

INTERNATIONAL GEOSCIENCE EDUCATION ORGANIZATION
NEWSLETTER 99-1

From the Editors:

Our distribution list is growing with each newsletter and interest is mounting about the third International Conference on Geoscience Education, January 16-21, 2000, in Sydney, Australia. If you haven't gotten a program or are looking for additional information, please be sure to check out the website at <http://www.agso.gov.au/geoscied/>.

The steering committee is interested in your comments on the proposed charter for the International Geoscience Education Organization. A copy of the proposed charter can be found in the first newsletter, 98-1 on our website at <http://cosm.sc.edu/~csemgr/carpenter/newsltr.html>. Please refer your comment to the editors or to Chris King at eda22@cc.keele.ac.uk.

In the newsletter, we like to celebrate awards and honors received by geoscience educators and let people know about upcoming conferences or meetings where international participation is encouraged, as well as engaging in on-going discussions about the state of geoscience education.

In the last newsletter we established the following categories (yes we are developing this as we go) Honors and Awards, Announcements, Around the World, Articles, Article Responses, and Other Notes and Comments. Please consider making a contribution to the newsletter. If we believe that an international commitment to geoscience education is an effective way to support our vision for a scientifically literate society, we must recognize that communication is the first critical step.

The Editors,

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ANNOUNCEMENTS

GeoSciEd III
Sydney, Australia
January, 2000

Planning for the conference is well advanced. The program will be an exciting mix of topics with oral, poster and workshop presentations by participants planned. There will be a mid-

conference field trip in the tradition of Hilo. It will not be to an active volcano but will include an interesting range of sites of geological interest in the sedimentary and igneous rocks surrounding Sydney. We also plan to visit the site of the 2000 Olympic Games good environmental practice has been a key factor in the planning. Pre- and post-conference field trips are being organized further afield. Like most countries in the world, many of the tourist destinations in Australia are centered around geological monuments. Field trips to the Great Barrier Reef, Ayers Rock and Kakadu (the home of Crocodile Dundee) will be available if there is sufficient interest. A post conference trip to Kangaroo Island is planned which will not only provide an opportunity to see spectacular geology but will also enable participants to get close to Australia's unique fauna and flora.

The conference venue is superbly equipped, close to accommodation ranging from 5-star hotels to student housing and minutes by public transport from Sydney Harbour or the Pacific coast beaches. Social events include a welcome social, a traditional "Aussie BBQ", the Conference Dinner and a Harbour Cruise on the last night . The weather at this time of the year in Sydney is warm and pleasant encouraging the informal lifestyle which makes it a great place to visit.

We have had a good initial response and expect participants from all continents ranging across the education spectrum from elementary school teachers to University academics as well as company and government geologists. The program is being planned to satisfy the interests of all of these groups.

So if you are interested in improving geoscience education, enjoy good food, wine and beer or any one of the foregoing join us in Australia to pick-up where Hilo left off. It will be a great opportunity to strengthen our International Geoscience Education Association.

Ian Clark
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Earth Science Teachers' Association Conference
Durham University, UK
September 17 - 19, 1999

ESTA's Annual Conference runs from the evening of Friday, September 17, to lunch time on Sunday, September 19, and includes lectures, workshops, Saturday afternoon field visits, a range of meetings and discussions, and a chance to meet many other geoscience teachers. There will be a range of trade and academic exhibits as well.

In addition, the Friday will comprise a number of In-Service Education and Training (INSET) courses, which are booked separately. Each course runs from around 9.30 to 4.30. The following sessions will run

INSET for primary science teachers (Key Stages 1 – 2, 5 – 11 year olds);
INSET for secondary science teachers (Key Stages 3 – 4, 11 – 16 year olds);
Post-16 INSET course (for geology teachers of 16 – 18 year olds);
Higher Education workshop (for university geoscience teachers).

More details from Trevor Morse, Department of Geological Sciences, University of Durham, Durham, DH1 3LE. Tel. 0191 374 2520, Fax 0191 374 2510, email T.J.Morse@durham.ac.uk

The ESTA Conference normally attracts between 100 and 150 geoscience teachers from across the UK. Visitors from overseas are most welcome and have found the conference very worthwhile in the past. We hope to see you there!

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AROUND THE WORLD

SPAIN

A Struggle of the AEPECT (ASOCIACIÓN ESPAÑOLA PARA LA ENSEÑANZA DE LAS CIENCIAS DE LA TIERRA) Against an Act That Means the Menace of Extinction of Geosciences in Spain.

In our net site "www.civila.com/hispania/geociencias" and in the AEPECT journal, Enseñanza de las Ciencias de la Tierra, vol. 6.nº3. December, 1998, pp.206-210 and 287-292, the recent menace to the existence of the Geosciences in Spain is explained. Also listed are AEPECT's efforts to stop and reject the Act that Spanish Education Administration Authorities proposed for announcement in February.

Geology in primary and secondary education is currently limited. The move to reduce the contents and hours at the secondary level moved the President of AEPECT, Emilio Pedrinaci, to organize a struggle to stop the Act through the active participation of the local and regional AEPECT coordinators in the organization, and the participation of each AEPECT member in order to creatively stop the publication and application of the Act.

We asked for help from several Spanish media and local, regional and central organizations (political parties, trade unions, professional and mother-father scholar organizations, and also significant individuals scientists). The AEPECT President was received by the highest Administration Education Authority. By now, the Act is stopped, but the Spanish Government may return to the Act in the future and we must keep well prepared. It's because of this recent menace that we are preparing arguments supporting the importance of Geoscience teaching at all education levels. Yet, we need more comprehensive reflections about the place of Geoscience in the curricula for the XXI century, the role of regional and local societies, and the specific contributions of the geosciences in scientific study and in education of the whole population as a critical component to maintaining a sustainable way of life.

Yet we need more comprehensive reflections about the place of the Geoscience in the curricula for the XXI century planetary, regional and local societies, about the specific contribution of the Geoscience to the scientific and integral human education of the whole population for a more sustainable way of life.

(I have prepared additional thoughts on this topic which can be found on the IGEO webpages or you can email me at "Montserrat.Domingo@uab.es").

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THE PHILIPPINES

I want to thank Gary Lewis, 3rd International Conference on Geoscience Education, for the prompt delivery of the box of conference circulars and posters. It arrived a day before the annual Geological Convention (December 2-4, 1998). It was dubbed Centennial Geological Convention as last year we had the Centennial celebration of Philippine Independence. While last year many Filipinos reveled over the freedom that began a hundred years ago, the geoscience community here has yet to see itself emancipated from the grip of traditional paradigms. Many geoscience educators in the Philippines are not yet aware of the changes that are happening in the geoscience education community. Teachers continue to teach the way they were taught and the curricula have the staunch proclivity to cater to the needs of industries, basically mining. However, a more conscious infusion of environmental principles in the curriculum is recently burgeoning as the media, at some time, were teeming with reports of mining-related environmental problems.

Until recently, Geology in the Philippines was not so popular a course in the universities. As such only three institutions in the country offer courses for a bachelor's degree in Geology. I remember at one time, when asked about my course, I said " Geology". And the one asking replied, "So you want to be a priest". I said " No, it's geology, not Theology! ". It's only recently that geology became popular when a 7.8 magnitude earthquake hit Luzon in 1990 followed by the eruption of Mt. Pinatubo a year after. Thanks to these events, the Philippine Institute of Volcanology and Seismology, which used to have a small and "eons-old" building, acquired a new place --- big and with state of the art technology.

Geoscience education as a distinct field has no place yet in conferences and conventions in the Philippines. Hopefully with my initial strides to popularize it, along with my new "recruits", I won't be the only Filipino presenting in the next conference in Australia as I was in Hawai'i.

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NIGERIA

Science Teachers Association of Nigeria and The British Council Lecture on Science Education in the 21st Century and the Prospects for Global Unity
Friday 21st August 1998
University of Lagos, Nigeria

Lecturer: Dr John Oversby (University of Reading) representing The Association for Science Education but speaking in a personal capacity.

A case for a radical re-organization of the global science curriculum to reflect the centrality of modeling in science, and to recognize the interests of learners at all levels, included a proposal for restricting chemistry to no more than 15% of the science curriculum and devoting 10% to earth sciences. The bulk of the curriculum, at least 50%, would take up the themes of life sciences and their environment, in which earth sciences has a significant role to play. In addition, earth sciences represent one of the few areas of science in which new theories have been in active construction this century, spawning a whole range of new models to explain the structure of the earth. The lecture also promoted access to recent scientific thinking through the Internet, partly as a solution to teacher shortages, but also as a cultural activity modeling international communication in science. Cheaper computers, the improving access to the Internet, especially in developing countries, and greater demand for high quality education, would drive the greater use of computers in education.

The response was thoughtful, and a serious discussion of the challenges and opportunities took place.

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ARTICLES

What 'Scientific Literacy' for Earth Science?

The concept of 'scientific literacy' is currently being hotly debated; that is, what elements of science should be taught to/learned by all students. If geoscience educators are to enter this debate, we must be clear on the elements of Earth science that we consider crucial to the learning of all pupils. These need to be carefully considered, because if we require too much curriculum time, our contribution will not be taken seriously, but if we ask for too little, then the Earth science component will be small and unlikely ever to be increased.

So what would you include: Below is the result of a brief personal brainstorm. What would you add/delete/rephrase?

Knowledge:

Major processes affecting our planet (astronomical, atmospheric, oceanic, terrestrial, crustal and deep Earth), their links and products.

Methods used for evaluating and addressing questions and problems in Earth science.

Methods of gathering Earth science information.

Earth study involves applying knowledge and techniques from a broad range of sciences and other disciplines

Understanding Earth processes:

Act in 3D space and have 3D effects involve many variables, some predictable, some less so.

Act at all scales from micro to macro.

Act over time scales from very short to very long.

Have many feedback loops

Skills:

Techniques of measuring/observing and recording Earth processes and features.

Use of key features in identification and classification.

Attitudes:

Appreciation that the Earth is finite in space and time and cannot be regenerated.

Exploitation is necessary but must be sustainable.

Commercial projects that might affect the Earth must be carefully evaluated before during and after their implementation and monitored throughout.

[This piece has been amended in the light of many comments. Many thanks.]

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A New Model for Understanding Aspects of Geological Time

There are few concepts in the earth sciences more important than time. In this work a tentative model has been proposed in order to explain how students understand geological time.

In the earth sciences, temporal understanding is mediated by a series of scientific principles, which allow the reconstruction of the time-induced changes that take place in both the physical and biological environments. It is suggested however, that such principles might be based on a collection of cognitive skills that we use in order to orient ourselves to temporal phenomena on a day to day basis. In the psychological literature such cognitive skills largely fall under the category of Causal Reasoning. Causal reasoning can be defined as the ability to group temporarily successive occurrences into coherent units based on cause effect relationships. Furthermore, causal reasoning is constrained by three principles which define what constitutes a causal event.

Priority: the temporal ordering of causes in effects. On a daily basis priority is determined through our understanding of relative concepts including before and after (succession), as well as absolute measures (clock time and schedules). Such cognitive correlates are comparable respectively to the geological principles of superposition (succession), and radiometric time (clock time and scheduling).

Mechanisms: The search for antecedents that could have produced the phenomena to be explained. In part, such understanding is imparted through our experience with repeating cycles. In the earth sciences, this is comparable with the general principle of the "Present as key to the past".

Determinism: the actual cause of a physical event. Determining causes is largely constrained by our previous knowledge.

In addition, to using these principles as a guide for analyzing student understanding of geological time, they might also be incorporated into a teaching strategy for helping students deal with this complex issue.

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"NOTES, COMMENTS, HELP NEEDED"

I have undertaken major and minor research projects sponsored by the Department of Science and Technology, GOI, New Delhi and by U.G.C., New Delhi. My two articles on geoscience teaching aids have appeared in the international journal "Teaching Earthscience", U.K., and in the journal "Computers and Geosciences." My program on shape analysis has also appeared. I have talked on geological themes for the All India Radio Stations at Tirunelveli and Thoothukkudi. I have published a university level text book entitled "General Geology". I have undergone a PG Training Course in Sediment Transport Technology sponsored by UNESCO and host by State Public Works Department, Government of Turkey, held at Ankara/Istanbul. My script for an educational television entitled "The Profile of a Geologist" is awaiting sponsor. (If you can spot somebody please let me know!).

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Request for Research Contacts

I am struggling to identify colleagues who are researching the learning of geoscience concepts. Briefly, I have no difficulty in locating researchers who are proposing new ways of

TEACHING, especially at post-compulsory levels of education, but relatively little activity which focuses on the way people (children and others) conceive geoscience concepts. Of course, I engage regularly with the huge body of research literature on the "alternative frameworks" movement and have even made tiny contributions myself. However, even here I find important omissions, notably the perceptions and conceptions of teachers (and parents) concerning geoscience. I am also in touch with the huge output of reports and articles which focus on new ways of teaching geosciences, many of which are not explicitly research-based.

I am becoming increasingly more confident with my hypothesis that there is a vicious cycle in operation across society (or societies) which is likely to perpetuate the low levels of attention given to geoscience across all levels and sectors of society. This includes schools, publishers and television producers. Exceptions, of course, include professional geoscientists, working in many different contexts. This vicious cycle thrives on unsystematic knowledge, popular misconceptions, very few geoscience television programmes, the "taxonomic approach" to rocks, fossils and minerals represented by the stocks of high street bookshops and ineffective school teaching which fails to encourage further learning. All of this, I hasten to repeat, is hypothetical: but I am currently following up all these ideas. My main concern is society as a whole: the population at large.

It might be the case that many of our efforts in devising new school curricula and new ways of teaching geoscience (whether or not in the constructivist camp and whether they cover individual schools or entire nations) are doomed to (relative) failure because of the lack of society-wide grasp of the key issues. In particular, I consider it likely that the poor grasp of geological time is inhibiting key opinion leaders, including teachers. It might turn out that research attention given to the teaching and learning of geological time will provide us with a more secure foundation for all the other activities which are currently progressing.

The contrast with other disciplines cannot be too stark. Take history, for example. I am hypothesising that the widespread understanding of matters historical can be attributed in part to the powerful learning activities which primary (5 to 11 yrs) teachers are able to devise. Furthermore, the effective use of artifacts and other history-related learning resources, especially by teachers and parents, reinforces this society-wide interest in history. This is then reflected in the number and quality of television programmes and high street books. A virtuous cycle is in place.

What is even more galling is that geoscience events frequently hit the headlines and short-term interest is boosted enormously. However, the lack of a secure temporal framework ensures that interest rapidly fades.

Having concluded (Trend 1998) that some children tend to group geoevents into just two categories ("ancient" and "very ancient"), I am now looking at the conceptions of geoevents held by student teachers and serving teachers. I will then be moving to other sections of society. I would be most grateful if colleagues could make contact to express their views on my research and, if appropriate, to let me know of their own research activity.

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

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