sup> at the beginning of this volume). A loose form of 'separate development' characterised this interface at this stage, with each party's norms and expectations being carried into the venture as a somewhat self-contained set of guides to behaviour.

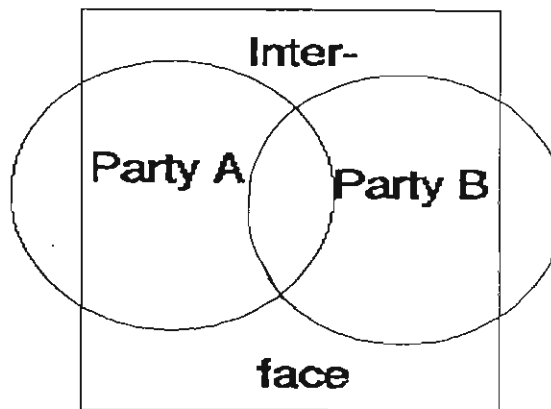
Also there was always a flow of potentially disruptive inputs from outside the interface: especially from the management of one of the parties and from the political pressures on OPTUS (see the description

at the beginning of this volume).

### SIROSCOUR

At its outset, this interface probably came as close as any of the interfaces to the ideal boundary relationship depicted in diagram 7. It was probably in one of the *diagram 4* situations (although of course with three parties, rather than the two shown in the diagrams), probably diagram 4(B):

**Diagram 4(B)**



The parties were largely in agreement on most tenets of the arrangement, even if their motives differed significantly (see the description of SIROSCOUR at the beginning of this volume). They were on common ground when it came to what the project consisted of, and who was to do what: even if the detail had not been straightened out, and much of the common ground would turn out to be quicksand. At that stage, the basis of the Greenfields-PD&F conflict about what a turnkey plant really was had not yet arisen; nor had PD&F's reported attitudinal problems towards working with wool.

This shared understanding was helped by the fact that this was (at least on paper) a reasonably 'neat' arrangement: notwithstanding some



unconventional facets, such as absence of a project-specific contract between CSIRO and PD&F, or *any* contract between CSIRO and Greenfields. The arrangement was complex in a number of ways (see the description at the beginning of this volume), but it is doubtful whether this prevented understanding and allocation of roles and obligations.

The interface initially had a reasonable degree of direction, focus and vision. There was a spirit of co-operation. All parties were eager to push on as fast as possible. Many of each party's main values, norms, expectations and behavioural orientations seemed to have been adequately accommodated, and there appeared to be an appropriate balance between technical and commercial values. The interface was suitably amenable to outside environmental influences: for example, from the industry and from CSIRO's commercialisation policy (or what this Division of CSIRO took that policy to be).

#### **B. THE 'AFTER ACCULTURATION' CULTURAL 'SHAPE' OF EACH INTERFACE**

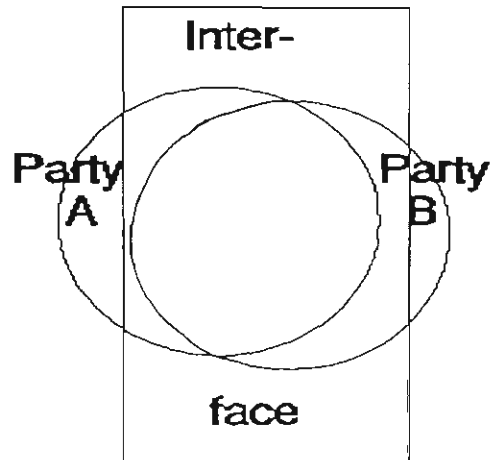
The cultural 'shapes' of three of the interfaces had changed markedly within a couple of years. The main changes within this period, and certainly by the time the interfaces were investigated in this study, are summarised here. Again, substantiation of the assessments is available in the descriptions of the case studies at the beginning of this volume and in chapters 6 to 10.

#### **DUNLENA**

At the time the DUNLENA interface was examined, it had been in existence for some seven years, but there is good evidence (see the description at the beginning of this volume) that virtually all the acculturation identified then had come about much earlier: within per-

haps two or  $2\frac{1}{2}$  years of the interface's establishment. The interface had become an outstanding illustration of a *diagram 7* interface:

### Diagram 7



The inter-party boundaries were permeable and highly overlapping; most of each party's main values, norms, expectations and behavioural orientations were encompassed by the interface. The interface abounded with shared meanings and understandings and shared goals and visions. Each party understood completely - and accepted - the other's needs and expectations. There was a clearly co-operative approach to solving problems. Knowledge was readily shared across boundaries. The interface had developed a strong system of norms: relating, for example, to product-handling and open communication.

This situation had come about almost solely as a result of the CSIRO group learning the ways of the commercial world of specialist chemicals, and adapting its thinking to those ways. The success with which the group had done this, through flexibility, dedication and good judgment, was highlighted by most interviewees: Du Pont, as well as CSIRO/SIROTECH. Most informants pointed to Du Pont's role in encouraging this degree of shift, through 'fine tuning' their procedures to guide the CSIRO people in the necessary direction. Some interviewees

flagged instances where Du Pont had taken this to an extreme, by behaving in a blatantly uncommercial manner, such as they would never think of doing in other commercial arrangements (see the description of DUNLENA at the beginning of this volume).

#### **MMP**

At the time the MMP interface was examined, it had been in existence for almost two years (although a joint venture of a more limited form, with two of the four partners, had been in existence before then). Even in this brief period, there had been a marked move of the interface from its initial diagram 5(B) situation to, or at least well towards, the *diagram 7* situation portrayed in the preceding diagram.

The boundary to the common cultural zone among the parties had loosened to accommodate the main values, norms, expectations and behavioural orientations of all the parties. Although there were still some reservations on the part of MIM's (and reportedly UBE's) management, the interface had come much closer to accommodating these two large companies' business-management, business-development and marketing cultures; each party was quite relaxed about, and could identify with, the interface's main values. Defensive communication and communication at cross purposes was happening much less often. Knowledge was being shared across boundaries more spontaneously. An outstanding appreciation had developed of where other the parties were coming from. Cliques had diminished (but not completely disappeared).

#### **I<sup>2</sup>**

Over the two years this interface had been in existence, there had been remarkably little change in its cultural structure and balance.

There had been significant changes in the commercialisation arrangement itself; the CSIRO group had come to be performing virtually all the marketing, market-development, manufacture-control and other commercial tasks, while OPTUS had changed from being a joint venture partner to being a research-contracting customer of CSIRO (see the description of I<sup>2</sup> at the beginning of this volume). But the interface still possessed the same fundamental characteristics it had had at the outset: essentially good cross-cultural understanding and balance, good communication, but lack of shared goals and questionable commitment and questionable management-support from one party in particular.

The increasing influence of the environment on this interface is notable. The political environment bearing on OPTUS prevented them from injecting many of the commercial skills they could have provided: even if their commercial capacity in the key areas had permitted this. Other environmental influences (like the pressure coming from elsewhere in the CSIRO Division, which effectively reduced the CSIRO group's commitment; and the pressure on both parties from third parties, notably other satellite operators) were also significant.

These environmental influences might alone have been sufficient to prevent this interface from moving closer to the ideal diagram 7 situation: even without the very significant intra-party contributing factors. But at the same time certain fundamental strengths of the interface, centring on strong dyadic bonds and outstanding appreciation of the other party's perspectives, prevented the interface's cultural 'shape' from sliding in the direction of diagram 1.

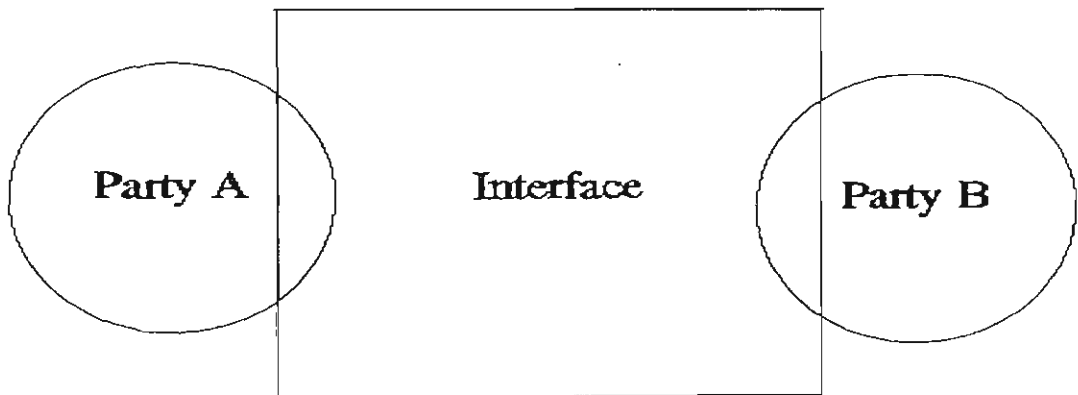
This interface retained the *diagram 4(A)* cultural 'shape' shown in the

'before acculturation' summary (above).

### SIROSCOUR

By the end of the first 'loop' of the SIROSCOUR interface (after about two years), the interface's cultural structure had moved all the way from diagram 4 onto *diagram 1*:

**Diagram 1**



The parties no longer had much sense of unity; certainly the earlier shared goals and spirit of co-operation had disappeared: notwithstanding the rapidly emerging realisation that all three parties were in a predicament together, and would sink or swim together. There was a high degree of conflict in most of the inter-party dealings. 'Win-lose' aims had come to be important; it was no longer possible even to contemplate meeting all three parties' aims. Attempts to solve the problems were for the most part based on a competitive approach. Misunderstandings were common. A high degree of role-confusion had also developed. The motivation of at least one of the parties had dropped greatly and that of one other had dropped discernibly.

The interface now incorporated few of any party's most important values, norms, expectations or behavioural orientations. The interface

during its latter stages was driven by little more than individuals' and parties' professional pride. Leadership had fallen away. Communication was selective and defensive in the extreme; PD&F had to "drag every last piece of information out of CSIRO piece-by-piece", for example (telephone interview with PD&F, 21 October 1992). One party even resorted to what almost amounted to bribery (Greenfields' offer of a half-a-million dollar low-interest loan to PD&F "in exchange for lodging all the technical material on SIROSCOUR with us": interview with Greenfields, Greenfields Melbourne, 16 September 1992), in an attempt to accomplish what even a minimal amount of communication would have accomplished.

Even formerly clear shared meanings had disintegrated. For example, the aim of developing and commissioning a product that was fully competitive with the dominant existing product on the market had come to mean for PD&F developing and commissioning a product that was completely *new*; CSIRO on the other hand continued to see competitiveness with rival products in terms of SIROSCOUR's *efficacy* (see the description of SIROSCOUR at the beginning of this volume).

In short, the 'quicksand' referred to in the discussion of the 'before-acculturation' SIROSCOUR had had its inevitable effect.

#### C. SUMMARY OF CHANGES IN CULTURAL 'SHAPE' THAT HAD TAKEN PLACE

- \* The *DUNLENA* interface had changed from a somewhat unbalanced, distrusting, interculturally 'blind', 'apartheid'-based and competitive interface of diagram 3, all the way to an integrated, coherent, committed, focused, communicating, understanding and co-operative interface of diagram 7.

- \* The *MMP* interface had changed from a generally coherent but culturally disjointed, somewhat poorly communicating and slightly uncertain interface of diagram 5, well towards an integrated, committed, focused, communicating, understanding and co-operative interface of diagram 7.
- \* The *I<sup>2</sup>* interface had remained through it all a relatively unchanged diagram 4 interface; it continued to be reasonably coherent, cross-culturally understanding and balanced, with good communication, but with a lack of shared goals and questionable commitment and questionable management-support from one party.
- \* The *SIROSCOUR* interface had changed from a generally integrated, coherent, committed, focused, communicating, understanding and co-operative interface of diagram 4 (close to diagram 7), all the way to a divided, fragmented, incoherent, conflict-riddled, leaderless and interculturally 'blind' interface of diagram 1.

In more general and simple terms,

- \* *the cultural 'shape' of DUNLENA and MMP improved markedly over these interfaces' lifetimes;*
- \* *the cultural 'shape' of I<sup>2</sup> did not change significantly over the interface's lifetime; while*
- \* *the cultural 'shape' of SIROSCOUR deteriorated markedly over the interface's lifetime.*

### THE PROMINENCE OF EACH DIMENSION OF SOCIAL BEHAVIOUR IN EACH INTERFACE

The discussion in this appendix dips into the data on the social and intercultural events and processes in the case studies, to make a first assessment of how prominent a part each of the dimensions of social behaviour constituting the theoretical framework (Table 5) played in the respective interfaces. This assessment provides the basis for carrying out the preliminary analysis of each dimension's likely influence on interface effectiveness, which was formulated in chapter 4.

The discussion presents *illustrations* of important social and intercultural events and processes occurring in the interfaces. The focus is *the overall pattern of variation among the interfaces* against each particular dimension. More complete descriptions of the interfaces' many significant events and processes, including full attributions of data, are given at the beginning of this volume, and also (in the case of the dimensions that measure up well in the preliminary analysis) in chapters 6 to 10. For these latter dimensions, the discussion here is partly a briefer form of the analysis in those later chapters; there is substantial cross-referencing to that later analysis.

#### EMPHASIS OF INTERCULTURAL SIMILARITIES, AND EXPLOSION OF INTERCULTURAL MYTHS:

All four of the interfaces in the case studies showed, at different times or in the actions and attitudes of different participants, *both* a tendency to play up intercultural similarities (and often to explode intercultural myths) *and* a tendency to play down intercultural simi-



larities or to emphasise intercultural differences. In DUNLENA, for instance (see the description at the beginning of this volume), both the CSIRO people and the Du Pont people emphasised the huge culture-gap between the two groups early on in the interface's lifetime. That gap was at the heart of the only inter-party conflict in this interface (see section A of chapter 8). On the other hand, from about two years after initiation of the arrangement, both parties continually emphasised intercultural *similarities* (like their broadly similar perceptions of rewards and preferred working styles), and the virtual interchangeability of the CSIRO group and one of Du Pont's own research teams.

This ambivalence over time or across participants does not necessarily preclude examining the influence on interface effectiveness of specific behaviour associated with these intercultural attitudes; indeed this influence is investigated in chapter 6. However it *does* make it impractical to assess the correspondence between how prominent a part these attitudes played in each interface overall, and changes in interfaces' cultural 'shapes'. That is, it is not practical to carry out the preliminary analysis of this dimension's influence on interface effectiveness. So the full detailed analysis carried out in chapter 6 will have to proceed without the benefit of the preliminary analysis's confirmation of a prima facie influence on interface effectiveness from these intercultural attitudes/behaviour.

#### **ACTING IN WAYS THAT PRESERVE A PARTNER'S MOST VALUED DIFFERENCES:**

##### **SIROSCOUR**

In this interface, no party seemed to be very interested in attempting to preserve their partners' most valued differences. Indeed, a contin-

uous series of actions had the effect - and apparently often the intent - of playing down highly valued differences (see the analysis in section C of chapter 6). The epitome of this was the series of steps taken to undermine a most valued difference of PD&F: their ability to come into a plant and, irrespective of the material to be handled and the precise type of process being used, pursue their engineering-design/fabrication task professionally and autonomously. Far from having this distinguishing feature respected, PD&F were furnished with detailed instructions, warnings and unsolicited assistance. There were few signs of the professional trust and respect PD&F had always regarded as their hallmark.

### **The Other Three Interfaces**

In the other three interfaces, most parties frequently took steps that had the effect of preserving their partners' most valued differences. Often they went out of their way to do this. Two outstanding illustrations of this are available in just one of the interfaces, DUNLENA (see the analysis in section C of chapter 6). First, ready acceptance of the 'manufacture in Australia if economically feasible' clause maintained both partners' key values and passionately-held priorities. Second, there was agreement that both parties would get the most out of the arrangement if the CSIRO group was able, as a group, to maintain its cultural identity. Du Pont made it clear that they had no intention whatsoever of strongly influencing CSIRO's underlying approach to its research. Rather, they wanted only to make the best of what the CSIRO team found, recognising that team's unusual (to them) background and attitudes.

**Conclusion:** DUNLENA, MMP and I<sup>2</sup> featured many instances of parties

preserving their partners' most valued differences, whereas SIROSCOUR demonstrated clear cases of the precise opposite.

#### **ABANDONMENT OF NO-LONGER-SUITABLE OLD WAYS:**

I<sup>2</sup> cannot sensibly be positioned against this dimension; the behaviour of the two I<sup>2</sup> parties is near the opposite ends of the dimension (see the description at the beginning of this volume). Furthermore the MMP interface is evidently neutral on the dimension; the participants showed no particular inclination or disinclination to abandon no-longer-suitable old ways (again see the description at the beginning of this volume). So only DUNLENA and SIROSCOUR will be addressed here.

#### **DUNLENA**

DUNLENA contained one party, CSIRO, which was notable (after the first two years or so of the interface's lifetime) for adopting new perspectives and new ways of doing things and abandoning old, no-longer-suitable ways. This is one of the most prominent features of DUNLENA (see the description at the beginning of this volume and the detailed analyses in chapters 6 to 10). CSIRO's partner (Du Pont) is at least neutral in these terms: the Du Pont people did not show *an unwillingness* to adopt new perspectives and to abandon old, no-longer-suitable ways. But the interface's cultural framework and operating arrangements are so close to Du Pont's that in point of fact the Du Pont people were seldom *required* to critically rethink their established ways of thinking and doing things.

#### **SIROSCOUR**

Two of the three parties to SIROSCOUR - PD&F and the CSIRO group - displayed a marked reluctance to adopt new perspectives and to abandon

old, no-longer-suitable ways. Again, PD&F's clinging as long as possible to their established ways of doing things and the CSIRO group's general all-round conservativeness feature prominently in the description of SIROSCOUR at the beginning of this volume, and in the detailed analyses in chapters 6 to 10. The other party (Greenfields) was neutral in these terms: they did not show either any keenness or any reluctance to adopt new perspectives and to abandon old, no-longer-suitable ways. On the whole, the SIROSCOUR interface tended to stick with tried-and-tested approaches and methods with which the parties were comfortable: whatever difficulties that might pose.

**Conclusion:** The party to the DUNLENA interface required to go through most cultural change showed a relative willingness - eventually - to abandon no-longer-suitable old ways, whereas the SIROSCOUR parties required to go through most cultural change showed a marked reluctance to abandon their old ways.

#### **GOODWILL TRUST:**

##### **DUNLENA**

Apart from during the interface's uncertain first couple of years, what amounted to goodwill trust was at the very heart of the DUNLENA arrangement. Nowhere was it better illustrated than in Du Pont management's action 'above and beyond the call of duty' in overhauling their management procedures and at least one Du Pont research project, to bring them to exceed what was demanded under the formal arrangement (see the description of DUNLENA at the beginning of this volume).

##### **MMP and I<sup>2</sup>**

Trust is important in *MMP* because of the combination of the widely-

separated skills and knowledge of the partners and the novelty and profile of the venture. It would have been impossible for MMP to have operated successfully for any period without each party manifesting at least a degree of trust. Trust - clearly of the goodwill form - is well illustrated in the lengths UBE went to in publicising to some of their long-standing customers how much they had thrown in their lot in the magnesium industry with the joint venture (see the description of MMP at the beginning of this volume). But from time to time and from place to place MMP also displayed *distrust*. This was especially prominent in the MIM/QMC and the MIM/UBE interactions; trust-based issues in these interactions feature prominently in the analysis in section E of chapter 6. This interface must be regarded, then, as featuring a mixture of trust (clearly including the goodwill variety) and distrust.

The same is the case with  $I^2$ . The mix of trust in this interface is also analysed in section E of chapter 6. The trust pervades most of the inter-party dealings, while the distrust is most evident in the latter stages of the project.

#### **SIROSCOUR**

This interface was driven, over most of its lifetime, by intense distrust, which started within months of the arrangement's inauguration. Again, this features prominently in the analysis in section E of chapter 6; several illustrations are given there.

**Conclusion:** DUNLENA showed ample evidence of goodwill trust, and MMP and  $I^2$  evidence of both trust (including goodwill trust) and substantial *distrust*. SIROSCOUR rapidly developed intense distrust.

**IDENTIFICATION AND PURSUIT OF SHARED GOALS:****DUNLENA**

It is clear from the analysis in section A of chapter 7 that from the very earliest days, CSIRO and Du Pont enthusiastically embraced the goal of using research-generated compounds to identify, develop, manufacture and market novel agricultural chemicals for controlling a broad range of pests, with as much as feasible of the commercial manufacture of the compounds taking place in Australia. Even during the first two years, when the venture's future was being jeopardised by CSIRO's refusal to provide Du Pont with full compound structural details (see the description of DUNLENA at the beginning of this volume), there was no compromise on this broad goal. Indeed both parties readily subscribed to the general aims even before the venture was actually established (when the 'manufacture in Australia if economically feasible' clause was being negotiated).

**MMP**

While the early stages of this interface saw some of the parties bickering about their respective roles and the venture's relationship to their existing business (see the description of MMP at the beginning of this volume), there was never any dispute on even the more detailed aims of the venture: development of technology for establishing in Australia a major international magnesium metal industry, using QMC's ore body, Australian technology and appropriate sources of international business and marketing expertise. Again, all parties willingly embraced this goal.

**SIROSCOUR**

The goal of this venture at the broadest level - to develop, install

and commission an effective SIROSCOUR line in Greenfields' plant - was shared among the parties. But the parties differed significantly in what they saw as the venture's *next level* of goals (see the analysis of goal-sharing behaviour in section A of chapter 7). CSIRO's aim at this level was creation of a scouring line that clearly demonstrated SIROSCOUR's capacity and quality. Greenfields' aim was to create a line that produced the highest quality scoured wool; to Greenfields, the 'generalisability' of the know-how and the discreteness of the SIROSCOUR technology were not important. PD&F's aim at this level was to build an excellent scouring line that would be seen as a PD&F product in all respects; while quality of output was obviously important, PD&F's focus was elsewhere.

## I<sup>2</sup>

Here the parties' goals differed at even the broadest level (again see the analysis of goal-sharing behaviour in section A of chapter 7). CSIRO's broad goal was simply to finish development of the product, and to get as many as possible sold. OPTUS's broad goal went far beyond that: the product had to be *in a form that meant it could be used only, or most readily, with OPTUS's communications system*.

**Conclusion:** DUNLENA and MMP featured a high degree of goal-sharing and enthusiastic pursuit of the shared goals, SIROSCOUR a moderate degree, and I<sup>2</sup> very little.

## INTIMACY OF CONTACT:

The case studies do not provide a significant spread among the interfaces on this dimension: despite the intuitive impression that they would (see section B of chapter 7).

This lack of spread does not necessarily preclude examining the influence on interface effectiveness of specific behaviour associated with the intimacy of contact; indeed this influence is investigated in chapter 7. However it *does* make it impractical to assess the correspondence between how prominent a part intimate contact played in each interface overall, and changes over time in interfaces' cultural 'shapes'. That is, it is not practical to carry out the preliminary analysis of this dimension's influence on interface effectiveness. So here also (as with the dimension "emphasis of intercultural similarities, and explosion of intercultural myths", examined earlier), the full detailed analysis carried out in following chapters will have to proceed without the benefit of the preliminary analysis's confirmation of a prima facie influence on interface effectiveness from behaviour associated with intimate contact.

#### **APPROXIMATE STATUS BALANCE BETWEEN PARTIES' REPRESENTATIVES:**

The MMP interface is omitted from this discussion because the mix of people from different status levels in various parts and at different stages of the arrangement is too complicated to permit any meaningful analysis (see the description of MMP at the beginning of this volume).

#### **DUNLENA and I<sup>2</sup>**

In each of these interfaces, two sets of representatives in each party seemed to be in the best position to articulate cultural beliefs and shared values, and to generalise new perceptions throughout their organisation (see the analysis in section C of chapter 7). As nearly as could be judged from the information available on organisational structures and management arrangements and people's roles, these two sets of managers seemed to be closely matched in status, on the basis



of measures such as span of responsibility, autonomy, 'slot' in the corporation and assessed influence on corporate policy.

### SIROSCOUR

This interface, by contrast, is characterised by an *imbalance* in the status of some parties' representatives. The two main CSIRO managers involved, who are program managers, have relatively narrow and specialised domains of responsibility (see the analysis in section C of chapter 7). They are in the third tier of management within this Division of CSIRO, and in the fifth tier in CSIRO as a whole. This is to be contrasted with the situation of the key person from each of CSIRO's partners in SIROSCOUR: chief executive of a company, albeit a small or moderately small company.

**Conclusion:** DUNLENA and I<sup>2</sup> featured an approximate balance in the status of the representatives of the two parties, whereas SIROSCOUR featured a marked status imbalance.

### ASSUMPTION OF CATEGORY-INDEPENDENT ROLES:

#### SIROSCOUR

When the SIROSCOUR arrangement was experiencing grave problems and was virtually 'on its last legs', there was much role-exchange, mostly in desperation and in an ad hoc fashion, without consultation among the parties (see the analysis in section D of chapter 7). Apart from in that 'last-resort' situation, SIROSCOUR lacked any role-exchange, and certainly showed no strategic category-independent role performance. The roles pursued by the CSIRO group, PD&F and Greenfields were the unmistakable respective 'pure' roles of the publicly-funded research laboratory accessing its know-how through a commercial arrangement

with industry, the engineering-development company plying its trade in designing and building equipment originally developed by a publicly-funded laboratory, and the commodity-processing company improving its capabilities in collaboration with CSIRO.

### The Other Three Interfaces

The summaries of the case studies at the beginning of this volume and the analysis in section D of chapter 7 document a notable systematic definition, assumption and acceptance of category-independent roles in the other three interfaces. *The CSIRO group in I<sup>2</sup>* took on the full range of marketing, product-development and manufacturing functions. *CSIRO C in MMP* rapidly took on the full range of management and leadership functions for a highly targeted industrial R&D program, the other participants in which were experienced companies. And eventually *the CSIRO group in DUNLENA* assumed a role coming very close indeed to the role normally played by one of Du Pont's in-house research groups.

**Conclusion:** DUNLENA, MMP and I<sup>2</sup> all featured category-independent roles, and a wide acceptance of such roles, whereas SIROSCOUR lacked any sign of the strategic adoption of such roles.

### STRONG AND CONSISTENT MANAGEMENT SUPPORT:

#### I<sup>2</sup>

*Lack of management support* was one of the most frequent discussion points with I<sup>2</sup>. The outlook on the project by the management of both parties was at best neutral and remote and at worst unsupportive (see the description of I<sup>2</sup> at the beginning of this volume). *OPTUS management* often lacked interest in I<sup>2</sup>, failed to take the necessary decisions, and generally regarded the project as "*laissez faire*: they

weren't enthused about it, nor did they insist that it be scrapped" (interview with OPTUS B, OPTUS Sydney, 6 August 1992). *CSIRO management's* commitment was limited and variable. The most senior CSIRO manager interviewed, CSIRO A, graphically described the Division's and the Institute's scepticism about commercial development as a proper role for CSIRO, and their reluctance to commit resources to such work (interview, CSIRO Black Mountain, 26 August 1992).

### **The Other Three Interfaces**

All three of these interfaces (see the descriptions at the beginning of this volume) displayed clear evidence of strong, committed support from the management of each party (with the possible partial exception of MIM in the MMP interface). Again, this is a prominent discussion point in many parts of the analysis; management support is identified repeatedly as something at the root of many of the key social and intercultural phenomena in these interfaces. It is at the root of, for example, Du Pont's concentration on keeping DUNLENA information and property at arm's length from Du Pont information/property, and the MMP interface's intentness on putting together the best possible combination of partners.

**Conclusion:** For the most part, DUNLENA, MMP and SIROSCOUR all received strong and consistent support from the various levels of management in both/all parties. I<sup>2</sup> received weak, variable management support from both parties.

### **RELIANCE ON CONTRACTUAL ARRANGEMENTS AT THE EXPENSE OF TRUST:**

Most aspects (including contractual aspects) of two of the four case study arrangements - *SIROSCOUR* and I<sup>2</sup> - were relatively poorly defined

(see the descriptions at the beginning of this volume), so there would seem to be little chance that these ventures could have 'gone over-board' through applying contractual provisions to matters that would more appropriately have been left to trust.

Both the other arrangements (*DUNLENA* and *MMP*) were relatively well defined, with quite comprehensive contractual provisions. But at the same time both these interfaces featured high levels of mutual reliance and trust: at least after *DUNLENA*'s early days (see the description at the beginning of this volume). There was no evidence that any of the participants were concerned about 'over-contractualisation'. Even during the first two years of *DUNLENA*'s lifetime, when the interface was characterised by much distrust, there was no sign that this was attributable to over-reliance on contractual provisions. Indeed, one of the most important causes of the CSIRO group's refusal to provide Du Pont with structural details of the compounds they had synthesised (again see the earlier description of *DUNLENA*) lay in something that had *not* been written down: an obligation for CSIRO to provide these details.

**Conclusion:** There was no evidence in the case studies of reliance on contractual provisions where trust may have better achieved the objectives.

DEVELOPMENT OF EXCESSIVE CONFLICT IN ACCORDANCE WITH BROWN'S REASONING:

)  
)  
)  
)

MAINTENANCE OF CONFLICT AT TOO LOW A LEVEL:

)

Section A of chapter 8 shows that conflict in four of the 19 separate conflict-based interactions identified in the case studies reached excessive levels: at least at some times. Three of these conflicts were

in SIROSCOUR, and the other in DUNLENA. But at the same time there were two other, less potent, conflicts in SIROSCOUR and one other, less potent, conflict (albeit an intra-party conflict) in DUNLENA. Likewise, Section A of chapter 8 identifies six of the 19 separate interactions identified in the case studies that featured unhealthily low levels of conflict. Five of these interactions were in the I<sup>2</sup> interface, and the other in MMP. Here also there are other interactions in these interfaces (especially in MMP) that do *not* feature conflict being kept at an unhealthily low level.

Thus it would be problematic to try to distinguish among the interfaces in the way being aimed for in this appendix. This conclusion does not necessarily preclude examining the influence on interface effectiveness of specific behaviour associated with either the build-up of excessive conflict or the limitation of conflict to very low levels; indeed these influences are investigated in sections B and D of chapter 8 respectively. However it *does* make it impractical to assess the correspondence between how prominent a part the build-up of excessive conflict or the limitation of conflict to too low a level played in each interface overall, and changes over time in interfaces' cultural 'shapes'. That is, it is not practical to carry out the preliminary analysis of these dimensions' influence on interface effectiveness.

#### **HANDLING EXCESSIVE CONFLICT USING THE APPROACHES IDENTIFIED BY BROWN:**

As noted in the preceding section, certain interactions in DUNLENA and SIROSCOUR demonstrated excessive levels of conflict. As shown in section C of chapter 8, *DUNLENA* demonstrated ample evidence of all of Brown's approaches to controlling that excessive conflict: for alter-

ing each party's perceptions of the conflicts and their actions, and for changing the interface and its context in various ways. *SIROSCOUR*, on the other hand, showed no sign of systematic, widespread use of Brown's conflict-control strategies.

#### NUMBER OF CONFLICTS:

MMP, I<sup>2</sup> and *SIROSCOUR* all contain larger numbers of separate conflicts than DUNLENA. Only two conflicts were identified in DUNLENA, while between five and seven separate conflicts were identified in each of MMP, I<sup>2</sup> and *SIROSCOUR* (see section A of chapter 8).

#### FLEXIBILITY/RIGIDITY OF THE SOCIAL SYSTEM WITHIN WHICH CONFLICT DEVELOPS:

##### *SIROSCOUR* and I<sup>2</sup>

These interfaces featured relatively loosely defined social systems.

In *SIROSCOUR*, many details for operation of the social system constituted by the interface were left partly to chance (see the description of *SIROSCOUR* at the beginning of this volume). These related to (inter alia) the very definition of precisely what was being licensed, what it was that CSIRO understood PD&F were to do under the arrangement, and the "turnkey plant" with which PD&F were to provide Greenfields. Channels for resolving disagreements had not been clarified, and there were multiple points of contact on the arrangement in some of the parties. Time and again, interviewees from all parties lamented not having exercised a particular communication channel for a particular purpose, rather than the one they had in fact used. The looseness of this interface's social system was reflected in the fact that the company in whose plant the first *SIROSCOUR* line was being developed was not formally party to an agreement with CSIRO (again see the descript-

ion at the beginning of this volume). Nor was there a formal oversight committee for the project: unlike the other three arrangements.

Perhaps the ultimate reflection of  $I^2$ 's loose, flexible social system was the way CSIRO stepped in to fill the vacuum left when it became evident that OPTUS were not going to be able to provide the range of inputs they had undertaken to provide (see the description of  $I^2$  at the beginning of this volume). There were no histrionics and no territorial arguments; there was just a major change in role for CSIRO, almost as if the roles had been interchangeable all along. Likewise with OPTUS's change of role from collaborator in an R&D joint venture, to a customer for the CSIRO group's research services. Furthermore it is clear from both the interview material and the minutes of the venture's oversight committee that this committee operated quite informally and loosely.

#### **DUNLENA and MMP**

These interfaces are at the other extreme. Both these arrangements are formal joint ventures; this necessarily dictates a more rigid social system. The responsibilities and roles of each party are relatively clearly stipulated, and foci for resolving differences are identified in the agreement. Both arrangements have well defined (and - unlike  $I^2$  - effectively used) management committees or boards. Management of the arrangements is formal and strictly reported. Relatively inflexible management practices - like DUNLENA's system for the flow of chemical compounds and the results of testing them - are built integrally into the arrangements (see the description of DUNLENA at the beginning of this volume).

**Conclusion:** The SIROSCOUR and I<sup>2</sup> interfaces were relatively flexible social systems, and DUNLENA and MMP relatively rigid social systems.

CONFLICT ABOUT SUBJECTS THAT QUESTION THE BASIC ASSUMPTIONS ON WHICH THE RELATIONSHIP IS FOUNDED:	)
	)
WAY IN WHICH THE GROUPS IN CONTACT APPEAL TO THEIR MEMBERS' PERSONALITIES:	)
	)
CONDITIONS UNDER WHICH CONFLICT-LEARNED BEHAVIOUR TRANSFERS TO NEW NON-CONFLICT SITUATIONS:	)
	)

It is not possible to assess the correspondence between the prominence of these conflict-based dimensions of social behaviour in the respective interfaces, and changes in the interfaces' cultural 'shapes'. This is not possible because a significant number of 'founding assumptions' conflicts, conflicts appealing to different extents to the actors' total personalities and transfers of conflict-learned behaviour to non-conflict situations occur in all four of the interfaces (see the analyses in chapter 8). This prevents meaningful distinction *among the interfaces* in terms of each of these dimensions.

Again, this does not necessarily preclude examining the influence on interface effectiveness of specific behaviour associated with these types of conflicts and social circumstances in which conflicts occur. Indeed (as noted) these influences are investigated in chapter 8. However it *does* again make it impractical to carry out the preliminary analysis of these dimensions' influence on interface effectiveness.

**CONFLICT KEPT FOCUSED ON DEFINITE OBJECT OF CONTENTION:**

MMP's conflicts (see section A of chapter 8) are not notable for either a strong focus on definite objects of contention or ready displacement onto other issues, so that interface's conflicts will not be included in this preliminary assessment.



A few of the conflicts in the case studies provide outstanding illustrations of continuing focus on a specific "object of contention".

The main *DUNLENA* conflict, conflict *DUNLENA B* (see section A of chapter 8), is repeatedly identified and discussed as a conflict that maintained such a focus, on an "object of contention" in the form of CSIRO's refusal to provide Du Pont with full compound structural details. This focus was maintained despite the ready availability of various alternative "personal and subjective" or "matters of principle" foci (see the analysis in section G of chapter 8).

Likewise, a number of the  $I^2$  conflicts also maintained the focus on very specific "objects of contention": OPTUS's inability to provide the commercial inputs that had been expected from them, and the need for CSIRO to try to provide them instead; and the need for OPTUS to back out of the arrangement, at least in its original form. Again this happened despite the availability of various alternative "personal and subjective" foci (again see the analysis in section G of chapter 8).

The case studies also provide illustrations of conflicts where the focus *was* displaced from the initial issue. The two best illustrations of this occur in *SIROSCOUR*: conflicts *SIROSCOUR B* and *SIROSCOUR C*, concerning respectively what information, and how detailed and complete information, CSIRO had provided to PD&F; and the need, and the correctness, of PD&F designing and building all components of the *SIROSCOUR* line 'from scratch' (see section A of chapter 8).

**Conclusion:** *DUNLENA*'s and  $I^2$ 's conflicts tended to be kept focused on definite objects of contention more than *SIROSCOUR*'s conflicts.

**CONFLICTING ORIENTATIONS TOWARDS A CONFLICT PER SE:****I<sup>2</sup>**

In I<sup>2</sup>, clearly the parties displayed highly compatible orientations towards conflicts. While I<sup>2</sup> offered potential for one party to markedly misunderstand where the other party was coming from, and the basis of that other party's dissatisfaction, these misunderstandings never materialised. Instead, both parties openly and honestly shaped up to the bases of the various conflicts that developed. For instance, OPTUS never tried to hide their developing inability, because of their changed business plans and the changing political pressures on them, to pursue I<sup>2</sup> as vigorously as they had intended (see the description of I<sup>2</sup> at the beginning of this volume). CSIRO for its part recognised OPTUS's changing role, and did so from the earliest days. At the same time, OPTUS understood the difficulties CSIRO faced in finding the resources necessary for their contribution to full-speed development of technologies.

**SIROSCOUR**

This interface is at the other extreme; SIROSCOUR repeatedly illustrated parties' "conflicting orientations" towards its conflicts. Nowhere was this clearer than at the heart of conflict SIROSCOUR C (see section A of chapter 8), regarding PD&F's insistence on designing all SIROSCOUR components 'from scratch'. PD&F saw little need to resolve this conflict, because at no stage - perhaps until the very last days of the interface - did they come remotely close to sharing CSIRO's and Greenfields' perception of the conflict and its seriousness, even though there is no doubt they were aware of the other parties' strong dissatisfaction (see the description of SIROSCOUR at the beginning of this volume).

**DUNLENA and MMP**

These two interfaces are somewhere between the extremes on this dimension. The parties to both interfaces displayed significant conflicting orientations towards some of the conflicts. In *DUNLENA*, there were (for example) major conflicting orientations between the parties on conflict *DUNLENA B* (regarding CSIRO's provision to Du Pont of full compound structure details: see section A of chapter 8), while in *MMP* there were equally significant conflicting orientations between two of the parties (QMC and MIM) on conflict *MMP D* (regarding MIM's independently checking out the worldwide magnesium metal scene: also see section A of chapter 8). In each case one party simply could not see what the other party was making a fuss about.

But such strongly conflicting orientations towards the basis of conflict were far from universal in *DUNLENA* and *MMP*. In fact the descriptions of these interfaces at the beginning of this volume make it clear that the parties viewed most of the conflicts in the same light, with each party understanding the basis for the other's concerns.

**Conclusion:** The parties to  $I^2$  showed very few conflicting orientations towards the bases of that interface's conflicts, the *DUNLENA* and *MMP* parties showed some conflicting orientations, while the *SIROSCOUR* parties revealed major conflicting orientations.

**CONFLICT'S REDUCTION OF "INTELLECTUAL RESOURCES":**

Section A of chapter 8 identifies the four conflicts that are probably the most serious of all the conflicts in the case studies: conflicts *SIROSCOUR C*, *D* and *B*, and conflict *DUNLENA B* (for the first two years or so of *DUNLENA*'s lifetime). These four conflicts could be expected

to result in most reduction in the "intellectual resources" available to the parties. In fact, all four of these conflicts displayed ample evidence of most of Deutsch's "reduced intellectual resources", including extreme distinctions between black and white and good and evil, reduced time perspective focusing on the immediate rather than the overall consequences, and "fear-inciting rumours".

Section A of chapter 8 also identifies the six conflicts that are probably the *weakest* of all the conflicts in the case studies: five of the I<sup>2</sup> conflicts, and conflict MMP C. These six conflicts might be expected to result in minimal reduction in "intellectual resources" available to the parties. Indeed, comprehensive search of the data bearing on these less serious conflicts showed very little evidence of Deutsch's "reduced intellectual resources". Certainly the polarisation, rumour and "reduced time perspective" emerging from the SIROSCOUR and DUNLENA conflicts were nowhere to be seen.

**Conclusion:** This dimension of social behaviour has the effect of distinguishing between the SIROSCOUR and DUNLENA interfaces, where at least the four most serious conflicts seemed to "reduce intellectual resources", and the I<sup>2</sup> and MMP interfaces, where at least the six lowest-conflict interactions showed no evidence of this phenomenon.

#### REGULATED OR INSTITUTIONALISED CHANNELS FOR CONFLICT-RESOLUTION:

##### DUNLENA

This interface has available several regulated, institutionalised channels for handling conflict: quite apart from channels directly associated with its formal structure (like its board). These came (for instance) with Du Pont's processes for handling so-called "candidate

compounds", which the interface adopted as its processes, for use on a day-to-day basis. Several instances of their use are articulated in the description of DUNLENA at the beginning of this volume and in chapters 6 to 10; they were prominent tools of Du Pont C (and others) in controlling conflict in DUNLENA.

### **The Other Three Interfaces**

Comprehensive examination of the data on the other three interfaces revealed little evidence of institutionalised/regulated handling of conflict. MMP displayed some signs of this, but mainly as a direct consequence of its status as a formal, structured joint venture. There was no evidence in MMP, I<sup>2</sup> or SIROSCOUR of the pervading presence of institutionalised/regulated approaches to conflict-management that were so prominent in DUNLENA.

**Conclusion:** DUNLENA displayed much more handling of conflict through regulated/institutionalised channels than did the other three interfaces.

*In the following five sections, to do with behaviour associated with the exercise of power, only two interfaces, DUNLENA and SIROSCOUR, are compared. This is because they represent extremes in terms of how well the interfaces' power bases and power relationships are defined (see section A of chapter 9). Clarity of definition of an interface's power bases and power relationships was argued in chapter 2 to be the key intermediary variable in the analysis of the influence of power on interface effectiveness.*

## STRATEGIC USE OF POWER TO PRE-EMPTIVE ENDS:

### DUNLENA

What was termed in chapter 2 the "Sumo wrestler" approach (getting into a position to prevent one's partner from exercising coercive force) was used often and prominently in DUNLENA. This strategic application of power to pre-emptive ends was most evident in Du Pont C's 'fatherly oversight' role, identified and discussed at many points in the thesis. Other less obvious, but still significant, illustrations of this strategic application of power in a pre-emptive way in DUNLENA are analysed in section B of chapter 9.

### SIROSCOUR

SIROSCOUR was by no means devoid of 'muscle-flexing' by the participants, but this was mostly the tactical, pragmatic exercise of power to cope with conflicts after they had arisen. Comprehensive search of the data on SIROSCOUR revealed very few instances of what might have been strategic use of power to pre-emptive ends. Furthermore, instances that *were* located seemed to be ill-advised (see the analysis in section B of chapter 9).

**Conclusion:** There was much more strategic use of power to pre-emptive ends in DUNLENA than in SIROSCOUR.

## PARTIES' ATTEMPTS TO ACTIVELY SPREAD THEIR OWN SOCIAL VALUES:

### DUNLENA

Blau's mechanism directed to this end has two elements (see chapter 2). A party's spreading of its own social values (says Blau) is accompanied by a process of "opposing counter-ideologies that depreciate these values". While the former element was much in evidence in DUN-

LENA (Du Pont systematically and strategically spread its own social values to CSIRO: like 'no-frills' chemistry, a focus on new commercial products, and systematised testing and compound-handling processes), there was no sign of the latter element.

This may simply have been because the CSIRO group, for reasons investigated at length elsewhere, soon became receptive to the spreading of Du Pont's values. Perhaps this made it unnecessary for Du Pont to follow up promulgation of its own social values with attacks on alternative value-sets put forward in opposition. Be that as it may, the ultimate conclusion must be that Blau's phenomenon of parties strategically spreading their own social values was not evident in DUNLENA.

#### **SIROSCOUR**

Not even the former element of Blau's mechanism was evident in SIROSCOUR. Attempts in SIROSCOUR to 'convert' a partner to another culture - PD&F's attempts to 'educate' the CSIRO group on the principles of reworks and ad hoc engineering modifications, for example, and attempts by various parties to have their partners observe commercial proprieties - were tactical, pragmatic steps, often amounting to steps of desperation, rather than strategic moves.

**Conclusion:** Blau's phenomenon of parties strategically spreading their own social values was not fully evident in either DUNLENA or SIROSCOUR.

#### **COPING WITH UNCERTAINTY IN CRITICAL ORGANISATIONAL AREAS:**

Each interface's areas of greatest uncertainty, most critical to the interface's successful operation, are identified in section C of chap-

ter 9. The analysis in that section makes it clear that the parties to DUNLENA coped well with those uncertainties, whereas none of the three parties to SIROSCOUR did so, and one party - PD&F - by any relevant measure coped especially poorly.

However it is doubtful whether this should be taken as the basis for a preliminary analysis of this dimension's likely influence on interface effectiveness, because *both* parties to DUNLENA showed this ability to cope with uncertainty. This casts a question over whether this variable could have contributed much to clarifying DUNLENA's power relationships. Arguably, coping with uncertainty in critical areas can assist to clarify power bases and power relationships only if one party to an interface coped significantly better than the other(s).

As with a number of the dimensions discussed earlier, this does not necessarily preclude examining the influence on interface effectiveness of specific behaviour adopted by particular individuals to cope with uncertainty in critical organisational areas; indeed this influence is investigated in chapter 9. However it *does* again make it impractical to assess the correspondence between how prominent a part this behaviour played in each interface overall, and changes over time in interfaces' cultural 'shapes'. That is, it is not practical to carry out the preliminary analysis of this dimension's influence on interface effectiveness.

#### USE OF META-POWER/RELATIONAL CONTROL:

##### DUNLENA

Section D of chapter 9 provides outstanding illustrations of the use of meta-power through relational control in DUNLENA. Through control-



ling the interface's social/management structure for handling compounds and for feeding back to CSIRO the results of testing (and ultimately therefore for rewarding the CSIRO people), Du Pont were able to shape "social relationships and social structures through the manipulation of the components of the interaction system", and "to alter the 'type of game' the actors play" (Baumgartner et al. 1976, pp.224 and 225). The analysis in chapter 9 reveals little evidence that the CSIRO Division exercised meta-power to any significant extent.

#### SIROSCOUR

As would be expected with an arrangement whose power bases are so unclear (see section A of chapter 9), SIROSCOUR showed no evidence of exercise of meta-power/relational control; even if the CSIRO Division was potentially in a position to attempt to exercise meta-power (again see the analysis in section D of chapter 9).

**Conclusion:** One party to the DUNLENA interface (Du Pont) clearly exercised meta-power/relational control, while no SIROSCOUR party did so.

#### INSTITUTIONALISED DECENTRALISATION:

Comprehensive review of the data from the case studies showed no evidence at all of Baumgartner et al.'s efforts to mobilise strategic resources "to carry out structuring activities and to counteract [the leadership's] attempts to amass further power" (1976, p.235: see chapter 2). So this dimension cannot be investigated in the analyses. Perhaps the absence of institutionalised decentralisation resulted in part from involvement in each interface (or at least in negotiating the arrangement under which the interface came into being), of a number of levels of management from both/all parties. Perhaps this made

development of extra-management channels of influence unnecessary.

#### **BASIS OF INCORPORATION OF PARTIES INTO THE INTERFACE:**

The descriptions of the case studies at the beginning of this volume show the interfaces in the case studies to represent two if not all three of Smith's modes of incorporation of groups into societies (chapter 3). *DUNLENA* and - to a large extent - *MMP* are *cultural pluralisms* (as this concepts has been translated to commercialisation interfaces: see chapter 3). *I<sup>2</sup>* and *SIROSCOUR*, on the other hand, were at least *socially pluralistic* arrangements. One of the parties (or two of them in the case of *SIROSCOUR*) was severely restricted in the channels it could use to further the interface's aims, being 'permitted' to operate only in a relatively narrow, well-defined channel 'reserved' for a group of its type.

*SIROSCOUR must be omitted from the following three sections, to do with details of interface culture-formation, because the description of this interface at the beginning of this volume showed that at no stage did SIROSCOUR develop what could realistically be described as a culture. Certainly it developed some values and norms but these were fragmented and weak, and could not be regarded in the same light as, say, MMP's or DUNLENA's cultural systems. So it is meaningless to discuss how the SIROSCOUR interface formed its cultural system per se.*

#### **PRECISE MODE OF DRAWING ON CULTURES OF CONSTITUENT GROUPS IN FORMING INTERFACE'S CULTURE:**

##### **MMP**

The description of MMP at the beginning of this volume showed that it was clearly based on *cultural transmutation* (see chapter 3). "A unique

subcultural entity" was created by selectively drawing on and developing the cultures of the partners. Thus the MMP culture is strongly based on, *inter alia*, QMC's focus on Australian technology, on merging research and commercial values, and on freeing up communication channels; UBE's and QMC's foci on careful strategic positioning; and MIM's focus on careful planning and evaluation of options. Ample measures of national pride, global focus, patient investment, strong centralised management and a spirit of 'perform or leave' also contributed significantly to MMP's cultural system.

### DUNLENA and $I^2$

The description of these interfaces, on the other hand, showed both to be clearly based on *cultural shift* (see chapter 3).

In *DUNLENA*, the party which underwent most cultural change - the CSIRO group - adopted its values and orientations directly and virtually unchanged from the culture of its partner, Du Pont. Much evidence is quoted throughout the analyses in chapters 6 to 10, of the CSIRO group (after the first two years or so of the interface's lifetime, which period is analysed at length in its own right) willingly embracing Du Pont's essential cultural tenets. Du Pont's culture thereby became the cultural framework of the *DUNLENA* interface.

In  $I^2$ , the interface's values and orientations were provided not by the culture of CSIRO's commercial partner, but rather by the instrument/software development industry (see the description of  $I^2$ , at the beginning of this volume). The CSIRO group, through observation and imitation, alone developed a culture that would appear to stand the test against the organisational culture of instrument/software devel-

opment companies. This cultural framework was in turn largely adopted by the interface as *its* central core of values, norms and preferred ways of behaving.

It is not possible to use the data from the case studies to investigate the second prediction from Mendoza's reasoning (concerning the relative influences on interface effectiveness of *cultural incorporation* and *cultural shift*: see chapter 3), because the case studies do not provide any instance of cultural incorporation.

**Conclusions:** MMP's culture-formation process largely amounted to cultural transmutation, and DUNLENA's and  $I^2$ 's to cultural shift.

#### **SUDDEN DISCONTINUOUS BREAK WITH THE 'OLD' CULTURE:**

##### **MMP and $I^2$**

These two interfaces provide outstanding illustrations of the 'agent of change' role described by Siverts (chapter 3); both CSIRO C in MMP and the CSIRO group in  $I^2$  broke with their 'old' culture in quite a dramatic, discontinuous way (see the descriptions of these two interfaces at the beginning of this volume). Both breaks seemed to be desperate results of taking "the only way out when everything else seems to fail" (Siverts, 1969, p.111).

##### **DUNLENA**

The CSIRO group and its leader in DUNLENA at first strongly resisted adopting the interface's culture (which is largely Du Pont's culture: see preceding section of this appendix, and the description of DUNLENA at the beginning of this volume), and feared sacrificing their most strongly-held values and beliefs (see chapter 6). The following sect-

ion of this appendix, as well as the analysis in chapter 10, describe this group's vacillation between the 'old' and 'new' cultures as they came gradually to immerse themselves in the latter.

**Conclusion:** 'Agents of change' in MMP and I<sup>2</sup> broke suddenly and desperately with their 'old' culture, whereas those in DUNLENA did not.

#### **OPPORTUNITIES FOR MAINTAINING LINKS WITH THE 'OLD' CULTURE:**

Steps to maintain links with the 'old' culture often take the form of vacillation between the cultures, or identity management to permit both cultures to be manifested simultaneously (see the reasoning of Eidheim, Balis Lal, Blumer and Duster and Sherif, articulated in chapter 3). Taken at its face value, this dimension of social behaviour therefore is largely the obverse of the one discussed in the preceding section, and distinguishes between DUNLENA and MMP/I<sup>2</sup>. Only the party experiencing most cultural change in the former interface (the CSIRO group) occupied both cultures simultaneously or alternately.

But quite apart from *short-term* movements back and forth between the two cultures, the analysis in chapter 10 identifies channels in the other two case studies (MMP and I<sup>2</sup>) for the CSIRO people to maintain their links with the 'old' culture on a *longer term* basis. Neither of the CSIRO groups/individuals in these interfaces was entering the contact situation indefinitely or for a period to last at least several years. Rather, in both cases prior discussion of the longer term commercialisation needs had flagged changes to the arrangements that could well be necessary after two years or so. It was expected that each CSIRO group/individual could well be required then to return to their traditional research work. Any researchers in MMP or I<sup>2</sup> who were

keen to maintain some form of contact with their 'old' culture therefore could look forward to such contact after perhaps two years.

So the CSIRO groups/individuals in all three of DUNLENA, MMP and  $I^2$  had significant opportunity, *one way or the other*, to maintain their links with their 'old' culture. This lack of spread does not preclude examining the influence on interface effectiveness of specific behaviour associated with the maintenance of links with the 'old' culture; indeed this influence is investigated in chapter 10. However it *does* make it impractical to assess the correspondence between how prominent a part maintaining links with the 'old' culture played in each interface overall, and changes over time in interfaces' cultural 'shapes'. That is, it is not practical to carry out the preliminary analysis of this dimension's influence on interface effectiveness.

**Conclusion:** Lack of spread on this dimension of social behaviour (broadly defined) across the interfaces prevents carrying out the preliminary analysis of likely influence on interface effectiveness.

#### **PREPARATION AND PLANNING FOR, AND MANAGEMENT AND CONSOLIDATION OF, CULTURAL CHANGE:**

The hypothesis on smooth merging/integration of cultures of constituent groups (see chapter 3) does not have any implications for  $I^2$ , because that interface's culture was not developed through merging or integrating the cultures of the parties to the interface, or even through adopting the culture of one of them. Rather, as described in a preceding section,  $I^2$ 's culture was essentially the culture of the instrument/software industry.

**DUNLENA and MMP**

The hypothesis on smooth merging/integration of cultures of constituent groups (see chapter 3) identifies a number of steps for preparing and planning for, and managing and consolidating, cultural change. The descriptions of these interfaces at the beginning of this volume and the analysis in section C of chapter 10 shows that both DUNLENA and MMP adopted most of these steps.

For example, the CSIRO group in *DUNLENA*, which experienced much more cultural change than the Du Pont group, had prepared for entering the interface through a preceding broadly similar arrangement with a Japanese company. Also, the analysis in chapter 10 shows that the ground-rules for what was to become DUNLENA were developed relatively early on, and that this interface, above the others, paid attention to Sales and Mirvis's active management of culture clashes, and "scanning of the culture and its reexamination following change" (see chapter 3).

The description of *MMP* at the beginning of this volume identifies much "strategic and emotional preparation" for the entry of CSIRO C (who experienced by far the greatest amount of cultural change) into the interface, "rehearsal of [the] possible implications", and definition of "ground rules for cross-cultural contact" (see chapter 3) *between CSIRO and QMC*. This had come through CSIRO C's long interaction with QMC before the interface was established, as well as through contract research CSIRO had performed for some years for QMC, and CSIRO's membership of QMC's board. "Preparation" for CSIRO's (and CSIRO C's) contact *with MIM* had also taken place, through the extensive contract and collaborative research CSIRO had performed for and with MIM over many years; this research had thrown up controversial issues in connection

with ownership of intellectual property and royalties, resolution of which had inevitably contributed much to developing ground rules for future interactions between CSIRO and MIM (like MMP).

### **SIROSCOUR**

The attention to 'culture-audit' and preparation for and consolidation of cultural change in DUNLENA and MMP contrasts starkly with SIROSCOUR's attention to these matters. SIROSCOUR's low degree of documentation and planning (in general) flows through to this planning and consolidation of cultural change. Review of the data on SIROSCOUR revealed virtually no evidence of steps to these ends (see the analysis in section C of chapter 10).

**Conclusion:** DUNLENA and MMP devoted significant attention to planning and preparation for, and management and consolidation of, cultural change, whereas SIROSCOUR gave very little attention to these tasks.

### **WILLINGNESS/KEENNESS TO PERFORM IN THE 'PUBLIC' DOMAIN OF THE INTERFACE:**

#### **DUNLENA and MMP**

The CSIRO group in *DUNLENA* (as the group undergoing by far the greater amount of cultural change) demonstrably adapted well to 'thinking publicly': once they had overcome the initial suspicion about what Du Pont would do with structural details of the compounds they were feeding into DUNLENA. Evidence of their willingness (indeed often their keenness) to share their thoughts with Du Pont is documented at a number of points in the analyses in chapters 6 to 10, as well as in the description of DUNLENA at the beginning of this volume.

The analysis in section D of chapter 10 shows that CSIRO C in *the MMP*



*interface* (as the person undergoing by far the most cultural change) also welcomed the opportunity to expose his thinking to CSIRO's partners in the interface: for example, through his periodic reports for the management group. CSIRO C's frank public dealings with the partners extended into dealings that revealed his commercial naivety and inexperience (like his act of conspicuously surrounding himself with people expert in the detail of the areas he was to oversee).

## $I^2$ and SIROSCOUR

Several ways in which the CSIRO group in  $I^2$  also adapted to 'thinking publicly' are also described in the analyses and in the description at the beginning of this volume. This adaptation was encouraged by a number of features of  $I^2$ , like the close personal relationship between the key CSIRO and OPTUS characters, and the CSIRO group's unfamiliarity with much of the role it had to take on in this venture (see the earlier description of this interface). Other considerations also pointed inescapably towards early sharing of information and thoughts: like the genuinely collaborative basis on which the arrangement had been developed from its very earliest days, possible applications of the technology on which  $I^2$  was based in areas other than those in mind at the outset, and the continuing possibility of use of systems other than satellite systems for the transmission of data.

At the same time it is clear that the CSIRO people in  $I^2$  were keen to keep many of their innermost thoughts from the OPTUS people. This was best illustrated through attitudes displayed by CSIRO C; as he said (interview, CSIRO Black Mountain, 28 August 1992), "If there were problems, they weren't mentioned to OPTUS. If they were, OPTUS would say 'Oh no; CSIRO's done it again!'"

The CSIRO group in *SIROSCOUR* clearly preferred to operate in the 'private' domain constituted by the Division and the research group. A comprehensive search of the data revealed virtually no signs that this group was at all inclined to share its thoughts with its partners. Indeed, the analysis in section D of chapter 10 identified evidence that the group was *against* sharing its thoughts.

The analysis in section D of chapter 10 shows that the other *SIROSCOUR* party undergoing major cultural change (PD&F) willingly shared their private thoughts with their partners, and had tried to initiate a 'clearing of the air' in the difficult *SIROSCOUR* situation. This would have amounted to further public sharing of their innermost thoughts.

**Conclusion:** The parties to DUNLENA and MMP who underwent most cultural change showed a greater inclination to think in the 'public' domain of the interface than did the corresponding  $I^2$  and *SIROSCOUR* parties.

#### USE OF SYMBOLIC REPRESENTATIONS TO BRIDGE INTERCULTURAL GAPS:

Three of the four interfaces in the case studies displayed much use of symbolic representation to deal with the culture 'shock' experienced by groups or individuals. The odd interface out,  $I^2$ , was not entirely without symbolic representations of gaps between the partners, but these seemed to play a distinctly less important part in interface development; only the other three interfaces will be addressed here.

#### SIROSCOUR

The participants in this interface, with the probable exception of the CSIRO people, tended to use symbolic representations to address the intercultural gaps between the partners in a generally aggressive,

negative and competitive way. This was the case across most aspects of the interface; many illustrations are provided in the analysis in chapters 6 to 10, and especially in section E of chapter 10.

### **MMP**

The participants in MMP tended to use symbolic representations to address intercultural gaps in a generally constructive, open-minded, positive and co-operative way. Again, many illustrations are provided in the analyses, and especially in section F of chapter 10.

### **DUNLENA**

The participants in DUNLENA used symbolic representations to address intercultural gaps *both* in an aggressive, negative and competitive way, *and* (after the first couple of years of the interface's lifetime) in a notably constructive, open-minded, positive and co-operative way. This variation in use of symbolism makes it difficult to categorise this interface for the purpose of the preliminary analysis of this dimension's likely influence on interface effectiveness. However, consistent with the overall thrust in the thesis, it has been decided (see the argument in section E of chapter 10) to give most weight to the long-term trend, and to regard DUNLENA as an interface whose use of symbolic imagery was fundamentally positive and constructive.

**Conclusion:** The parties to MMP and - probably - DUNLENA used symbolic representations to handle culture-shock more positively and constructively than did the SIROSCOUR parties.

DESCRIPTION OF EACH CONFLICT IDENTIFIED IN EACH INTERFACE,  
AND ITS SIGNIFICANCE IN THE INTERFACE

(These descriptions are expansions of the summaries  
appearing in the boxes in section A of chapter 8.)

IN MAGNESIUM METAL PROJECT:

**Conflict MMP A:** MIM A (who had recently arrived at MIM) had to fight against a number of values fundamentally entrenched in MIM, before he succeeded in gaining the company's support for the MMP project. These included the company's outlook on such important issues as diversification, taking risks, and working collaboratively with competitors from other countries.

**Conflict MMP B:** These demarcations centred on the right to act as principal operator of the commercial magnesium metal plant intended for construction following the project, and the right to international marketing of magnesium metal products. From MIM's point of view, this issue is closely linked to conflict MMP A.

**Conflict MMP C:** MIM saw themselves at various times as being allowed to play only a very limited part in developing the joint venture's ethos, priorities and policies. The importance of this is that MIM saw it as jeopardising the whole venture, because of the danger that the ethos, priorities and policies the joint venture *did* adopt would be research-driven.

**Conflict MMP D:** This conflict was illustrated through MIM's independent worldwide checking-out of magnesium metal market information. To MIM, this was no more than reasonable due-diligence. To QMC, it was a sign of serious mistrust and lack of commitment on MIM's part.

**Conflict MMP E:** MIM A (in particular) found CSIRO C's relatively undiscerning, machine-like, computer-driven, systems-oriented approach to management quite foreign. He was inclined to fight it. The significance of the conflict arising from this comes from CSIRO C's pivotal role in the venture.

#### **IN SIROSCOUR:**

**Conflict SIROSCOUR A:** This issue was discussed at some length by most interviewees, in the context of what almost seemed to be a corporate guilty conscience on CSIRO's part. It is a particularly important issue because it focuses attention onto the approaches CSIRO divisions adopt to interpreting the Organisation's policy on commercial dealings, and thereby represents an important foundation for this Division's cultural system.

**Conflict SIROSCOUR B:** The issue was how much engineering know-how and what associated engineering drawings CSIRO had provided to PD&F, what this material amounted to, and what CSIRO should reasonably have provided. Since lack of engineering know-how on wool-handling and the decision by PD&F itself to develop and build 'from scratch' all components for SIROSCOUR were the main foci of the difficulties with the SIROSCOUR project, this conflict is at the heart of this interface.

**Conflict SIROSCOUR C:** This conflict has a degree of overlap with conflict SIROSCOUR B. PD&F's resolve to build all components ab initio is at the heart of SIROSCOUR. Not only did this decision doom the project but it also embodied many of the conflicting meanings and divergent aims that illuminate the social structuring process in SIROSCOUR.

**Conflict SIROSCOUR D:** This conflict drove much of the relationship between PD&F and Greenfields, especially during the later stages, and was also important in the whole SIROSCOUR arrangement. The issue was whether a "turnkey plant" is handed over in a state that enables the commissioner to start up operations 'on Monday morning', with all 'fine-tuning' having been done, or requires extensive pre-start-up work by the party who commissioned the equipment.

**Conflict SIROSCOUR E:** This conflict hinged on 'private' work by Greenfields to improve SIROSCOUR as a process, without involving, or even informing, CSIRO. It had even more serious implications for *the second 'loop'* of SIROSCOUR.

#### **IN DUNLENA:**

**Conflict DUNLENA A:** CSIRO's philosophies and approaches for commercialising the Organisation's technology - for example, principles for dealing with companies, the types of companies the Division should contemplate dealing with, and ownership of intellectual property - were at the heart of the DUNLENA arrangement. The pressure these philosophies and approaches exerted on DUNLENA tended to diminish with CSIRO D's move off-line (see the description of DUNLENA at the beginning of this volume), although his profile and reputation as the 'father' of the Division's work in this area ensured they would periodically become topical. These philosophies and approaches continued to generate significant conflict even at the times the author visited the Division, when DUNLENA had been in existence for seven years.

**Conflict DUNLENA B:** CSIRO's initial distrust and fear that Du Pont would 'steal' their compounds was the main driving force for all the

interpersonal and intergroup relations in the early stages of DUNLENA.

**IN I<sup>2</sup>:**

**Conflict I<sup>2</sup> A:** Both parties, but especially CSIRO, were frustrated from an early stage by the unavailability of equipment development and marketing know-how (as distinct from satellite technology and communications know-how which OPTUS *could* provide). A number of possible solutions were considered (including bringing in a third party), until it was eventually decided that there was no alternative to CSIRO taking whatever steps were necessary to develop itself the necessary level of commercial expertise in this area.

**Conflict I<sup>2</sup> B:** OPTUS had eventually concluded (as many felt they should have concluded before they came anywhere near this arrangement) that their sole interest in I<sup>2</sup> was as a marketing tool for their communication services. Once this had been decided, given the timetable for introduction of OPTUS's own satellite it was almost inevitable that OPTUS would contribute little to rapid development of I<sup>2</sup> *as a product in its own right*, and would instead delay I<sup>2</sup> through tying its actions in with its strategy for acquiring its own satellite.

**Conflict I<sup>2</sup> C:** There was a view in OPTUS that the failure to get I<sup>2</sup> onto the market and achieve the predicted market share as quickly as had been predicted, could be partly attributed to CSIRO's failure to inject the minimum necessary development effort.

**Conflict I<sup>2</sup> D:** This was one of two I<sup>2</sup> conflicts (the other being conflict I<sup>2</sup> G) that were intra-CSIRO. Managers from other parts of the Laboratory were fearful of CSIRO's involvement in commercial dealings

because, however successful a commercial development might be, it always takes resources (they believed) from other projects. Indeed, this was often expressed as *the more successful* a commercial development is, *the more resources* it takes from other projects. These other managers were also fearful of losing at least a large part of their access to the group concerned with I<sup>2</sup>, for meeting their instrument-development needs.

**Conflict I<sup>2</sup> E:** With increasing clarification of the incompatibility of I<sup>2</sup> with OPTUS's mainstream business and the continuing indifference of OPTUS's senior management to I<sup>2</sup> as a product, it became inevitable that OPTUS would leave the arrangement: at least in its original form. Both the very departure itself and the approach adopted by OPTUS to effect their departure created significant conflict from time to time.

**Conflict I<sup>2</sup> F:** This conflict overlapped significantly with a number of the conflicts already described. Its genesis was summarised very well by SIROTECH (interview, SIROTECH Melbourne, 14 August 1992):

We [that is, the CSIRO side] only got our money from the sale of the device; they got their money from the sale of traffic *and* the device.

**Conflict I<sup>2</sup> G:** In some respects, this is the higher-level form of conflict I<sup>2</sup> D. Some interviewees identified the often 'hot-and-cold' approach to commercial activity by CSIRO management at a number of levels. This caused a deal of conflict in (and around) I<sup>2</sup>.



THE VARIOUS 'FOUNDING PRINCIPLES' ASSESSED AS HAVING BEEN  
FUNDAMENTALLY THREATENED BY THE FIVE 'FOUNDING PRINCIPLES' CONFLICTS

Conflict SIROSCOUR C - between CSIRO/Greenfields and PD&F, regarding the latter's insistence on designing all parts of the system 'from scratch' - ran a real risk of jeopardising not just one or two but indeed all five of the 'founding principles' identified for the SIROSCOUR interface in the box in section E of chapter 8. This conflict could well have brought the whole arrangement down in a heap (and indeed eventually did contribute notably to the project's demise). It thereby put an end to (for example) any hope - at least in the short to medium term - of SIROSCOUR enabling Australia to capture more value-adding industrial activity based on Australian commodities, enabling the quality of SIROSCOUR-produced wool to be demonstrated, and enabling this CSIRO Division's accumulated experience and know-how to be demonstrated. And of course almost by definition this conflict undermined the final 'founding principle': the SIROSCOUR project could hardly contribute to the worth of Australian companies as CSIRO licensees if the Australian company awarded this licence in the face of fierce competition, was setting about its task in what was regarded by many informed people as an ill-informed way.

Conflict SIROSCOUR D - between PD&F and Greenfields, regarding what constitutes a 'turnkey plant', and who is responsible for 'fine-tuning' - ran a real risk of jeopardising four of the five 'founding principles'. (It may not have set back by too much the CSIRO Division's demonstration of the value of its skills and know-how: although it certainly would not have helped this.)

Almost by definition, **conflict I<sup>2</sup> A** - regarding the absence of the commercial inputs from OPTUS that CSIRO expected - and **conflict I<sup>2</sup> E** - regarding OPTUS's 'backing out' of the project - both ran a real risk of jeopardising all but the last of the five 'founding principles' identified for the I<sup>2</sup> interface in the box in section E of chapter 8. Paradoxically, these conflicts, taken together, held a prospect of *strengthening* the final 'founding principle'; OPTUS's non-performance and prospective withdrawal, taken with the decision not to involve a third party, made it absolutely essential that the CSIRO group become even more involved in 'hands-on' commercial activity.

**Conflict DUNLENA B** - between CSIRO and Du Pont, regarding CSIRO's provision of structural details of its compounds - ran a real risk of jeopardising all four of the 'founding principles' identified for the DUNLENA interface in the box in section E of chapter 8. Had it not been controlled, this conflict could have been expected to question:

- \* the CSIRO Division's capability of working creatively with companies;
- \* Australia's ability to get *any* (let alone "a high proportion" of) manufacturing activity from these compounds; and
- \* the long-term future of the DUNLENA arrangement,

as well as the very over-arching task of the venture: identifying and bringing into commercial production at least one major new agricultural chemical.

DEGREE OF CULTURAL SHOCK APPARENTLY EXPERIENCED  
IN THE DUNLENA, MMP AND SIROSCOUR INTERFACES

(The I<sup>2</sup> interface is not included here because the data from that interface revealed relatively little use of symbolic representation to bridge important intercultural gaps.)

Potentially, entry into *DUNLENA* and *MMP* seemed likely to shock and dislocate the CSIRO people (who were the people expected to undergo most cultural change) more severely.

But although the intercultural gaps were relatively wide, the CSIRO group in *DUNLENA* and CSIRO C in *MMP* had both had the benefit of substantial cultural 'sensitising' through one channel or another. This 'sensitising', which is discussed in section C of chapter 10, seemed almost to have been 'tailor-made' for people who were subsequently to enter these respective interfaces. It exposed the people concerned either to a broadly similar sort of commercialisation arrangement to the one they were about to enter (as with the CSIRO group entering *DUNLENA*), or to various other activities with the same partners as the forthcoming venture (as with CSIRO C who was entering the *MMP* arrangement).

As a result of these 'sensitising' activities, entry to *DUNLENA* and *MMP* by the CSIRO group/person seems to have been a relatively 'soft landing' in potentially rough terrain.

The CSIRO group and the two companies in *SIROSCOUR* had not had the benefit of such intercultural 'sensitising' through specific earlier ventures or other interaction that in effect looked ahead to the

forthcoming commercialisation interface. As a result, entry to the SIROSCOUR arrangement of the CSIRO group and the PD&F group (the two groups expected to undergo most cultural change) was not cushioned in the same way.

But this did not seem to matter all that much, because here the inter-cultural gap per se seemed to be narrower. The CSIRO group's and the two company groups' cultural systems seemed fundamentally to be significantly closer to each other than had been those of (say) the four participant groups/people in MMP. The CSIRO Division's long-standing contact with operators of wool processing plants (for example), and their substantial contact with the culture underpinning this industrial activity, had perhaps served to narrow the gap between the pair of cultures, to the stage where more targeted cultural 'sensitisation' activities - as with DUNLENA and MMP - were simply not needed as much.

Perhaps this goes part of the way towards explaining why intercultural differences seemed on the whole to have played a less significant part in social structuring of SIROSCOUR than in the social structuring of the other interfaces: see the analyses in chapter 10.

All factors considered, it can be concluded that broadly comparable levels of culture-shock probably greeted the CSIRO groups or individuals entering DUNLENA, MMP and SIROSCOUR and the PD&F group entering SIROSCOUR.

BENEFITS FOR INTERFACE MANAGEMENT,  
FROM WIDESPREAD USE OF THE MODEL

Widespread systematic use of the model should markedly improve management perspectives and techniques bearing on both interface managers'/ participants' broad approach to involvement in a commercialisation venture and the interface's own approach to its tasks.

*Interface managers' and participants' fundamental approach to involvement in a commercialisation venture* could be improved through, first, encouraging them to critically examine their thinking, behaviour and attitudes in the areas defined by the dimensions in *cell C* in the indicative form of the model in Figure 1, in chapter 11. These dimensions of behaviour could quite possibly be supplemented, through further studies, by other dimensions with a similar mode of influence.

To a large extent this examination could actually be done within the confines of these people's own thinking. Because this behaviour's influence on interface effectiveness is context-independent, often the interface managers and participants would not need to delve very much into the detail of the characteristics of the (proposed) formal commercialisation arrangement or into the complexities of the thinking, behaviour and attitudes of the (proposed) commercial partner.

By contrast, improving these people's approach to involvement in the venture through encouraging them to examine their thinking, behaviour and attitudes in the areas defined by the (context-dependent) dimensions in *cell A* in Figure 1 (and other similar dimensions of behaviour that might be identified in the future) will normally directly encom-

pass the interface's cultural and structural contexts. Here, the people concerned will be well advised to cast their thinking, behaviour and attitudes directly against characteristics of the (proposed) formal commercialisation arrangement and/or the thinking, behaviour and attitudes of the (proposed) commercial partner.

Likewise, *the interface's approach to its tasks* could be improved through, first, encouraging interface managers/participants to critically examine their thinking, behaviour and attitudes bearing on the areas defined by the dimensions in *cell D* in the model (and similar dimensions of behaviour that might be identified in the future). Here also, for the reasons already given, this will perhaps be able to be done largely within the confines of their own thinking, without too much delving into the precise details of the (proposed) formal commercialisation arrangement or into the complexities of the thinking, behaviour and attitudes of the (proposed) commercial partner.

Again this is in stark contrast to how the interface's approach to its tasks could be improved through encouraging managers/participants to examine their thinking, behaviour and attitudes in the areas defined by the (context-dependent) dimensions in the top half of the matrix: in *cell B*. As with dimensions from *cell A* (discussed above), improvements here will normally be directly related to the interface's cultural and structural contexts, so again the people concerned will be well advised to cast their thinking, behaviour and attitudes directly against characteristics of the (proposed) formal commercialisation arrangement and/or the thinking, behaviour and attitudes of the (proposed) commercial partner.

Dimensions of social behaviour selected from just two diametrically opposed cells in Figure 1 can illustrate in more concrete terms how adoption of the model could lead interface managers and participants to improve their thinking, behaviour and attitudes in this fashion. The dimensions selected for such an illustration are "recognition of, and respect for, intercultural similarities/differences" (from cell A), and "assumption of category-independent roles" (from cell D).

The model's practical messages for interface management, based on these two indicative dimensions of social behaviour, are articulated in the remainder of this appendix. The discussion draws directly on the case studies for illustrations of successful education and guidance of interface managers' and participants' thinking; it may be necessary to refer to the descriptions of the case studies at the beginning of this volume, and in particular to the lists of those interviewed. The context-independent dimension from cell D is dealt with first, because it represents a simplest case of applying the model.

**A. A SIMPLEST CASE OF APPLYING THE MODEL: DIMENSION OF BEHAVIOUR  
SELECTED FROM CELL D: ASSUMPTION OF CATEGORY-INDEPENDENT ROLES**

Interface managers' attention to category-independent roles should to a large extent be able to concentrate on educating individuals/groups about how they can feasibly take on roles and tasks for which until now they may not have deemed themselves qualified. The case studies provide several illustrations of how groups and individuals changed their thinking, behaviour and attitudes in this respect, and suggest factors that were prominent in bringing about this change. Three examples will be described here.

## 1. CSIRO C in the MMP Interface

Over a period of a few years preceding inauguration of *MMP*, *CSIRO C* became convinced that he should be more flexible in his approach to industrial R&D, and that a role managing industrial R&D would not be as outlandish as it had once seemed. This change in thinking occurred largely as a result of *CSIRO C*'s intimate interaction with *QMC*, including while he was performing and managing contract research *QMC* had commissioned from *CSIRO*, and while he was travelling internationally with *QMC A* and *QMC B* to develop their magnesium business.

Factors important in establishing and developing such a close relationship (and, in turn, in encouraging a predisposition towards a category-independent role) are identified in the thesis; they include trust, mutual respect and institutional support: including the relatively free hand *CSIRO C* had been given over many years by *CSIRO*'s senior management.

## 2. The CSIRO group in DUNLENA

This group soon became convinced they had to take on a role virtually identical to the role of one of Du Pont's own research groups. In this case, though, their 'conversion' took place largely after the interface had been established: in particular through a concerted 'education' program to show group members that industrial research methods and values need not be detrimental to creative synthetic chemistry. The 'educating' role was performed by both more senior management in *CSIRO* and influential Du Pont characters.

Again, factors important in bringing about these changes in thinking and behaviour are identified in the thesis; they include trust, mutual



respect and understanding, and carefully formulated management initiatives.

### 3. The CSIRO group in I<sup>2</sup>

This group did not need to cultivate a category-independent role in the ways evident in the other interfaces, because the CSIRO Laboratory had long been philosophically inclined towards taking their products well along the development path. The question to ask here is what factors contributed to 'natural' development of this philosophy over several years prior to establishment of I<sup>2</sup>.

The main such factors were CSIRO A's and CSIRO B's personal values and philosophies, and the well defined and widely understood values and norms of the relevant industry (which made it feasible for the CSIRO group to develop the wherewithal for their category-independent role). The group's enthusiasm for a category-independent role defied equivocal or hostile attitudes from senior management in the CSIRO Division and the CSIRO Institute, and from other groups in the Laboratory.

The key observation from these illustrations is that in each case keenness to take on a category-independent role *did* actually emerge largely through the individual or group being educated about, or persuaded of, the advantages of seeing their role in a particular way. The focus for bringing about a new outlook on roles they might be able to fill was indeed inwards, as the individual (often encouraged by others) critically reviewed his former concept of his work in R&D projects.

At a general level, it should readily be possible for research labor-

atory and company managers to identify the basis of a strategy for educating themselves and their people in the areas defined by cell D in the model (and the same reasoning applies to the areas defined by cell C). This strategy could hinge on the mechanisms and methods featuring in the preceding illustrations from the case studies (staff secondment, close involvement of senior managers in commercialisation ventures, creative management and leadership). Or it could rest on other mechanisms/methods: perhaps recruitment of staff from other cultures, creative use of management-development courses, or adoption of systematic programs for progressively exposing researchers to issues encountered in the application of research-generated technology.

**B. A MORE COMPLICATED CASE OF APPLYING THE MODEL: DIMENSION OF BEHAVIOUR SELECTED FROM CELL A: RECOGNITION OF, AND RESPECT FOR, INTERCULTURAL SIMILARITIES/DIFFERENCES**

As argued above, it would seem essential for attention to the context-dependent dimensions in cells A and B to be cast directly against interfaces' cultural and structural contexts. Thus managers' consideration of how intercultural similarities/differences can best be coped with (the sample dimension from cell A) should extend well beyond their own and their people's immediate ability and commitment to understand and respond to intercultural similarities/differences. They should consider this issue in a broader context and in a longer time-frame, against deeper signs of their and the (proposed) partner's outlooks on intercultural similarities/differences. And they should also ask whether the 'hard' characteristics of the (proposed) formal commercialisation arrangement are likely to encourage productive attitudes towards intercultural similarities/differences.

In short, the model suggests that interface managers should take the broadest view in anticipating and actively seeking out culture-based

uncertainties, concerns and ignorance on the part of those intended to come together in the proposed venture. They may need to devote considerable thought and effort to removing or managing these uncertainties/concerns/ignorance.

Thus a research laboratory's interaction with a proposed partner that has shown a reluctance to acknowledge or respect intercultural similarities - perhaps through its behaviour in earlier commercialisation arrangements, or through its handling of negotiations leading up to the proposed arrangement - might need some form of serious ongoing attention. Perhaps the underlying commercialisation arrangement should have certain structure or timing, to encourage recognition of intercultural similarities. Again the case studies provide illustrations of the sorts of measures that can be successfully built into commercialisation arrangements to this end. Again three examples will be described here.

- \* The laboratory might seek to establish the venture at the earliest possible stage, when the technology is at a relatively early stage of development. This could force the company to work closely with the laboratory for a substantial period, thereby arguably increasing the chances of intercultural understanding. This seemed to be an important factor in the evolving intercultural soundness of DUNLENA.
- \* Alternatively, the arrangement could perhaps demand close intercultural collaboration on certain tasks (like reviewing progress and resolving disagreements). Undoubtedly it would be excessive to claim that intercultural understanding and co-operation can

be mandated through the physical structuring of a venture. But there is good evidence from the case studies that the specification of management arrangements at quite a general level (as with CSIRO C's role in MMP) and the more detailed formal allocation of responsibilities (as with a number of aspects of DUNLENA) can contribute greatly to intercultural understanding.

- \* Yet again, the arrangement might be structured so that selected key opinion-formers in the laboratory or the company are closely involved in operations. Roles for strong, well-informed personalities able to help bridge intercultural gaps (as with QMC B in the MMP interface) might prove to be especially effective. Possibly the arrangement could even be brought to enshrine a 'godfather' role, with a senior manager from one of the parties monitoring intercultural understanding, and advising both parties on problems and issues. The role of Du Pont C in DUNLENA provides an outstanding illustration of how much this can improve interface effectiveness.

At the extreme, perhaps looking at behaviour and thinking of interface participants in this way against the interface's cultural and structural contexts might convince the laboratory that intercultural understanding is so important, and the (proposed) partner so incapable of developing that understanding, that no amount of fine-tuning of the arrangement and no amount of preparation for entering the interface would do much good. Perhaps in these circumstances there may be no alternative to seeking a different partner or if necessary abandoning the (proposed) venture altogether.





