Wollongong University initiative fosters Australian-ASEAN relationship

In this second year of a major international exercise, government officials from five of the six ASEAN nations gathered in Wollongong in April and May for an eight-week training program directed by the Centre for Technology and Social Change of The University of Wollongong.

The program was established under an agreement between Australia and the ASEAN nations. Its purpose is to train ASEAN officials in the formulation of strategies for the use of science and technology in development. The program is funded by the Australian government's aid agency, ADAB, and is supported by the Department of Science.

Professor Stephen Hill and Professor Ron Johnston, Directors of the Centre for Technology and Social Change, were selected by the Australian government to direct the program. In 1986, their expertise, based on extensive international experience in science and technology policy in both advanced and developing countries, has been complemented by Mr Don Scott-Kemmis, formerly of Sussex University's Science Policy Research Unit. The selection of Wollongong's Centre for Technology and Social Change to run this program demonstrates the high national and international reputation it has now acquired in dealing with the consequences of technological change in the modern world.

The program is a unique innovation in the training of people to take command over the use of technological change for the advantage of their societies. It involves not only seminars, but practical work-experience for participants to learn from Australia's government and industry approaches to technological development.

The direction of the program also depends on continuous contact with each of the ASEAN nations about their development priorities and specific needs for science and technology policy training.

Both Professors Hill and Johnston visited each of the nations to consult with Heads of Science and Technology Ministries to set up the program in 1984; they established a High Level Consultative Meeting between the governments and Australia to discuss the program in early 1985; Professor Hill again consulted with the nations at the end of 1985 following the first training program last year; and in between, Professor Johnston has been involved in related consultancy with the Philippines government, and Professor Hill with the international organisation UNESCO, with the regional organisation ESCAP, and with the Malaysian government.

The Centre has therefore ensured that Wollongong has become a major focus for advice across the whole ASEAN region on the role of science and technology in development.

The Centre of Technology and Social Change is an independent, non-profit, research, consultancy and training organisation attached to The University of Wollongong, which deals with issues related to technological change.

Ceremonial Visitor's Chair

At a ceremony last month (April) The University of Wollongong was presented with a superbly hand-crafted timber ceremonial chair for use by the University Visitor. The Visitor is his Excellency the Governor of New South Wales. The chair was crafted by Peter Adams of Melbourne at a cost of $2,000. Funds for the purchase were raised by the Australian Federation of University Women and the Friends of the University at a book fair held in 1983.

The presentation was made to the University Chancellor, Mr Justice Hope, by Jan Cumming, a member of the Federation of University Women.

Graduation 1986 at Wollongong

On the lawn after the last-but-one of the Confering of Degrees ceremonies are the Vice-Chancellor Professor Ken McKinnon, the Federal Minister for Education, Youth and Community Affairs Senator Susan Ryan, and the Chancellor Mr Justice Hope. Senator Ryan delivered the occasional address to graduates in Education. For pictures of the graduation days, turn to pages 3, 4 and 5 of this issue.
Oil and gas are formed by the breakdown of organic remains (largely plants—both land plants and algae—but also bacterial products) within sedimentary rocks under the influence of temperatures in the range 60 deg C to 200 deg C under confining pressure. The changes in the organic matter associated with the reactions which lead to oil and gas formation can be tracked by determining the chemistry of the oils or the properties of the products (within sedimentary rocks under the influence of temperatures in the range 60 deg C to 200 deg C under confining pressure). The reflectance of the humified residues of woody tissue (vitrinite) is a very sensitive measure of the extent of the changes. Reflectance is measured on vitrinite in polished surfaces of sedimentary rocks with the areas measured typically being about 0.002 mm by 0.002 mm. The method allows high precision with samples containing less than one per cent of organic matter.

Work by the author (Professor A. C. Cook of the Department of Geology in the University of Wollongong) in part with Dr Agu Kantslor (now Shell, Nigeria) and Dr Greg Smith (now BHP) has outlined the nature of vitrinite reflectance variation over most sedimentary basins in Australia. In the case of the Cooper/Eromanga Basin (Figure 1), this work showed that while gas should predominate near the Nappamerri Trough, a number of plays exist in relation to oil occurrence. Soon after the preliminary part of this work had been reported to the company exploring the area, oil discoveries were made in play C in Figure 1. Later, Sandradurage Padmasiri (also known as Paddy) correlated some of these oils with their probable source rocks.

With the Gippsland Basin, Australia's major oil producing province, the problem has been where to look next after the first flush of major discoveries. Work with Greg Smith showed that differences in the timing of temperature rises in various parts of the basin, when linked with relatively subtle changes in the origin and composition of the organic matter, can explain the gas-prone area near shore and the oil-prone distal offshore areas. It remains to be seen how successful this model is in directing further exploration in the Gippsland Basin. Current work includes a study by Joseph Kim on the nature of vitrinite reflectance variation over most sedimentary basins in Australia. In the case of the Cooper/Eromanga Basin (Figure 1), this work showed that while gas should predominate near the Nappamerri Trough, a number of plays exist in relation to oil occurrence. Soon after the preliminary part of this work had been reported to the company exploring the area, oil discoveries were made in play C in Figure 1. Later, Sandradurage Padmasiri (also known as Paddy) correlated some of these oils with their probable source rocks.
IF one factor more than any other distinguished the May Graduation Ceremonies from those of a year ago it was that this time they were blessed with good weather. The ceremonies took place in the Union Hall and degrees and diplomas were conferred by the Chancellor of the University Mr Justice Hope.

Noteworthy feature of the proceedings was the awarding of a University Fellowship—only the fifth to be so awarded—to Robert Pearson AO for services to the University, in particular his association with educational institutions in the region and his role in the amalgamation of the former Wollongong Institute of Education with the University.

Proceedings began on Wednesday May 7— for graduates in Mathematics, and Science (in which, for the first time, there was awarded the new degree of Bachelor of Environmental Science) in the morning and Engineering, Metallurgy and Education after lunch.

On Thursday morning degrees in Commerce were awarded and in the afternoon it was the turn of Arts and Creative Arts (with the Bachelor of Creative Arts degree being awarded for the first time since the course was instituted). Friday was reserved for graduands in Education in the morning and for the disciplines of Arts and Education in the afternoon.

Occasional Addresses after each ceremony were respectively by Professor John M. Bennett, Professor of Computer Science at the University of Sydney; Professor R. E. Luxton, Professor of Mechanical Engineering at the University of Adelaide; Dr Susan Bambrick, Dean of Studies at the Australian National University (and the recipient of an OBE for services to education); Dr Rosiland Dubs, Registrar for the Australian National University (and originally from Wollongong); Senator Susan Ryan, the Federal Minister for Education and Youth Affairs and the Minister Assisting the Prime Minister on the Status of Women; and Ms Joan Ford, Human Resources and EEO Manager of Esso Australia.

In all 609 degrees and 260 diplomas were awarded. Winner of the University Medal was Matthew Ward, a 22-year-old Mathematics graduand who received the prestigious medal with his Bachelor of Mathematics Degree (hons). Matthew now embarks on a doctorate degree course—also in Mathematics.
Among the first to be awarded the degree of Bachelor of Creative Arts is Sue Rowley. Giving her courage to face the cameras are her daughter Anne and her husband Dr Jim Falk, a much-media-exposed figure from the Department of History and Philosophy of Science in the University.

Natasha Moldrich, who gained an Associate Diploma in the Arts, is the daughter of Challice Moldrich, a well-known figure on campus. He was University Secretary until moving on a few months ago.

'Well done darling, I'm proud of you.' So might Mr Allan Coates, Lecturer in Accountancy, be saying to his daughter, Mrs Barbara Smith, who graduated Bachelor of Commerce (with Merit). She, too, is a campus figure. She works in the Staff Office.

Gay Cunis carried off a Diploma in Teaching and is now doing a Bachelor of Education course at the Canberra College of Advanced Education. With her here are her mother, Gillian, from the University Publicity and Information Unit, her brother George, and her father Peter Cunis, who is a member of the Council of the University.

Appointed a Fellow of the University was Robert Pearson AO. Only the fifth Fellow to be appointed, Mr Pearson was honoured for his work on behalf of the University and for services to education.
Doffing caps with the University Chancellor is a pig-tailed Darlen Louise Christie, one of the first to graduate for the degree of Bachelor of Environmental Science. The degree was awarded this year for the first time.

This is the Nowra Group—all teachers who have studied in their spare time and have now earned Graduate Diplomas in Educational Studies (School Administration) with their lecturers: Dr Michael Hough, extreme left, Mr Ray Cleary middle, and Janice Tanner (crouching left) who taught the students part-time. She is Principal of Berry Primary School.

The occasional address to graduates in Arts and Creative Arts was delivered by Dr Rosiland Dubs, Registrar at the Australian National University.

Academia and politics mix at the graduation ceremonies are Professor Ron King, Mr Steve Martin, the local member of Parliament, Mr Colin Hollis, the member for Throsby, and Senator Susan Ryan, who delivered the occasional address.

Iain Standen, Bachelor of Engineering (hons), with his mother, Margaret, who is employed in the Department of Metallurgy.

A cheerful ten-year-old, Barbara Cooper, enjoys a quick snack. She was not a graduate.

Rosemary Livissianos graduated with a Bachelor of Arts degree. Her father, Mr Fred Hickson, does volunteer work for ‘The Friends’.

Right: Well may they smile. This cheerful group were among the first to graduate from the new course of Environmental Science.

Far right: Two Bachelor of Metallurgy graduates in a one-time male preserve. They are Sharon Barker, left, and Catherine Keitley.
A FAMILY AFFAIR

Aboriginal Preparation Course

APART from a family name, what do Karen, Jimmy and Noeleen Carlson have in common? They all have their sights set on entering University Preparation Course (UPC) and entering post-secondary education in 1987. The Carlson team—mother, father and daughter—are students in the Aboriginal strand of the UPC Project. Funded by the Federal Government's Participation and Equity Program (PEP), the course is organised conjointly by the University and TAFE. It is the first of its kind in the Illawarra. Successful completion can provide an alternative mechanism for entry to The University of Wollongong.

Travelling from as far away as Nowra and Bulli, 18 Aboriginal students this year enrolled in UPC classes. Most are mature age (over 21) and all share a common goal—to pick up on where they left off with a formal education. As is well known, formal education for most Aboriginal students in European/Australian schools has been seriously disrupted and incomplete. In nearly all cases it lacked opportunity for a strong Aboriginal perspective. Being culturally distant from Aboriginal needs and values such education can now be seen as inappropriate. Margrett Gilson and other staff of the Aboriginal Education Unit aim to address this inadequacy.

In the present UPC Program Aboriginal Studies is an integral part of the course and taught entirely by Aboriginal people. Aboriginal perspectives and participation in planning phases have been included as well in most other areas of the curriculum. While staff still have a long way to go they nonetheless believe they are heading in a positive direction. Keep an eye on Aboriginal University Preparation Courses. They may provide an opportunity for someone you know to enter tertiary education.

Geology’s role in oil and gas exploration from page 2

chemistry of some oils and oil-like material extracted from coals.

Dr Michelle Smyth of CSIRO has collaborated in work on the relationship of the composition of coals to that of organic matter in associated sedimentary rocks. We also set up a scheme for computing and mapping the prospectivity of a specific unit.

Orthodoxy concerning source rocks for oil maintains that coals cannot source oils. Much of the work referred to above indicates that coal can act as a source for oil. Some of the evidence has been collected in a paper written with Heike Struckmeyer which analyses source rock models and concludes that coals do act as source rocks. As most Australian sedimentary basins are dominated by coal measures sequences, this proposal is of critical importance in appraising the chances of finding oil. It is also finding application in Indonesia where very young coal measures sequences are generating oil. Hermes Pangabean, an ADAB-sponsored student, is currently working on a sequence in Kalimantan extending work done earlier by his colleague Bukin Daulay, now returned to Bandung. H. K. Mishra is producing data which will assist the search for oil and gas in the Permnian basins of India.

Work in or associated with the Wollongong University Geology Department has led to much more extensive knowledge of the control thermal regimes have on the occurrence of gas and oil, and to a much wider view of the kinds of organic matter which can source oil. This work has been undertaken with the co-operation of a number of oil companies who have been generous in providing samples, well logs, maps and opportunities to consult with their staff. Support from NCRAC, ARGC and indirectly from NERDDC has also been valuable.

References


Optical spectra of impurities in semiconductors

THE technological importance of semiconductors is well established. From the early days when germanium and silicon were being developed for radar detectors, until the present when the semiconductor-chip industry dominates high technology, it has been recognised that an understanding of the physics of these solids was imperative if their full potential was to be realised.

One of the most powerful techniques for gathering information about matter is that of optical spectroscopy. A mammoth quantity of data has been, and is being, collected internationally about the electronic properties of semiconductors using this technique. The detailed behaviour of electrons in these solids has been determined for materials which are essentially alloys, down to those of unprecedented purity. The electrical properties, and hence the device characteristics, are dominated by the impurity content of the semiconductor, and also by the way in which the ionic cores of the atomic constituents of the solids vibrate about their equilibrium positions under the thermal-energy content characteristics of the temperature of the material. A knowledge of the nature of the impurities in semiconductors, is then vital to a full understanding of the properties of the extrinsic solid.

A chemical impurity substituting for a host atom in a semiconductor very often behaves like a giant hydrogen atom. In this case, though, the environment of the hydrogenic atom is not the vacuum in which the electron and the proton of the hydrogen atom find themselves, but the electro-dynamically complex space of the host substance. Thus, when probed, the impurity system reveals not only its own properties, but also those of its host atom to which it is intimately coupled.

Optical spectroscopy of atomic systems, both in absorption and emission of electromagnetic radiation, has long been exploited for unravelling atomic properties and is directly applicable to the study of many types of impurity atoms and their complexes in semiconductors. Observations of the hydrogenic absorption spectra of the classic group III and V impurities in silicon and germanium, and their counterparts in the many compound semiconductors, have been used from the mid fifties until now for the purposes mentioned. A sample of the semiconductor is located in the beam of a spectrometer and the transmitted signal compared with the incident one over a range of photon energies.

The sample is usually cooled to cryogenic temperatures to minimise thermal ionisation of the impurities and thermal broadening of the spectral features of interest. The exceedingly sharp spectral lines of the impurities can be effected by the application of an external perturbation such as that produced by either a magnetic field or, since a solid is involved, a mechanical force. The latter may be hydrostatic or uniaxial. Experiments of this type give further fundamental information about the electronic properties of the impurity and hence, for example, about the device applications of the impure semiconductor.

In the Department of Physics at Wollongong University, instrumentation has been developed which permits the simultaneous application of both a magnetic field and an uniaxial compressive force to semiconducting samples while maintaining these at near-liquid-helium temperatures in the optical beam of a Fourier transform spectrometer. This represents essentially the state of the art for this type of observation and permits the unambiguous construction of the complete model of many different types of impurities in a number of semiconductors. Detection of the far infrared radiation required for many of the experiments is accomplished with a liquid-helium-cooled semiconducting bolometer, the output of which is monitored with a phase-sensitive amplifier followed by digital data collection.

Emission spectroscopy is also carried out in the Department. An argon ion laser is used for either direct excitation of the samples or pumping a ring dye laser whose output then provides the exciting radiation. The samples are again held at cryogenic temperatures although facilities exist for observations to be made through the continuous range of temperatures from liquid helium to room. The experimental arrangement permits not only photoluminescence studies but also Raman and Brillouin scattering measurements.

The emitted radiation is analysed with either a grating spectrometer or a scanning Fabry-Perot interferometer or both. Again digital data collection is employed, there being in-house facilities for the analysis of the data and for the production of hard copy output.

As for the absorption observations, the photo-luminescence spectrum of a semiconducting crystal may convey detailed information on both fundamental properties of the material and the nature and abundance of impurities and defects present in the specimen. In many cases, particularly where 'deep' rather than 'shallow' centres are involved and for materials where strong absorption due to lattice vibrations occur at infrared wavelengths, the photo-luminescence technique is favoured over that of infrared absorption.

In some applications photoluminescence provides a means of studying recombination kinetics and processes in semiconductors whereby the detailed manner in which energetic charge carriers lose energy and finally recombine may be examined.

The current fundamental research involves the piezo-zeeman absorption spectroscopy of "shallow acceptors" in germanium and emission spectroscopy of shallow impurities and excitons bound to such impurities in the compound semiconductors zinc telluride, cadmium selenide, cadmium telluride, and gallium selenide. The latter experiments are aimed at clarifying both the chemical origin of various prominent emission spectra lines and bands and also associated energy level structures and effects due to interaction between neighbouring impurity complexes.

The luminescence facility of the Department is ideally suited to the non-destructive analysis of semiconductor materials. A collaboration in this area has been carried out with the Chemical Physics Division of the CSIRO for the evaluation of the effectiveness of different techniques for the introduction of impurities into silicon solar cells and how these are distributed throughout the cells.

The research is supported principally by funds from the Australian Research Grants Scheme and the University Research Grants Committee.

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The Gazette - issues to come

The next issue of The Gazette will be published on July 20. Articles discussing Departmental activity, particularly research activity, are wanted by not later than noon on Friday June 27. Subsequent issues will appear on September 20 and November 20.
New Professor of Biology for Wollongong University

THE Chancellor of The University of Wollongong, Mr Justice Hope, has approved the appointment of Professor Helen Garnett as Professor and Chairperson of the Department of Biology. Professor Garnett has indicated that she will accept the appointment and join the University in time for the start of the 1987 academic year. Professor Garnett was born in 1946. She was awarded a Bachelor of Science degree in 1967, and a First Class Honours degree in 1968, both from the University of Sydney. A Doctorate of Philosophy was awarded by the University of Wales in 1974. During study towards the Ph.D., Professor Garnett was employed as a Research Officer in the Cell Biology Research Unit, University College of Wales, and later in the Poliomyelitis Research Foundation in Johannesburg.

In 1974 Professor Garnett was appointed Lecturer in the Department of Botany and Microbiology at the University of the Witwatersrand and promoted to Senior Lecturer in 1978. She was appointed Foundation Professor and Head of Microbiology in 1979, which position is still held. Professor Garnett has published extensively in prestigious journals and has received numerous research grants, including recognition by the Council for Scientific and Industrial Research. Major research interest is in the pathobiology of virus infections, of both plants and animals.

... and a Professor—School of Health Sciences

CHANCELLOR of The University of Wollongong, Mr Justice Hope, has approved the appointment of Dr G. Dennis Calvert as Professor, School of Health Sciences. Dr Calvert has accepted the appointment and will join the University later this year.

Dr Calvert was born in 1942 and is married with two children. He has obtained the following education and professional qualifications: Bachelor of Medical Science, Otago 1965; Bachelor of Medicine; Bachelor of Surgery 1966; Doctor of Medicine, Otago 1975; Master of Clinical Biochemistry 1976; Member of the Royal Australasian College of Physicians 1970; Fellow of the Royal Australasian College of Physicians 1975; Member of the Royal College of Pathologists (UK) 1975; Fellow of the Royal College of Pathologists of Australasia 1976.

During the period 1967-1973 Dr Calvert held various medical appointments with the Auckland Hospital Board, Auckland Hospital and Queen Elizabeth Hospital, University of Birmingham. In 1973 he was appointed Senior Registrar in Clinical Biochemistry with the West Midlands Regional Health Authority. Since 1976 he has had the academic rank of Reader in the School of Medicine, Flinders University, South Australia, and Senior Medical Specialist, Department of Clinical Biochemistry, Flinders Medical Centre. He is also Director of Technical Services in the School of Medicine at Flinders University.

Dr Calvert has published extensively and has been the recipient of considerable research funds, principally from the National Health and Medical Research Council and the National Heart Foundation. Major research interests are Plasma lipoprotein and cholesterol metabolism and Epidemiological studies.

Classical scholar visits Wollongong University

PROFESSOR Emmanuel Hatzantonis, renowned scholar of classical and Italian literature, was a welcome visitor to the Department of European Languages in The University of Wollongong in April.

Professor Hatzantonis has been teaching Italian, French and Spanish at the University of Oregon since 1959 and since 1971 is its professor of Italian. He has also taught at San Jose State University in California and at the University of Colorado. His numerous articles have appeared in learned journals around the world.

Father Brian Gore Guest Speaker on Wollongong Campus

GUEST speaker at the University on Monday April 7 was Father Brian Gore, the heroic Colombian Missionary Priest who lived and worked in the Philippines from 1969 until his return to Australia in 1984.

During his address Father Gore discussed his experiences. How, for example, against a background of extreme wealth and poverty unequalled in South-East Asia, Father Gore's diocese initiated the formation of labour unions in the province—the Federation of Free Farmers and the National Federation of Sugarcane Workers which has evolved into one of the most militant Philippine trade unions.

The extraordinary efforts of the Marcos government to discredit Father Gore and his colleagues as symbols of resistance, and Father Gore's analysis of the challenge to the Church within communities of abject poverty and oppression, were also part of his compelling talk.

Father Gore pictured with Dr Dioni Regozo of Metals Technology Pty Ltd. Dr Regozo is currently working with the Department of Metallurgy and Materials Engineering at The University of Wollongong.