Academic Publishing in the Australian Changing Funding Environment: An Analysis of Journal Rankings in the Geosciences

K. Smith[a] **and D. Marinova**[b]
[a]PhD student, Institute for Sustainability and Technology Policy, Murdoch University, Perth, Western Australia, K.Smith@curtin.edu.au
[b]Institute for Sustainability and Technology Policy, Murdoch University, Perth, Western Australia

Abstract: The 1990s observed continual change in the funding environment of Australian universities and research organizations. A major component of this was a closer collaboration with industry through the establishment of research centres. The field of geosciences is one example of success in developing and maintaining links with industry partners. The paper assesses whether the close collaboration with industry has changed the publication patterns of geoscience researchers based on the case study of three Australian centres: a key centre for teaching and research, a special research centre and a cooperative research centre. The focus of the analysis is on: (1) the choice of journals when publishing in the geosciences; and (2) the importance of journal rankings, such as the ones produced by the Institute for Scientific Information (ISI) and officially recognised by the Australian federal government for funding purposes. The analysis confirms the importance of ISI journal titles for the Australian geoscience community as far as refereed journal publications are concerned. Nevertheless, the researchers use a very selected number of titles which is determined by the specifics of their work (research topics and geographical areas) and the requirements of their environment, including university, industry and government.

Keywords: *bibliometric modelling; journal publications; journal rankings; research performance.*

1. INTRODUCTION

A study of the research performance of geoscientists in three Australian research centres, a Key Centre for Teaching and Research (KCTR), a Special Research Centre (SRC) and a Cooperative Research Centre (CRC) was undertaken to establish the validity of the reliance on the bibliometric measure of citation analysis as a useful indicator of true research performance and impact. The KCTR and SRC were university-based and have been in existence for 12 and 11[1] years respectively, while the CRC was located at the Commonwealth Scientific and Industrial Research Organisation (CSIRO), had existed for 5.5 years and has a number of participating partners from university and industry as core parties. At the time of joining the centres, a number of the researchers were well established as scientists and had published intensively.

Some of the policy implications of this study are outlined in Smith et al. (2003). The detailed analysis of the researchers' publishing output, and particularly their journal publications, is now used to examine whether the journal titles considered of high significance by the Institute for Scientific Information (ISI) and recognised by the Department of Education, Science and Training (DEST) are also used by the Australian geoscience researchers.

2. THE ROLE OF ISI

The ISI is headquartered in Philadelphia, USA. It is a database publishing company which has been enabling access to the global journal literature for the past forty years. The company uses sophisticated computerised approaches and the Internet to deliver its products, most of which are available through a variety of subscription rates (ISI, 2000).

McKiernan (2000, p.41) states that "(a)lthough there were predecessor and pilot projects, the first large-scale implementation of (Eugene) Garfield's citation indexing method was implemented in 1963 with the publication of the Science Citation Index (SCI)". The SCI Expanded database now covers over 5,600 of the world's leading science and technical journals, adding 16,000 new citation records to this database per week. Journals are

[1] Out of the 11 years, the SRC was a KCTR for 7 years.

available back to 1973. The ISI databases are used world wide as a source of information regarding the publishing record and resultant productivity of researchers. They have also been used to feed data into the Australian federal government's policy evaluations of research capability.

The ISI's owner, Eugene Garfield's study in 1969 lead to the formulation of the so-called Law of Concentration "by which the bulk of the information needs in science can be satisfied by a relatively small, multidisciplinary core of journals" (Bensman, 2001, p. 714). It is upon this outcome that the ISI indexing service is based.

The "ISI's editorial staff reviews nearly 2,000 new journal titles annually, but only 10-12% of the journals evaluated are selected" (ISI, 2001). The Institute claims that:

> [The] ISI captures all cited references from each of the 8,000 journals covered, citation information is available on covered journals as well as those not covered but that have been cited by any of the 8,000 core journals (ISI 2001).

The journals are evaluated by the ISI on the basis of the following indicators:

- basic publishing standards;
- editorial content;
- internationality of authorship;
- existing citation data on the journal;
- timeliness of publication ("the ability to publish on time implies a healthy backlog of manuscripts essential for ongoing viability" (ISI, 2001);
- adherence by the journal to international editorial conventions;
- English language article titles, abstracts and keywords – an essential indicator; and
- application of peer review.

This tone of exclusivity mirrors the perceptions of the academic scholar and the research scientist in their view of scholarly journal publication. It has spread to the geosciences, yet authors like Blair (1992) and Klimley (1993) remark that there are a number of media, including government reports, maps and other grey literature, in which the geoscientist publishes, reads and which are not captured by the ISI.

3. ISI AND THE GEOSCIENCES

The geosciences are covered by the ISI under the main categories of *Geosciences, Multidisciplinary* (GM) which comprises a list of 117 titles; *Engineering, Geological* (EG) – 17, *Engineering, Petroleum* – 27, *Geochemistry & Geophysics* (GG) – 47 and *Geology* (G) - 35, the total number of ISI geoscience titles being 218 (24 journals appear on more than one list simultaneously). It was found that the participant researchers have further used 21 ISI titles outside the geoscience categories, adding to the above mentioned list of ISI titles. There are, however, a wide range of other refereed journal titles in the area of geosciences which do not make it on any of the ISI lists.

The study found that the participant researchers from the three centres heavy relied on both ISI indexed and refereed non-ISI titles for journal publication. This acknowledges the geoscientists' recognition of their value and consequently of the importance of this measure of academic performance. The analysis presented below is indicative and addresses two main questions: (1) has joining a centre changed the researchers' preferences for journal titles when publishing? and (2) how accurately do the ISI lists reflect the Australian geoscientists' journal publishing preferences? To do so, we first examine the ISI journal titles no longer in use by the case study's participants, and then analyse the used ISI and non-ISI titles.

3.1 ISI titles no longer used

Out of the total number of 239 ISI journals relevant to the Australian geoscientists (218 officially recognised by ISI plus 21 additionally used by the participant researchers), 61 titles (around 25%) were used prior to joining the research centre but no longer used. This decline of interest in ISI titles was most evident at the CRC where 41 titles were no longer used and less pronounced at the KCTR (13) and the SRC (17). The researcher membership of the CRC includes many geoscientists, as well as academics and/or scientists from the fields of law, social science, environmental science and soil science. There was evidence in the titles now used that some of the CRC participants have switched geoscience fields and/or are now publishing in journal titles in which they had not published in the past as they had become relevant to research projects that were being currently conducted. These trends were not evident for the KCTR or the SRC whose research staff remain very focussed on geoscience. The titles abandoned by them reflect a differing emphasis in geoscientific research rather than a new field.

Some of the ISI titles no longer used by the Australian geoscientists from the case study include:

Applied Geochemistry;
Geochimica et Cosmochimica Acta
Geophysical Research Letters;
Journal of Geophysical Research: Solid Earth;
Journal of Petrology;
Nature; and
Transactions of the Royal Society of Edinburgh – Earth Sciences.

Examples of changing research areas for the KCTR include the now missing fields of palaeontology (*Alcheringa)*, planetary science (*Earth & Planetary Science Letters)*, and mineralogy (*American Mineralogist)*. Subject areas have changed for the SRC with titles in the planetary science (*Earth, Moon & Planets)*, geochemistry and geophysical areas considered no longer relevant.

3.2 ISI titles used

Table 1 shows the use of journal titles by the participant researchers in the study. Each journal use is presented as a fractionated event (according to the number of authors) as well as unit count, both pre and post joining the centre. The data in Table 1 contains 26 titles which achieved greater than or equal to five unit hits per title for at least one centre. The table includes 19 geoscience ISI titles for which the 2001 impact and citation ranks are also shown. The ISI impact factor measures the frequency with which the "average article" in a journal has been cited as at 2001 to articles published in 2000 and 1999. This factor is a ratio between citations and recent citable items published and is claimed to provide a way to judge the prestige and influence of a particular journal. Ranking by total cites is for the total number of citations of journal articles for the same period.

Multiple authorship (as indicated by fractionated counts) was common before the establishment of the centres and has continued (Table 1). It is particularly prevalent for the high-count journal titles, such as *Australian Journal of Earth Sciences* (*AJES*)*, Economic Geology and the Bulletin of the Society of Economic Geologists* (*EG*) and *Journal of Geochemical Exploration* (*JGE*). These titles are ranked GM 39 (of 117), GG 14 and GG 43 (of 47) respectively. This means that in the eyes of the ISI, the *AJES* and *EG* are prestigious, but not among the highest ranked within their categories. The *JGE* is close to the bottom of the list in its GG category.

When compared with the total cite counts, the *AJES* falls from 39 to 49 place (of 117) while *EG* and *JGE* improve their rankings, from 14 to 12 and from 43 to 27 (of 47) respectively.

American Mineralogist is listed first, hence as the most prestigious in the GG category. This title was used only by researchers from the CRC and prior to joining the centre. The ISI top impact ranked journals from the other categories were not used by the Australian geoscientists. This includes *Advanced Geophysics*, ranked first in the GM category, *Review of Geophysics*, first in GG and *Quaternary Scientific Review*, first in G.

The top citations ranked journal in the GG category, *Geochimica et Cosmochimica Acta*, was used only by the SRC participants although its usage has declined after joining the centre. Another title to note is *Geology*, ranked very highly in the G category (first for citations and second for impact out of 35 titles). It has experienced a growth in interest from the participants in the KCTR (fractionated count 3; unit count 9) and remained relatively stable for the SRC (fractionated count 0.7; unit count 3), though is no longer used by the CRC. This reflects the CRC's geoscientific orientation.

The ISI top citations ranked journals from the other categories were not used by the Australian geoscientists. This includes *Journal of Geophysical Resources*, ranked first in the GM category and *Geotechnique*, first in EG.

There are only two titles in the list in which all three centres publish:

• *AJES* – the continued use of this title post joining the centres indicates the geoscientists' recognition of the need to alert practicing Australian geoscientists to their work. Although this title does not rate very highly (GM 39) in the ISI rankings, the Australian orientation of the research undertaken by the centres makes this "home" journal very appropriate for dissemination of research outcomes. It is also the only ISI-indexed Australian geoscience journal title.

• *EG* – both directors of the KCTR and the SRC have been or are on the editorial panel for this title and it is likely that because of their involvement the participant researchers are encouraged to publish there. The waning interest in this title by participants from the CRC reflects their changing geoscientific orientation to geochemistry, soil related science and exploration.

Table 1. ISI journal titles used by Australian geoscientists

Impact rank / Citations rank*	JOURNAL TITLE	KCTR Fractionated/ unit *pre*/post centre	SRC Fractionated/ unit *pre*/post centre	CRC Fractionated/ unit *pre*/post centre
GG10/4	American Mineralogist			*10.33 / 15.00* nil
GM39/49	Australian Journal of Earth Sciences	*2.67 / 5.00* 2.46 / 10.00	*7.07 / 13.00* 6.08 / 11.00	*13.61 / 22.00* 4.65 / 12.00
--	Australian Journal of Soil Research			*2.33 / 5.00* 1.16 / 3.00
GM47/7	Canadian Journal of Earth Sciences	*2.86 / 6.00* 0.99 / 3.00		
--	Canadian Mineralogist	*1.95 / 6.00* 0.73 / 3.00		*3.41 / 6.00* 0.7 / 2.00
GM44/12	Clays & Clay Minerals			*8.99 / 18.00* 2.83 / 6.00
GG7/5	Contributions to Mineralogy & Petrology		*4.73 / 10.00* 0.58 / 2.00	
GG3/2	Earth & Planetary Science Letters		*4.25 / 11.00* 3.30 / 10.00	*0.70 / 2.00* 0.35 / 3.00
GG14/12	Economic Geology and the Bulletin of the Society of Economic Geologists	*6.24 / 19* 5 / 17	*14.00 / 30.00* 10.13 / 24.00	*5.20 / 10.00* 0.75 / 2.00
GG4/1	Geochimica et Cosmochimica Acta		*2.64 / 8.00* 0.64 / 3.00	
G2/1	Geology	*0.90 / 3.00* 3.01 / 9.00	*1.83 / 3.00* 0.73 / 3.00	3.66 / 5.00 nil
G29/25	Geology of Ore Deposits			*2.69 / 6.00* nil
GG43/27	Journal of Geochemical Exploration		*nil* 2.24 / 6.00	*16.63 / 34.00* 8.50 / 20.00
GG2/9	Journal of Petrology		*1.75 / 3.00* 1.56 / 7.00	
GG22/26	Mineralium Deposita	*1.00 / 3.00* 4.43 / 13.00	*1.16 / 3.00* 2.70 / 5.00	
--	Mineralogical Magazine			*5.00 / 7.00* nil
GG33/32	Mineralogy & Petrology		*1.55 / 6.00* 0.83 / 2.00	
--	Nature	*0.95 / 4.00* 0.70 / 2.00	*3.33 / 5.00* nil	
--	New Scientist		*5.00 / 5.00* 1.00 / 1.00	
GM72/47 G21/10	New Zealand Journal of Geology & Geophysics			*6.29 / 9.00* 0.50 / 2.00
G23/20	Ore Geology Reviews	*0.5 / 1.00* 3.96 / 12.00		
--	Palaeogeography, Palaeoclimatology, Palaeoecology			*1.39 / 6.00* nil
GM14/17	Precambrian Research	*0.40 / 2.00* 2.73 / 11.00		
--	Quaternary International			*nil* 1.94 / 6.00
--	Transactions of the Institution of Mining and Metallurgy Section B - Applied Earth Science		*2.49 / 5.00* nil	
GM41/52	Zeitschrift für Geomorphologie			*8.33 / 12.00* 1.00 / 1.00

* The impact and citations ranks for ISI titles refer to 2001. GM denotes Geosciences, Multidisciplinary; GG is used for Geochemistry & Geophysics and G for Geology. "--" denotes ISI titles not assigned to the above geoscience categories.

Some of the participants from the CRC exhibited a strong preference for the *JGE* prior to their joining the centre, and this has continued afterwards. One of the participant researchers had been an Associate Editor of this journal with full editorial control for Australia prior to joining the CRC and continued this interest until 1999.

In conclusion, *AJES* clearly appears the preferred ISI journal tiled by the Australian geoscientists. The preferred international titles are two: *EG* (preferred by the KCTR and SRC) and the *JGE* (preferred by the CRC). The Society of Economic Geologists continues to publish its journal *EG* in paper format and it is not yet available as an electronic journal (SEG, 2001). Elsevier offers the *JGE*[2] in electronic and paper formats.

3.3 DETYA titles used

There were in total 81 titles used by the participant geoscience researchers which were not included in the ISI indexes. Seven of them appeared on the 2001 list of the Department Education, Training and Youth Affairs (DETYA), now DEST, refereed journals listing (DETYA, 2001). The DETYA list[3]:

> contains the names of journals that have been assessed by DETYA as satisfying refereeing requirements for the Higher Education Research Data Collection (HERDC)... Inclusion only indicates that *refereeing* requirements have been meet (*sic*). Other requirements for articles, set out in the HERDC specifications, must also be met.
>
> Articles published in journals not listed on this Register may still be eligible for counting in the HERDC if they meet the relevant requirements.... (DETYA, 2001).

This list is particularly important and needs to be closely monitored by those working in centres whose funding is influenced by DETYA, namely the university based researchers. It recognises publications by Australian researchers in journals which are not covered by the ISI, as being of high quality.

However, it was found that the use of the DETYA titles by the geoscience researchers was not extensive. The use of the DETYA listed *Exploration Geophysics* was by one researcher from the KCTR. The SRC researchers make no use of any of the titles. The CRC researchers have made use of four of the titles before the participants joined the centre and continued to use three of the titles *(Agenda, Australian Geographical Studies*, and *MESA Journal)* since joining the centre. Further inspection of the publication lists regarding this usage reveals that only one of these CRC researchers is employed by a university.

4. CONCLUSIONS

The journal title preference analysis of the three geoscience centres produced some interesting patterns:

- Each centre uses one preferred title – *Journal of Geochemical Exploration* for the CRC, *Economic Geology* for the SRC and the KCTR. Given the extensive choice of ISI indexed journal titles in which to publish, it is surprising that the main preference for each centre comes to a single title.

- Each of the final titles chosen by the participants is respected in the field of geosciences, is widely read and captured by the ISI. The decision to publish is most likely based on a title which represents the work of the centre and the data suggests that ISI recognition of prospective journal titles is important in this selection.

- There is some continued use by the CRC of DETYA (DEST) titles and little to no use by the KCTR and the SRC. The preference of the participants from these two centres to publish in ISI indexed journals overrides the need to publish in DETYA listed titles.

- The use of other refereed titles by all three centres is modest.

- There is significant preference for the *Australian Journal of Earth Sciences (AJES).* The Australian bibliometric study by Bourke et al. (1996) reports that nearly two-thirds of

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[2] As the objectives of the Association of Exploration Geochemists and Elsevier publishers differed, they have now parted company. As of 2000, the Association publishes its own journal: *Geochemistry: Exploration, Environment, Analysis* (AEG, 2001), with the *Journal of Geochemical Exploration* continuing as an Elsevier title (Simpson, 1999, p.1).

[3] It would be speculative to consider why certain titles are not considered by DETYA as worthy of being included on their listing. The data regarding those titles considered by DETYA in past years, and rejected, is not available.

Australian publications in non-SCI journals are in international journals. The exception is in the earth sciences "with a lower proportion in Australian SCI journals and a higher proportion in non-SCI Australian journals which suggests that Australian journals in that field may be less well represented in the SCI than in other fields" (Bourke et al., 1996, p. 33). This is supported by the evidence from the case study. The only representation of an Australian earth science journal in the ISI's SCI index is *AJES*.

- *Exploration Geophysics,* the society journal of the Australian Society of Exploration Geophysicists, is another popular Australian geoscience title in this case study, but given the criteria under which ISI judges journals for indexing, it has not qualified for inclusion as an ISI indexed title. Yet it is a title covered in the DETYA listing.

- All of the top five journals currently used most by the Australian geoscientists from the three centers combined (see Table 2) are ISI indexed geoscience titles.

- None of the preferred titles used by any centre is an electronic journal.

- There is a range of journals which ISI ranks very highly but are not used by the Australian geoscientists. This includes: *Advanced Geophysics*, *Review of Geophysics*, *Quaternary Scientific Review*, *Journal of Geophysical Resources* and *Geotechnique*.

Table 2. Journal titles most frequently used by the Australian geoscientists

	Journal title
1	Economic Geology and the Bulletin of the Society of Economic Geologists
2	Australian Journal of Earth Sciences
3	Journal of Geochemical Exploration
4	Mineralium Deposita
5	Earth & Planetary Science Letters

The analysis confirms the importance of ISI journal titles for the Australian geoscience community as far as refereed journal publications are concerned. Nevertheless, the researchers use a very selected number of titles which is determined by the specifics of their work (research topics and geographical areas) and the requirements of their environment, including university, industry and government.

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6. REFERENCES

Association of Exploration Geochemists (AEG), *The Journal of the Association of Exploration Geochemists*, http://www.aeg.org, 2001 (accessed 19 March 2003).

Bensman, S.J., Urquhart's and Garfield's laws: the British controversy over their validity, *Journal of the American Society for Information Science and Technology*, 52(4), 714-724, 2001.

Blair, N.L., Use of citation index to quantify the influence of earth science researchers on the work of others, *Geoscience Information Society Proceedings*, 23, 65-68, 1992.

Bourke, P., L. Butler, and B. Biglia, Monitoring research in the periphery: Australia and the ISI indices, Research Evaluation and Policy Project Monograph No. 3, Research School of Social Sciences, Australian National University, Canberra, 1996.

Department of Education, Training and Youth Affairs (DETYA), *Higher education research data collection,* http://www.detya.gov.au/ highered/research/herdc.htm, 2001 (accessed 27 November 2001).

Institute for Scientific Information (ISI), *Products + Services ?2000*, Philadelphia, USA, 2000.

Institute for Scientific Information (ISI), *The ISI Databases: The journal selection process*, http: //www.isinet.com/isi/hot/essays/ 2001 (accessed 10 October 2001).

Klimley, S., Limitations of Science Citation Index data in evaluating journals and scientists in geology, *Geoscience Information Society Proceedings*, 24, 23-31, 1993.

McKiernan, G., Researchindex: autonomous citation indexing on the web, *The International Journal on Grey Literature*, 1(1), 41-46, 2000.

Simpson, P., Past-president's message, *Explore*, 102 (January). 1, 1999.

Smith, K., and D. Marinova, Bibliometric modelling and policy making, Proceedings of the International Congress on Modelling and Simulation, Townsville, Australia, 2003.

Society of Economic Geologists (SEG), http://www.segweb.org/journal.htm, *Economic Geology and the Bulletin of the SEG*, 2001 (accessed 19 March 2003).