INTERNATIONAL GEOSCIENCE EDUCATION ORGANIZATION

NEWSLETTER 98-3

From the Editors:

We are delighted with the response to the request for notes and articles for the newsletter. There are interesting and exciting things happening in geoscience education around the world as the reports show. We want to encourage you to continue to submit notes and articles. You do not need to wait for a newsletter deadline. Send a short report when you get home from a conference or send us a copy of reports submitted elsewhere. Do it while you are thinking about it.

The reports and correspondence suggest that many of us share a sense of isolation and frustration. How difficult it is to keep promoting education and its importance, particularly if we are surrounded by colleagues dedicated to research with little time or interest in teaching. The struggle to have the geosciences recognized as the critical science that pulls together the other sciences in a fully integrated look at our world, is a constant challenge. That is why the prospect of an international coalition is so inviting and this newsletter can be the thread that links everyone together. Hopefully we can pool our efforts to find creative ways to address this issue that will help all countries assess and affirm the need to have comprehensive geoscience education as a part of the science curriculum.

We have had some problems with our e-mail distribution list, but hopefully, as a result of several days of gnashing teeth, the problems are resolved. Do let us know if you have problems receiving the information. Please distribute this newsletter to anyone who is interested and by whatever media is necessary.

Please remember that you can now find the newsletter at:
http://www.cosm.sc.edu.~csemgr/carpenter/newsltr.html

A Spanish version is available on
http://reaction.psc.sc.edu/!csemgr/carpenter/spanish.html.

Look forward to hearing from you and seeing you in Australia in January of 2000!

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HONORS AND AWARDS: Well Done!

Alan V. Morgan received the E. R. Ward Neale Medal from the Geological Association of Canada. The Neale Medal is awarded to an individual who has made, or is making significant contributions to the public awareness of geoscience.

John R. Carpenter received the Neil Miner Award from the National Association of Geoscience Teachers. The Miner award is given to an individual for exceptional contributions to the stimulation of interest in the earth sciences.

Mary E. Dowse received the Public Service Award from the American Association of Petroleum Geologists for her educational and outreach work.

ANNOUNCEMENTS:

GEOSCIED III
Sydney, Australia, January 17 - 20, 2000

G'day everyone. Just a brief note to let you all know that the full circular, with details of the 3rd Geoscience Education Conference, is now up on the web at www.agso.gov.au/geoscied/.

Printed copies of the full circular will be available by the end of October and will be available on request to me (glewis@agso.gov.au) or by mail Gary Lewis, Geoscied III Administration, AGSO Geoscience Awareness, GPO Box 378, Canberra ACT 2601, Australia

We are seeking people/groups who are willing to distribute copies of the circular around their areas or spheres of influence. We can provide bundles of circulars and/or a small poster. Just let me know the number and to where they need to be sent and you will get a package as soon as possible.

I will admit that I have just come back from a week on Kilauea with Project Lava - and thought of you all as I passed through lovely downtown Hilo. It will be great to meet up with you all again in Sydney in 2000.

Fond regards and I look forward to hearing from you.

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31st INTERNATIONAL GEOLOGICAL CONFERENCE
Rio de Janeiro, Brazil August 6-17, 2000

According to the first circular, there will be four sessions on Geological Education

26-1: Geoethics
26-2: Pre-College Science Education Curricula

26-3: The Influence of Geoscience Education on the Development of Third World Countries
26-4: Geological Curricula for the 21st Century

More information about the conference can be obtained from http://www.31igc.org.

AROUND THE WORLD:

CANADA Hilo and the 2nd International Geoscience Education Symposium are now 7400 km and 14 months behind me, and though I retain vivid memories of many of the sights, people, and experiences associated with GEOSCIED II, certain episodes have faded into dim oblivion, only to be resurrected by the timely application of external stimuli. Thus my luggage's unplanned 5-day stop-over in California, on the way home from Hawai'i to Toronto, comes to mind now only when I wait (nervously) at airport baggage carousels. In much the same way, the arrival of yesterday's e-mail message from Chris King finally unearthered a deeply repressed recollection of my offer to write a Newsletter contribution!

So, having used up half my 200-word allotment, I should probably write something relevant to Geoscience Education. A couple of exciting conferences, one past and one future, come immediately to mind.

Last May, at the Geological Association of Canada - Mineralogical Association of Canada (GAC-MAC) Annual Meeting in Quebec City, I was one of many enthusiastic attendants and participants at the "New Partners in Earth Science Education" Special Session, sponsored by the Canadian Geoscience Education Network. Sixteen oral and poster presentations showcased a variety of innovative approaches to the delivery of geoscience messages at all levels, each involving a cooperative partnership of some kind. I'd be happy to provide details of the program and presentations to anyone interested. Abstracts are published in:

Geological Association of Canada - Mineralogical Association of Canada (GAC-MAC) Annual Meeting Quebec '98 - Carrefour in Earth Sciences GAC-MAC/APGGQ Abstract Volume 23, 1998.

This coming November (5th to 7th), the Science Teachers' Association of Ontario (STAO) is presenting their annual conference in Toronto. The theme for STAO '98 is "Meeting the Challenge of Change," and the conference will focus on the many new demands of science curriculum reform in Ontario. One welcome challenge will be the development of new courses for Earth Science, bringing the Ontario secondary school curriculum in line with the Pan Canadian Common Framework of Science Learning Outcomes. Several special sessions, dealing with geological time, the fossil record, groundwater, climate change and weather, are designed to allow delegates to gain a greater understanding of the Earth Sciences. A feature attraction of STAO '98 is an address by the Association's Honourary President and Canadian astronaut, Dave Williams (Mission Specialist and Crew Medical Officer on STS-90).

We also look forward to the many Earth Science education activities planned for the Geological Society of America Annual Meeting in Toronto in October. For more details, check out the GSA Toronto '98 website: http://www.geosociety.org/meetings/98/index.htm

Lots of great stuff in store for '99, too!

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SOUTH AFRICA Geoscience Education Initiatives in South Africa.

South Africa is in the initial stages of transforming its school education system toward an outcomes-based model, named curriculum 2005. One of the implications of this transformation has been an increased prominence for the traditional geoscience subjects and their realignment with the physical and life sciences, creating the Natural Sciences Learning Area. University geoscience departments, which have actively campaigned for this development, are now engaged in setting up the necessary teacher-training and curriculum materials development infrastructure to drive the process. A national working group under the auspices of the Geological Society of South Africa plans to release sample learning modules with a strong South African emphasis for evaluation by teachers in early 1999.

During 1998, South Africa has been celebrating its first Year of Science and Technology with, among other activities, week-long S&T Festivals in all major centers. A traveling road-show has included locally-designed and built, life-size robotic African dinosaurs and their mammal-like reptile ancestors, which have proved to be a centrepiece of the festivals and which have played an important role in highlighting the potential contribution of geoscience to Science Education in the country.

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UNITED KINGDOM UK Geosciences Education Consortium

The UK Geosciences Education Consortium is the collective name for two innovative learning and teaching projects: The UK Personal & Career Development Network (funded by the Department for Education and Employment for two years to March 1998) and The Earth Science Staff Development Project (funded by the Higher Education Funding Council for England - HEFCE for three years to November 1999).

The Network was set up to encourage and facilitate the integration of personal and career development into the Higher Education (HE) curriculum. This was achieved by tailoring normal curriculum activities to develop students' key skills and competencies and providing concise skills development exercises, with a Geoscience flavour, for use in the curriculum.

The outcome of this was the publication of "Helping Earth Sciences Students to Develop Key Skills: a Portfolio of Curriculum Exercises" in July 1998. A copy of this document was given to all Earth Science departments in the UK. Interest in the document has also come from overseas and copies have been sold to Earth Scientists in Australia, America and South Africa. The Network's sister project - the Earth Science Staff Development Project - began in December 1996. Prior to this, all Earth Science meetings and conferences in the UK were

solely research-oriented. The main aim of the Project is, therefore, to provide a forum for the discussion of learning and teaching issues in the Earth Sciences, share good practice, discuss problems (and solutions) and to encourage the interaction between teaching colleagues from different institutions.

The forum takes the form of small (~20 participants) workshops and an annual two day symposium. Over the last two years the Project has provided eight events attracting 140 different participants from 40 out of the 47 institutions offering Earth Science courses in the UK. Topics covered are varied and have included Computer-Based Assessment, Web-based learning, team-working, teaching large classes, using spreadsheets in teaching and learning, and fieldwork. The proceedings of each event are published on the World Wide Web and in the form of booklets sent to all participants, Heads of Departments and staff development units - hence, even those academics unable to attend the event can reap the benefits.

Participants have been enthusiastic (especially those who were initially skeptical) and have valued both the opportunity to discuss issues with colleagues (and to see that they are not alone with their teaching problems) and the exchange of ideas and good practice and many have already integrated elements of the workshops into their courses. It is imperative that the Consortium has the means to continue its provision of the above services beyond the present funding programmes. At present, the Consortium is in discussion with other key players in Earth Science learning and teaching in the UK (including the TRIADS computer-based assessment project, the Earth Science Courseware Consortium - a computer-aided learning project and the Geological Society) to be ready to take advantage of any funding opportunities which may arise.

Rapid changes are taking place in learning and teaching in HE in the UK with a proposed strategy by HEFCE to provide a large sum of money for substantial funding for the establishment of 'subject centres' to coordinate the dissemination of, and further develop, the services currently provided by the Consortium and other projects. It is not known yet whether the Earth Sciences will have a discrete subject-centre but we believe that if it does not then the future of the Earth Sciences as an educational discipline could receive a severe setback in the UK. Already departments are being closed or merged due to funding problems. This new funding represents a unique opportunity for Earth Sciences to establish a firm agenda for the future educational development of the discipline in its own right. We are working pro-actively to maintain the networks and fora we have developed and would wish to see the valuable work, accumulated knowledge and extensive contact network preserved and enhanced through continued support. In this respect we are actively seeking support from other Earth Science education bodies to strengthen our case.

More information on any of the Consortium issues (Network, Portfolio or Staff Development) can be obtained from:

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AUSTRALIA

If I had been told one year ago in Hawaii that I would be putting my school's Year 11 subjects on the Internet I would have said "no way!" This term I have been involved in a project in South Australia looking at why students are leaving school early. The school was asked to come up with a project that could investigate ways of helping students complete their post-compulsory schooling. One of the main problems we experience is an inability of a growing group of students to attend classes regularly for a wide range of reasons. Open Access or correspondence school is an alternative for these students, but has some major organizational problems.

Looking at advances in technology and children's way of thinking and learning in the late 90's made me think that having units on-line could be a way to increase access to the curriculum. This has now become the focus of our research project. One of the subjects I am hoping to offer on-line is a Year 11 Geology unit. Science by its nature should contain practical experiences, and Geology MUST contain field experiences. So how do we achieve these things in a virtual setting? Are there ways that a virtual world can deliver the same experiences? These are some of the questions I am hoping to find answers for.

If you have any experience with virtual learning or know of good web sites please let me know on bkn@muirden.sa.edu.au.

Please visit our website on http://www.muirden.sa.edu.au/

Hope to see you all in Oz in 2000!
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INDIA

The status of Geoscience Education in India was discussed in a one-day workshop in Bhubaneswar, India on the 18th of September, 1998, organized by the Society of Geoscientists and Allied Technologists. Despite enhanced activities in Mineral Exploration and exploitation, education and training in Geosciences have not kept pace with developments. Geoscience is not taught as a separate subject in Indian Schools. Students are introduced to formal Geoscience in the Universities and higher technical institutes. The participants felt that employability has a direct effect on the quality of students and employability of Geoscientists can be considerable enhanced by including applied aspects such as Geotechnical Engineering, hydrology, land use science, environmental science in the curricula. Another related conference on "mining Engineering Education-Reorientation Needs" was organized by the Mining, Geological and Metallurgical Institute of India on 24th - 25th April, 1998, in Calcutta. The necessity of remodeling curriculum in mining engineering including adequate basic science and geoscience input was discussed. The overwhelming concern was for development of career opportunity.

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UNITED KINGDOM

Study Course - Dissemination of Geoscience Research Results The need for multi-disciplinary, international training courses. In a fast-moving research topic of international importance, great economic significance, and involving separate geo-scientific disciplines, it is necessary to disseminate results as quickly as possible to key workers. Conventionally, this has been done at scientific conferences addressed by leading figures in the particular research field, commonly with questioning as the main form of audience participation. However, the content of such conferences is typically focused at a very narrow range of disciplines and the interactive 'contact time' between speakers and audiences is usually short. It is also difficult to integrate fully the material presented by different contributors.

An alternative way of disseminating such results, so as to foster international co-operation and team-working on a formal or informal basis, is to use the medium of an educational training course designed to bring together lecturers and students on the basis solely of their expertise, interests and needs. Positive steps must be taken by the organisers of such courses, to avoid attracting lecturers and students on the basis of their nationality. In addition, problems associated with the inevitable geographical spread of researchers involved in solving a fast-moving global issue require careful planning and adequate funding to prevent geographical factors causing the 'self-selection' of students and lecturers, thereby causing the benefits of the education provided to be distorted by national factors.

For example, a course should not be attended predominantly by students from locations close to the course venue, while students who might gain a greater benefit from the event are excluded by virtue of living in more distant countries. Careful thought is also needed to ensure that widely differing scientific disciplines are presented within a well-structured framework. An example of an 'Advanced Study Course': The 'Advanced Study Course' approach can be illustrated by means of a recent course organised by the British Geological Survey (BGS- 7th - 18th September 1998). This event presented the latest technical advances in the study of past groundwater- flow (palaeohydrogeology) to students from throughout the European Union and Associated States. This topic is of major international importance. Groundwater is a major resource, both for public and commercial consumption, in Europe and world-wide. Groundwater is also the major medium for pollutant transport from disposal sites for various types of waste, ranging from domestic waste through to radioactive waste produced by the nuclear energy industry. Furthermore, groundwaters flow across national boundaries. To resolve major problems related to sustainable management of water resources and safe management of wastes, researchers should be familiar with the application of many different techniques and many diverse scientific problems.

Workers should also be knowledgeable about the varied approaches adopted in different countries and must understand the physical, hydrogeological, hydrogeochemical, mineralogical and petrological techniques that can be used to answer questions concerning past groundwater flow. Different investigations require the various types of data to be used in different ways. In groundwater resource investigations, palaeohydrogeological information is used largely to constrain the distribution of old waters (palaeowaters) and to test theoretical models for the present replenishment (recharge) of groundwater resources. In contrast, waste management applications tend to emphasize the calibration of theoretical models for the future flow and chemical evolution of groundwaters, as a precursor to risk assessment. The complexity of both the approaches and the problems were tackled in the course by adopting a holistic approach to palaeohydrogeology, covering all the major applications of the subject and highlighting the inter-relationships between them. This required careful planning by the organisers to ensure that contributions from the various lecturers were integrated effectively.

Solving The Geographical Problem:
The course was made possible by funding provided by the Commission of the European Communities (CEC), as a technological development and demonstration (RTD) activity under its Environment and Climate Programme. This ensured that participants could be drawn from a wide range of countries, thereby minimizing geographical biases among the participants. In total, 30 students from 13 countries attended the course, while lecturers were drawn from six countries. The information presented in the course drew heavily upon several ongoing and recently completed international research projects, involving workers from many countries, that were also funded by the CEC. Four of these projects were funded by the Nuclear Fission and Safety Programme of the CEC while a further project was funded by the Environment and Climate Programme of the CEC. In addition, the course drew on the experience of researchers working in both the Swiss and Canadian programmes for the management of radioactive wastes. Thus, this Advanced Study Course illustrates how the CEC funding can be used to bring together the output of a range of international programmes as well as information from experts from a wide range of countries.

Solving The Inter-disciplinary Problem:
Most critical of all is the way in which the course format allowed intercommunication of research results from separate disciplines which usually communicate their research findings separately. In the Advanced Study Course, 'specialists' from every major discipline took it in turn to present their findings in interdisciplinary 'classroom' situations. Students also had opportunity to participate in 'self-education' through workshops within which each one presented their own research results to the rest of the class.

Conclusions:
Our experiences suggest

1. There are significant advantages in an educational training course format rather than conference format for dissemination of research results. For example, a course fosters more effective interaction of participants and lecturers because more time is available to each lecturer than is the case in a typical conference.
2. It is highly advantageous to have an international funding source such as the CEC.
3. More detailed advanced planning is required than for a conference. In particular, the programme of instruction needs to be more tightly planned, and integrated so that multi- disciplinary research is presented holistically.
4. Other organisations should be encouraged to adopt this format.

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ARTICLES: FUTURE EVOLUTION OF THE EARTH SYSTEM

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The Second International Conference on Geoscience Education in Hawaii, 1997, was concerned with the Earth as a system. Here, I want to report on some investigations about the long-term future evolution of our home planet. It is well known that the Earth system consisting of the components solid Earth, hydrosphere, atmosphere, and biosphere evolves under the external forcing of an increasing insolation. In the framework of self-regulation in the Earth system, the increasing insolation is balanced by a decrease in atmospheric CO2. Lovelock and Whitfield (1982) have been the first raising the question how much longer the biosphere can survive on Earth. In their model, atmospheric CO_2 falls below the critical level for C3 photosynthesis in only 100 ma. Later this problem was reexamined by Caldeira and Kasting (1992), in a more elaborate numerical model taking into account that C4 photosynthesis persists to such low concentrations of atmospheric CO_2 as 10 p.p.m. They found that the biosphere could survive for at least another 0.9 Ga to 1.5 Ga after present time. In our Potsdam group (Franck et al., 1998a; 1998b) we extended the geostatic model of Caldiera and Kasting by the inclusion of geodynamic phenomena like spreading and continental growth. According to our model the biosphere will become extinct in about 500 Ma and after that the Earth may lose its water to space and follow the path of its sister planet Venus.

References:
Caldeira, K. and Kasting, J.F. 1992. The life span of the biosphere revisited. Nature 360, 721-723.
Franck , S., Kossacki, K., Bounama, Ch.1998a. Modeling the global carbon cycle for the past and future evolution of the Earth system. Accepted for publication in Chem. Geology.
Franck, S. , Block, A., von Bloh, W., Bounama, C., Schellnhuber, H.-J., Svirezhev, Y. 1998b. Drastic reduction of Biosphere Life span as a Consequence of Geodynamics. Submitted to Tellus.
Lovelock, J.E. and Whitfield, M.1982. Life span of biosphere. Nature 296, 561-563.

ARTICLE RESPONSES:
In response to Newsletter 98-2, "What Earth Science ‘Explanatory Stories' would you include in your National Curriculum?", by Chris King, UK: Roger Trend, UK, R.D.Trend@exeter.ac.uk, wrote: Is there a geoscience "vicious cycle" operating across the global society ... or is it only in the UK? In his article in GeoSciEd Newsletter 98/2 Chris King suggested that one of his "explanatory stories" might relate to understanding of deep time. I could not agree more and I suspect that effective teaching and learning of deep time might open the doors to a greater understanding of geoscience across society at large. I am starting with UK primary (five to eleven years) teachers, but the cycle can be broken at any stage. Briefly, I think that the poor conception of deep time among primary teachers results in the avoidance of all geoscience material, especially that concerned with Earth history.

Because the primary teacher does not feel secure in her grasp of deep time, relative and absolute, she does not develop the geoscience-related learning opportunities with her normal imagination and effectiveness (as she does with history). Such opportunities may be in the formal curriculum or they may arise in the course of normal classroom interaction (e.g.a media news item). The consequent lack of knowledge and understanding among the pupils is then transmitted throughout society, hence the vicious cycle (which can be broken by the International Geoscience Education Organisation).

I have yet to find relevant research evidence for this so this must remain a hypothesis until I can obtain the research evidence myself. I am active in this field. Finally, I suspect that this vicious cycle applies to all levels of schooling, certainly 5 -16 years, whether or not geoscience matter is visited in Science or Geography: but that is another set of issues and a further research programme.

Reference: Trend, R.D. An investigation into understanding of geological time among 10- and 11-year-old children. International Journal of Science Education, 1998, 20(8): 973-988

NOTES, & COMMENTS

UNITED KINGDOM (Chris King) WE NEED YOUR HELP - call for International Coordinators. Would you be willing to act as International Coordinator for your region? We still have many parts of the worked where we need a named person to act on behalf of Geoscience Education. This is not a big task, but is nevertheless vital for our future. The task involves: * distributing copies of the newsletter, either by email or by post/mail to all those in your area who would be interested in receiving a copy, as well as to other colleagues you may have in other parts of the region or the world; * contributing to the newsletter. We hope you will be willing to contribute to the newsletter at least once a year by writing a piece of some 200 words. This could cover a wide range of topics relevant to Geoscience Education, such a particular new developments in your region, thought-provoking ideas on the Geoscience Education topic, reports of Conferences, etc. or anything else that you think others might find interesting. * distributing Conference circulars. We hope you would be willing to send email or hard copies of the conference circular(s) to all the following in your area: Geoscience publications/journals; Geoscience education publications/journals; Science education publications/journals; Geography education publications/journals; Colleagues who may be interested in attending the conference.

If you are willing to do all these things, please reply to this letter/email as soon as possible. The conference circulars are now ready to distribute. WE NEED YOUR HELP NOW – PLEASE DON'T DELAY.

Chris King – c.j.h.king@educ.keele.ac.uk

UNITED KINGDOM (Chris King) In response to our request for people to act as international coordinators for their own regions, Alfredo responded that, after many years of fighting in Italy on behalf of Geoscience Education with little or no support from his colleagues, he had finally felt that he should give up his 'mission' and concentrate on academic research in his own area of Geology. Those of us who have known Alfredo over the years were very dismayed to hear that this great fighter on behalf of the 'cause', both nationally and internationally, was no longer able to continue. However, we would like to assure you Alfredo that your efforts have inspired many of us to greater efforts ourselves and

we would like to thank you for all your hard work over the years. We certainly wish you well in the somewhat calmer waters of academic geology and hope to see you at future conferences when your companionship will be most welcome.

ISRAEL, (Nir Orion) In a short note from Israel, Nir Orion noted that he returned this summer from a mini-conference in Portugal. This symposium was organized by Luis Marques from the University of Aveiro. The participants were a group of 30 leading Portugese teachers and the main objective of the conference was to expose these teachers to new approaches in geoscience education in order to start a process of change in the Portugese Earth science curriculum. In addition to local speakers, Luis invited Nir, Vic Mayer and Robert Frodeman from the USA, and David Thompson from the UK.

UNITED STATES (John Carpenter) Most of the US contingent met in Reston, VA (suburban Washington) at the USGS offices Oct. 3-5, for the annual Coalition for Earth science Education meeting. The meetings were informal and very informative. Laure Wallace, Frank Ireton and Stephanie Stockman deserve many "atta boys" and "atta gi rls." The really good news is that even if the list of participants was smaller than we would have liked, there were several new folks, some of whom are much younger than some of us older folks.