RESEARCH ONLINE

Asia Pacific Media Educator

Issue 14 Article 7

12-1-2003

Career potential for new science journalists

T. Coyle
University of Wollongong, tcoyle@uow.edu.au

Recommended Citation
Coyle, T., Career potential for new science journalists, *Asia Pacific Media Educator*, 14, 2003, 92-105.
Available at:http://ro.uow.edu.au/apme/vol1/iss14/7

Research Online is the open access institutional repository for the University of Wollongong. For further information contact the UOW Library: research-pubs@uow.edu.au

RESEARCH ONLINE

Career Potential For New Science Journalists

Despite public support for science reportage, science stories are rare in Australian media. The reasons for this are not clear but the net impact is that there are few opportunities for aspiring science journalists in a market that is dominated by a few high-profile individuals. Thus, budding science journalists would probably be best served by trying to create new opportunities and widening the market for science journalism, rather than competing for the few existing niche positions. This study investigates the potential career paths for new science journalists as well as the challenges facing science journalism in Australia.

Troy Coyle
University of Wollongong, Australia

Open any Australian newspaper, and you are bound to find pages of political, economic, sport, and entertainment stories. What you will probably struggle to find are science stories. Likewise, for television and radio, apart from the *Australian Broadcasting Corporation's* (ABC) science programs.

With scarce opportunities to publish or broadcast science, career opportunities for science journalists are limited. Science journalism also appears to be the net output of a selected group of individuals, who often work across media (e.g. Robyn Williams as ABC radio science reporter and science reporter for print) and within a particular media (e.g. anchoring across science television shows). Reed (2001) notes that specialist science journalists, such as Robyn Williams and David Suzuki, are enthusiastic exponents of science, but their high-profile expertise can inhibit science writing by others (also in Reed, 2002).

Also, it does not appear that there is a tailored educational route for science journalists (i.e. through University training and internships). Most science reporters appear to "fall into" a career in science journalism than strategically directing their career towards science journalism.

This study investigates the career opportunities and potential career paths for new science journalists, as well as the challenges facing science journalism in Australia. The research questions are:

- Are science stories lacking in the media and what are the reasons?

©AsiaPacific MediaEducator
Issue No.14
December 2003

• Is there public demand for more science reportage?

• What has been the career path of Australia's leading science journalists? Did they strategically choose to become science journalists or fall into the career by chance?

• Is it necessary for science journalists to have undertaken specialist training in science reporting?

• What courses or training in science journalism are offered at Australian universities?

• How does the relationship between scientist and science journalist contribute to the effective reporting of science?

To obtain journalist's views and experiences of their profession, a survey of Australia's leading science journalists was undertaken. Fifteen responses were returned: Robert Thurman (who writes a weekly column in the *Ballarat Courier*); Warren Nunn (*Brisbane Sunday Mail*); Brad Couch (*Adelaide Sunday Mail*); Brendan O'Malley (*Brisbane Courier Mail*); Simon Grose and Rosslyn Beeby (*Canberra Times*); Bob Beale (*ABC Science Online* and *The Bulletin*); Richard Aedy (*The Buzz*); Peter Lavelle (*Health Matters* on *ABC Online)*; Desley Branch (*Innovations* on ABC's *Radio Australia*); Jonica Newby, Karina Kelly and Paul Willis (*Catalyst*); and two anonymous respondents. The survey results and a review of the literature were then used to examine the above questions in regards to the career potential for new science journalists and issues they will face.

The survey was sent out directly to science journalists and editors for distribution to staff (when journalist's contact details were not readily available) .Therefore, the exact number of journalists who actually received the survey is not known. The questions included in this study were broadly based on those used by Metcalfe and Gascoigne (1995) except that some questions were adapted, omitted or added to account for the inclusion of journalists from radio and television in this study.

Science Journalism in the Australian media

The science journalist, through reporting science issues relevant to the wider community, plays a vital role in the public perception, understanding and awareness of science. One of the problems with the image of science in Australia is that people often don't understand the relevance of science (Lucas, 2003). Increasing the public understanding of science creates an intelligent, informed and skilled group of people who will act as an extremely valuable resource for society and increasing public awareness of science can contribute enormously to social well-being as it creates a community

that is confident in its possession of scientific ideas and is happy to transmit that confidence to its children (Salleh, 2001). Regardless of how well informed they may be, the ways in which ordinary people perceive science and technology will have a significant, albeit indirect, effect on such things as the levels of government funding for scientific research, recruitment of young people into science, the areas of science chosen and the kinds of people who work in science (Barns, 1989). Despite its vitally important role in raising awareness and understanding, science reportage is rare in Australian media.

A review of the literature shows few published studies investigating science content in the Australian media, a finding also noted in previous studies (e.g. Gascoigne and Metcalfe, 1995; Metcalfe and Gascoigne, 1995). The main source of information appears to be mostly unpublished studies undertaken by the Science and Technology Policy Branch of the Federal Department responsible for science in 1989 and 1993 (cited in Metcalfe and Gascoigne, 1995) and in 1997, 1999 and 2001 (cited in Department of Education, Science and Training, 2002). The data published in Metcalfe and Gascoigne (1995) showed that the average share of science news in 17 major newspapers ranged from 1.3% in 1989 to 2.9% in 1993; science coverage on television fluctuated between 1% and 5% in 1993. Pe-Pua and Morrissey (1994) found a similarly low level of science reportage in non-English newspapers, with a mean percentage of total area associated with science and technology stories of just 0.47% across 25 newspapers in five non-English languages. In contrast, the largest categories were commercials (30.84%); entertainment (8.97%); politics and government (8.11%).

Most science stories being reported are actually overseas in content. A 1973 study reported 18% of the *Sydney Morning Herald's* science stories came from overseas (Newman, 1973), this rose to 27% in 1988 and subsequently dropped to 23% in 1991 (Hendy, 1991 unpublished; cited in Metcalfe and Gascoigne, 1995) and in 2001, non-Australian science and technology stories comprised 36% of stories in the print media (data cited in Department of Education, Science and Training, 2002).

According to a survey conducted by AGB McNair on behalf of Commonwealth Scientific and Industrial Research Organisation (CSIRO, 1997), involving a sample of 1060 Australians in all cities, regional Australia, male and female, all ages and socioeconomic groups, Australians would rather learn more about scientific discoveries than hear about sport or political news from the media. Medical discoveries had the strongest support with 54% of the respondents saying they were very interested. These were followed by environmental pollution (47%), technology (46%) and

science (43%). In comparison, 39% said they were very interested in crime, 37% in employment, 33% in sports news and 22% in politics. Why are the media gatekeepers choosing not to cover science stories, when the Australian public, it seems, would be happy to have more stories included?

Simonds (1998) notes that advertisers' reluctance to sponsor science pages deters news organisations from promoting science stories, stating that a career in science journalism might seem attractive, but if you really want to make a contribution to the public awareness of science, become a science advertising person. Reed (2002) cites increasing pressures on journalists because of proprietors' greater reliance on display-advertising revenues with declining circulations of print media.

It is generally recognised that the media in advanced capitalist societies are predominantly commercial enterprises engaged in the selling of commodities and entertainment to consumers, that the pressure of sales, readership or ratings is a powerful determinant of content and style (Barns, 1989). If the emphasis is on creating what is called the right editorial environment to attract readers with money to spend on advertiser's products or services, the primary driver for the choice of topics and their treatment will be maximising the advertiser's market (Toohey, 1989). Thus there appears to be a real need to develop the market for science advertising in order to stimulate the media's interest in science. However, this should not be a difficult task, given the modern trend for advertisers to differentiate products on the basis of technology (e.g. cosmetics, cleaning products, and even patented advances in toothbrush designs).

Another reason may be that editors and other gatekeepers have underestimated the public's interest in science. Nearly half of all newspaper editors are ignorant in the field of science (Anonymous, 1998). A survey of the attitudes of 31 editors towards scientists showed that scientists have a generally unflattering image among these influential media chiefs (Pockley, 1983).

Jenni Metcalfe (pers comm, 9 September 2003) stated that a major failure of science journalism has been that science journalism is still not taken seriously by most editors and news directors in mainstream media outlets and needs to become part of the mainstream media coverage, rather than being part of a special science page or broadcast program. However, science is but one kind of story that's on the news editor's desk and it's got to somehow ramp its way up the list of priorities to get into the very small number of stories that will ultimately make it into the news bulletin or into the newspaper the next day, so to a degree the science story has to sell itself very hard, within a tough marketplace of news stories (Julian Cribb in The Media Report, 1997). The pace

of science is often too slow to appeal to newspaper editors (Blum, 2002; Rensberger, 2002).

Survey respondents in this study had varying attitudes from their editors or chief of staff towards science stories, with comments ranging from "the chief of staff is most interested in science stories" (from anonymous) to "ambivalent" (from Warren Nunn) and "if it is a good story they are happy regardless of story but sometimes their eyes glaze over if a story is technical." (from Brad Couch).

Career paths for science journalists

In a summary of the major publishers and broadcasters of science stories, Metcalfe and Gascoigne (1995) showed that only 7 of the top 12 daily newspapers in Australia employed specialist science reporters, and this represented a total of nine reporters. They found that the ABC was the only network to employ a full-time science reporter for news and current affairs programs and, at that time, *Quantum* and *Beyond 2000* were the only specialist science programs in Australia. Since that time, both programs have been axed and now the only national science programs appear to be *Catalyst, Health Dimensions,* and *Landline,* which are all aired on the ABC. For children, CSIRO jointly produces the half-hour *"Turn me on science"* episode that airs once a week on *Totally Wild* on commercial television.

ABC radio dominates in science coverage (Metcalfe and Gascoigne, 1995) with *The Buzz* (Richard Aedy reporting on the technology issues), *Earthbeat* (Alexandra de Blas reporting on environmental science), *All in the Mind* (Natasha Mitchell exploring themes in science, religion, and health with the mind as the key focus), the *Health Report* (Norman Swan), the *Science Show* and *Ockham's Razor* (Robyn Williams) and *Innovations* (Desley Branch as Producer/Presenter). *Triple J* has a science commentator (Dr Karl Kruszelnicki) and the ABC also has an on-line science gateway (*The Lab*), which has a daily science news service and fortnightly features and forums.

Most science journalists are employed by university information units and CSIRO, not by the media (Woodruff, 1986). In terms of career potential, there are few positions and these would generally not be open to new career science journalists (i.e. often already filled by high-profile science journalists). Thus, budding science journalists would probably be best served by trying to create new opportunities and widening the market for science journalism, rather than competing for the few niche positions that already exist.

It appears that many successful journalists have not had

extensive formal training in science journalism. Of the 15 science journalists who responded to this study, six had a background in science and only one had had training in science journalism, which was through a cadetship at the ABC. Fourteen of the respondents considered it unnecessary for a science journalist to have a background in science to be able to report science stories well, although most considered that it would help. One response stated "formal training in science may sometimes get in the way of critical objective reportage...and can instead sway someone towards science 'promotion', 'communication' or 'translation'". Brendan O'Malley, said a degree was not necessary but would help in "minimising mistakes, asking the right questions, gaining trust by scientists and putting breakthroughs in perspective in terms of their likelihood to affect change/be commercialised and their overall importance".

Almost all (12) of the journalists were attracted to science journalism because they found science interesting. Two had found they didn't want to be practising scientists themselves and so were attracted to science journalism. One had been ordered by their boss to cover the science round, but had "found it fun".

The results of this study imply that most science journalists have not relied on formal training, either in science or in reporting science. They appear to have general journalism backgrounds and have then fallen into the more specialised field of science journalism, although most already had an interest in this area. The finding that many of Australia's most successful science journalists did not have any specific training in science journalism questions the need for universities to provide such specialist training.

McIlwaine (2002) examined journalism students' ability to write a news story based on a scientific journal after four hours of science journalism instruction. Although the project was limited in terms of numbers of students examined, it supported the assumption that journalism students, given even minimal instruction and experience, can begin to competently handle science stories from primary and secondary sources. This suggests that there is no requirement for journalists to undertake long courses in science journalism in order to become competent science reporters. However, a major fault in the methodology was the lack of a control measurement (i.e. the student's ability to report on science stories should have also been measured before they were instructed in science journalism for comparison to their ability after instruction). Thus it is difficult to measure the actual success of the instruction, when the journalists could have been inherently competent in reporting science stories.

An interesting statement made at the Tokyo Declaration (1992) was "science journalism is a profession, its further development through training and education programmes is

necessary to enhance this professionalism". One of the key recommendations of the Tokyo Declaration (1992) was for UNESCO and its partners to continue to encourage the inclusion of science journalism in the curricula of universities. This emphasizes the importance of education for science journalists as professionals (in contrast to the empirical results of McIlwaine's 2002 study).

Obviously further investigation of the relevance and usefulness of specialist science journalism training is required, in terms of the impact it has on improving science reportage and the benefits it would provide to graduates entering the profession. Several Australian universities have implemented or have plans to implement specialist science journalism training opportunities (summarised in the Notes). Formal studies of the success of these programs, in terms of graduate outcomes, need to be undertaken.

Significance of the relationship between science journalist and scientist

Dornan (1999, cited in McIlwaine, 2001) stated "the creation of a full-time science beat within a news organisation makes the writer dependent on the co-operation of the scientific community, since, unlike other reporters, the science journalists have no set forum whose affairs could be covered on a daily basis". Dornan adds that "the journalist must cultivate the trust of scientists, and this could be accomplished only by producing coverage of which scientists themselves approved".

McIlwaine (2001) also cites Crewdson (1993) who pointed to an interdependence of science journalists and scientists in the fact that most science writers were far closer to their sources than other journalists, even to the extent that they belonged to the same professional organisations.

Scientists are fearful or suspicious of the media, especially if they have not had much media experience (Gascoigne and Metcalfe, 1997; 1999). So, there may be a role for scientists to also be educated in dealing with the media, to smoothen the relationship between scientists and journalists. Science, with its inherent uncertainties, can be hard to put across to the public, but blaming 'sloppy' journalism is just too easy, and if researchers are to make their points effectively, they should learn more about how the media work (Anonymous, 2002). Highfield (2000) had a similar view and suggested that scientists could learn from the journalists' obsession with the reader and should realise that speaking to a basic human need is the foundation of all good communication.

Recher (1992) identified two key issues in terms of scientists' communication abilities:

• the failure or unwillingness of scientists to communicate the results of their research directly to the public (through the media in its broadest sense and not just elite science programs geared towards an educated audience); and

• the inability of most scientists to communicate in simple language.

As scientists will acknowledge, some scientific interpretations are wrong, or at least, are so uncertain as not to be certifiably true and it's part of the culture of science to put out preliminary findings, along with detailed descriptions of how the research was done, precisely, in order to get comments pointing out possible errors or suggesting better interpretations (Rensberger, 2002). Scientists expect journalist to share their concern with scientific norms relating to the provisional nature of scientific knowledge and recognition of the collegial nature of scientific endeavour (Australian Press Council News, 1999). However, journalists sometimes do not understand the cautionary way in which scientists prefer their results to be interpreted and will often take a sensationalist line by drawing long conclusions from limited results (such as reporting successful results in animal trials as the next cure in humans) and this makes scientists cautious. The basic accusations about the media's reporting scientific developments are (Pockley, 1983):

• there is a lack of basic knowledge of the subject matter of the science;

• there is a lack of understanding of the significance of the science;

• there is a lack of continuity- today's news is seldom followed up over time, let alone by the one reporter; and

• there is a lack of quality and quantity in the coverage of complex topics which cannot adequately be condensed into a few words.

McIlwaine (2001) notes that "the principal blame for what is seen by scientists and science promoters as public ignorance of science and consequent lack of support for science is directed towards journalism". He adds that journalism's relationship with science has ebbed and flowed since the Second World War; from extreme enthusiasm immediately after 1945, through skepticism and disillusionment in the 1970s and early 1980s, back to a form of hero-worship in the late 1980s and 1990s. He concluded that journalism may now be entering a new phase in that relationship and that science is not likely to be any happier about journalism than it has ever been.

Basically, scientists and journalists come from two different worlds, where one side is characterised by a methodical and precise assessment of data from close analysis over an extended time period and the other side wants simple, direct and speedy answers uncluttered by qualifying statements, thus the two groups are mutually suspicious of each other (Metcalfe and Gascoigne, 1988). This is an accurate description of the stereo-typical view of the relationship, but the survey results of this study showed that most journalists do not hold this view. Four journalists considered that scientists were suspicious of journalists, five thought they were not and the remainder thought that some were and some weren't just like any other sector.

Karina Kelly says that "these days most scientists are keen to take part in a story made by *Catalyst*". However, Bob Beale notes that scientists "seem to be most afraid of condemnation by their colleagues for being self-publicists and of the less rigorous approach of the media to the primacy of facts". Thus there may still be some level of suspicion, but the situation does not appear to be as extreme as it is portrayed in the literature.

Challenges and developments in science journalism

Gascoigne and Metcalfe (1995) showed that the challenges facing science journalism in Australia included: the need for more in-depth and critical analysis of science and technology; overcoming the negative or trivial perceptions of editors, chiefs of staff, news directors and other gatekeepers about the importance of science and technology stories; and integrating science and technology with social, economic and political issues. The latter point was also raised by Eckersley (1986), who considered that the media tends to run science stories largely for their entertainment value and have rarely looked at science as a political issue or its importance to the economic and social welfare of Australia.

Journalists responding to my survey, suggested the following challenges facing science journalism in Australia:

- funding, which is critical in the public media, and allocation of airtime, space or science coverage;
- that there is only a very small community of science journalists, which means that there is not a critical mass of coverage or critical enough engagement with issues;
- a requirement for better networking within the profession across the different media (i.e. print, radio, tv and online). This hasn't been as successful as attempts in the UK and USA and thus meaningful professional development of and discourse amongst

science journalists had been limited in Australia;

• keeping abreast of new and breaking stories and then actually getting these to the media. So often you hear of something months or years after it has happened;

• unbiased reportage, for example, the objective reportage of stories in terms of evolution and creationism;

• treating science as a mainstream issue of great importance to the nation's future rather than an oddball topic to dabble with now and again;

• convincing editors, chief of staff and other executives of the importance of science stories;

• making it informative and still getting a run;

• cutting through the public relations "bumpf";

• to achieve coverage across scientific disciplines, including ecological science as distinct from covering environmental issues in terms of political lobbying by green interest groups, and agricultural science (treating farmers as business innovators rather than colourful bush characters);

• overcoming the culture that Australians prefer their heroes to be physically active (sports stars), glamorous (actors) or powerful (business leaders, politicians etc) as opposed to being clever of thoughtful;

• ensuring that science does not become too simplified. Science must be made accessible to the public but ensure that the readers understand how difficult, expensive and time consuming research is and how the findings may be open to interpretation;

• diversifying coverage from just medical and health coverage; and

• communicating complicated science in a way that informs the public without sensationalising the material.

Brad Crouch identified that one of the successes of science journalism in the past ten years has been that science now seems to reach a wider audience and is a lot "cooler". Rosslyn Beeby also thought that science is now given more prominence and has moved away from "gee-whiz/crazy, kooky boffin tabloid style coverage to being categorised as news". Karina Kelly suggested that science journalism has contributed to the Australian public becoming more scientifically literate.

An anonymous respondent identified online publication as an exciting area for science journalism. Certainly this is an emerging resource for science journalists and its impact on science journalism as a career should be investigated in future studies.

Science journalists play a vital role in improving the public

Conclusion

perception, understanding and awareness of science, yet science reportage is notably rare in the Australian media. The literature clearly suggests that there is public support for science reportage. However, the media is not responding to this public interest. The reasons for this are not clear but the net impact is that there are very few opportunities for budding new science journalists in a market that is dominated by a few well-established high-profile individuals. Thus, new science journalists will need to create new market opportunities for science reportage. In this respect, on-line science journalism and its possibilities should be further investigated.

Few of Australia's most successful science journalists have had formal training in science journalism and appear to have fallen into the specialisation rather than strategically directing their career towards science journalism. A degree in science is a benefit but not a necessity to successful science reportage, with many successful science journalists having no formal background in science at all.

Several Australian universities have specialised courses for science journalism training. However, the significance and importance of such training is not clear. Perhaps the general principles of journalism can simply be applied to science journalism without specialised training.

The relationship between science journalists and scientists appears to be vital to the successful reportage of science stories. Despite scientists' criticisms of science journalists, the need for scientists to be trained in dealing with the media could be more important than the need for journalists to be trained in science. Although the literature highlights an uneasy relationship between scientists and science journalists, this study of science journalists suggests that they do not find their dealings with scientists as difficult as the literature implies.

This study identified several areas for future research. Firstly, there is a requirement for content analyses of the prevalence of science stories in the Australian media. Secondly, more studies should be commissioned regarding the public demand for science stories. The fact that such studies to date indicate a high demand for science stories in the media, also raises the question why the media are not catering for this demand. A comprehensive survey of publishers, editors and other executives should be undertaken to answer this question. This may require a detailed analysis of advertisers' support for science reportage. The outcomes of the study could then be used to develop a comprehensive strategy for increasing science reportage.

Given the public benefits of increased science reportage, such a study should be publicly funded through the Federal

Department of Education, Science and Training.

Further studies are also required to understand the impact and relevance of specialised science journalism training on journalist's ability to adequately report science stories. Several Universities have specialised science training opportunities and should be involved in assessing the success of these courses.

Finally, in addressing the issues identified by Australia's science journalists, the first step would be for science journalists to organise themselves into a formal body to convince editors, chiefs of staff and other executives of the importance of science stories.■

NOTES

Summary of major science journalism courses available at Australian Universities:

Australian National University: Centre for Public Awareness of Science. Offers a Bachelor of Science Communication, Master of Science specialising in Science Communication, and Graduate Diploma in Scientific Communication.

Griffith University: Bachelor of Science/Bachelor of Arts Science Communication. First offered in 1997 when it replaced the Bachelor of Science with Media which ran from 1991 to 1996.

James Cook University: No longer runs the subject Science Journalism but encourages undergraduates to undertake 18 units in a non-journalism discipline, which can include biological sciences, marine sciences, medical sciences etc

University of New South Wales: Bachelor of Science (Communication) and Bachelor of Science (Media and Communication). Planning a postgraduate Science Communication course for 2004. Both courses began in 2000.

University of Queensland: Bachelor of Science/ Bachelor of Journalism and Graduate Diploma in Science Journalism.

University of RMIT: Master of Technology in Science Communication and eLearning.

University of Sydney: Bachelor of Science (Media and Communications).

University of Tasmania: Writing about Science undergraduate unit that embraces science journalism and other forms of "writing about science". Planning to expand science journalism activities through to a new Honours program planned for 2005 (at the earliest) and eventually to a Research Higher Degree.

University of Western Australia: Bachelor of Science (Communication Studies) commenced in 2002.

University of Wollongong: Master of Journalism where students can specialise in science journalism. Commenced in 1997 when it replaced the Masters of Arts (Journalism) which ran from 1990 to 1996.

REFERENCES

Anonymous (1998) Survey: Newspaper Editors are Ignorant of Science. *Editor and Publisher,* 121 (8), p:4.

Anonymous (2002) Media Studies for Scientists, *Nature,* 416 (6880) pp: 461.

Australian Press Council News (1999) Volume 11, No 2. *Science Reporting.* Accessed from http://www.prescouncil.org.au/pcsite/public/may99/science.html on 8/9/03.

Barns, I. (1989) Interpreting Media Images of Science and Technology. *Media International Australia,* 54, pp:22-29.

Blum, D. (2002) Investigating Science. *Nieman Reports,* 56 (3).

CSIRO 1997. *Real Aussies Prefer Science to Sport.* Media Release 97/120, 15th June 2003. Accessed from www.csiro.au/communication/mediarel/mr1997/mr97120.htm on 30/9/03.

Crewdson, J. (1993) Perky Cheerleaders: By Accepting Research Reports without Adequate Checking Science Writers do a Disservice to the Public. *Nieman Reports,* 47(4), pp: 11-16.

Department of Education, Science and Training, (2002). *Australian Science and Technology at a Glance 2002.* Published by the Commonwealth of Australia.

Dornan, C. (1999) Some Problems in Conceptualising the Issue of Science in the Media. (In) Scanlon, E., Whitelegg, E. and Yates, S. (Eds) *Communicating Science: Contexts and Channels,* pp:179-205, London: The Open University.

Gascoigne, T. and Metcalfe, J. (1995). Science Journalism in Australia. *Public Understanding of Science,* 4, pp: 411-428.

Gascoigne, T. and Metcalfe, J. (1997) Incentives and Impediments to Scientists Communicating Through the Media. *Science Communication,* 18, pp: 265-282.

Gascoigne, T. and Metcalfe, J. (1999) *Training Scientists to Understand and Love the Media.* A Presentation to the World Science Conference, Budapest, 1999.

Hendy, P. (1988) Analysis of Science and Technology Issues in the Sydney Morning Herald. An Analytical Report, unpublished, p: 8.

Hendy, P. (1991) *Content Analysis of Science Reporting in the Sydney Morning Herald and The Australian.* Australian Centre for Independent Journalism, University of Technology Sydney, unpublished, p: 18.

Highfield, R. (2000) Selling Science to the Public, *Science,* 289, pp:59.

King, J. (1986) An Input-Output Study of Science News in the Press. *Australian Journalism Review,* 8 (1&2), pp: 50-58.

Lucas, P., MP (2003) QLD Minister for Innovation and Information Economy, on Ministers On-line Chat Session 30 May 2003. Accessed from www.generate.qld.gov.au/index.cfm?pageID=515 on 8/9/03.

McIlwaine (2001) Science and Journalism: A Mexican Stand-Off? *Australian Journalism Review,* 23 (2), pp: 167- 188).

McIlwaine, S. (2002) *Journalists Need to Know How to Write About Science – And We Can Teach Them.* Paper presented at ANZCA 2002 Conference.

Metcalfe, J. and Gascoigne, T (1995) Science Journalism in Australia. Public Understanding of Science, 4, pp: 411-428.

Metcalfe and Gascoigne (1998) *Media Skills Workshops: Breaking Down the*

Barriers between Scientists and Journalists. A presentation to the International Conference on the Public Communication of Science and Technology, Berlin

Morrison, R. (1999) *How I became a Science Communicator* accessed from http://www.asc.asn.au/commun.rob.htm on 25/7/03.

Pe-Pua, R. and Morrissey, M. (1994) *Content Analysis of Non-English Language Newspapers.* Office of Government Information and Advertising,100 pp.

Pockley, P. (1983) *A National Program for Promoting Pubic Understanding of Science.* Paper Presented to the 53rd ANZAAS Congress, Perth, 18 May 1983.

Reed, R. (2002) From 'Gee Whizz' to 'Shock-Horror': the Limited Frameworks of Science Journalism. *Australian Journal of Communication,* 29, pp: 43-58.

Recher, H. F. (1992) Simple Journalists of Simple Scientists?: Are Environmental Issues too Complex for the Media. *Australian Zoologist,* 28 (1-4), pp: 19-23.

Rensberger, B. (2002) *Reporting Science Means Looking for Cautionary Signals.* Cambridge, 56(3) pp:11-13.,

Salleh, A. (2001) Science in the Media, The Good the Bad and the Ugly. *Australian Science Teachers Journal,* 47, pp:28-37.

Simonds, S. (1998) "Science lacking in Appeal for Advertisers". ANU Reporter, 29 (6), accessed from http://info.anu.edu.au/mac/Newsletters_and_Journals/ANU_Reporter/_pdf/vol_29_no_06/appeal.html on 25/7/03.

The Media Report, Radio National Transcripts, 17 April 1997. For Science Week- A Look at Science in the Media. Accessed from www.abc.net.au/rn/talks/8.30/mediarpt/mstories/mr970417.htm on 8/9/03.

Tokyo Declaration (First Declaration UNESCO, 1992) accessed from www.arts.unsw.edu.au/hps/sts_corelinks/coursesubjects/subjects-details/scts on 25/7/03"

Toohey, B. (1989) Journalism and Academia: The Constraints of Marketing. *Australian Journalism Review,* 11, pp: 22-26.

Woodruff, B. (1986) The Popularising of Science. *Australian Journalism Review,* 8 (1&2), pp: 29-32.

TROY COYLE, PhD (Biological Sciences) works a Research and Development Manager at the University of Wollongong. She is currently completing her Masters of Journalism with the Graduate School of Journalism. Email: tcoyle@uow.edu.au