PREVIEW

AUSTRALIAN SOCIETY OF EXPLORATION GEOPHYSICISTS

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Contents

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Introduction

I shall be continuing in this, my third year, as Preview Editor, helped out ably by Andre Lebel. Next year the position will be passed to some talented person in Victoria. If you have articles for inclusion in Preview, or if you know someone in Victoria to nominate as editor for next year, please contact either Andre or myself.

Who doesn't read their local?

PREVIEW

We recently received the following letter from Henk van Paridon, Head of the Continuing Education Committee, *"You may have noticed my appeal in Preview for ideas and members. I was shocked to find that, unlike myself, a lot of members don't read this publication. Thus, the disappointing but not entirely unexpected response has been zilch."*

This sounds like a cry from the heart and I can only sympathise with him. Although Preview is supposed to be the 'voice of the membership' it has not always worked out that way. However, I had hoped that people might read it even if they didn't respond to it!

Response to the wine offer is usually pretty good and so is the attendance at conferences and annual executive meetings when free beer is available. Perhaps today's geophysicist is more communicative when well oiled at social functions!

Editor

Branch News

New South Wales

The July meeting of the NSW Branch was held in the Nelson Brasserie at the Lord Nelson Hotel, The Rocks. Mike Etheridge of Tectonex Geoconsultants Pty Ltd spoke on "The Strucutral and Tectonic Evolution of the North West Shelf".

The annual student evening is planned for 25 September, 1991. Letters have gone out to local tertiary institutions eliciting speakers; response should be good judging by past years.

The local Branch is also involved in the promotion of a one-day seminar on "Geophysical Techniques in Urban and Industrial Environments", on Friday 15 November. We encourage our membership to attend this timely introduction to a new field of geophysical endeavour.

The NSW Branch Committee has decided to help fund production of a pilot training video on Aeromagnetics with a grant of $2 000 to Macquarie University's Foundation for Geophysical Research.

Scott Gagen
Secretary

Victoria

At the August meeting Dr Richard Smith spoke on methods for displaying EM data. he described a new 'spike' filter which enhances the anomaly. This filter is avaialble from Macquarie University ($250). Funds raised will be used for further research.

The September meeting scheduled for Tuesday 10th, will be held at the Geebung Polo Glub, Auburn Road, Hawthorn. The geophysical aspects of well known wine growing areas with appropriate examples (liquid!).

David Gamble
Secretary

Queensland

A Branch meeting was held in Brisbane in June entitled "Image Processing in Mineral and Petroleum Exploration" and presented by Bob Walker of Geoimage Pty Ltd, a Brisbane-based company providing bureau image processing services to industry and Government. Bob presented a wide range of examples illustrating how image enhancement techniques can be applied to geophysical or other spatial datasets, and showed how interpretation of data can be enhanced by such processing.

The next Branch activity is a wine tasting and dinner to be held at John Robb Cellars, Spring Hill on 16 August.

The next technical meeting is planned for first week of September on the theme of "Groundwater and the Geophysicist", with a presentation by Col Mackie of Mackie Martin & Associates. Visitors to Brisbane are most welcome. Please contact the Branch Secretary for further details.

A membership survey was distributed in June to all Queensland Branch members to identify members' geographic and professional distributions, and to determine priorities for Branch activities. The response to the survey has been good. Details will be collated and summarised in the next newsletter.

A "de-facto" Mt Isa sub-branch has emerged, with a membership of about 10. "Meetings" are held regularly, usually most Friday nights. Dave Tucker and Dave Isles are the co-ordinators of the sub-branch activities.

Voya Kissitch
Secretary

Mount Isa!!

Preview's valiant correspondent in Mount Isa has staggered out of the Irish Club long enough to fax us this important communique:

"Mount Isa, in a dramatic switch of labels, has now become the BLACK HOLE of Mining Geophysics in Australia. Failed equipment is said to disappear into the HOLE at a great rate, never to surface again. Fortunately, equipment drivers are never around when this happens. They are elsewhere quenching their thirst and solving the world's problems.

To meet the drivers and avoid the HOLE, ASEG members are invited to join the Mt Isa Geoscience Group organised and co-ordinated by a maestro of bawdy ballads, Dr K Maiden [(077) 442 867]. Meetings take place once a month on a very informal basis; talkers and listeners are both welcome.

So next time you are passing through Mt Isa, pick up you Honorary Membership card at the Irish Club.

Expect to sponsor a round or two!

Western Australia

Mr Andy Duncan (Aerodata) and Prof. Dan Loewenthal - (Tel Aviv University and currently visiting Curtin University) gave us some food for thought on airborne EM and reverse time migration respectively during our last technical metting. One of the committee (a nameless person) who was a little too eager to get away quickly ended up donating $120 and 5 demerit points for the privilege! (You mustn't do 100 in a 60 zone!).

Thanks to all those people who gave up their time to help out on the booth at the Careers Expo, especially (in no particular order) the committee, Greg Street, Hugh Doyle, Leesa O'Neill, Roger Clifton, and Adrian Young.

Up and Coming

In the near future we'll be organising a couple of Case History Nights. At the moment we have Stuart Robinson (C.E.C.) with a presentation of the Scuddles deposit. If you, or any of your crew, has something that might be of interest to the membership (not necessarily Geophysical - maybe from a Geological or Engineering, or even and Accounting, point of view?) then the committee would love to hear from you. Full confidentiality will be assured if you dob in someone else!

Andie Lambourne
Secretary

Geophysicists at War

Reprinted from The Australian Geologist Newsletter 79, June 1991

In the 1960's my company, Geosurveys of Australia Pty Ltd, was fortunate enough to secure the employment of pioneer geophysicist Dr Wilfred Stackler out of Canada. Forty years previously, Wilfred had been an employee of the famous German Seismos Company, one of the first geophysical contractors in the world. There he had played a significant part in the development of a number of geophysical instruments and survey techniques. These were principally in the field of gravity exploration, but also early seismic technology, something that was to have a remarkable sequel, half a century later, "Down Under" in Australia.

During World War I Wilfred was a young engineer in the German Army at a time when his country was locked in trench warfare in Flanders. Operations had reached a stalemate, and the opposing German and Western Allied Armies were bogged down and literally rotting away in disastrous trench warfare. Advances and retreats repeatedly caused enormous casualties, but neither force was progressing far in either direction. Trenches expanded into underground tunnels, then into bunkers and finally into catacombs. Both armies finally settled into attempting to destroy each other via massive underground demolition of each other's strongholds via explosives.

Hill 63 was one such position. Each side knew of the other's devious preparations, and each sought to trigger first. The doyen of Australian geology, the illustrious Professor T W Edgeworth David, was in charge of the Australian mining engineers tunnelling under the nearby German position. Great chambers were being hacked out and loaded with high explosive.

How to gauge the respective enemy's progress and their whereabouts beneath insignificant Hill 63, presented major imponderables. Consequently as each side clawed its way forward, each developed more sensitive listening devices in order to pin-point indications of each other's activities and positions. So developed the first primitive seismic listening devices. Just as kids hold one open end of a jam tin to their ears and against say a wall to concentrate echos and sounds within, so new listening devices were developed and improved by the opposing engineers. Soon tapping devices were added and used on the walls in quieter times. These sourced sound waves designed to provide reflective energy for further directional and time-distance refinements.

Just how complicated the "mining contest" became is reported in the "Anzac to Amiens" abridged narrative (1948) of CE Bean's "Official History of the Australians in the War of 1914-1918 ." It tells (p351-2)...."of an Australian miner on duty 'listening' on 24th April 1917 in a tunnel of the middle deep system when footsteps approached from the German direction. Thinking that the Germans must have dug through into the same tunnel further on, the listener blew out his light and prepared to act. The steps came very close - and then passed six feet overhead. The German miner was in some old gallery previously unknown to the Australians. They soon afterwards destroyed it. Far above, on the surface, on 9th April 1917, a German raiding party discovered in a British trench a clay of a kind they knew must have come from deep mines. They began to probe for them and were very close to the 'deeps' when Zero Day and Zero Hour arrived.

The remainder of the story is better known. At 3.10am on June 7th 1917, nineteen great explosions tore out immense craters at many places along the Messines Warfront. Hill 63 was literally blown into history as many tens of tons of high explosive blasted off. Another chapter of inhuman warfare had been concluded.

Wilfred Stackler was not amongst the dead or injured and lived eventually to emigrate to Canada and finally to Australia - the country of one of his old enemies. Out of the latter came a much happier twist. In 1965, Wilfred delivered two scientific papers to the Australian Petroleum Exploration Association Conference in Adelaide. On the final evening he was a guest at the conference cocktail party being attended also by an equally respected drilling engineer and Veteran of World War I in the person of John McD Royle. John was a past Chairman of Longreach Oil Company Limited and long a contractor in oil drilling in the Great Artesian (Eromanga) Basin. Knowing that both were old soldiers from the 19-14-1918 war, I introduced them. There were greetings followed by a few questions and then suddenly the two threw their arms wildly around each other. There was a great noisy excitement as the two recounted how each had been an engineer in his respective (enemy) mining corps. Each had once been busy under Hill 63. It was an extraordinary coincidence as the two poured out their early experiences. The two old enemies rekindled old memories and became friends for the remainder of their lives. Incredibly the two had each been tapping out sound waves and recording return echoes in order to locate the other's progress in undermining the infamous hill. Each was a pioneer in the development of reflection seismic exploration and each lived through to better days.

Reg C Sprigg, Earth Sciences History Group Newsletter No 9, 1987.

REFERENCES

Australian Atomic Energy Commission, 1963 - Rum Jungle Project. Australian Atomic Energy Commission.

BMR, 1948 - Radioactive Mineral Deposits. Bureau of Mineral Resources, Australia Pamphlet 3, 25p, with appendices and plates.

GOYDER, G W 1869 - Annual Report of the Surveyor-General of South Australia. South Australian Parliamentary Papers.

S *Needham*,- from Earth Sciences History Group Newsletter No 9, 1987.

Earthquake Prediction

Do electromagnetics have anything to offer?

David V Thiel and Steven G O'Keefe
Radio Science Laboratory, Division of Science and Technology
Griffith University, Nathan, QLD.

Introduction

Earthquakes occur apparently without warning in all parts of the world, not only in earthquake prone areas. While there are countless reports and theories about earthquake percursors, seismic recording remains the principal monitoring technique. Unfortunately, many major earthquakes are preceded by extended periods of seismic inactivity. For example in fault based events, as found at tectonic plate boundaries, the pressure increases over time. In some regions this pressure is released through minor seismic events. In other areas, however, pressure release is not possible until a large earthquake occurs. One example of this situation is the Loma Prieta earthquake which occurred in October 1989 in California. Here the epicentre was 18km below the surface and very close to the San Andreas fault. Increased levels of electromagnetic emission (EM) in the ULF band were observed 5 weeks before the event, (Fraser-Smith et al., 1990). Since 1986 there have been a number of papers describing abnormal EM observations prior to major seismic events. In one case (Yoshino et al., 1985), radio direction finding methods were able to locate the region of the epicentre, although this was calculated after the event. Much of the scientific work before 1989 is summarised in volume 57 of the journal The Physics of Earth and Planetary Interiors (1989). Despite the cautious optimism, there are still some unanswered questions. Researchers still search for an adequate mechanism to explain why such emissions occur at such variety of frequencies (signals from 0.1 Hz to almost 1 MHz have been recorded) and to explain why, in some cases, the radiation is confined to quite narrow bands of the spectrum. Since the early 1970s researchers have been cracking small rock specimens in the laboratory and observing electrical discharges, currents, voltages and radiation in bands from radio to optical. Signal levels are generally small and the emissions irregular. Is it possible that both macroscopic and microscopic observations can be used in a single theory? Positive signs are now emerging.

Laboratory Work

It is possible to observe electromagnetic emissions when a rock specimen is scratched or subjected to compression. These observations can be made even if the material contains no piezoeletric material (Cress et al 1987) and more recently observations have been made in ice (Thiel, 1991). The signal is characterized by discrete events consisting of one or two sinusoidal waveforms and can be correlated with acoustic emission events (Yamada et al., 1989:Thiel, 1991). A single event is thought to correspond to crack formation or step-wise crack extension. The most likely explanation of the electrical activity lies in dislocation generation. In rock the chemical structure is always complex and so it is virtually impossible to ascertain where cracks form. Despite this, it is clear that chemical bonds either between rock grains or through rock grains, are broken. Residual charge from the broken bonds on both sides of the crack is accelerated by the changing voltage across the crack (the result of a changing capacitance) resulting in electrostatic discharge around the crack tip. Thus one can equate a single electromagnetic pulse with the formation of a single crack. This theory is still being actively pursued.

Field Work

Apart from a study of electromagnetic observations over the period before an earthquake, a number of other avenues have been explored; rock fracture during blasting and bore-hole jack experiments. During blasting, three distinct phases of electromagnetic emission can be recorded (O'Keefe & Thiel, 1990). The first can be directly related to the moment of detonation of the explosives in the bore-hole. In multi-hole, sequenced blasting along a rock bench it is possible to identify each hole detonation with an impulsive EM noise sequence. This has been identified with the rock fracture in the immediate vicinity of the hole. Following this there is an extensive period of seemingly random EM pulses which correspond to the falling of rock fragments onto the pit floor.

This correlates well with an acoustic signal received during this time. In the third period and lasting up to minutes after the rock fall, there are periods of quite regular EM pulses. Often the pulse sequence commences with a large pulse and terminates with a large pulse. This sequence of pulse (e.g. see Figure 1) is thought to be the result of individual cracks forming in the intact rock wall behind the blast. The pulse amplitude is thought to relate to the size of the crack which forms. One can therefore identify a major crack spawning a series of minor cracks which generate electromagnetic pulses having a uniform size at constant time intervals. The constant time period between EM events suggests regular subsidiary cracking. This sequence, if monitored some distance away would be recorded as a narrow band emission as was recorded prior to the Loma Prieta earthquake (Thiel & O'Keefe, 1991). One can argue that in this case, there was regular cracking in the region of the epicentre 35 days before the onset of the major quake. The rock material in the vicinity of the epicentre of the Loma Prieta earthquake and at the quarry are unlikely to have significant stratification which might lead to systematic and uniform rock failure. Mechanisms which are likely to result in uniform fracturing like "bookshelf" faulting are therefore not likely explanations of these observations. (In "bookshelf" faulting, a layer of material is sandwiched between two horizontal faults. The movement of the fault planes can result in a regular series of vertical fractures through the material; movement which resembles books in a bookshelf inclined at the same angle).

A series of experiments on a thin ice sheet on a fresh water pond allowed an investigation of this mechanism on a brittle material which was both two dimensional and uniform. A bore hole jack expanded in a 10 cm hole in the ice produced significant ice fracture at quite large distances from the bore hole (Thiel, 1991). Again, regular EM pulses similar to that obtained during quarry experiments were recorded.

One can conclude that, in this case at least, crack extension is the most likely mechanism.

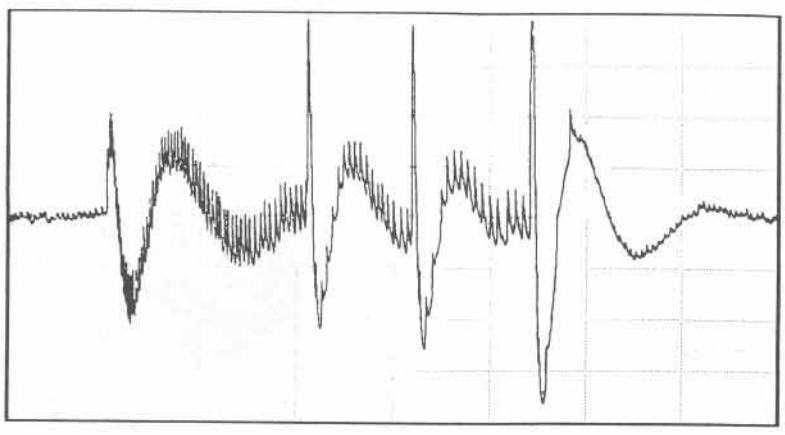

Figure 1: An example of a train of EM pulses received after a blast

Conclusions

The aim of this paper was to point out the current direction of electromagnetic investigations of rock fracture processes as they relate to earthquakes and in particular, earthquake precursors. Clearly, there is still much to be done. Never-the-less this does appear to offer the possibility of not only indicating the likelihood of an oncoming seismic event, but also allowing some determination of the epicentre and the processes which take place in the vicinity of the epicentre. We have not discussed the desirability of such warning systems, particularly if they can be implemented at more than one month before a seismic event. Even the most optimistic will agree that predicting the time of a seismic event by this means is impossible.

Only warnings of a general nature are possible and these can only be made once an area is particularly well understood. In the final analysis this might be unachievable and perhaps an undesirable goal. Despite this, we may gain a better understanding the processes of earthquake formation.

Acknowledgements

This work is currently supported by a grant from the Australian Research Council. The assistance of the Brisbane City Council quarry and the Centre for Cold Ocean Resources Engineering (St John's, Canada) for some assistance with field work is gratefully acknowledged.

References

See page 7.

Good News for Geophysics in Sydney

Ted Bowen
Macquarie University
School of Earth Sciences

For many years there have been attempts to get together a grouping of the geophysical talent from the universities in the Sydney region, notably by the late Laric Hawkins. Finally, success has been achieved with the formation of the Sydney Universities' Consortium of Geology and Geophysics (SUCOGG for short!). The functions of the consortium are to facilitate collaboration in both research and upper level teaching. Already we have been granted $140,000 by the Australian Research Council to build up research equipment infrastructure in the consortium, and plan to spent it on electrical/EM items. Cooperative teaching, in place in some courses for many years, is set to expand. And this is only the beginning. SUCOGG breaks down many old barriers and opens up exciting new opportunities. For example, at the recent ASEG/GSA conference in Sydney, there was a strong plea for a geophysical research institute in the eastern States by David Green in his GSA Presidential Address. We understand that AMIRA is holding discussions along similar lines. Canberra has a program of creating Cooperative Research Centres (CRCs) to encourage the amalgamation of existing groups into larger centres. Clearly there are opportunities here for SUCOGG to further broaden and strengthen its capabilities in Geophysics.

Individually, each of the institutions has bright spots to report. At Macquarie, Dr Friedemann Wenzel, a joint appointee with CSIRO Exploration Geoscience, arrived in September. He came from the seismic research group at Karlsruhe University, probably the strongest in Europe. Friedemann's specialty is seismic data processing, filling a long-belt hole in the Sydney scene. Also, the University has undertaken to maintain the present strength of Geophysics for a five year period, ending an earlier period of uncertainty.

The University of Sydney is soon to finalise the appointment of the Edgeworth David Professor of Geology; the chair has been offered to an eminent marine geoscientist whose research interests should impact significantly on the Department of Geology & Geophysics and its geophysical activities in 1992.

At UNSW, substantial new grants are supporting research into groundwater and environmental problems using geophysical techniques. This is an exciting field which is attracting a great deal of interest here and overseas.

With the acquisition of university status UTS has greatly increased its research activities. Command Petroleum recently donated a substantial amount of Australian seismic data, supplemented by well logs, maps and reports. Access to this material is open to all researchers, and two UTS post-graduates have commenced projects utilizing some of these data. Stand by for further news as it comes to hand.

Earthquake Prediction

(Continued from page 6)

References

Cress, G.O., Brady, B.T., and Rowell, G.A., 1987. Sources of electromagnetic radiation from fractures of rock samples in the laboratory. Geophys. Res. Lett., 14, 331-334

Fraser-Smith, A.C., Bernardi, A., McGill, P.R., Ladd, M.E., Helliwell, R.A., and Villard, O.G. Jr., 1990. Low frequency magnetic field measurements near the epicentre of the Ms 7.1 Loma Prieta earthquake. Geophys. Res. Lett., 17,1456-1468.

O'Keefe, S.G., and Thiel, D.V., 1990. Radio noise monitoring during rock fracture at blast sites. 3rd Int. Symp. Rock Fragmentation by Blasting. Aust. Inst. Min. Met., Brisbane 279-281.

O'Keefe, S.G., and Thiel, D.V., 1991. Electromagnetic emissions during rock blasting. Geophys. Res. Lett., (in press).

Thiel, D.V., and O'Keefe, S.G., 1991. A possible source mechanism for the Loma Prieta earthquake ULF magnetic emission data. Geophys. Res. Let. 1991 (submitted).

Thiel, D.V., 1991. Electromagnetic emissions (EME) from ice crack formation: preliminary observations. J. Cold Regions Sci. & Tech. (submitted).

Yamada I., Masuda, K., and Mitzutani, H., 1989 Electromagnetic and acoustic emission associated with rock fracture. J. Earth & Planet Int. 57, 157-168.

Yoshino, T., Tomizawa, I., and Shibata, T., 1985. The possibility of using direction finding technique to locate earthquake epicentres from electromagnetic precursor radiation. Annales Geophysicae, 3. (6), 727-730.

Western Geophysical Singapore Centre Upgrade

Western Geophysical in its continuing efforts to provide efficient quality seismic processing services has upgraded its Supercomputer facility at the Singapore Data Processing Centre. The current IBM 3090-200E Supercomputer has been replaced by an IBM 3090-400S vector Supercomputer complex. This new machine features 4 CPU's and 4 high speed vector processors. Coupled with the two powerful STAR array processors the new complex offers nearly 650 MFLOPS of power and over 2.6 times the current capacity for seismic data processing. This system is the largest vector computer in Singapore and has more than three times the capacity of any other dedicated seismic processing system in the region.

This processor complex expansion has been accompanied by a similar increase in peripheral updates and upgrades. This includes the upgrading of current disk and tape units, plus the addition of latest technology disk and tape units offering increased speed, efficiency and reliability.

In conjunction with the Singapore Data Centre upgrade will be the installation of a Perth based seismic data processing centre. This centre is linked to the Singapore Supercomputer via a 64kb data link. It will be equipped with the personnel and equipment to provide our Australian clients with state of the art data processing, efficient turnaround of large and small scale 2D and 3D projects, and convenient day to day interaction between clients and Western Geophysical processing Geophysicists.

The Australasia region is on a strong growth path in resource exploration and development. Western Geophysical will continue to upgrade and enhance the data processing capabilities of its regional Singapore centre to keep pace with the requirements and expectation of our regional and world-wide clients.

Scitech
Discovery Centre

Geoscience Exhibit Competition

☆☆☆ **WIN** ☆☆☆

2 cases of premium ASEG Wine

The WA Scitech Discovery Centre has established a Resource Section as a priority area for future exhibits; to place Geoscience and Geophysics within the general community's ambit of experiences. Costs per exhibit start at $10 000 and reach $100 000.

Members are asked to submit ideas with sketches for suitable exhibits incorporating the following criteria:

The exhibit:

- ☞ **must extend knowledge**
- ☞ **should be interesting throughout the age range**
- ☞ **must be more than just a button to push or a read of a didactic panel**
- ☞ **must involve some sort of activity**

Any exhibit created by Scitech for the WA region could be either shipped to other States for use or duplicated under ASEG sponsorship.

A select panel of ASEG members will judge the entries to submit to Scitech.

Closing date for exhibit ideas (with sketches) is 30 September 1991. Entries to be forwarded to:

M Micenko
Hadson Energy Limited
35 Ventnor Avenue
West Perth WA 6005

☆☆☆☆☆☆☆☆☆☆☆

Cryogenic Gravity Gradiometer

Summary of Recent Progress

FJ van Kann, MJ Buckingham, MH Dransfield, C Edwards and R Matthews, Department of Physics, University of WA

(Extract from Technical Report, June 1991)

At the end of 1989, the laboratory prototype gradiometer had successfully demonstrated a noise level of a few Eotvos in a one second bandwidth with a good rejection of linear accelerations and rotational accelerations about the sensitive z axis. This performance, which represented the best ever recorded gradient sensitivity at the bandwidths of interest for airborne resource exploration of any laboratory instrument, was reported in 1990 at the 19th International Conference on Low Temperature Physics (van Kann et al 1990). However, various technical setbacks with thermal and rotational control and some of the superconducting circuit elements prevented the mobile testing of the gradiometer at that time.

The BP Australia-University of Western Australia research contact expired at the end of 1989 and the consequent loss of research staff has significantly slowed the research and development work. Nevertheless, it has proved possible to make substantial progress in identifying and overcoming the technical difficulties. At present, the appropriate modifications are being incorporated into the gradiometer and the construction and assembly phase is well underway. This should be followed by testing of the gradiometer, initially in the laboratory and then in a mobile environment. It should be noted that these mobile tests will be of a rather limited nature due to the lack of an external rotational stabilisation platform. Nevertheless, success in the mobile testing is a crucial landmark in the progress towards testing the gradiometer in an aircraft.

The Gravity Gradiometer for Geophysical Exploration (CGGPP/6 July 1991)

For the last ten years, the gravity gradiometer research team at the University of Western Australia has been developing a cryogenic gravity gradiometer designed specifically for airborne gravity prospecting for minerals and hydrocarbons. It is intended that the gradiometer ultimately be used in a light aircraft in a manner similar to aeromagnetic surveying. The aim is to make possible rapid and high resolution airborne gravity surveys for regional mapping as well as for direct target detection.

Work on the instrumentation has reached the stage where we believe it has become important to keep the exploration industry informed of our progress so that we can receive input and support from the eventual beneficiaries of the research and development. To this end we have already formed, for example, an association with Aerodata Holdings and their subsidiaries World Geoscience, Aerodata and Austirex in Australia and Questor and BGM in North America. This has already been valuable in establishing directions and goals for the ongoing development.

We are also looking at the interpretation aspect of gravity gradient data and at modelling and simulation studies. Some of our early work in this field was presented at the 8th Australian Society of Exploration Geophysicists Conference and Exhibition in February of this year[1]. A more technical paper[2] was presented in August 1990 at an international conference and published in Physica B volumes 165 & 166.

We are presently reconfiguring and improving some aspects of the prototype instrument with the aim of making mobile land-based measurements later this year. This programme of tests will provide useful information required for the development of the first field instrument and serve to demonstrate the capabilities of the prototype. The approach of these landmark tests of the gravity gradiometer make it important that we broaden our level of contact with industry. Consequently, we would appreciate hearing from all those who may have an interest in the project or who wish to be kept informed of progress.

[1] *Dransfield, M.H., Buckingham, M.J., Edwards, C., Mann, A.G., Matthews, R., Turner, P.J., van Kann, F.J., (1991). 'Gravity Gradiometry for Geophysical Prospecting'. Explor. Geophys., 22, 107-110*

[2] *van Kann, F.J., Buckingham, M.J., Dransfield, M.H., Edwards, C., Mann, A.G., Matthews, R., Penny, R.D., Turner, P.J., (1990). 'Laboratory tests of a mobile superconducting gravity gradiometer'. Proceedings of the 19th International Conference on Low Temperature Physics, Physica B, 165 & 166, 93-94, North Holland.*

Geophysics Unit Wins International Conference Award

Reprinted from the NSW Roads and Traffic Authority News

The hard work and dedication of members of the Road Traffic Authority's Geophysics Unit (which is part of the Geotechnical Group of the Materials Services Section at Milsons Point) were rewarded at a recent international geophysical conference.

Chris Walker, Manager of the Geophysics Unit, together with Scientific Officers Tak Ming Leung and Maung Aung Win and consultant Bob Whiteley, won the award for best poster paper at the conference against the best Australian and overseas competition from industry, academia and other government bodies.

The paper, entitled "Engineering Seismic Refraction: An Improved Field Practice and a New Interpretation Program, REFRACT" was presented at the joint Australian Society of Exploration Geophysicists 8th Conference and Exhibition and the Geological Society of Australia Exploration Symposium held at the Darling Harbour Conference Centre.

The paper was the culmination of three years of development by the Geophysics Unit to the point where it now leads engineering seismic refraction practice in Australia and probably the world. Advances have been made *across the board* from field practice and equipment through to interpretation practice and software development so that a high quality, efficient seismic service is now offered.

Seismic refraction surveys are conducted by the Geophysics Unit throughout NSW. The method aids in geological correlation and geotechnical design problems. For example, it is a major aid in estimating bulldozer rippability for the excavation of road cuttings.

The conference paper, which espoused the Geophysics Unit's field practice and newly-developed interpretation software, REFRACT, attracted the interest of Australian and overseas delegates. The REFRACT program, which was demonstrated on computer, received many buyer enquiries and the strong interest of one geophysical equipment manufacturer with a view to including the software in its seismographs. Initial sales of REFRACT are expected within six months.

Apart from the award, perhaps the most gratifying moments during and after the conference were the congratulations and acknowledgements of peers in the seismic refraction industry. These brought home to the members of the Geophysics Unit the excellence of their work and were satisfying rewards for their dedication and innovations over the past three years.

ASEG Research Foundation

The ASEG Research Foundation (ASEGRF) formally commenced its function in September, 1989. The aim of the Foundation is to support research into exploration geophysics via approved research projects at B.Sc.Hons. and M.Sc. level in Australian tertiary institutions.

As a result of donations from companies and individuals the ASEGRF has established a base from which to fund projects. Currently the ASEGRF is supporting group research projects at four different Universities, three at BSc (Hons) level and one at MSc level. Three of the projects focus on mining geophysics and one on petroleum geophysics.

Institutions are now being requested to nominate appropriate projects for consideration by the ASEGRF. These projects may cover any aspect of exploration geophysics and should have an applied objective. Subcommittees for mining geophysics and petroleum geophysics have been established and will be responsible to review projects in their relevant field and make recommendations to the ASEG Research Foundation Committee.

The guidelines for the research grants as well as key questions that must be addressed by researchers can be found on page 16. *Deadline for nominations is 31 October, 1991.* Proposals should include a brief outline of the project, the purpose for which funds are required and details of other funding available to the project. The key questions outlined in the enclosed guidelines must be addressed.

Your early nomination will assist us in selecting suitable projects for support in 1992. Notification of results will be made by 20 December, 1991. Please ensure that colleagues in your department are made aware of this notice. Nominations should be forwarded to:

Joe Cucuzza, Secretary
ASEG Research Foundation
c/- AMIRA
9th floor, 128 Exhibition St
MELBOURNE VIC 3000

ASEG RESEARCH FOUNDATION

Post to: Treasurer, ASEG Research Foundation, N Hungerford, Billiton Australia, PO Box 872K, Melbourne Vic 3001

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Letters

ASEG Federal President

Dear Dr Uren

Many ASEG members are members of the Australian Institute of Geoscientists (AIG). Geophysicists are represented on the AIG Federal Council and are the state representatives in Victoria and Tasmania. The AIG emphasises care for the interests of individual Geoscientists rather than for the interests of corporate entities such as petroleum and mining companies.

Recently the AIG was advised by the Australian Stock Exchange (ASX) that it had been granted accreditation for the purposes of the Listing Rules. The amendment formalising this decision will come into effect in the third quarter of 1991. To date only members of the Aus.IMM have been accredited.

The NSW Branch of the ASEG has discussed the matter of encouraging members of the ASEG who are not already Aus.IMM members to consider joining the AIG so that they can gain accreditation with the ASX for reporting purposes. We favour such support for the AIG but believe that it is more appropriate for the ASEG Federal Executive Committee to undertake Australia-wide support.

The AIG Perth Branch is preparing a newsletter with information on the impending ASX accreditation. We suggest that this information might be incorporated in a future edition of Preview. We understand that the AIG will contact you directly seeking circulation of AIG material.

Yours sincerely
Scott Gagen
Secretary ASEG NSW Branch

Dear Editors:

The SEG Geophysical Activity Report is often quoted as evidence that something in the region of 95 percent of all exploration expenditure is for petroleum, and that mining, engineering, and other geophysical exploration accounts for the remaining 5 percent or less.

From my experience as a member of the SEG Activities Committee, I feel that these results may have some distortion in them, related to the gathering of the data. For some unknown reason, there would appear to be a much greater reluctance on the part of mining companies and contractors to respond to the SEG questionnaire than is true of petroleum companies and contractors. In any case, petroleum contractors are generally much larger than mining contractors and only a few are necessary to report most of their activity. At least in Australia, I'm certain that there is more expenditure on mineral exploration than is represented by the report. In other words, I would question whether the percentage for mining and other exploration is really as low as 5 percent here.

On another issue, often this statistic of 95 percent is used to somehow indicate the greater importance of petroleum exploration, whereas it may simply reflect the greater relative expense of the seismic method, which accounts for 98 percent of petroleum exploration. As there is a great variation in the costs of different methods, expenditure can't be used to indicate activity necessarily.

Roger Henderson
Ramsgate, Australia

Previews Comment:

Come on Roger, you must know very well the answer to "..... for some unknown reason .....". It's simple: REAL GEOPHYSICISTS NEVER FILL OUT FORMS, NEVER ANSWER QUESTIONNAIRES.

That one ought to spark of a bit of a debate!

The Editor
Dear Ms Heath

Geophysical Museum Pieces

I have been tardy in writing this letter which is prompted by Greg Street's contribution on "Geophysical Museum Pieces" in Preview, Dec 1990, Issue 29, and a later letter from John M Stanley on the same subject in Preview, Feb 91, Issue 30.

The Bureau of Mineral Resources. from the 1950s until at least 1983 when I retired, had put aside geophysical equipment for use in a future earth sciences museum. In 1986 this extensive collection was formally handed over to the Museum of Australia. Most of it is in storage in a Commonwealth Government store (DOLGAS) at Oaklands, near Albury NSW, where storage conditions are good but not ideal.

A very detailed report on the earlier equipment was written by Dr Peter Sydenham and an article published in the BMR Journal of Australian Geology and Geophysics, Vol 1, 1978, pps 241-248. In 1985 I wrote some notes on the significance of the collection of the Museum of Australia and included comments on equipment not seen by Dr Sydenham. Perhaps some idea of the scope of the collection will be of interest to ASEG members.

The earliest item is the dip circle used by Professor Sir Douglas Mawson in the Antarctic, then sound ranging equipment used in World War 1 and early geophysical observatory equipment made by the Carnegie Institute of Washington (established in WA in 1919), the Schmidt magnetic balances used in the Imperial Geophysical Experimental Survey in Australia in 1929-1930, and the Aerial and Geological and Geophysical Survey of Northern Australia, 1935-1940, Oertling gradiometers, Holweck De-Jay inverted pendulums (ex Shell Development Pty Ltd) Thyssen gravity meter (ex Shell), chronometers, and a representative range of equipment from the post World War II metric exploration and assaying equipment (much Australian made), ground and airborne metals exploration equipment and seismic equipment including the Heiland geophones from the first (1948) reflection seismic system in Australia.

Recently, there has been a revival of interest in the Museum of Australia. If their present extensive site can be retained at Yarramundi Reach on the shores of Lake Burley Griffen, there should be ample room for a comprehensive earth sciences building. However, the Museum of Australia has a low political priority in these difficult economic times and much public pressure will be needed before any significant advance is likely to be made towards an establishment worthy of the name. Nevertheless, many of us who have seen much of the growth and contribution of the earth sciences in Australia still hope to see it in our lifetime.

Yours sincerely
MAX ALLEN
ACT Branch

Membership

New Members

The following new members' details need to be added to the relevant State Branch database:

New South Wales

BEST, P.W.	Active	
COLLIS, G.D.	Associate	Delta Gold

Queensland

BARR, T.M.	Associate	Oil Company of Aust.

Victoria

MITCHELMORE, L.	Active	BHP Petroleum

Western Australia

COLE, A.G.	Student	Curtin University
LAMONT, M.G.	Student	Curtin University
LONG, A.S.	Associate	Simon Horizon

Where Are They???

Does anyone have the new address for any of the following members:

Mr P R GOURLAY formerly of Tasmania
Mr J L SEARA formerly of West Germany
Mr D A Rompotes formerly of Victoria
Mr P MILLS formerly of Botswana
Mr R J TAYLOR formerly of Adelaide

Change of Address

E R ALLISON
To: Sarawak Shell Berhad
Locked Bag No. 1
98009 Miri Sarawak
MALAYSIA

STEPHEN AUFDERHIDE
To: 206 Brodie Road
MORPHETTVALE SA 5162

RICHARD BENNETT
From: Quadrant Geophysics
PO Box 334
Northbridge NSW
To: Box 5718 Mail Centre
TOWNSVILLE QLD 4810

CRAIG BLUNDELL
To: BHP Research
Melbourne Laboratories
PO Box 264
CLAYTON VIC 3168

CAMERON BLYTH
From: 11 Preston St
Como WA
To: 3 The Bulwark
WILLETTON WA 6155

P J CHAMBERS
From: U5/116 Angelo St
South Perth WA
To: Lot 18, Tapper Road
BANJUP WA 6164

A CHESHIRE
From: PO Box 710
Byron Bay NSW
To: PO Box 720
BYRON BAY NSW 2481

JOE CUCUZZA
To: 9th floor
128 Exhibition Street
MELBOURNE VIC 3000

BEVAN DOCKERY
To: PO Box 1270
SUBIACO WA 6008

D R EYLES
To: 88 Westmore Drive
WEST PENNANT HILLS NSW 2125

KERRY GALLAGHER
From: La Trobe University
Bundoora VIC 3083
To: Fisscon Track Research Group
Dpt of Geological Science
University College of London
Gower St
LONDON WC1E 6BT ENGLAND

MICHAEL GILES
From: 46 Ardessie St
Ardross WA
To: Tensor Pacific
283 Normanby Road
PORT MELBOURNE VIC 3207

BOB GRAEBNER
From: GSI
PO Box 655621
Dallas Texas USA
To: Halliburtn Geophysical Services
PO Box 819052, MS 2-A-111
Dallas, TEXAS 75381 USA

LAURENCE HANSEN
From: 115 Doveridge Drive
Duncraig WA
To: 16 Gairloch Place
JOONDALUP WA 6027

ROSEMARY HEGARTY
To: PO Box 322
WEST PERTH WA 6005

DAVID W LAPPI
To: Lapp Resource
4900 Sportsman Drive
Anchorage Alaska
USA 99502-4169

ANDREW LEWIS
From: 38 Winnall St
Clapham SA
To: 4/4 Antis Street
PHILLIP ACT 2606

CHRIS LUXTON
To: 21 Highland Avenue
MITCHAM VIC 3132

STEVEN MACKIE
From: Questa Australia
46 Fullarton Rd
Norwood SA
To: Geosim Ltd
5/29 Bulteel St
New Plymouth
NEW ZEALAND

JAMES MACNAE
From: 115 Grant Timmins Drive
Kingston Ontario Canada
To: Lamontagne Geophysics Pty Ltd
4A Whiting Street
ARTARMON NSW 2064

RON PALMER
To: Stockdale Prospecting
PO Box 3152
DARWIN NT 0801

J SCRIMSHAW Previously J PRITCHARD
To: Woodside Petroleum
1 Adelaide Terrace
PERTH WA 6000

MICHAEL SZCZEPANIAK
From: 50 Pangeza St
Stafford Hts QLD
To: 100 Cross Road
HIGHGATE SA 5063

RAYMOND TEAKLE
From: 78 Queen St
Norwood SA
To: 3 John Street
NORWOOD SA 5067

GRANT THOMAS
To: CRA Exploration Pty Ltd
PO Box 1559
MOUNT ISA QLD 4825

EDWARD TYNE
From: NSW Geological Survey
GPO Box 5288
Sydney NSW
To: NSW Geological Survey
GPO Box 536
ST LEONARDS NSW 2065

ROBERT WHITE
From: Surtec Geosurveys Pty Ltd
207 Tooronga Rd
Terrey Hills NSW 2084
To: Tooronga Resources Pty Ltd
Same address

DAVID WILSON
From: Pancontinental Mining
1 Macquarie Place
Sydney NSW 200
To: Newcrest Mining Ltd
179 Great Eastern Highway
BELMONT WA 6104

SHANE WRIGHT
From: 60 William St, Redfern
To: U7/142 Beach St
COOGEE NSW 2034

M E YOUNG
To: Pontwgan Mill
Caerhun Conwy
Gwynedd LL32 8TD
UNITED KINGDOM