Australian
Society of
Exploration
Geophysicists
ACN 008 876 040

Preview

August 1996

Issue No. 63

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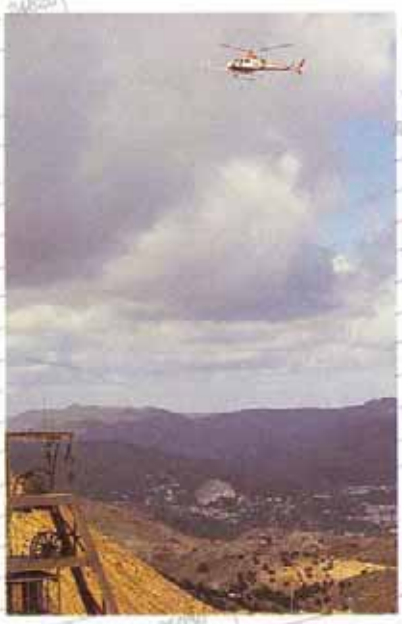

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PREVIEW ADVERTISING RATES (PER ISSUE): B&W
Business Card $30, ¼ pg. $70, ½ pg. $100, Full pg. $200
Colour Full pg. $1100. Advertisements accompanied by Colour
Review articles are $1500.

Print Post Approved - PP3272687 / 0052, PREVIEW is a publication of the Australian Society of Exploration Geophysicists, circulated to a membership of approximately 1350.

Artwork and Printing by Jenkin Buxton Printers Pty Ltd

Editor's Desk

Twenty-five years

As a Society we are officially twenty-five years old this year and have been a bit slow off the mark in making a suitable response to this milestone in our history. Your editor has been detailed to set the ball rolling and, accordingly, is seeking contributions from the membership, especially senior members, for a commemorative issue of Preview in December. State Branches have been alerted and will be cajoling at the local level for "good copy". A few details of our history are presented on p.21 for your interest and to help jog memories of potential contributors. If any of you know of senior members (or ex-members who may not be reading this) who might have interesting memories of our birth and growth please let them know that their contributions will be very much appreciated.

Membership List

Our new membership list is published soon for distribution with the October Preview. It is time to remind members that the concept of "address" has changed significantly in the past few years and that the change is gathering pace. The e-mail address is now commonplace and becoming more important as an avenue of communication so members are encouraged to supply same (if they have one) to Janine Cross at our Melbourne secretariat for inclusion in the new Membership List. Entries this year will include name (with appropriate title such as Dr. Mr. Mrs. Ms.), company affiliation, street or postal address and one 'phone number, one fax number and one e-mail address if applicable. Following previous practice first names (if supplied) rather than initials are used with the family name.

Membership Survey

Full results of the Membership Survey conducted during the last membership round are published in this issue. We owe thanks to Geoff Pettifer and Ciarin Lavin for their huge effort in collating and reporting on the results. Those interested in the more detailed fabric of our Society will find it an informative article. There are messages in it for your editor which he will endeavour to act upon for a more interesting Preview.

Mike Shalley, Editor

President's Piece

Conference Time

This year I was lucky enough to attend the APPEA conference in Darwin, the OTHER conference for petroleum geophysicists. Darwin is not the place for pomp and circumstance and this was no doubt the most relaxed APPEA I have attended.

There seemed to be an increasing number of familiar faces in the crowd, survivors after ten years of depressed prices. No doubt the statistics will prove me wrong but those faces, on average, seem to be getting older. One speaker gladdened the heart of the greybeards by reminding us that, in our rush to embrace new technology, we sometimes forget the basics. It's always comforting to know that some old bits of wisdom are still relevant even though there is never an icon for them in the software.

Certainly I have seen examples of over application of technology. My company participated in a 3D survey even though there was no expectation of a reservoir. But generally, new technologies have enabled us to reduce risk in spectacular fashion, to identify and map with confidence prospects that simply could not be seen before. In a sense, exploration technology is leading development technology and our engineers are telling us that it is all well and good to find these prospects but, unfortunately, they are too small to be exploited.

Emerging technologies and their applications are a recurring theme at ASEG conferences. I believe that our conferences and exhibitions are THE best venues to showcase or become exposed to them. Our focus on the sharp end of exploration means that employers are more inclined to send front line workers (as well as greybeards) to an ASEG conference and I heartily endorse this view. Our conference volumes of Exploration Geophysics are becoming collectors' items. Even my geological colleagues find them useful.

With the last issue of *Preview* you received the registration form for our 12th Conference and Exhibition. We are looking forward to an exciting event so start those registrations rolling.

On historical matters, Andrew Mutton reminded the Federal Executive that our 25th Anniversary as a Society seemed to pass without notice, so Mike Shalley is co-ordinating an effort to rectify that. I encourage any of you who are interested, and particularly our senior members, to contact the editor if you have anything to contribute in the way of text or ideas. This will be a group effort (see editorial).

Henk van Paridon
ASEG President

Calendar Clips

October 21-24 1996
3rd Cuban Symposium of Geophysics/Meeting of the Latin American Union of Geophysicists.

October 21-23 1996
SEG of Japan, 95th Conference Kyoto University Japan

October 25 1996
Kalgoorlie Goldfields Expo, Organised by AGSO and the Geological survey of WA

November 10-15 1996
SEG Annual Meeting (see advert. p.35)

December 18-20 1996
33rd Annual Convention & Meeting on Geophysical Instrumentation

February 3-5 1997
Karlsruhe Workshop on Amplitude-preserving Seismic Reflection Imaging sponsored by SEG

February 23-27 1997
12th ASEG Conference & Exhibition (see advert. p.13)

(Details and more events on Pages 41, 42)

Preview - Next issue

- *ASEG Membership List*
- *Feature Article – Developments in Seismic Applications*
- *Excitations – Multi-parameter Borehole Surveying*
- *SP, IP and Black Shale – Historical notes*

Executive Brief

The upcoming Sydney conference and the future of ASEG publications are the dominant items on the agenda at meetings of the Federal Executive.

Sydney Conference

The Sydney conference organisation is well under way with several booths sold and an excellent response to sponsorship. The Registration Brochure with Provisional Programme was distributed in the last edition of Preview. You can read more about the progress of the conference on p.12 and in Mark Russell's NSW Branch News (p.8). See also the conference advertisement on p.13.

Publications

The Publications Review Committee (a sub-committee of the Federal Executive) has begun a thorough investigation of the actual costs of and revenue from publications. This process will continue over the next few weeks during which there will be wider consultation, particularly with the Conference Organising Committee, with the objective of establishing a fair distribution of the cost burdens.

Advertising is a significant source of revenue but requires a lot of effort to maintain. With three essentially different publications (four if we include the Membership List) the attracting and coordinating of advertising is a problem which needs to be addressed now. As a first step we will bring all ASEG advertising under a single umbrella so that advertisers and potential advertisers will have a single point of call. Janine Cross at the secretariat has agreed to handle that. Previously Geoff Dickson handled advertising for Exploration Geophysics and we thank him for his sustained effort in that field.

New Membership

Membership is growing steadily and it was particularly good to see twenty-one student members join in the last month.

Preview

A smooth transition has been made in transferring the editing job of Preview to Brisbane. Congratulations to Mike Shalley for continuing the excellent standard of this publication.

Robyn Scott
ASEG Federal Secretary

ASEG People Profiles: The New Federal Executive

In this issue we introduce First Vice President - Steve Hearn, Committee Member assisting the Treasurer - Peter Hatherly and Second Vice President - Wayne Stanisowsky.

First Vice President,

Steve Hearn

Steve Hearn grew up in Queensland country towns, developing an affinity for relaxed rural attitudes and outdoor lifestyles. At the University of Queensland he was taught by the legendary UQ team of Sydney Hall and the late Jack Webb. He did a Ph.D. under the latter from whom he absorbed a broad range of seismological knowledge. Whilst studying he developed an enduring interest in computational geophysics. He earned extra cash doing a memorable variety of contract field work throughout Australia.

Steve emerged from uni into the early 80s seismic boom and joined Seiscom Delta just in time to help wheel the Megaseis into their new Brisbane centre. Subsequently he consulted to Seiscom's Melbourne operation, and also paid numerous sleepless visits to their Central Australian crews, helping to keep the in-field Megaseis functional. He spent two years with Velocity Data, mainly writing the initial version of the Velseis processing system, with occasional relief provided by excursions to the desert to record VSP's, and test prototypes of VD's weight-drop uphole system.

He returned to UQ in 1987 to lecture in exploration geophysics, motivated primarily by a desire to help preserve a broadly based, high quality degree in applied geophysics at that university. He has reaped enormous satisfaction from contributing to the education of numerous students of geophysics and geology, eventually seeing them making their mark in industry. Recently he converted to a fractional appointment at UQ, and currently also works with Digicon Brisbane. He is interested in all aspects of seismic exploration, with current foci being multi-component techniques and exploitation of emerging computer technology.

Steve has served on the Queensland Executive of ASEG, and was chairman of the Technical Papers Committee for the 1992 Gold Coast conference. Away from work he unwinds by keeping up with two young daughters and he enjoys music.

Committee Member assisting the Treasurer, Peter Hatherly

Peter Hatherly holds a BSc(Hons) from the University of Sydney (1975) and a PhD from Macquarie University (1983). The PhD was undertaken through part-time studies while working mainly as an engineering geophysicist with the Geological Survey of NSW. Most of that work was with Derecke Palmer and involved seismic refraction surveys and the development of processing and modelling procedures for the generalised reciprocal method.

In 1983 he moved to Australian Coal Industry Research Laboratories where he worked until 1993 on developing techniques and applications in coal mining for a wide range of geophysical methods. With Iain Mason and Stewart Greenhalgh, in-seam seismic methods for detecting coal seam disruptions were developed for Australian conditions. 3D seismic methods were successfully trialed with the assistance of Brian Evans and Curtin University, and the borehole capability of the radio imaging method (RIM) was developed by Larry Stolarczyk with assistance from Keeva Vozoff and Macquarie University, and Glynn Rogers of CSIRO Division of Radiophysics.

Peter moved to CSIRO Division of Exploration and Mining in Brisbane in 1993 and has established a fruitful relationship with AMIRA and the CRC for Mining Technology and Equipment. Major new initiatives in which he has played a key role with AMIRA include extensive trials of geophysical logging and imaging methods in underground metalliferous mines, the development of geophysical sensors for guiding directional drilling systems, and the use of seismic monitoring techniques to map the ground caving processes which accompany mining and need to occur in, at least, a predictable manner.

Peter is committed to bringing geophysics into mining and sees it's potential to have a major impact on the safety and profitability of mining operations. His work faces many challenges - technical, cultural and managerial. It is still a new application for geophysics and, while it is encouraging that more companies are starting to look more seriously at using geophysics in their mines, there is still much to be done.

The geophysics community also needs to be made more aware of the role they could be playing. Peter's presence on the Federal Executive may help bring this about. He holds honorary positions at Curtin and Macquarie Universities and has supervised a number of Masters and PhD students. He has been a member of ASEG since 1973 and is also an active member of SEG and EAEG.

Second Vice President, Wayne Stasinowsky

Wayne is currently the Federal ASEG Second Vice-President. His duties involve overseeing conference organising committees and liaising with the Conference Adviser Committee of which he is also a member. Wayne has been involved with organising the last Brisbane conference in 1992. He was also Queensland Branch Vice-President in 1992 and Queensland President in 1993 and 1994.

Wayne is currently employed by BHP Minerals Exploration and based in Brisbane. His current role involves liaison with BHP's Research activities and is likely to involve a fair amount of travel to BHP's centres around the world.

In 1981, Wayne gained an Applied BSc in Geophysics with honours from the University of Queensland. He also completed a Graduate Diploma in Computing Science from Queensland University of Technology in 1991.

BHP first employed Wayne prior to completing his honours in 1980. He remained with the company for eight years, working in Newcastle with their Coal Development Group, in Brisbane with Minerals Exploration as a Project Geophysicist on their Mt Isa programme and with BHP Engineering in Brisbane and Wollongong as a Geophysicist with their Geotechnical consulting services.

In 1989, Wayne decided to form his own consulting company called Mining Geophysics. He used this to work mainly in coal geophysics, helping to establish high resolution seismic and detailed aeromagnetics as techniques which underground coal mines could use to help detect structures and hazards ahead of mining.

Wayne was convinced to rejoin BHP Minerals Exploration in 1995, working in the Mt Isa block before taking his current position.

Wayne feels the ASEG is a great asset to Australian geophysicists and wants to help with its organisation. He feels that his broad range of experiences in seismic, coal and minerals geophysics, as well as consulting and working for a large company, can help him relate to many ASEG members.

ASEG Branch News

Victoria, May-August

The Victorian State Branch is alive and well after a period of dormancy following the AGM of April 30th. We express our thanks to former President Jim Cull and the outgoing committee for their work. A new, enthusiastic committee has been elected and we look forward to a year with the promise of an interesting speaker and social program. The new committee is:

President: Geoff Pettifer, Geo-Eng
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email: geoffp@geo-eng.com.au

Vice-President: Paul McDonald, MPV
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email: mcdonaldp@wizza.agvic.gov.au

Secretary: David Gamble, Acacia
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email: dga@acacia.com.au

Treasurer: Andrew Barrett, Consultant
Tel: (03) 9803 9916, Fax: (03) 9888 7980

Committee Members:

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Trevor Lobo, Tel: (03) 9799 2192

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Peter Smith, Arrow Consult
Tel: (03) 9288 0333, Fax: (03) 9288 0333
email: pcsmith@ozemail.oz.au

Ideas for meetings include an industry night, a student night (followed by a BBQ), a wine tasting/dinner, joint meetings with PESA, GSA, IAH and AusIMM and "show and tell" meetings at the Geological Survey and the Universities. Watch this space! The committee have also budgeted for two speakers to visit from interstate. We are interested to hear from other Branches of impending speakers so that we may improve our speaker program.

We can also improve our meetings with the help of Victorian State Branch members, who are encouraged to contact Ron Palmer or Ciaran Lavin if they know of any prominent people, coming to Melbourne, who may be available to speak to the local Branch.

The other major event for the State Branch is the preparation for the 13th ASEG Geophysical Conference and Exhibition in the Spring of 1998, to be held either in Melbourne or possibly in Hobart, but organised from Melbourne, with the Tasmanian Branch members help. The jury is still out on this one but a decision is to be made soon. The nucleus of a Conference Organising Committee, consisting of Mike Asten, Suzanne Haydon, Ciaran Lavin, Ron Palmer and Shanti Rajagopalan met for the first time on August 26. We are keen for others to join the COC. A letter is going out to Branch members soon seeking expressions of interest.

If members have any ideas or comments to help the Branch revitalise itself, please contact any of the committee members. We are also keen to have a student(s) representation on the Branch Committee. Any one interested?

Geoff Pettifer
President

New South Wales

"Digging deeper beyond the dirt!"

Plenty of activity since last we wrote. Is it that things seems to be getting busier all the time or is it just the onset of thirty-something?!?! Anyhow, hope last issue's news wasn't too much guff if you read it, if not, shame on you!

The 1997 Conference Committee is in full swing and heading down the main straight as this issue comes to you. You will see advertisements in this issue and you should have received your copy of the Registration Booklet with the last issue. Pretty impressive, even if I say so myself, so don't get left behind and come along to your Olympic City in Feb '97.

By now you'll have guessed that I'm on the committee, actually mostly for Publicity, but also for the 2nd ASEG Student's Day, so if you're keen to act as a volunteer tour guide for a small group of students for about an hour during the Sydney Conference on Wednesday Feb 26, 1997, let me know. Trust me, it's a heap of fun!

The technical program since April has been:

May 1996: "Single Pass Multi-Sensor Airborne Surveying Using The Dighem System", by Steve Kilty, Geoterrex Pty Limited. The use of single pass multi-sensor surveys has become more common within the last three years because of improvements in electronic and mechanical designs. In the past, the primary limitation was the high cost of such surveys, caused by the need to use large, powerful and expensive helicopters. However, significant weight reductions have been achieved recently through the use of composite fibre technology for electromagnetic sensors and through LSI miniaturisation of the electronic consoles. These reductions in weight and size have allowed multi-sensor systems to be installed into single engine light turbine helicopters, resulting in a

halving of operating costs. Unfortunately, the weights of radiometric sensors have not shown similar reductions. The high data density obtained with the typically 4 metre sample intervals with multi-sensor surveys provides improved mapping and often direct detection of mineralisation. Furthermore, the seven measured parameters (4 EM, 1 magnetic, and 2 radiometric) produce useful results in most areas, where one parameter may not.

June 1996: "3D Pre-stack Time Migration, An Application to The Ravva 3D Seismic Data Set, Offshore India", by Jim Montalbetti & Leigh Brooks, Avalon Exploration Consultants & Command Petroleum Limited.

Good to see the Petroleum Sector in Sydney still bulldozing its way through seismic data - entertaining and informative.

July 1996: Annual Yuletide Dinner - Nigel Jones agreed yet again to organise this most successful of events for July. After perusing his copy of "The Cheap Eats of Sydney", we got the jump on next year's ASEG Conference Theme of 'Asia-Pacific Exploration' by partying at the "Kampung Malaysian" just down from Central Station.

A very pleasurable evening ensued, getting some mid-winter fire in our bellies and some good reds in our heads (could it have been some ASEG stock???!!!)

August 1996: "Continuity Processing of the Ravva 3D Seismic Survey, India", by Bala Kunjan, Command Petroleum Limited. Yikes! Two technical talks in a row from Command Petroleum, they must really be setting the standard for hard labour! (Keep it up).

General News of some of our Members:

The "Every Crowd Has A Silver Lining" Department: It is a great pleasure to announce that two of our branch members have gone silver. They are Anna Challis and Steve Greaves. Both of these members have received Silver Certificates from the SEG in recognition of twenty-five years of continuous membership.

The Multi-Talented, Multi-Tasking, Multiplexing Michael: A career change, but of a more unusual nature, has been made by Mike Smith. He is currently multiplexing between exploration management at Auspac Gold and airborne marketing at Geo Instruments. Mike will sustain essential contacts with joint venture partners and landowners on behalf of Auspac Gold in its international exploration activities. At Geo Instruments, he brings his knowledge of the broad range of requirements of exploration companies to the marketing of high quality specialist geophysical services.

Prodigal Son Returns! The Co-operative Research Centre for Australian Mineral Exploration Technologies (CRCAMET) is delighted to announce that Dr Brian Spies has been appointed Director of the Centre, replacing Andy Green, who has stepped down for personal reasons. Brian's appointment comes at an exciting time for the CRC, as the current research projects near completion, and the challenges of geophysical education and research for Australia beyond the current term of the CRC need to be addressed.

Brian is a graduate of the University of New South Wales, (which was nominated as the best university in Australia by the Good Universities Guide), and he is reputed to have spent some time at Macquarie University obtaining his doctorate. He returns to his native Australia after 17 years in the USA where he was prominent both in scientific research in mineral and petroleum exploration, and through his major contributions to the Society of Exploration Geophysicists and other geophysical societies. He is also the new SEG Secretary-Treasurer from the next SEG meeting in Denver. Brian, his wife Pamela, and two daughters Alexandra and Anna (who have temporary Texan accents!), are looking forward to life in Sydney.

Geo Instrument's 10th Birthday Celebrations:

August 1 marks a decade of dedication to geophysics from the Geo Instruments crew. Congratulations to Roger (The Godfather) Henderson et al on 10 years of happy (sic) times together.

Mark Russell
Branch Secretary

South Australia

June - August 1996

June/July:

An Industry Update Evening was held at Santos. Our thanks go to Schlumberger-GeoQuest for their sponsorship of this successful event. The speakers represented a diverse range of companies which utilise geophysics, including Schlumberger-GeoQuest, Santos, Boral Energy, MIM Exploration, Pitt Research and Dynamic Satellite Surveys. The diversity of speakers made for both an interesting and informative evening.

August:

Jim Applegate gave an interesting presentation on Environmental Geophysics, giving greater breadth to our understanding of the application of geophysics in Australia.

Samanda Bell,
Branch Secretary

Photograph next page

South Australian Branch Presidents: B.R:. Rod Lovibond, John Hughes, Jim Allender, Craig Gumley, Terry Crabb, Reg Nelson.F.R.: Andy Megee, Rod Hollingsworth, Ken Seedsman. Absent: Kim Francombe, Nick Sheard.

Western Australia

Technical News

Our Technical meeting of July 17, 1996 was very well attended. Talks were presented by Peter Williams of Etheridge, Henley and Williams on "Techniques of aeromagnetic interpretation from a geologist's perspective" and by Geoff Smith of Woodside Petroleum on "Laminaria - A new Timor Sea Discovery".

At the Technical Meeting of August 21 1996, James Crowley of Apache Energy will give a talk on "The Stag Oilfield" and Andrew Long will describe a structural interpretation of the Perth Basin. A future talk will discuss CRA's Honeymoon Well nickel deposit. Students' Night is scheduled for October.

People News

Professor Howard Johnson from Imperial College, London, is the 1996 Esso Distinguished Lecturer; he will present the workshop "Essentials of Reservoir Geology for Improved Oil Recovery" in Perth on August 29.

David Abbott of Tesla-10 is pressing ahead with the organisation of the joint ASEG and PESA Golf Day on November 29 at the Araluen Country Club.

Andre Lebel
Branch Secretary

Conferences

The Australian Society of Exploration Geophysicists
12th Geophysical Conference and Exhibition

Co-hosted by:

The Society of Exploration Geophysicists
Petroleum Exploration Society of Australia

Latest news from the Conference Secretariat comes from the Exhibition, Social, Workshop and Sponsorship Committees.

Exhibition

Already over 92 booth spaces have been signed up from over 50 companies (approximately 35% of these being from the international sector). Every opportunity is being given to exhibitors to "stand-out" in the crowd, with suspended signage and illuminated signs as some of the options, and perhaps the odd helicopter and vibrator truck.

Social Programme

Also, an exciting social program endeavours to attract not only delegates and exhibitors to the conference, but also partners, with the Showtime Harbour Cruise expected to be one of the highlights of the 4-day social scene - which includes the Welcome Reception (on the Monday evening this time), a special Breakfast Speaker, the Conference Dinner and Farewell Cocktail party. A post-conference Golf Day in the Hunter Valley Wine Regions, is planned for the following Friday. (For those who don't play golf there is wine to taste instead!)

Sponsorship

Enthusiastic responses from sponsors is greatly assisting the financing of the conference. Special thanks should be given to Western Geophysical as Principal Sponsors; Digicon, Schlumberger, Silicon Graphics, UTS Geophysics and World Geoscience, as major sponsors, and many others. Geo Instruments, Geoterrex and others are providing their support through the committee work of their staff.

Workshops

The workshop program has attempted to address the various needs of our delegates with topics which cover new ground. Reservoir geophysics is currently of considerable interest to our petroleum colleagues, and two courses of one day (Geostatistics) and four days (Reservoir Characterisation) duration are offered. For the mineral geophysicists, there are courses on surface and downhole EM, and on geographic information systems (GIS), which bring together the increasing numbers of disparate data sets. Finally, there is a forum on the interpretation of regional geophysical datasets in mineral and petroleum exploration.

Simon Stewart
Geo Instruments Pty. Limited

Research

New AMIRA Project

Image Processing and Interpretation of Airborne EM Data for Regolith/Geological Mapping - P476

Dr Andy Green and Dr Tim Munday of the CRC for Australian Mineral Exploration Technologies will commence a new AMIRA project which aims to demonstrate that substantially improved exploration strategies may result from the use of airborne electromagnetics (AEM), as a regolith and bedrock geological mapping tool, in regolith-dominated terrains.

Areas with substantial regolith cover present significant exploration problems in Australia and overseas. Processes of deep chemical weathering, erosion and sedimentation conceal ore deposits by altering, weakening or burying their geological, geochemical and geophysical expressions. The same processes have also resulted in the formation of secondary mineral deposits within the regolith. A principal issue in exploring through deeply weathered terrains is the inherent complexity of the regolith materials that are commonly present. This complexity can pose formidable problems and challenges, particularly in areas of transported overburden. AEM data have a considerable, but largely untested, potential to provide a better understanding of the regolith and bedrock structure in deeply weathered terrains. Different materials are characterised by contrasting electrical properties. This means that the EM method may be a sensitive technique for mapping properties of weathered rocks and can thereby provide the basis for a new generation of both regolith and geological maps that incorporate subsurface information not obvious in magnetic data and unobtainable from other data. Remote sensing and radiometrics provide useful, though shallow information, whilst magnetics responds variably to regolith, largely because of the dispersed character of magnetite relative to fresh rock (Table 1).

Table 1

Technique	Skin depth in typical regolith materials
Remote sensing	< 1 micron
Radiometrics	< 1 metre
Radar	5-20 metres
AEM	10-100 metres
Magnetics	Not Applicable

Andy Green and Tim Munday believe that AEM can be a cost effective tool for mapping geology along with associated and transported regolith. For this to be translated into reality two conditions must be satisfied. Firstly, it must be possible to derive valuable geological information from the data and secondly this information must be obtained at a price commensurate with its value. In fact it is the purpose of this project to demonstrate the feasibility of the first condition. Satisfying the second, when the data have not been acquired for another purpose, depends primarily on the cost of AEM data acquisition, currently between $30 and $60 per line kilometre. Clearly at these prices it is unlikely that AEM would be used in large regional surveys the way magnetics/radiometrics are used today. However, Drs Green and Munday believe that there can be dramatic reduction in these costs in the same way that there has been for magnetic surveying in recent times. The cost of magnetics has fallen from over $300 per line kilometre in the early fifties to less than $10 per line kilometres in the nineties. Through the same period the quality of the data has steadily improved. This has occurred because there has been a strong demand from industry for high quality, regional surveys where unit costs can be kept low. These same pressures will work to reduce the cost of AEM data if there is sufficient demand from the industry.

Increased demand for AEM data will reduce processing and acquisition costs significantly as the systems become more streamlined, better compensated and automated. In addition, because the application of EM for geological mapping will not necessitate an aircraft with large magnetic moment, industry will see some systems migrate to smaller aircraft with lower capital and operating costs.

It is feasible to envisage a combined system, producing high quality magnetics and wide-bandwidth AEM, operating on a low cost platform for $15-20 per line kilometre. Such a system. operating in areas of significant cover, would effectively map regolith and bedrock changes. The new wider bandwidth AEM data would also be more sensitive to geology and regolith, especially in resistive areas.

All this is predicated on a demand from industry for high quality AEM data. This project is the first step towards stimulating that demand.

Aims of the Research Project

The aims of the project are:

1. Develop new image processing and noise removal methods for the enhancement and display of geological information in AEM data; and

2. Interpret the resulting images from a geological perspective to determine their potential for mapping both regolith and bedrock geology.

The research will be conducted through a series of case studies in areas of interest to sponsors using data from a variety of airborne EM systems. The results of detailed field studies, additional drilling, ground geophysical studies, downhole EM measurements and petrophysical investigation will provide the constraints on the interpretation.

Benefits to Sponsors

The research findings and new techniques will be transferred to industry through seminars and workshops and through one-on-one discussions with individual sponsoring companies. Some of the main benefits expected from the research include regolith and geological mapping methods using AEM systems, particularly in areas of substantial transported overburden. The research will provide an improved understanding of factors affecting the electrical conductivity of regolith materials. New approaches for the preprocessing, enhancement and display of regolith-geological information in airborne EM data using modern image processing and noise removal techniques are also anticipated.

Duration of the Project and Current Sponsors

The project officially commenced on 1st August, 1996 and will be completed in two years. Currently it is being supported by the following companies:

BHP Research
Goldfields Exploration Pty Ltd
Normandy Exploration Limited
Sumitomo Metal Mining Oceania Pty. Ltd.
Stockdale Prospecting Limited
World Geoscience Corporation Limited

The project is still open for support so if you are interested please call Joe Cucuzza at AMIRA on Tel: +61 3 9679 9958, fax: +61 3 9679 9900 or email joe@amira.com.au.

Andy Green and Tim Munday would welcome any enquires about the project. They can be contacted at the following numbers:

Andy Green Tel: + 61 805 8365 Fax: +61 2 850 8366
or email a.green@dem.csiro.au

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Joe Cucuzza
AMIRA

Erratum

The June '96 issue of *Preview* contained an error on p.46 in the ASEG Membership Benefits block - an incorrect telephone number. The correct number for the Secretariat is (03) 9822 1399. We apologise for the error.

ASEG RF – Donations

The ASEG Research Foundation gratefully acknowledges a donation of US$5000 from SEG & SEG Foundation.

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Unipulse

with
Leonie Jones
University Of
Wollongong

In this issue, the UNIPULSE column will be devoted to an article by Professor Norm Uren from the Department of Exploration Geophysics at Curtin University. The article presents the background to the special geophysics meeting funded by the Australian Research Council (ARC) to formulate a "Strategy to make exploration geophysics viable by the 21st century". Many of the issues raised struck a chord with me, particularly the references to the plight of sole geophysicists in geology departments. The viability problems faced by exploration geophysics in Australian universities probably also explain the lack of submissions to this very column. I would urge you to read the article carefully and give serious consideration to making a submission to the workshop.

A Strategy to Make Exploration Geophysics Viable by the 21st Century

By Norm Uren

While Chairman of the Australian Geoscience Council, Professor Chris Powell successfully applied under the ARC Special Initiatives Program, on behalf of the University of Western Australia, Curtin University of Technology, the University of Queensland and the exploration geophysics community generally, for a grant from the ARC entitled: A Strategy to Make Exploration Geophysics Viable by the 21st Century. The Organising Committee for the project consists of Chris Powell (Chairman), Mike Dentith, Norm Uren and John McDonald.

The purpose of this article is to explain the nature of the research project, and to solicit written comments on the situation, and suggestions.

Introduction

For some time now the rather perilous situation of exploration geophysics in Australian universities has been painfully obvious. This sector of the education industry faces a severe viability problem. This in turn has restricted the level of exploration geophysical research at universities in Australia.

The following facts will help to document the situation.

- In 1991 at the ASEG Conference in Sydney, Professor Keeva Vozoff reminded the profession that with his retirement, and that of Professor David Boyd, the number of Professors of Exploration Geophysics in Australia was at a seriously low level. Since then, Professor Jim Cull, Professor Stuart Greenhalgh, Professor Jim Applegate and Professor John McDonald have been appointed.
- Norm Uren pointed out at the Sydney conference that the formula funding policy of the Australian Government for education meant that geophysics education would never be a viable financial proposition. The funding in proportion to student hours taught or on a similar formula would not generate enough funds to support the lecturers' salaries. He advocated the establishment of a major Exploration Geophysical Research Centre in Australia with special funding.
- The Australian Geoscience Council conducted a study resulting in the book Towards 2005: A Prospectus for Research and Research Training in the Australian Earth Sciences. It highlighted exploration geophysics as the major weakness in the earth sciences in Australian universities.
- The value of Australian mineral exports (including oil) now exceeds that from the agriculture and manufacturing sectors.
- Exploration geophysics has been the top priority area for Australian Research Council (ARC) funding for several years now, but suffers from the lack of suitable applications.
- The Department of Exploration Geophysics at Curtin University has over 140 exploration geophysics majors enrolled in 1996, making it one of the largest in the world, yet its teaching income alone will not pay the salaries of its teaching staff.
- Members of the AusIMM will know that mining education in Australia also suffers from problems of low enrolment numbers, and that the AusIMM is currently conducting an enquiry into this area.

ARC Exploration Geophysics Meeting

The Organising Committee has called a residential workshop style planning meeting, funded by the ARC grant, to consider ways of making exploration geophysics viable by the 21st Century. The meeting will involve 20 to 25 people from industry, government and academic institutions, and has as its purpose the preparation of a draft strategy which will be circulated widely for comment before presentation at a public forum to be convened at the ASEG Conference in Sydney in February. The workshop is scheduled for a fully self contained venue in Perth on 10th to 13th October 1996. It is planned that the document will be completed before any of the delegates will be permitted to depart.

Papers for consideration at the workshop are invited from the members of ASEG

All submissions will be acknowledged, and should be sent to Prof. Chris Powell, Geology Department, University of Western Australia, Nedlands, Western Australia 6009.

The following position paper was prepared by Norm Uren. It is not comprehensive, and is reprinted here to stimulate discussion.

The Future Development of Exploration Geophysics in Australia

What is Exploration Geophysics?

In the broadest sense, geophysics includes oceanography, meteorology, earthquake seismology, atmospheric physics and many other fields in which the principles of physics are applied to the study of the Earth and its atmosphere. Exploration geophysics, however, is the application of the principles of physics to the exploration of the Earth itself. It is a form of exploration technology which is becoming more important in the search for natural resources, as well as in environmental and land management. As the easily found deposits are exploited, we must explore areas which are covered by water, and areas with superficial cover, such as weathered rocks, which are typical of Australia. It is the main method of oil exploration where exploration targets are up to several kilometres below the surface in geological conditions which are often quite different from those on the surface.

Geophysical exploration is based on the physical properties of the components of the Earth. In common with most other areas of physics it is very dependent on mathematics and in common with modern technology, it is a heavy user of computers.

In earlier years, geophysical exploration has been carried out by physicists, mathematicians and geologists. Preparation to enter the profession of exploration geophysics has been by training in these disciplines. As the science develops, university courses in geophysics are developing. The challenge is to manage the development of the science of exploration geophysics in Australia. In Australian universities, courses are generally to be found in departments of geology, earth science, geology and geophysics, etc. In Canada, exploration geophysics is commonly found in departments of physics. There is only one Department of Exploration Geophysics in Australia.

Exploration geophysics covers a wide spectrum of activities which may be classified as follows, although the categories overlap to a fair extent.

The use of geophysics

This is meant to cover the use of geophysical results in exploration. The principal users are geologists, and interpretational skills are important. Modern geologists usually have some training in the use of geophysics in exploration.

The performance of geophysicists

The conduct of geophysical surveys, the processing of geophysical data and its interpretation are the province of geophysicists, often by geophysical contractors.

The development of geophysics

Research in the advancement of geophysical techniques is often carried out in universities, large exploration companies and by contracting companies.

There exists a recognised profession and a body of literature in exploration geophysics. In Australia there are about 1500 members of the Australian Society of Exploration Geophysicists, and its regular conference and technical exhibition attracts an attendance of between 500 and 600 delegates. It publishes the journal Exploration Geophysics, occasional monographs and the magazine Preview. The Society of Exploration Geophysicists, based in USA, is a truly international society with a world-wide membership of 14,000. It attracts an attendance of between 7,000 and 12,000 at its annual conference in the USA. It conducts conferences in conjunction with local geophysical societies in other countries, and attendance ranges from several hundred to the order of one thousand or so. It produces the journal Geophysics and the magazine The Leading Edge. It publishes a wide range of books and monographs, and maintains a staff of over forty persons.

The Problems with Geophysics

These are expressed in the Australian context, but they are not atypical of the rest of the world.

1. University economics

Class sizes are small and mainly taught at senior levels only. Funding on an EFTSU basis is usually inadequate to pay staff salaries. Often this is balanced by combining geology and geophysics where geology enrolments are many times larger. Geophysical equipment is expensive, and field work is costly.

2. Development of the science

Geophysics must be firmly based on the principles of physics, and not be taught as a descriptive science.

It is important to develop geophysics in Australia because the geological environment involves deeply weathered rocks, and high salinity, features which are not common in northern hemisphere countries. Australia has begun to address some of these issues through the CRC program, but there is a lot more to be done. Geophysical technology commonly can not be imported because it is inappropriate to Australian conditions. There is also a big opportunity to export Australian geophysical technology to other geologically similar areas (e.g. Africa, India and South America).

In university situations where geophysicists are in the minority, dominated by specialists in other areas of expertise, who are only occasional users of the science, they are often outvoted for resources. Indeed, they are a financial liability in geology departments. In such a situation, how may the science of geophysics be developed? The situation is worsened by the dominance of geologists in managerial roles. They are non-geophysics

specialists who have only a smattering of the subject, but do not hesitate to speak with authority on geophysics and dominate its syllabus. In this climate, recognition of the science and nurturing its development is difficult. Yet it is the future of exploration, especially where all the easy stuff has been found, and attention must be turned to more elusive targets. The science of exploration geophysics will be the most important path to future progress.

3. Exploration economics

Often exploration arms of companies are subject to periodic cuts as the economic climate fluctuates. Exploration arms within company contexts are often set up such that they cannot make a profit. It is often said that there is a lag of about ten years from discovery to production. Exploration does not have to be carried out each year in a particular area. Currently exploration is active in Australia but has declined to a low level in the USA. Those companies with overseas parents are presently reluctant to sponsor geophysical research in Australia when they are experiencing cuts elsewhere.

Axioms

- The science of exploration geophysics must be developed in Australia, with Australians publishing research findings in international journals.
- Geophysics needs to be developed based strongly on the principles of mathematics and physics.
- Methods of funding must be found to counter the EFTSU problem in the teaching of undergraduate programs.
- Exploration geophysics must have a close interaction and partnership with geology, and with the exploration industry. It must not exist out of context.
- Large groups of geophysical expertise need to be developed in Australia. Lone geophysicists in geology departments have a difficult job advancing the science. It is a wide field intellectually, and cannot be covered by one or two persons.
- Substantial funding is needed to enable university departments to be practitioners of the science, rather than text book teachers only. Geophysics needs access to substantial infrastructure, and equipment and field work is expensive.
- Universities need to produce exploration geophysicists skilled in the science, as trained professionals. It is no longer satisfactory to assume that geophysicists will receive on the job training in the basics of the subject when they obtain employment.

Solutions

There need to be two or three Departments of Exploration Geophysics established in Australia with staffing in excess of ten, and one with in excess of twenty staff, designated as Institutes for Geophysical Research. The focus must be on the exploration industry.

A national scholarship scheme is needed to enable undergraduates and post graduates to engage in full time studies.

Long-term funding stability is required. Industry funding on short term research projects is important, but long-term funding of the order of twenty or thirty years needs to be planned.

Salary levels need to be able to attract talent away from industry and from overseas.

Funding to such departments must be in excess of that gained on an EFTSU basis. This can come about in one or more of the following ways.

- Combine teaching departments with government functions like the Bureau of Economic Geology at the University of Texas at Austin, which serves as the Geological Survey of Texas.
- Fund research from resource taxes. The French Institute of Petroleum is funded from a levy on petrol. The Gas Research Institute in the US is financed by a levy on the interstate transportation of natural gas.
- Introduce service teaching in geophysics departments. Have physics service teaching done by geophysics staff. This would reduce the number of physics departments, but job opportunities in physics are not plentiful, and there are enough departments to produce more than the necessary number of physics graduates.
- Develop a public relations scheme to convince the Australian extractive industries that a financially stable university sector is vital to their companies' well being.
- Opportunities for exchange and co-operation between research laboratories need to be developed and used by exploration geophysics researchers.
- Provide postgraduate and post-doctoral fellowship schemes to enhance the researcher capability and attract young researchers during their most productive years.

The development of commercial arms in university departments can be a source of extra funding but is not recommended as it leads to conflicts of interest. Staff who depend on this for salary will have their priorities diverted from the advancement of the science. Direct competition with components of the industry will result and conflict with the industry being served by the departments will develop.

NOTE

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ASEG – 25 years of History

Our Society officially turned twenty-five this year, based on the signing of our Memorandum and Articles of Association by veteran Lindsay Ingall (June 1971) and stamping by the government (August 1971). The history buffs among you will have gleaned these snippets already from p.12 of the current Membership List. However, there is more; the society was conceived in January 1970 at the 1st ICOGEO (International Conference on Geophysics of the Earth and the Oceans) and became quite active *in utero* during that first year. Vol.1 No.1 of the Bulletin of the ASEG was published in September 1970 and this was followed by two or three more issues in 1971 before the bouncing infant society was delivered by a stamp of the NSW Government's Corporate Affairs Commission on 13th August 1971.

Unfortunately, as with most infants, this one had no sense of history at the time of its birth and the salient dates and events are not recorded in early issues of the Bulletin. No doubt there are many other interesting happenings of those early days which are also not recorded. To fill this gap we are requesting input from as wide a range of senior members as possible for a block-buster December issue celebrating our twenty-fifth birthday. If you have any memories let them roll, capture them on paper or disk and send them to the editor. The effort will be greatly appreciated.

Mike Shalley, Editor

Visiting Lecturer

AMT Workshop Brisbane

A three day workshop on Continuous Magneto-telluric Profiling for mineral exploration was held in Brisbane during July. The workshop was conducted by Frank Morrison from the University of California Berkeley and hosted by MIM Exploration at Spring Hill.

Representatives from MIMEX, CRAE, BHP Minerals, Aberfoyle and Placer attended, presenting case studies during the final day. Motivation for the workshop followed a visit by Electromagnetic Instruments Inc (EMI) of California to attend the 11th ASEG conference in Adelaide and to perform test surveys over selected areas for MIMEX, CRAE and BHP.

The content of the workshop covered a wide range of subjects from basic EM field theory as applied to AMT prospecting, instrumentation and acquisition, data processing and interpretation. The third day was devoted to AMT case examples with each company providing an illustration of a recent AMT survey.

Advantages and disadvantages of several conductivity imaging - inversion algorithms were discussed including the Born approximation, Occam and Rapid-Relaxation Inversion (RRI) methods. A suite of 2D forward models, which highlighted the effects different exploration targets have on measured AMT parameters, was also presented. The AMT response of thin steeply dipping conductors to different survey configurations was highlighted as such targets may not be evident in data acquired from routine configurations. The value of parameters such as the skew and tipper for 2D and 3D interpretation was also discussed.

The workshop proved to be very successful and provided the ideal situation for increasing the exposure of Continuous Profiling AMT within typical Australian exploration conditions.

John Donahue (MIMEX)

Frank Morrison demonstrating AMT field relationships.

Excitations

Stephen Mudge
RGC Exploration Pty Ltd

Line Kilometres to Hectares - Towards a Magnetic Photograph

How far does an aircraft have to travel to survey an area, but more importantly, how far apart should survey lines and tie lines be spaced for an aeromagnetic survey? A simple equation answers the first question and some visionary thoughts approach the second question.

Survey Distances

The cost and size of most airborne geophysical surveys are measured by the total distance travelled by the aircraft. Talk to a geophysicist and he'll tell you how many line-kilometres of data he's acquired, but talk to a geologist and he'll tell you how many square kilometres he's surveyed. The survey distance, the number of line-kilometres, is not a measure of the size of the survey area so an appropriate conversion between area and survey distance is required in order to plan and cost an airborne survey.

I use the following equation to obtain a conversion between survey line spacing and survey distance:

$$\text{DISTANCE} = 1010/S + 1010/T$$

where DISTANCE = survey distance per square kilometre (kms/kms^2), S = survey line spacing (metres) and T = tie line spacing (metres)

Shown in Table 1 below are conversion factors for a range of survey line spacings derived from this quation for the case when tie line spacing is ten times the survey line spacing.

Table 1
SURVEY AREA to SURVEY DISTANCE CONVERSION
(Tie line spacing = 10 x survey line spacing)

Line Space (metres)	Dist./Km^2 Km/Km^2	Line Space (metres)	Dist./Km^2 Km/Km^2
10	111.1		
25	44.44	250	4.44
40	27.78	300	3.7
50	22.22	400	2.78
75	14.81	500	2.22
100	11.11	1000	1.11
150	7.41	1500	0.74
200	5.56	2000	0.56

The idea is to multiply the survey area in square kilometres by this factor. For example, lets say the survey area is 500 square kilometres and we specify a survey line spacing of 200 metres with tie lines spaced 2000 metres apart (ten times the survey line spacing). The conversion factor is 5.56 line kms per square km and the total survey distance is simply 500 x 5.56 = 2780 line kilometres.

Survey Line Spacing

Survey line spacing is dependant on survey height. As the survey moves higher above the ground, the high frequency (short wavelength) part of the measured magnetic response is strongly attenuated and the need to maintain close line spacing diminishes. We would all probably like to conduct our aeromagnetic surveys with closely spaced survey lines, say 25 meters, at the lowest survey height practical in order to maximise resolution of the magnetic response of the underlying rocks. However cost ultimately controls survey specifications so line spacings are generally selected to suit the dimensions of the main target being explored for. This can be despite the fact that often a closer line spacing could have revealed useful information about the surrounding geology and surface cover rocks.

Tie lines are included in the survey for two main reasons. Firstly it is possible to use these to remove the drift of the Earth's magnetic field from the survey line data, and secondly to adjust the average magnetic level of survey line measurements in order to make a 2-dimensional map of the magnetic field. So how far apart should tie lines be placed to effectively fulfil these requirements.

Figure 1. Gone like a speeding bullet - a low level over-pass near Kalgoorlie WA.

In the first instance, the tie spacing ought to be selected so that the aircraft travel time between tie-line/survey-line cross-over is at the required time interval for the magnetic field drift correction. In other words, if you want to correct for the drift of the Earth's field every 60 seconds of survey line flying, then tie lines ought to be spaced a distance equivalent to 60 seconds of survey flight time. The speed of the aircraft is obviously a critical parameter in determining this distance. The second role of tie levelling requires a knowledge of the spectrum in height level changes of the aircraft along the survey lines.

Height changes are probably the main cause of magnetic levelling errors in a magnetic survey (other minor sources of error related to the aircraft can be described, but I've chosen to neglect these in this discussion). This is a difficult parameter to quantify

before a survey is conducted, other than to say that large magnetic level changes can be expected from surveys conducted in rugged terrains, and minimal errors can be expected from surveys in flat terrains.

The accepted industry standard is to space the tie lines a distance equal to ten times the survey line distance. This has proved to be an effective formula for all but the most height-variable surveys: those conducted in rugged terrains where extreme height changes are more the norm than the exception. For the average fixed-winged survey over flat terrains conducted at an aircraft survey speed of 70 metres per second (4200 metres per minute) tie lines spaced 4200 metres apart would provide a drift correction at a time interval of one minute. Clearly closer tie lines are better than widely spaced tie lines.

Most modern airborne magnetic surveys for mineral exploration have survey lines less than 400 metres apart, typically as close as 100 metres. I hasten to add that in recent times some fixed-wing surveys are now being conducted at 40 metre line spacing and Helimag surveys with lines spaced 20 metres are beginning to appear. All along the 10:1 rule for tie-line to survey-line spacing has been maintained, so tie line spacing is being reduced to the extent that explorers now get a useful extra (tie-line) survey, two orthogonal surveys in one. The 2-dimensional resolution of the magnetic response of the geology has improved enormously in modern times.

Future Survey Specifications

So what has the future got installed for aeromagnetics, and what is 'magnetic photography' all about. Well it seems that survey line spacing will get closer and surveys will get lower as explorers take greater interest in regolith geology. But more importantly, current research into the use of pilot-less aircraft, drones, shows encouragement for the adoption of these platforms for low cost, very high resolution aeromagnetic surveys in the not-to-distant future. The drones promise continued survey flying for long periods, a day or so, night time operations when the magnetic field is most stable, and faster survey times with lower costs. This all sounds too good to be true, but imagine several computer controlled, GPS guided drones flying over the area and surveys being completed in, say, 25% of current survey times. This will vastly increase data-flow rates to processing departments and increase the quantity of data for explorers.

Now I reckon this has to translate into better magnetic maps, in fact, I reckon that adoption of drones should mean more than reduced survey times. This technology suggests that all magnetic surveys ought to be conducted with very close survey line spacing, say about 25 metres, at low terrain clearance (just above tree top), and tie lines ought to be spaced at the same distance as the survey lines. In other words, the flight path ought to be an equi-dimensional grid so as to maximise the resolution of the magnetic field in 2-dimensions.

Our concerns for survey line and tie line spacings, and survey direction, would be largely historical, all surveys flight paths would be grid patterns oriented, say, east-west. The size of the flight path grid pattern would be equal to, or close to, the desired data processing grid interval, which would more accurately represent the true magnetic response of the underlying geology. Every pixel in a magnetic image would be (or located close to) a measured data point.

Figure 2. A low level turn to the next survey line near Kalgoorlie WA.

We would no longer agonise over survey line spacing and furthermore we would not be tempted to increase the line spacing in order to meet budgetary constraints. Moreover we would specify our surveys by size of the survey area, not by survey distance. We should then be able to plan and pay for surveys by the hectare, not the line kilometre - a bit like buying an aerial photograph of the area. Why not; after all we only think in terms of survey lines and line kilometres simply because of survey economics and ultimately budgetary restrictions. The new developments have to translate into more than reduced survey costs, they have to change the way we buy and use magnetics, so why not use magnetics the way we use aerial photography. The old art of making stereographic magnetic maps might even be revived!

Buy magnetics by the hectare, not by the kilometre, then every geologist can use the best quality magnetics without the worry and limitations imposed by survey parameters.

Happy Excitations.

Field Camp and Workshop

V.I.E.P.S

Victorian Institute of Earth and Planetary Science
Melbourne Monash Latrobe

VIEPS Geophysics Field Camp and Software Workshop

As part of the VIEPS agreement involving the Earth Science Departments at Melbourne, Monash, and Latrobe universities annual field camps have been established in Victoria to provide for undergraduate training in exploration geophysics. These camps provide a valuable opportunity for students to gain field experience using modern geophysical instruments and post-survey data reduction techniques. Apart from ensuring safety and efficiency in the field, students are instructed in quality control and data integrity prior to geological interpretation.

Many different individuals and companies have assisted with these camps by providing the essential geophysical equipment. Additional support has now been made available through Des Fitzgerald and Associates (DFA) to improve data reduction and interpretation capacities. Apart from mobilising industry standard software, DFA will provide technical experts for on-site instruction. As a result VIEPS now intends to offer broader access to these field camps. In particular it is anticipated that many company personnel will wish to participate in a refresher course provided by industry authorities.

Expressions of interest are now invited from individuals, exploration companies, government bodies and tertiary institutes wishing to participate in the 1996 VIEPS Geophysical Field Camp. The camp is provisionally scheduled for 18-22 November with on-site accommodation at the Dookie Agricultural College (near Shepparton, Vic).

Equipment to be made available will include:

- Geometrics G858 Caesium vapour magnetometer
- Geometrics G856 Proton precession magnetometer
- Scintrex CG3 micrograv gravity meter
- Sirotem Mk3 time domain electromagnetics
- Vectem 3-component downhole probe
- PulseEcho IV ground penetrating radar
- Bison multichannel digital seismic system

Data will be processed using software standards including:

INTREPID	ERMAPPER	NODDY FILAMENT
EMVISION	VISTA (+GPRVISTA)	

VIEPS Staff

Professor Jim Cull (Monash - EM, GPR)
Dr Lindsay Thomas (Melbourne - Gravity, Magnetics)
Dr Terence Barr (Monash - seismics, imaging)
Dr Mark Jessell (Monash - modelling)
Dr Greg Houseman (Monash - seismics, inversion)
Mr Albert Cementon (DFA - INTREPID, modelling)
Dr Nabeel Vassi (DFA - ERMAPPER, modelling)

Cost

With full accommodation including single room and all meals over 5 days:

Industry	$120 / day	$600 total
Students	$35 / day	$175 total

Further Information

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PetroBank

PetroBank Offers Solution to the E&P data Mountain

IBM encourages oil companies and governments to share the costs of data storage and management.

A databank solution for the oil and gas exploration industry, implemented successfully in Northern Europe, is now available throughout the Asia-Pacific region. Known as PetroBank, the solution was developed by IBM Petroleum's Exploration and Production (E&P) Data Solutions Group and Industry partners.

The E&P Data Solutions Group has some eighty employees world-wide, most of them having 15-20 years experience in the E&P business. Approximately fifty of these employees are dedicated to keeping PetroBank at the leading edge of data management technology.

"Oil companies and government bodies throughout the Asia-Pacific region are beginning to recognise the competitive benefits of having ready access to an archive of high quality geo-technical data," said Craig Hodges, IBM's General Manager, Petroleum in the

Continued p.26

Asia-Pacific. Such an archiving system cuts both monetary and human resources spent in preparing data for an individual report."

"In an industry where companies risk millions of dollars in searching for oil and gas, accurate interpretation of information is crucial. Yet it's a fact that around 60 per cent of a geophysicist's or geologist's time is spent searching for and preparing data while only 15 to 20 per cent is spent on data interpretation. This is not an efficient use of resources".

Managing the Data Asset

The oil industry lives or dies on the basis of the petro-technical data it collects, yet until recently, there has been little attention paid to managing the underlying data archive that makes exploration and exploitation possible. Additionally, the volume of data stored in many locations is expected to double in the next three years, chiefly through improved methods of data acquisition in the field through new seismic vessels and well data acquisition systems.

To take the European example, on the Norwegian Continental Shelf, cumulative seismic data collected up to 1993 exceeded the combined storage capacity of one million magnetic tapes - the equivalent of 300 terabytes. By the end of 1996 that figure is expected to have tripled.

Data management headaches in the E&P industry can only get worse: Data volumes are growing at approximately 25 per cent annually world-wide, and four-dimensional data collection, now being initiated, will compound the problem. "Previously, oil companies have stored data mainly on a project basis and there are several data management companies which provide solutions for a single oil field or region," said Craig Hodges.

"Commonly, the same data are used in several projects and by multiple companies being partners in the projects. That way the same data are duplicated and stored over and over again either in-house or at partner locations."

"However, PetroBank goes further to create an archive encompassing data gathered by both government agencies and oil companies where one master copy of data is stored. All parties that have access to the raw data can download a copy for their use, any time, and dispose of it after use rather than wasting resources storing the same data again and again."

It's estimated that 14 percent of the costs of any exploration or development project is spent on data management, which involves everything from media and storage to administration and retrieval costs.

Petro-technical data is something that never gets thrown out, yet most oil companies have not viewed data in the same way as more tangible corporate assets such as petroleum reserves or production infrastructure," said Alan Bays, a key member of IBM Petroleum's E&P Data Solutions team based in Calgary, Canada. "Because of this lack of attention to lifecycle management procedures for their information asset, archived data continues to be lost due to inadequate processes, physical degradation and inadvertent disposal."

"This is paradoxical, considering that information is essential to the operation of the organisation and in certain cases may be irreplaceable."

Industry Specialists

With the pressure in recent years to cut the cost of E&P by making better, faster decisions with fewer people, the process of finding and exploiting oil and gas reserves has changed dramatically in many oil companies. Today, integrated, multidisciplinary teams are commonplace and companies rarely have the luxury of dedicated specialists in each country or region.

That's where a database put together by industry specialists comes in. IBM has employees in each Asia-Pacific country - roughly within the triangle formed by New Zealand, India and Japan - who are dedicated to developing computerised solutions for the oil and gas industry.

"Frode Sandnes is an experienced general manager from the Indonesian oil industry leading our efforts in the Asia-Pacific," said Craig Hodges. "He has tremendous knowledge of the industry and of the problem that our solution addresses."

Mr. Sandnes addressed a PetroBank seminar held by E&P Data Solutions in Perth in mid-May which was attended by representatives from government, multinationals and independent oil companies, as well as IBM alliance partners.

Because this is a challenging and risky business, the notion of providing easily accessible digital data has generated immense interest throughout the region. "We have initiatives under way with every major country and most major oil companies throughout the Asia-Pacific," said Mr. Hodges.

"Our aim is to set out and agree on a proposal for managing the exploration data in each country of operation. This is a key industry in some of the developing countries of the region and established nations throughout the region. National oil companies and government regulatory bodies are concerned with attracting and retaining international oil companies to assist them in exploring for oil and gas in their countries."

"Having ready access to high quality data provides them one more advantage to encourage these companies to do business with them. PetroBank is a solution which affords national oil companies and national regulatory bodies that advantage."

"Oil companies differentiate themselves through their individual expertise and where they want to spend their capital resources and skills. They take the data PetroBank

Continued p.28

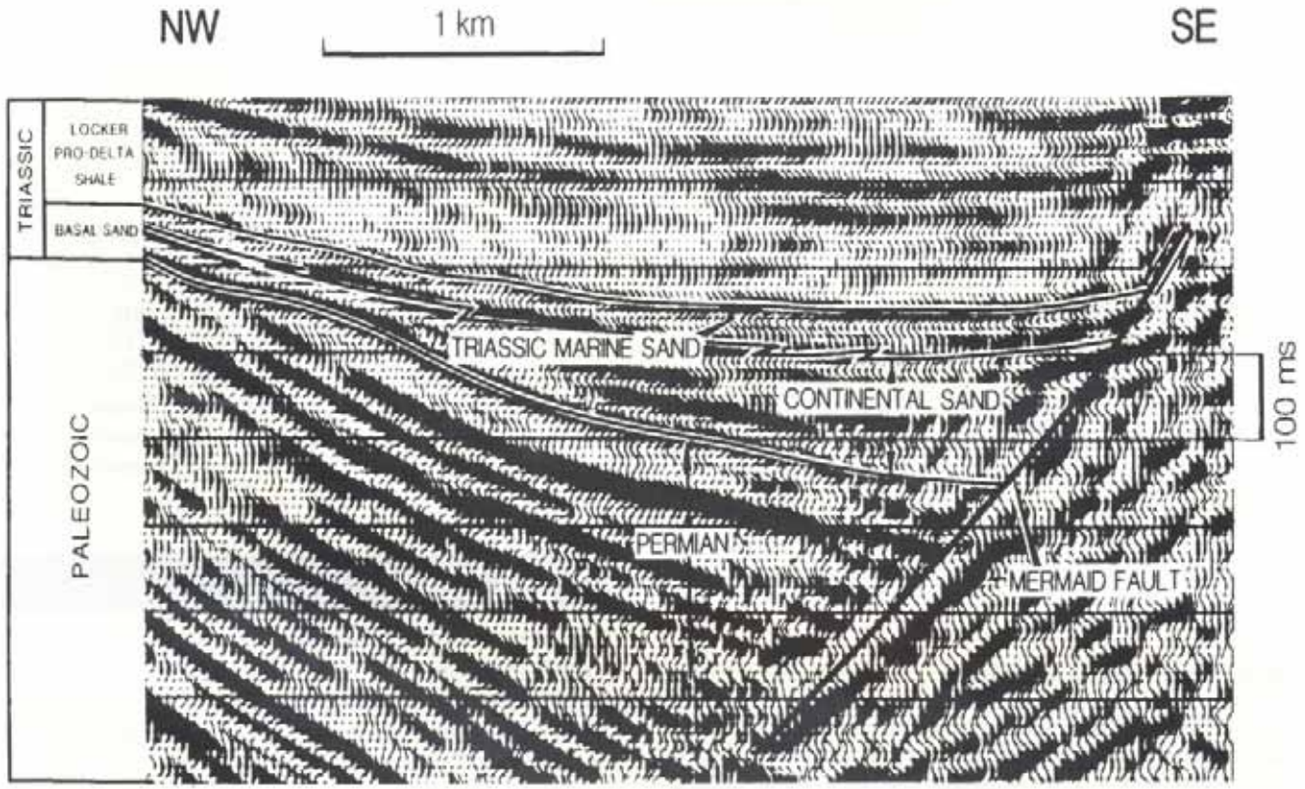
Seismic Window

with

Rob Kirk
BHP Petroleum

The following Example is taken from the Carnarvon Basin, Western Australia.

Carnarvon Basin, Western Australia - Triassic basal transgressive sand (Fluvial(?) and marine facies). Note fluvial(?) facies located in palaeolow set up by last subsidence of the Mermaid Fault. (See previous Preview for the "bigger picture").



PetroBank (Continued from p.26)

computation for their analysis based on their own risk assessments," said Mr. Hodges.

"Every country will have a different implementation scenario based on their legislation and government regulations. In some cases a national oil company will be in the driver's seat. We will, however, encourage a scenario where the oil companies participate with governments to share the costs of building and maintaining a data archive.

The Origins of PetroBank

The idea that resulted in PetroBank originated in 1992 in Norway. The idea was refined in 1993, and in 1994 IBM and a variety of industry partners throughout Europe developed and implemented the world's first POSC-compliant geo-technical data management solution for the DISKOS oil and gas exploration consortium. Currently, thirteen oil companies participate in the DISKOS* PetroBank solution.

"Rather than each individual oil company storing its own exploration data, we have developed a system to receive, store and index digital data as a centralised solution in which all participants - whether they are from competing oil companies or regulatory bodies - share the cost of management and enable the sharing of data in a secure manner," said IBM's Knut Korsell, the architect of PetroBank, based in France.

"PetroBank provides fast, economical, easy access to relevant petro-technical data. It also improves the productivity of E&P professionals and allows them to quickly take advantage of an opportunity.

"It is not the storage technology itself that is new (what was once a truckload of data can now be stored in a briefcase), but the software IBM has developed to benefit from the technology." Mr. Korsell explained. "PetroBank uses fourth generation application development tools with quality management complying with international standard ISO9001."

Many companies have detailed data about a particular oil field or project but it has not been fully integrated with information from surrounding areas because it has been too difficult and resource-consuming to access available data.

"To be competitive, it is important to integrate all relevant available data," said Crag Hodges. PetroBank is the tool that can aid both government agencies and oil companies in achieving competitiveness in a cost-effective manner."

How PetroBank Works

PetroBank stores large amounts of petro-technical data relating to a particular geographic area in a shared databank which is off-site and on-line. Each participating organisation - subject to appropriate security facilities - has access to the data subsets to which it is entitled twenty-four hours a day.

As only one central copy of data exists, the cost of providing data storage, media, equipment and space is reduced dramatically. Copies no longer have to be distributed to different locations and organisations. They can be accessed by remote users via high speed communications lines to a local application or project database. The complete PetroBank solution also offers customised changes to the basic as well as management facilities to design, implement and operate a production system on a central or client basis.

PetroBank is based on existing and emerging standards such as POSC, with remote and local users able to operate in a UNIX environment. It can handle a wide range of data media and formats including nine-track tapes, 3480/3490 cassettes and 8mm Exabyte cassettes. Data formats supported include SEG-Y, UK00A, ESSO-V2, Statoil-H2, GEOSHARE and LIS/DLIS.

The first step in loading seismic data into the PetroBank facility is re-mastering of the existing tapes. Seismic tapes are scanned for quality defects, reformatted if necessary and transcribed to a high capacity medium (IBM3590 tape cartridge). After the associated navigation is quality controlled, a comprehensive, accurate index of the data is constructed. The re-mastered data is then ready to be loaded into the PetroBank system.

As well as seismic, navigation, velocity and well information, other data objects which can be included as digital data can be stored in PetroBank. Such data includes scanned seismic sections, core photos and other relevant documentation.

Other advantages of a centralised databank include the availability of a complete overview of all available data via a comprehensive index; provision of easy to use, on-line search and order routines; faster turnaround and improved quality of the delivered data.

Among the business benefits are more effective decisions leading to a better success ratio; reduction in time from initial exploration to ultimate production of hydrocarbons; and reduced costs in all areas of the exploration and production process.

*As of March 1996, the DISKOS group included Amerada Hess Norway, Amoco Norway Oil Co., BP Norge, Conoco Norway Inc, Enterprise Oil Norge, Mobil Exploration Norway Inc, Norsk Agip, Norsk Hydro, Norsk Shell, Norwegian Petroleum Directorate (NDP), Phillips Petroleum Co Norway, Saga Petroleum and Statoil.

SEG News

Paul E. Hummel, Associate director for Programs and Shared Services of the Society of Exploration Geophysicists (SEG), has been named the organisation's Deputy Executive Director. He will assume leadership of the Society's Tulsa-based Business Office in mid-1997 upon retirement of the current Executive Director, F. Don Stoddard.

Details and more news next issue.

ASEG Membership Survey 95/96 - In Detail

Geoff Pettifer, Geo-Eng Pty Ltd
Ciaran Lavin, Minerals & Petroleum Victoria

Introduction

In the April Preview some particular results of the ASEG membership survey, in late 1995 - early 1996 were featured. In this issue a more detailed picture of the results is given, mainly in graphical format with point form to highlight particular results. The data have been collated by Ciaran Lavin and analysed by Geoff Pettifer, both of the outgoing Executive.

The data have shown five broad categories of membership: petroleum; minerals; environmental/groundwater/engineering; consultants/contractors; and academic geophysicists, which form the basis of this analysis. These five categories cover the three mainstream areas of geophysics: petroleum; minerals; and environmental/groundwater/engineering.

The ASEG membership survey was targeted at determining members interests in technical methods and topics and their attitudes to ASEG publication options for the future. With 687 responses from 1250 distributed, this gives the Executive its first reasonably comprehensive view of the constituency of the Society membership, the interests of members in technical subjects and the content and format of ASEG publications.

Hopefully the surveys can be repeated (and improved in design), at future membership renewal times, to fine tune the Executive's understanding of members views, expectations and aspirations for their Society.

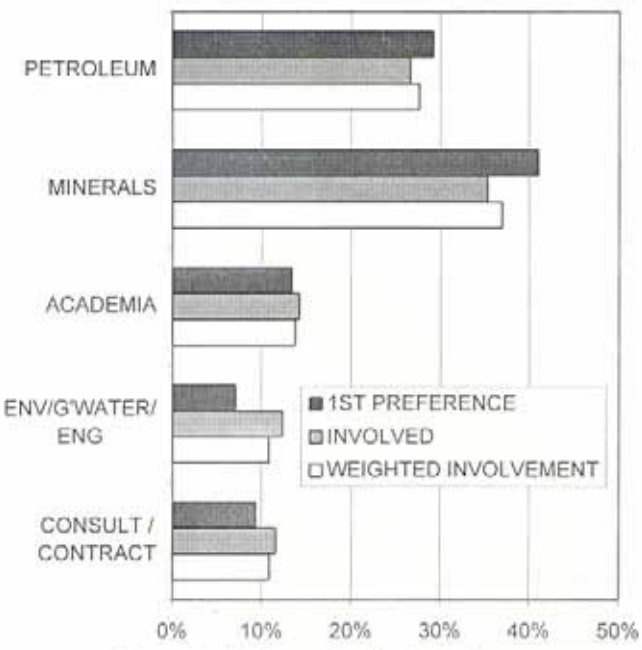


Figure 1. ASEG membership by industry.

Highlights

The results presented in Figures 1 to 20 show the following points of interest:

ASEG membership breakdown by industry sector (Figure 1) shows a healthy mixture between petroleum (27-29%), mineral (35-41%), academia (13-14%), environmental/groundwater/engineering (7-12%) and consultants/contractors (9-12%). The ASEG is not as strongly mineral oriented as some may have thought, however it certainly is more so than the SEG. The spread of percentage values depends on whether one considers first preference, involvement of any kind or weighting by preferences indicated.

The survey enables an analysis of the multiple interests of members and the potential for cross-fertilisation of ideas by members maintaining an interest in geophysical sectors other than their first preference. Figures 2 to 6 show the breakdown of particular interests/involvement of members in the five categories of membership, in other categories of geophysics.

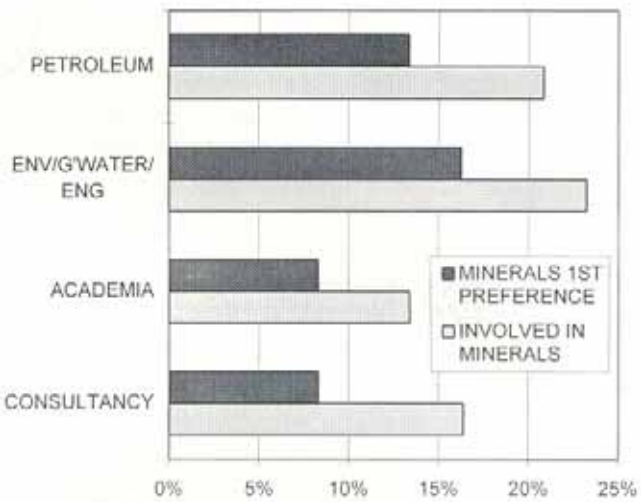


Figure 2. ASEG mineral geophysicists (35-42% of membership) other interests in geophysics. 46 % of those who consider themselves primarily mineral geophysicists and 84% of those with some involvement in mineral geophysics show a wide spread of interests.

Petroleum geophysicists (Figure 3) show the least interest in other geophysics, whereas consultants and contractors (Figure 4) show the greatest diversity of interest. Academic geophysicists have least declared their interests (Figure 6).

The 1 in 8 membership in academia figure reflects both the success of the ASEG student membership scheme and the high R&D nature of exploration geophysics.

Figures 7 to 12 show aggregate and the five category breakdown of interests in geophysical methods. There is a similarity in the interests of mineral

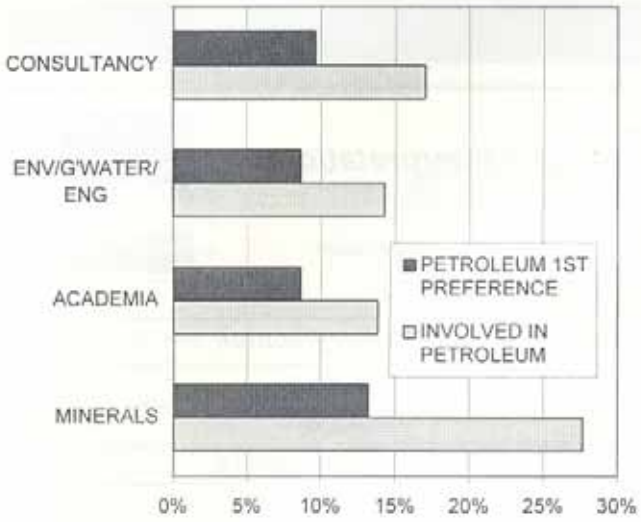


Figure 3. ASEG petroleum geophysicists (27-29% of membership) other interests in geophysics. 38 % of those who consider themselves primarily petroleum geophysicists and 72% of those with some involvement in petroleum geophysics show a healthy spread of interests.

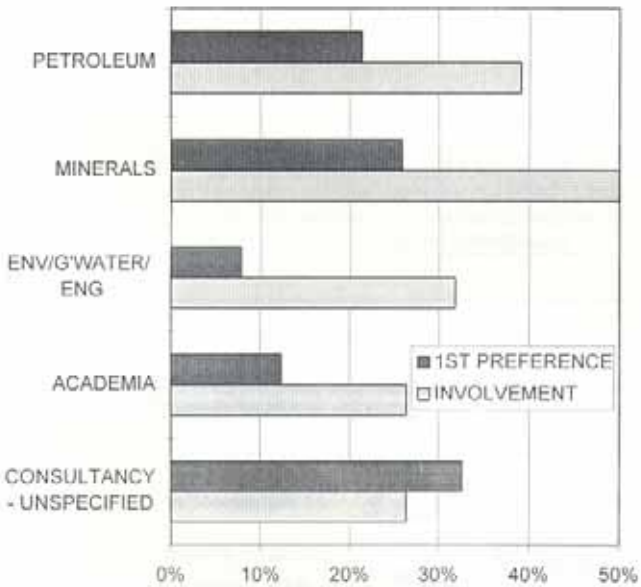
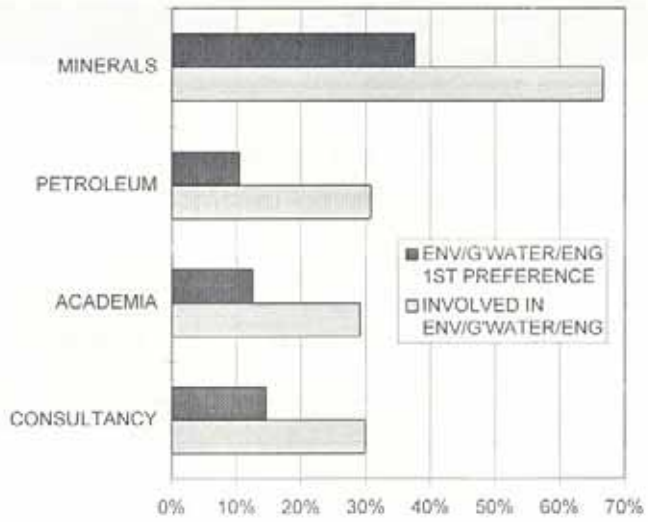


Figure 4. ASEG consultant/contracting geophysicists (9-12% of membership) show by their interests that it pays to project yourself as versatile in the consulting/contracting game. 33 % don't specify the nature of their consultancy interest while the total declared involvement in the three mainstream areas of geophysics is 175%. A high involvement in academic geophysics (27%) is also a feature of consultant/contracting geophysicists. Perhaps they have more time between contracts or perhaps the figures reflect the high involvement in development by consultants and contractors

Figure 5. (top of opposite column) ASEG engineering/ groundwater/environmental geophysicists (7-12% of membership) other interests in geophysics. 74 % who consider themselves primarily engineering/groundwater/environmental geophysicists show a strong leaning to mineral geophysics as well. Like consultant/contracting geophysicists, this groups versatility is shown by a high total declared involvement in the three mainstream areas of geophysics is (157%), with a strong involvement in consultancy (30%) and academia (29%).



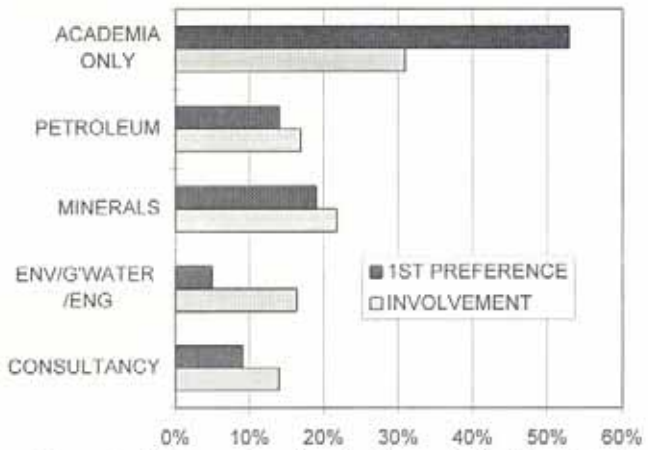


Figure 6. ASEG members involved in academia (13-14% of membership) show a high preference (53%) for not declaring their primary interest in geophysics (keeping their options open for employment perhaps). Relativities of academic interest reflect the overall membership relative interests in Figure 1

(Figure 8), consultants/contractors (Figure 10); environmental/groundwater/engineering (re 11); and academic geophysicists (Figure 12) biasing the interests in the ASEG membership to potential field and electrical methods. Figure 9 shows the geophysical method interests of petroleum geophysicists to be closely aligned to the SEG membership, that is seismic interpretation and processing methods.

Figures 13 to 18 illustrate members aggregate and the five category interests in technical articles in ASEG publications. Aggregate interest in technical articles in ASEG publications (Figure 13) is fairly surprising, showing equally strong interest in the three mainstream areas of geophysics, but particular interest in software reviews, industry news, potential field and electrical methods. ASEG mineral geophysicists (Figure 14) want more industry news; petroleum geophysicists (Figure 15)

Continued p.37

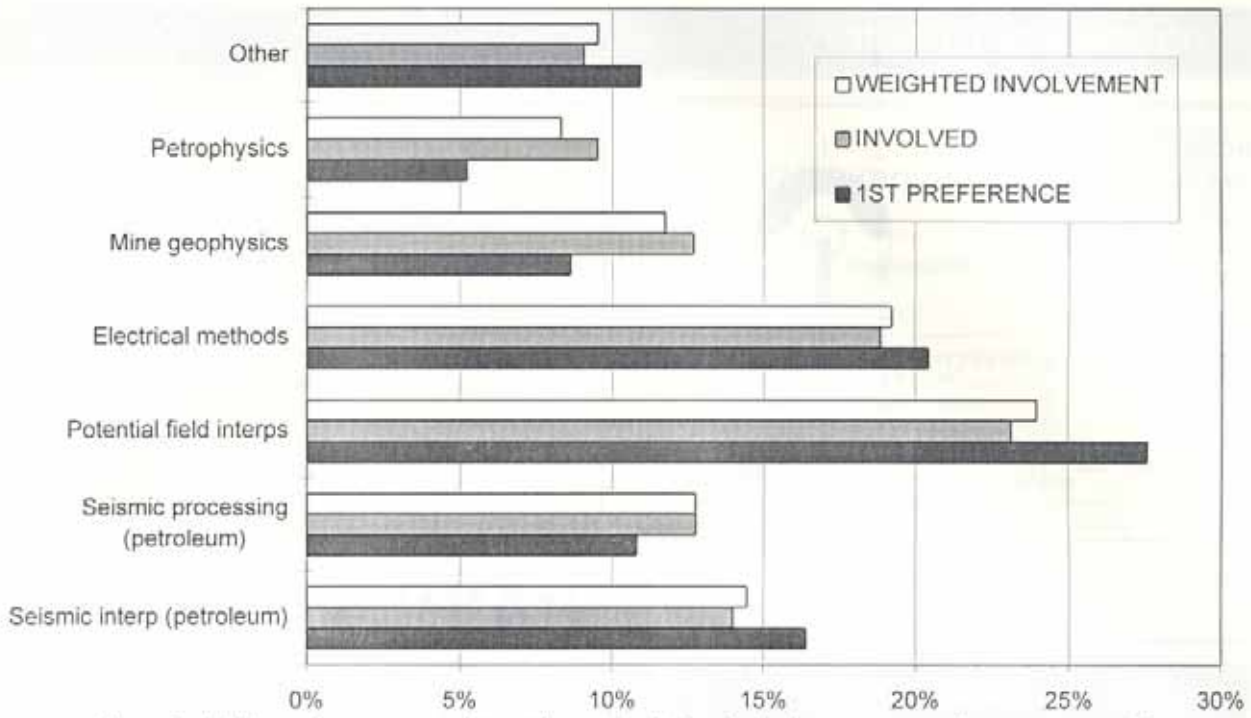


Figure 7. ASEG members aggregate interest in geophysical methods shows a strong preference to potential field methods, electrical methods and seismic interpretation in that order. This shows clearly the unique nature if the ASEG within the SEG family of societies.

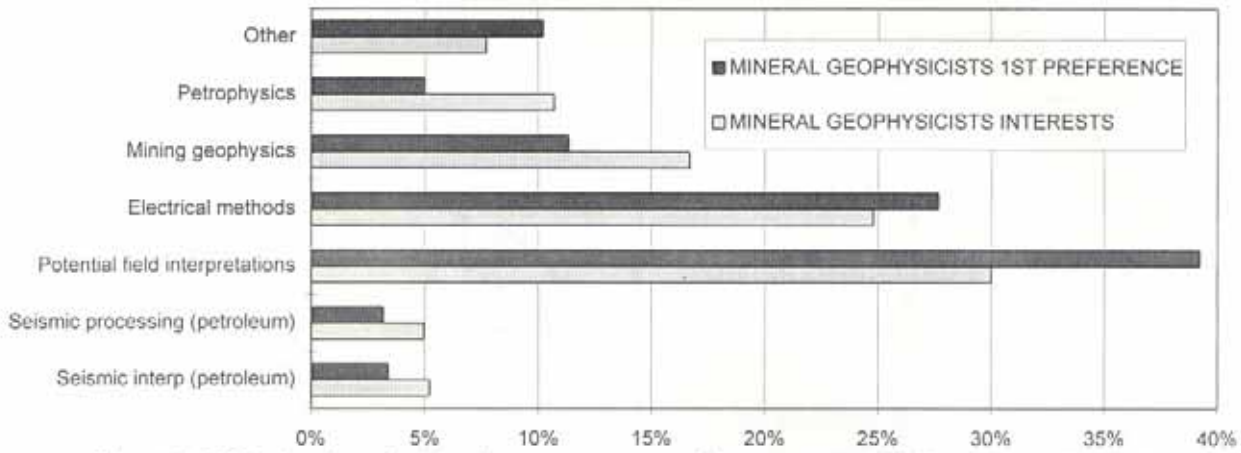


Figure 8. ASEG mineral geophysicists show a very strong preference to potential field and electrical methods and of course mining geophysics.

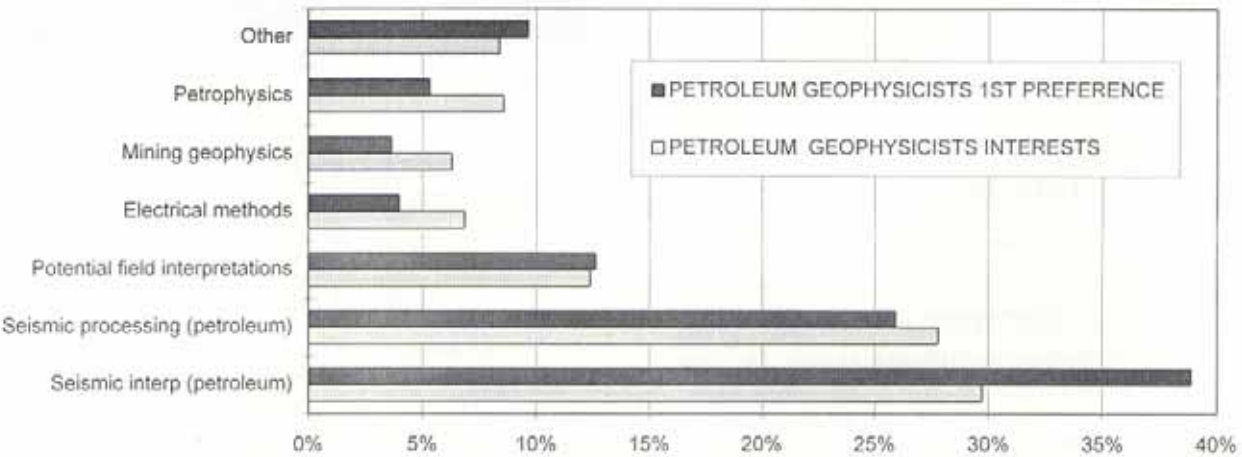


Figure 9. ASEG petroleum geophysicists show understandably a strong preference to seismic interpretation and processing methods, with reasonable interest in potential field methods.

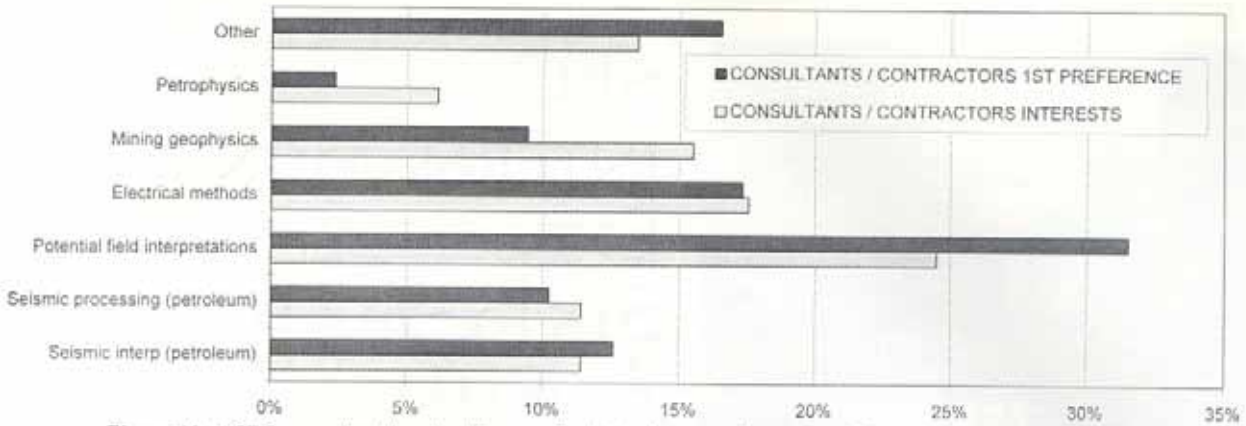


Figure 10. ASEG consultant/contracting geophysicists interests in geophysical methods closely follow those of the mineral geophysicists (Figure 8).

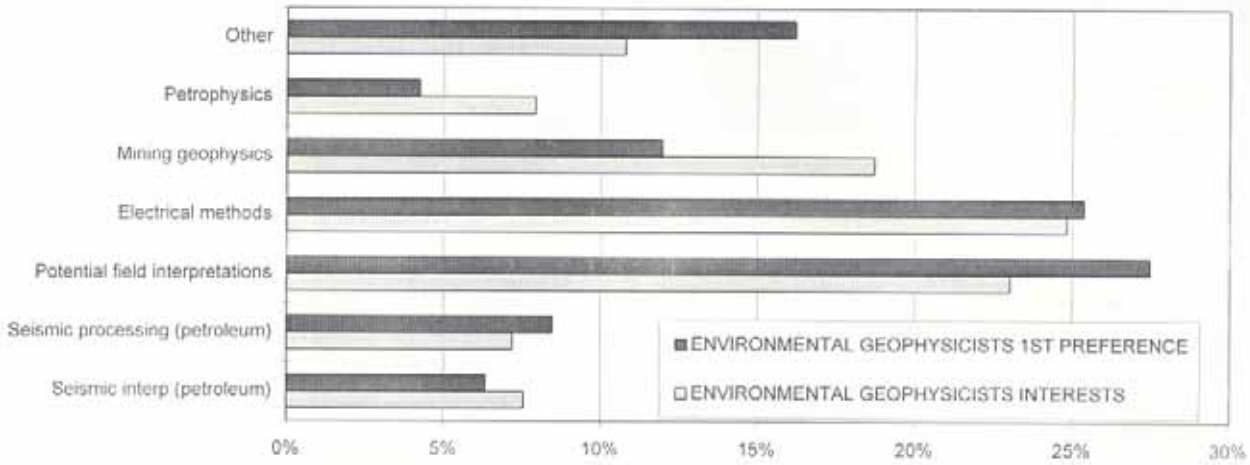


Figure 11. ASEG engineering/groundwater/environmental geophysicists show equally strong interests in potential field and electrical methods.

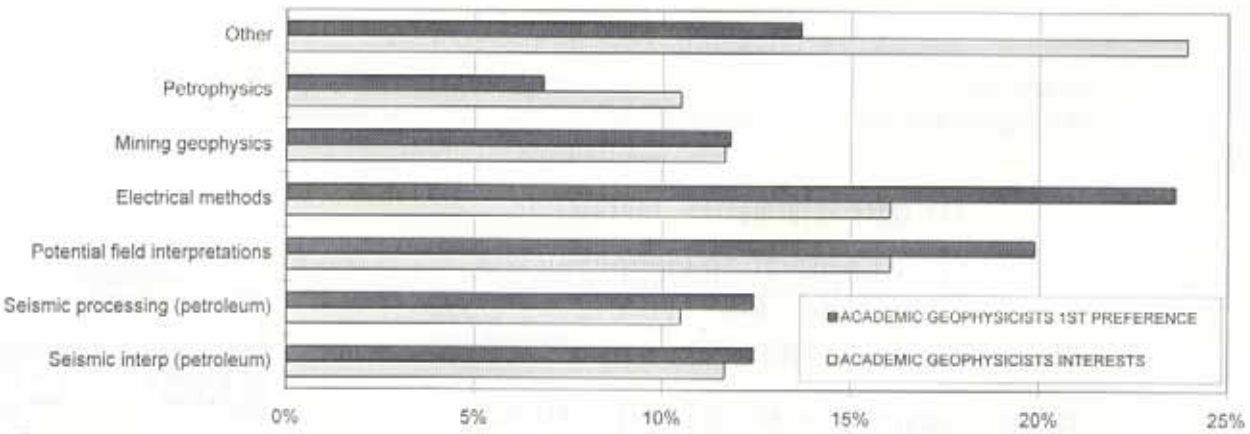


Figure 12. ASEG members involved in academia show the greatest diversity in interest in geophysical methods particularly other than the conventional methods reflecting their involvement in the leading edge of research in geophysics.

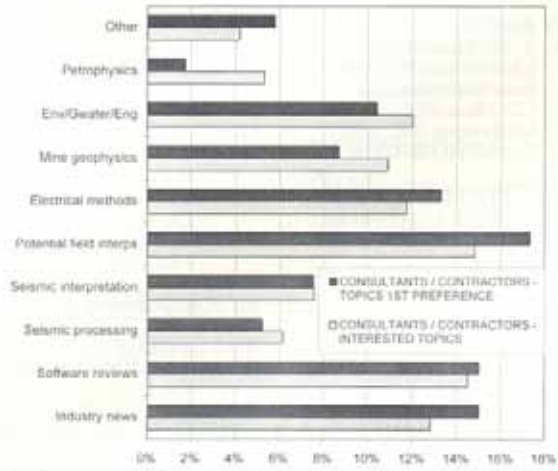


Figure 16. ASEG consultant/contracting geophysicists interests in technical articles in ASEG publications show an even and diverse spread.

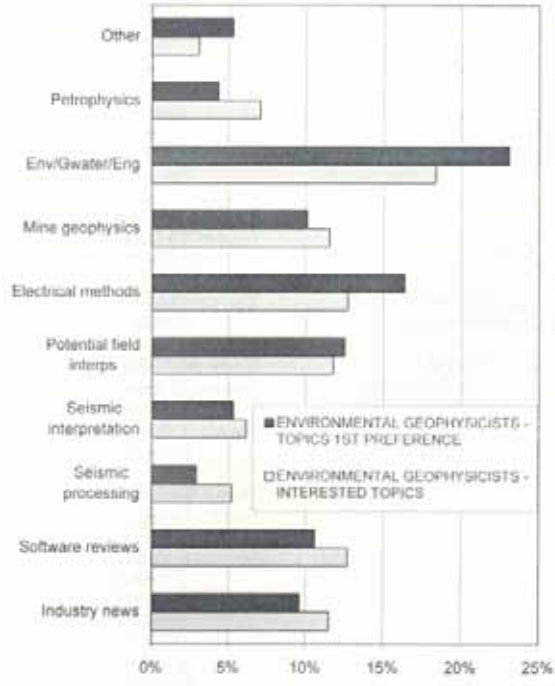


Figure 17. ASEG engineering/groundwater/environmental geophysicists interests in technical articles clearly demonstrates that this group more than any other is wanting good articles/ case histories in its field of primary interest.

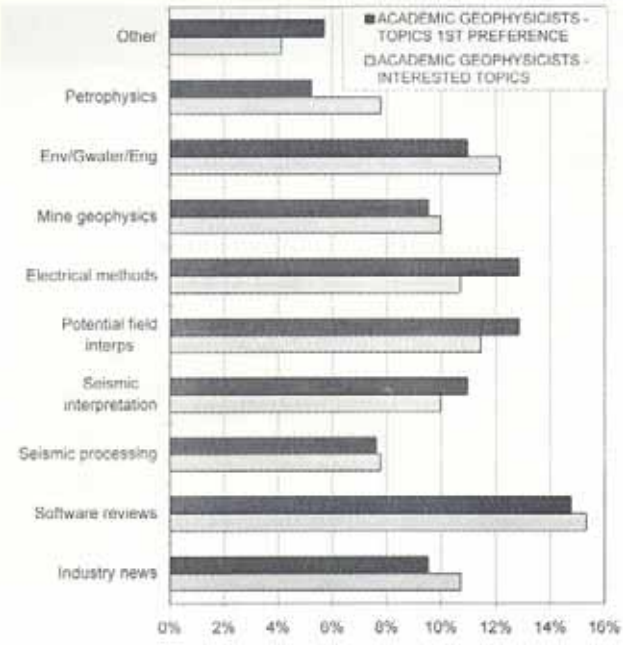


Figure 18. ASEG members involved in academia interests in technical articles in ASEG publications. Again a wide interest and a particularly strong interest in software reviews is shown.

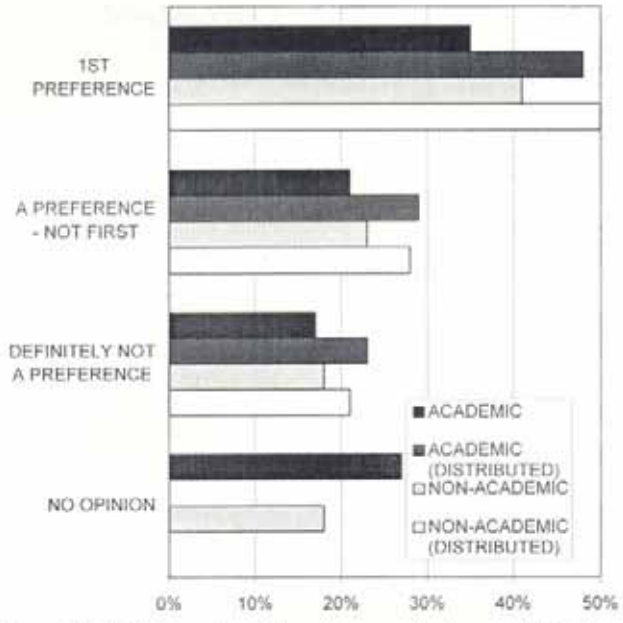
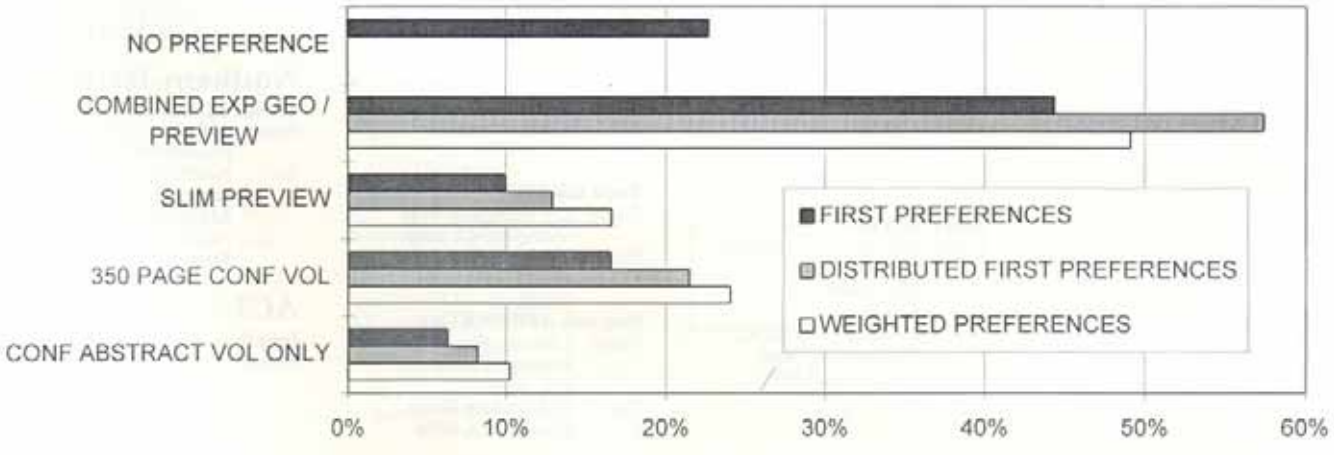


Figure 20. ASEG membership voting results for possible future options for ASEG publications showing a breakdown by academic and non-academic members.

Figure 19. (below) ASEG membership aggregate voting results for possible future options for ASEG publications: Exploration Geophysics, Preview and the Conference Volume.



Membership

New Members

We welcome the following new members to the Society. Their details need to be added to the relevant State Branch databases.

Western Australia

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Wanwu GUO
Dept. of Geology & Geophysics
University of WA
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Change of Address

The following changes need to be made to the relevant State Branch databases:

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Fitzroy VIC 3065
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To: Esso Australia Ltd
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Geoff PETTIFER
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Petroleum Operations Branch
Dept. of Agriculture, Energy & Minerals
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To: Principal Geophysicist
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Tel: (02) 232 8888
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To: 11 Hinks Street
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Western Australia

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Civic ACT 2604
To WMC Resources Ltd
191 Great Eastern Highway
Belmont WA 6104

Andrew BISSETT
From: PO Box 175
Belmont WA 6104
To: 9Canning Avenue
Mount Pleasant
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Todd GRANT
From: 22b Bangalay Way
Dianella WA 6062
To: 574 Light Street
Dianella WA 6062

Stephen ABERNATHY
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To: Po Box 69
Newdegate WA 6355

Sergey SHEUCHENKO
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Joondanna WA 6060
To: Mineral House
100 Plain Street
East Perth WA 6004

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Nth. Freemantle
WA 6159
To: 13 Butson Street
Hilton WA 6163

Terry VISSER
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Edgewater
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Fax: (08) 8218 5265

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Myilli Point Campus
NT University
Darwin NT 0909

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Jonathon ROOT
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South Hobart
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email:104017.713@compuserve.com

Rhiannon MORRIS
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RTZ Mining & Expln.
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To: Casilla 51
Vallenar
CHILE

Christopher MOORE
From; GENMIN: Mineral Resources
International Division
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Marshalltown 2107
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INDONESIA
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USA
To: Senior Geophysicist
Kennecott Exploration
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Utah 84116 USA
Tel: 95-801 238-2413
Fax: 95-801 238-2420

Jeremy READ
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United Kingdom
To: BHP Minerals International Inc.
PO Box 850
Green Point
Cape Town 8051
REPUBLIC OF SOUTH AFRICA
Tel: 44 181 741 8096
Fax: 44 181 563 0427
email: jrread@bhpmjhb.co.za

Where are they?

Does anyone know the new address of the following members? Last known addresses are given below:

Justin KEATING
Unit 2/72 Waterloo Street
Joondana WA 6060

Matthew RUTTY
CSSIP, SPRI Building
Warrendi Road
The Levels SA 5095

Resignations

The following members have resigned from the society and their details need to be deleted from the relevant state branch databases.

David COLLECOTT
BPB Wireline Services
PO Box 5465
Brendale QLD 4500

Eve HOWELL
Hadson Energy Ltd
PO Box 477
West Perth WA 6872

BHP Petrol:C
Locked Bag #1
Collins Street E PO
Melbourne VIC 3000

Calendar of Events

October 21-24 1996
3rd Cuban Symposium of Geophysics/Meeting of the Latin American Union of Geophysicsts, Havana International Conference Centre, Havana, Cuba
For further details:
Manual Marrerro Faz,
Ministerio de la Insustria Basica, Avenida
Salvador Allende No. 666,
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October 21-23 1996
SEG of Japan, 95th Conference Kyoto University Japan.
For more information contact
Business Manager
Tel/Fax: +81 3 3774 5858

October 25 1996
Kalgoorlie Goldfields Expo
Organised by AGSO and the Geological survey of WA
For more information contact
Alan Whitaker at AGSO
Tel: (06) 249 9702
Fax: (06) 249 9983
email:awhitake@agso.gov.au
or Steve Wyche at GSWA
Tel: (09) 222 3606
Fax: (09) 222 3633
email:s.wyche@dme.wa.gov.au

November 10-15 1996
SEG Annual Meeting
Denver, USA (see advert p)
For further details:
SEG, Tulsa USA
Fax: 0011-1-918-493 2074

November 27-29 1996
Nickel 96, Mineral to Market, Kalgoorlie WA
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December 18-20 1996
33rd Annual Convention and Meeting on Geophysical Instrumentation at National Geophysical Research Institute, Hyderabad, India
For further details:
Dr. P. R. Reddy, Hon Secretary
Indian Geophysical Union
NGRI Campus, Hyderabad
500 007 India

February 3-5 1997
Karlsruhe Workshop on Amplitude preserving Seismic Reflection Imaging co-sponsored by SEG at the Lufthansa Training Centre Seeheim Germany
For Further Details:
P. Hubral, Geophysical Institute
Karlsruhe, Germany
Fax: 49-721-71173
email: workshop@gpiwap1.physik.uni-karlsruhe.de

February 23-27 1997
12th ASEG Conference & Exhibition, Sydney Convention & Exhibition Centre, Australia
For further details:
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Conference Action Pty Ltd
PO Box 1231
North Sydney NSW 2059
Australia
Tel: +61-2-9956 8333
Fax: +61-2-9956 5154
email: geoins1@ibm.net

March 12-14 1997
The AusIMM Annual Conference
Ballarat VIC 3353
For further details:
Conference Secretary
R.M. Croggon , Univ. of Ballarat
PO Box 663
Ballarat VIC 3353
Tel: =61-53-279 113
Fax: +61-53-279 137

September 14-18 1997
Exploration '97 4th Decennial
Toronto Canada
For further details:
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101-345 Renfrew Drive
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Tel: 0011-1-905 513 0046
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The Australian Institute of Geoscientists (AIG) has introduced a new grade of membership called the **Registered Professional Geoscientist**. Further information from AIG at 22 Kurraba Rd., Neutral Bay, NSW 2089 Australia; Fax: (02) 9957 6788.

Bruce Hart, a petroleum geologist with the New Mexico Bureau of Mines and Mineral Resources, is conducting a survey of 3-D seismic interpreters. He is keen to receive responses from outside the USA. If you are interested contact Bruce at 801 Leroy Place, Socorro, NM 87801; Fax: +1 505 835 6333; e-mail: hart@nmt.edu

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