PREVIEW

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Special PREVIEW Feature:

Airborne Electromagnetics 15-20

Also in this issue

Special Features

Regular Features

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From the Editor

A bumper and interesting issue this time, thanks in part to Greg Turner's effort in organising our feature article on airborne EM from Peter Jackson of Geoterrex (p 15) and in reviving ASEG Corporate sponsor profiles as a regular feature (p 29). Talk to Greg about corporate sponsorship or colour in PREVIEW advertising/review articles. Geoterrex and NSW Department of Mineral Resources sponsored this PREVIEW colour issue. NSW is promoting the release of the new NSW magnetic and gravity colour images (p 21).

Brenton Oke joins PREVIEW with his regular ASEG secretary's report on the ASEG Executive (p 3). Positions are still vacant on the PREVIEW team (previous issue #43, p 23).

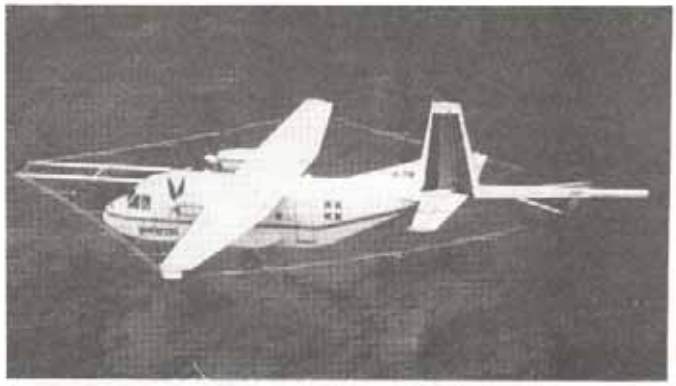
ASEG membership (p 32) swelled 92 members (9% increase!) in 2 months, thanks to the ASEG student membership initiative.

Seismic reflection anisotropy depth determination errors are reported in modelling experiments (p7).

Nigel Jones (p 25) reports on an interesting survey of NSW thoughts on ASEG meetings. Further news on the SA airborne radiometric calibration facilities can be found on p22.

News of innovative Australian company activities comes from Geo Instruments' foray into equipment manufacturing (p 20) and Earth Resource Mapping's amazing, world-first, CD-ROM software promotion (p 11).

News of conferences abounds - ASEG (p 20), airborne EM (p 19), remote sensing (p 22) and geology (p 28). ASEG Conference editors have been appointed (p 10).



The Geoterrex CASA 212-200 platform for GEOTEM airborne electromagnetic system (p15-20)

President's Piece

Henk Van Paridon has received some excellent responses to the request for courses as part of the continuing education program, but perhaps not as many as hoped for. Continuing Education concerns those aspects of geophysics that have been developed in recent years. Rarely will they form part of a university course or an existing course offered by another organisation. Continuing Education courses provide a means of catching up with geophysics beyond the graduate level, particularly when they are presented intensively over a short period of 2, 3 or 4 days. Courses in basic geophysics which are adequately covered by universities, the AMF, and other organisations are not part of the program. Examples of topics in mineral geophysics that I think would make extremely valuable courses are: down-hole TEM; spectral I.P.; magnetic remanence in interpretation; gridding, contouring and filtering as applied to large amounts of data. Each one could be presented as a short course. I am sure that there are others in mineral geophysics, and just as many again in petroleum geophysics.

I am convinced we have people with the appropriate expertise to prepare and present these courses in Australia in addition to the distinguished lecturers we invite from overseas.

We would be interested to hear which geophysical topics you would like to see presented as specialist courses, and whom you consider could present the course in Australia.

Hugh Rutter
President

ASEG People Profile

ASEG Committee Member 1993, David Gamble

David Gamble graduated from Melbourne University in 1965 with a Science degree in Geology and Geophysics. In the first 2 years of his working career he participated in the initial exploration at Kambalda, Greenvale, and Nepean mines. At the end of this period, feeling that Australia had enough new mines to keep them going for a while, he enrolled at the Royal School of Mines in London, and completed (eventually) a M.Sc.

in Mineral Exploration, rock climbing, mountaineering, and the pubs of Europe.

The summer of 1969 was spent in outer Saskatchewan involved in a large airborne EM and radiometric survey, following the discovery of the Rabbit Lake Uranium. Being quick to make the association between the Athabasca unconformity, and the Kombolgie in NT, he spent the next two years working for Barringer Research looking for porphyry copper deposits in Fiji. It was a hard life, but someone had to do it.

In 1973 he took a short contract in Oman, and discovered the Wadi Lassail Copper mine. This was the site of some very early Pulse EM work carried out by Duncan Crone. Age dating of old slag dumps indicated that this mine had been worked in the bronze age. Fortunately, the old miners had left the sulphide ores which are now being profitably expoited.

Returning to Australia, he married and settled in Perth, working as a consultant mainly in the search for calcrete uranium deposits. Moving back to Melbourne he joined BP Minerals, and in 1980 completed a post graduate diploma in mineral economics at Macquarie University. On the strength of this he moved into BP's Corporate Planning Division, an interesting career move, but one he is unlikely to repeat.

In 1986 the attraction of exploration proved too much, and he returned to consulting, specialising in data processing - sharing offices with Hugh Rutter, Guido Staltari, and Paul Hamlyn. This was a stimulating period, but in 1989 the lure of regular meals overcame the joys of private consulting, and he joined Billiton, where he looks after Computing and Geotechnical Services.

Secretary's Report - ASEG Executive

Federal Executive committee meetings are held once a month, usually on the first Monday, at the Geebung Polo Club in Hawthorn. The meeting agenda covers discussion of incoming and out-going mail, reports from the Treasurer, Preview Editor, Business Manager and Conference Liaison Officer and other matters arising or under review. They typically run for about three hours from 6pm. Minutes of these meetings are distributed to State branch Secretary's, Standing Committee Chairman and the SEG Committee as well as the Federal Executive.

We pay a surprisingly small fee for a private meeting room at the Polo Club, with no time limit. The fee includes a tray of nibbles but drinks are a personal expense.

Just to prove that all these late nights at the Geebung Polo Club are not spent sampling their extensive range of local, imported and boutique beers and in an effort to inform members about what is happening at the Federal level, a regular Secretary's column will appear in PREVIEW summarising the discussions at previous meetings.

Since the April PREVIEW we have had the Federal Annual General Meeting and two Executive committee meetings.

The Federal AGM was held on April 20th in conjunction with the Victorian branch AGM at the Kelvin Club in Melbourne and was attended by thirty members. President's, Treasurer's and Secretary's reports were distributed, discussed and approved. In accordance with item 48 of the Articles of Association, all incumbents of the Federal Committee resigned. There being no additional nominations for these positions, all nominated for re-election and were accepted by the members present.

Some of the issues discussed at the last two Executive meetings include:

- Koya Suto has been liaising with the AMF in Adelaide about housing a collection of ASEG publications, Research Foundation theses and geophysical journals in their library. Negotiations have been progressing well, but we are likely to be short of journals such as "Geophysics", "The Leading Edge", "Geophysical Prospecting" etc. If anyone has a collection of journals they would be prepared to donate to the ASEG library (with or without acknowledgement), please contact Koya (Tel: (03) 895 3041).

- There has been an overwhelming response to the one year free student membership initiative outlined in the April issue. Lets hope that these new members choose to renew and continue to enjoy the benefits of ASEG membership.

- Arrangements for the 1994 Perth Conference are progressing well.

- The software for our membership database requires urgent overhaul or replacement. At present it is impossible to extract many desired lists and these must be obtained manually; a very time-consuming and expensive process. Lindsay Thomas has been looking at alternatives to greatly improve our efficiency in this area.

- Last notices have been sent out to 44 members who are two years or more in arrears. If a response and remittance is not received, they will be removed from the database.

- Andrew Sutherland is investigating the scope and cost of a proposed book on the history of geophysics/ASEG in Australia.

- A motion was proposed by Mike Asten to formally congratulate the Queensland Conference Committee on a first class job in organising and running the Gold Coast Conference. This was unanimously supported by the Executive.

- Interviews with distinguished people in the field of geophysics may become a regular PREVIEW feature.

- There has been some response to the request for expressions of interest in joining an ASEG Publicity/Promotions Committee. Interested members are still invited to apply.

I hope this column has been of some interest to you. Feel free to contact me should you have any queries (Tel: (03) 652 6625; Fax: (03) 652 6282.

Brenton Oke
Secretary

ASEG Branch News

Victoria

The April 20th meeting included the Federal and State AGM. Phil Smith of BHPP was elected new president of the Victorian Branch. The committee would like to thank Greg Beresford for his valuable service in the position and also extend a warm welcome to Phil. Our appreciation is also given to Bruce Simons and Edward Pincerato who are stepping down from the committee this year. The 1993 committee is listed below.

On the May 6th meeting Prof. Robert Sheriff spoke on Reservoir Geophysics and his dictionary to a large turnout of Victorian members. His two day lectures on Reservoir Geophysics were also well attended. Many thanks to Rob Kirk for organising the course and to BHPP hospitality in hosting the event.

Next monthly meeting to be held on June to 8th with scheduled speaker Dave Spring (Petrofina). Other speakers lined up include Alan Anderson (BHPP) and Peter Arditto (BHPP).

1993 ASEG Victorian Branch Committee

President	Phil Smith	BHPP
Vice President	John Sumpton	Stockdale
Secretary	Zis Katelis	Schlumberger Geoquest
Treasurer	Paul McDonald	GSV
Committee	Dave Robson	WMC
	Alan Willocks	GSV

Zis Katelis
Secretary

ACT

The ACT Branch of ASEG held the AGM on 21st April 1993. The following executive was elected for 1993:

President:	Alan Hogan	CRAE
Vice President:	Charlie Barton	AGSO
Treasurer:	Mike Sexton	AGSO
Secretary:	Kevin Wake-Dyster	AGSO
Committee:	Peter Milligan	AGSO
	Richard Almond	PC Potentials

Guest speaker for the seminar following the AGM was Andy Green (CRCAMET) with a topic titled "Geophysics, Research and everything else - do they fit together?". The seminar topic fitted in well with the Geomagnetism Workshop with many of the registrants of the workshop staying for the seminar.

The new executive held a branch meeting on 3rd June 1993, with a seminar by Ted Tyne with a topic titled "Mapping NSW in the 1990's: New Geo-Politics, New Geo-Technology, New Geo-Data and New Geo-Ideas". The emphasis of the seminar was to highlight the current revolution in the minerals exploration industry fueled by new politics and new technologies. Geophysics is leading the way in providing new technology and new data to fuel the revolution. Ted highlighted that exploration companies, and State and Federal government geological surveys should be integrated together and seen collectively as "The Mineral Exploration Industry", as such cooperation is vital for future discovery of resources.

The 3rd June 1993 will also be remembered as the day the Richard's Review Report into AGSO was made public. The report was strongly in favour of retaining AGSO as the premier geoscientific organisation in Australia, with recommendations for an increased budget for enhanced acceleration of NGMA projects and additional mapping into the regolith and environmental land use problems. Implementation of the recommendations are yet to be ratified by the federal government, with financial issues still being the major controlling factor on whether the recommendations are implemented. *(Editors Note: More information next issue of PREVIEW)*

Kevin Wake-Dyster
Secretary

New South Wales

The Prof. Sheriff visit to Sydney was a successful stay with the reservoir geophysics short course, held on May 11 and 12, proceeding extremely well, with good attendance and response. Not to be undersold for crowd pulling power, Ted Tyne's presentation (held on 27th May) concerning new technology and perspectives facing the exploration industry, with emphasis on aeromagnetics, GIS, policy and politics was an informative talk enjoyed by one of the largest turnout of members for some time - it was a fitting climax to the previous three days of MRD/Aerodata seminars on aeromagnetics Interpretation.

During the course of 1993, the NSW ASEG in conjunction with the AIG will be addressing environmental geosciences with emphasis on the role that geophysicists and geologists alike play in the management, instrumentation, processing and interpretation of environmental surveys. The addressed work will include groundwater and contaminated sites, with "cross pollination" of skills from traditional industries monopolising environmental work at present. It is planned to culminate this address in a one day conference on environmental geosciences before Easter 1994, with possible provision for related training. Any expression of interest would be greatly appreciated.

1993 Committee

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	John Peacock	(02) 418 8077	(02) 418 8581
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	Roger Henderson	(02) 529 2355	(02) 529 9726
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	Barry Smith	(02) 362 4233	(02) 362 4248
	Jim Tayton	(02) 805 8376	(02) 805 8428
	Wes Jamieson	(02) 263 6080	(02) 263 6077
	Nigel Jones	(02) 263 6007	(02) 263 6077
	Juliet Salmon	(02) 263 6931	(02) 263 6077

Shane Wright
Secretary

Western Australia

ASEG WA recently held its AGM at the Raffles Hotel. Our guest speaker, Bob Sheriff, managed to squeeze us into his hectic schedule and provided us with an entertaining account of the origins of "The Encyclopedic Dictionary of Exploration Geophysics", as well as some insight to his views on the emerging discipline of Reservoir Geophysics. We thank Bob for his time and his company.

We thank the members of the outgoing committee and welcome in the new volunteers for the 1993/94 season. Your local committee is now:

President:	Brian Evans	Curtin University
Vice President:	Andie Lambourne	Geco Prakla
Treasurer:	Kevin Tucknot	Normandy Poseidon
Secretary:	Andy Padman	Woodside
Committee:	Alan Perry	World Geoscience
	Cathy Norman	World Geoscience
	Keith Mayes	Geo Peko
	Kim Frankcombe	Normandy Poseidon
	David De Pledge	Woodside

The committee has a lot of new blood and is keen to put some spark back into ASEG WA. They have met once already, and will meet again shortly to put together a technical and social program for the coming year.

The committee is at present reviewing the venue for technical meetings, and will probably experiment with the present format, perhaps switching to an informal lunch time meeting. If you have any suggestion we'd appreciate your input.

The new committee is especially interested in boosting the Petroleum side of the membership and creating a society that better caters for their needs.

Keep you eye on the mail box for up and coming events.

Andie Lambourne (outgoing secretary) &
Andy Padman
Secretary

South Australia

The SA Branch continued its Information Evening tradition in May this year with an extremely successful meeting. Representatives of 17 organisations ranging from petroleum to minerals and academia to contractors ensured a wide variation on subject matter for the evening. A near record attendance of 70 plus highlights the success of these evenings in keeping the local membership informed in what is happening in their profession. The following organisations were represented:

Placer Exploration	Adelaide University
Aberfoyle Resources	SADME - Minerals
SANTOS	SADME - Petroleum
Solo Geophysics	Dynamic Satellite Surveys
SAGASCO Resources	Petrosys
CRA Exploration	Flinders University
NCPPG	Zonge Engineering
Schlumberger - Geoquest	HGS
Haines Satellite Surveys	

In June, Professor Tom Davis, Professor of Geophysics at Colorado School of Mines gave a presentation to a small but enthusiastic meeting. Tom presented some results of multi-component seismic methods used to locate wells in highly fractured coal bed methane reservoirs in the states. This was a very well received talk given the recent moves to evaluate the potential for such production in Australia.

Finally some advance warning for the 1993 ASEG Wine release. We hope to finalise the selection for this years wine in time for order forms to be included in the August edition of Preview.

Ashley Duckett
Secretary

Queensland

A branch meeting was held on May 12 to take advantage of the visit by Prof Bob Sheriff. He gave an interesting talk about information exchange, including a potted history of the Encyclopedic Dictionary of Exploration Geophysics. The meeting was once again well attended with our current venue at the Gazebo Hotel proving very popular with members.

Prof Sheriff conducted a two day lecture on Reservoir Geophysics on May 13 and 14 attended by 15 people. The talk proved interesting and stimulating, particularly for the participants with less experience.

At a future meeting, we have been promised a talk from Dr John Stanley about his search for the Mahogany Ships. John also hopes to include case studies of other archaeological investigations. We hope to have this soon, but will depend on when John is coming through Brisbane.

Our congratulations are extended to student member Natasha Hendrick who has been awarded a Rhodes Scholarship. Natasha is currently completing a BSc Applied in Geophysics at The University of Queensland. We wish her all the very best for her stay in England, due to start in September.

Wayne Stasinowsky
President

ASEG Research Foundation News

The Seismic Reflection Process in Anisotropic Media

M. Norozi (Curtin University and Western Geophysical Company)
Supervisor Mr B. Evans (Curtin University)

Introduction

The accurate location and imaging of geological structures is essential to exploration companies who use the seismic reflection technique as a tool, to aid delineation of drilling targets. The conventional method of computing seismic data processing assumes velocity isotropy. For most processing computations, this assumption is adequate; however, erroneous positioning errors by as much as 22% of structural depth (Uren et al., 1991) and poor seismic imaging of the simplest structure, can occur due to seismic anisotropy. Any homogeneous, uniform material whose properties vary with direction possess anisotropy (Crampin et al., 1984).

Using a three dimensional physical modelling system located at Curtin University, it was the intent of the research project to record two dimensional (2-D) data considering only P-waves, over an anisotropic physical model, and to show that erroneous reflection positioning errors can occur due to seismic anisotropy on recorded seismic data. Also, a comparison of these results with those achieved by using conventional ray tracing, were of a secondary goal.

Model Building

To be able to simulate anisotropy (transverse isotropy) on a laboratory scale, a material is required which closely resembles the characteristics required for velocity anisotropy. Phenolite is a material which consists of thousands of very thin sheets of paper which are pressed and glued together to make a thick slab. It was believed that this would closely simulate the properties of shale. To record the data and to simulate a field

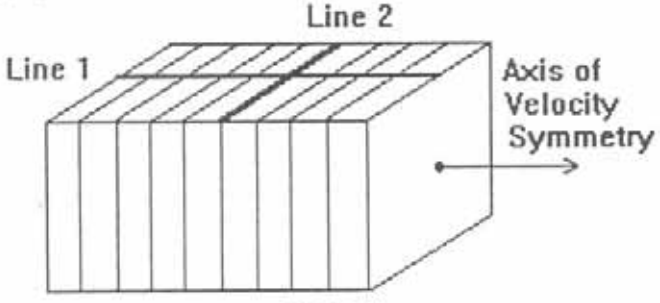

Figure 1.
Schematic diagram of a phenolite block. The layers are aligned vertically within the block. The model is 3300m in length, 1970 m in width, and 430 m in thickness (diagram not to scale). The axis of symmetry is perpendicular ot layering. Line 1 and line 2 are the recording lines.

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environment, both the model and recording parameters must be scaled. The scale used in this modelling was 1:10,000, in length and time. Hence, 1 cm and 0.2 microseconds in the modelling world is equivalent to 100m and 2 msec in the real world, respectively. All the following numbers used in this report are in scaled units (to real world dimensions). Fig 1 is a schematic diagram of the model.

Velocity Function of Phenolite Block

From sonic travel times through the block, a polar plot of velocity as a function of direction may be drawn. The ratio of distance and time yields ray velocity. The velocities found by direct computation, from distance and travel time, were plotted on the polar diagram shown in Fig.2.

A theoretical velocity function was then determined using Thomsen's (Thomsen, 1986) parameters (ε, δ^* and γ) for comparison with the experimentally determined polar diagram.

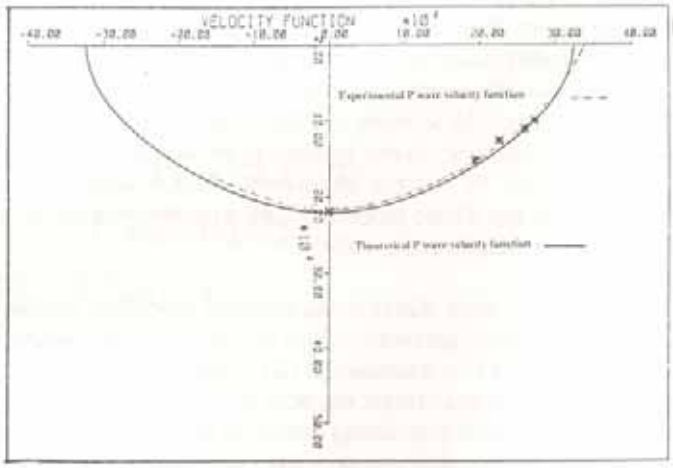

Figure 2.
The best fitting theoretical curve is plotted for comparison with the experimentally determined velocity function.

Physical Modelling

Two recording lines were chosen and labelled as line 1 and line 2 (see Fig. 1). Line 1 was normal to the layering while line 2 was parallel with layering and perpendicular to each other. Two P-wave transducers (450 KHz), one as a source and the other as a receiver, were used to collect seismic data. To find the best stacking velocity, along line 1, to correct the primary reflection from the base of the block (event A), a velocity analysis was run on CMP gathers. A stacking velocity of 2050 m/s for event A at 0.275 s was applied (Fig. 3).

Letting V=2050m/s, T=0.275s, it is possible to calculate the thickness Z of the model, which would be 281m (the actual thickness of the model was 430m). By recording along line 1 which was perpendicular to laminations within the model, there was a 65% error in correctly depth imaging the reflection.

Line 2 was a recorded line over the model which was parallel to the layering within the model. To find the best stacking velocity to correct the primary reflection (event B), a velocity analysis was run on CMP gathers. A stacking velocity

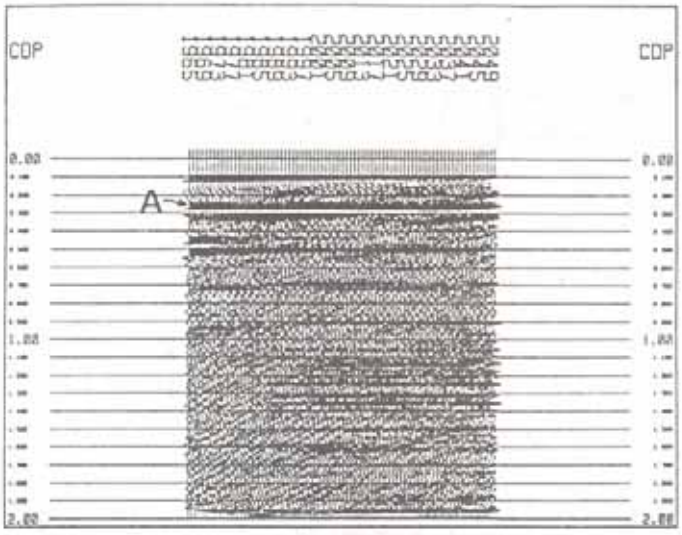

Figure 3.
Final stack section, along a line normal to the layering. The base reflection is at 0.275s (model's thickness=430m).

of 3300m/s for the P-wave was observed. Fig. 4 shows the final stacked section. It is clear that the reflection from the base of the model has occurred at 0.26s.

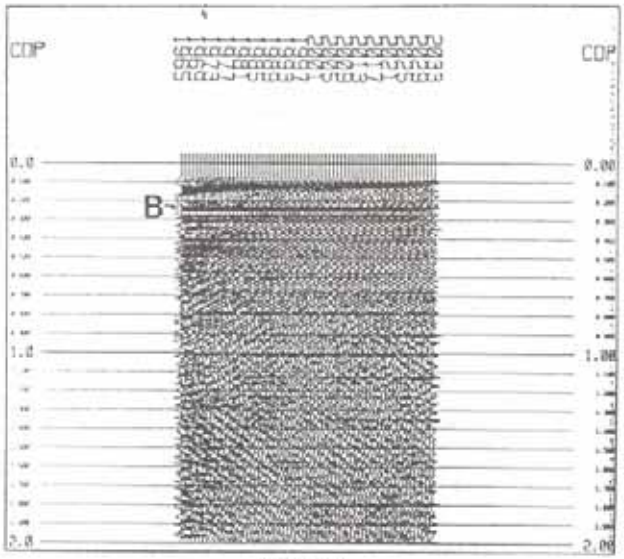

Figure 4.
Final stack section, along a line parallel to the layering. The base reflection is a t0.26s.

Using Z=VT, the thickness Z of the model would be 429m where V=3300m/s and T=0.26s. The actual thickness of the model was 430m. By recording along line 2 which was parallel to laminations within the model, there was only a 2% error in correctly depth imaging the reflection.

Numerical Modelling

It is not possible to simulate anisotropy or numerically define a model with the same characteristics as an anisotropic media with commercial ray tracing packages. Here we again used the original model with the same dimensions and the same P-wave velocities calculated from direct wave data (P-wave velocities along the line perpendicular and parallel to the layers were 2181m/s and 3333m/s, respectively).

Fig. 5 suggests that for numerically modelled data, the base reflection is at 0.4s with a stacking velocity of 2181m/s (compare with Fig. 3). The difference is due to laminations presented within the physical model whereas in the numerically modelled data the model has no laminations (a single isotropic layer).

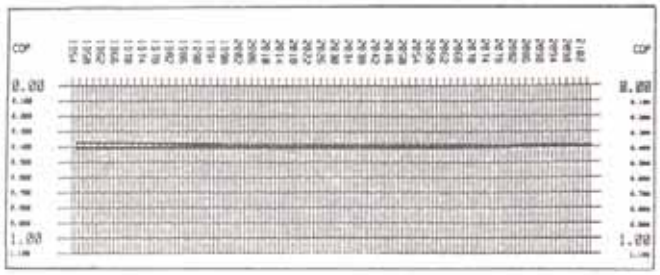

Figure 5.
Final stack section of numerically generated model. The base of reflection is at 0.4s (model depth = 430m).

Fig. 6 is the result of numerical modelling suggesting that the base reflection is placed at 0.258s with a stacking velocity of 3333m/s (compare with Fig. 4). The difference between the two results is minimal and is explained by the fact that the physical model in this direction behaves like an isotropic medium.

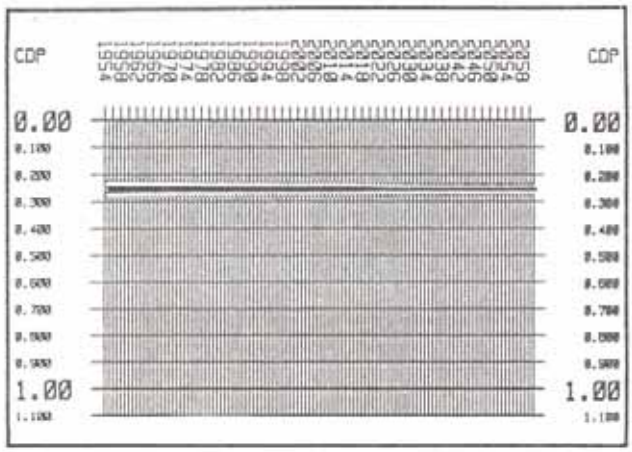

Figure 6.
Final stack section of numerically generated model . The base reflection is at 0.25s (model's depth = 430m).

Conclusions

It has been shown that by recording a line perpendicular to the axis of symmetry (simulated by recording a line parallel to laminations which were vertically oriented), only a 2% error occured in calculating the thickness (depth to the reflection) of the model. Recording a line parallel to the axis of symmetry made it difficult to obtain the thickness of a model correctly or within an acceptable range. Depth misties occur on recorded seismic sections and this may often be as a result of the presence of anisotropy, as demonstrated by this work.

It has also been shown that commercial numerical modelling software is inadequate where the geology has an anisotropic effect.

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About the author

Mohammad Norozi graduated with an Upper Second Class Honours in Geophysics, 1992.

This project was support by the ASEG Research Foundation, as the first part of a two stage Masters thesis, which he is continuing with at Curtin University of Technology, WA.

This paper won the best presentation prize in the ASEG (WA Branch) students night, 1992.

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Publications News

Exploration Geophysics Volume 23, Issue 4:

Volume 23 Issue 4, Special Publication # 6, "Geophysical Techniques in Urban & Industrial Environments". Papers have been typeset and proofed, and the issue should be printed and distributed before the end of June.

Exploration Geophysics Conference Publication, Volume 25, Issue 1/2:

Joe Odins and Richard Facer have been appointed as Special Editors for the Perth 1994 Tenth International Geophysical Conference Scientific Proceedings. Joe will coordinate the flow of manuscripts and will concentrate on mineral papers, whilst Richard will be responsible for petroleum papers.

Joe's dedicated Editorial contact numbers are:

Fax: (02) 525 9029
Phone: (02) 524 9567

Geophysical Signatures of WA Mineral Deposits - ASEG Special Publication # 7

Kim Frankcombe is to be commended for his efforts on the ASEG's behalf in working with the University of WA's Key Centre for Teaching and Research in Strategic Mineral Deposits in the preparation of this seventh ASEG Special Publication. Don Emerson has provided guidances to ASEG editorial, the papers have been properly refereed, and it will be published under joint ASEG and the Key Centre copyright.

It is hoped that htis will be the first of seven (eight?) Special Issues on the geophysics of the States and Territories mineral deposits.

Terry Crabb

A major CD-ROM Geophysical Software Promotion

by
Stuart Nixon
Earth Resource Mapping

(Editors Note: - Perth based Earth Resource Mapping recently had arguably the worlds largest, boldest and most innovative geophysical software promotion using CD-ROM. This is the story of how it was achieved).

Earth Resource Mapping (ERM) recently released ER Mapper 4.0, shipping tens of thousands of CD-ROM's to clients and as inserts into magazines, allowing prospective users to play with the full ER Mapper image processing software, and making it easy for clients to upgrade from release 3.0.

Late in 1992 ERM realised that it was possible to create high-volumes of CD-ROM's reasonably cheaply, and that this afforded several marketing opportunities.

We started approaching magazines around the world about inserting a CD-ROM into the magazine. ERM wanted to make a big impact on the market (we succeeded!), so there was a flurry of paperwork as non-disclosure agreements were signed, and ERM got down to the business of negotiating inserts with magazines. There were many tricks discovered during this process, and both ERM and the magazines were learning as we went along. For example, most magazines are created to weigh just under a postal weight limit. The CD-ROM and shrink-wrap would push weight over the limit, dramatically increasing postal costs.

While ERM completed negotiations for distribution of the ER Mapper 4.0 CD-ROM's, the main job of actually creating the CD-ROM's was initiated.

Before we could even think about CD-ROM's, there were many technical issues that we knew had to be resolved.

For example, we wanted on-line help. Not just quick help, but the complete manuals. Although Sun workstations support on-screen PostScript (xnews), X-terminals and PC's running an X server do not. So, we wrote an on-line help system, that runs on any X display, and created an on-line manual standard to ensure that not only were our 1,200 pages of manuals on-line, but you could actually find what you were looking for.

A complete set of 400Mb of sample datasets were also prepared. Because most processing is not just of a single type of data (such as airborne magnetics), but integration of data, we worked to provide many example types of data over the same area. The ER Mapper CD-ROM ended up including a wide range of data including SPOT Pan and XS, Landsat TM (several scenes over the same area), Landsat MSS, classifications from these, airphoto's, digital elevation data, aeromagnetics, radiometrics, vector road maps and hydrology, 3D seismic and airborne scanner data. All of this was co-registered, and then example algorithms developed to show how to process the data in different ways, and for different applications.

We then set up the startup scripts for ER Mapper so that no configuration would be required, and ER Mapper could run straight off the CD-ROM. This makes ER Mapper easy to evaluate and install from the CD-ROM.

Once these and other technical issues were solved, a disk version of the proposed CD-ROM structure for ER Mapper was created.

ERM purchased a couple of 1,000Mb of additional disk storage specifically for emulating and testing CD-ROM's. Disk image versions of the CD-ROM were created, tested, and recreated before we even looked at pre-mastering CD-ROM's.

One decision we made early on was to use Sun's native UFS file system on the CD-ROM, rather than the more common ISO 9660 (High Sierra) file format. ISO 9660 suffers from growing up from PC's, as it is basically a CD-ROM version of MS-DOS file structures. It has serious problems, including:

- Limited file name lengths (8+3).
- Directories can only be nested to 8 levels.
- Does not preserve Unix's file permission and execution flags.
- Slow performance.

Although some of these problems can be resolved by using a directory of symbolic links from a disk directory out to the ISO 9660 CD-ROM, this would have been ugly, and would not have allowed potential clients to drop a ER Mapper CD-ROM in the drive and use it.

So, we decided on using Sun's UFS file format for the CD-ROM's. This is not a real issue, as only Sun workstations could execute that version of the CD-ROM. ERM is about to introduce ER Mapper for DEC and SGI workstations, and again the file format native to the workstation will be used. Within a year, the "Rock Ridge" extension to the High Sierra format will become more common, and we will swap to ISO 9660 format CD-ROM's once this extension is supported by most workstations.

Once a clean CD-ROM disk image was prepared, it was then restructured to optimise the disk structure for the slow access time on CD-ROM's (which are about 15 times slower than hard disks). We were able to almost double effective performance of CD-ROM by tuning the disk structures.

Then, we cut our first pre-master CD-ROM's. These are "write once" CD-ROM's (not to be confused with WORM or Opto-Magnetic media). Write once CD-ROM's are sometimes called Gold CD-ROM's, because of the gold sub-surface plating on the CD-ROM.

called Gold CD-ROM's, because of the gold sub-surface plating on the CD-ROM.

These CD-ROM's are very expensive to create, but as they look just like a normal CD-ROM to the computer, they are invaluable for testing. ERM's pre-master testing was worth it - the gold master CD-ROM's tested and worked. After sending beta-site clients, copies of ER Mapper beta 4.0 on gold CD-ROM for testing, and integrating beta-site feedback back into ER Mapper 4.0, we were ready for the final cut.

Our first single production run of CD-ROM's involved over 50,000 CD-ROM's. When one realises this is over two tons of CD-ROM's, the scale of the production becomes apparent.

The size of ERM's CD-ROM productions put it right into the big league, and we shopped around the world in Europe, America and Australia looking for the best quality CD-ROM's, a company that could print four colour onto the CD-ROM, and had good pricing.

We finally settled on a USA company, who gave us the same prices as given to Apple Computers (ERM produces over 100,000 CD-ROM's each year), and I flew to our USA office hand carrying three gold CD-ROM masters, and three tape images of the CD-ROM - all of which had been tested and cross checksummed.

The CD-ROM's were cut from one of the gold CD-ROM's, and cross checked against the master CD-ROM's and tapes. We never needed to use the backups - but it pays to be certain with this sort of thing.

The extensive testing paid off. We never had any problems with the CD-ROM's created. Also, the detailed knowledge ERM now has about CD-ROM production is improving our support to clients - the recent introduction in May of release 4.0a (an upgrade release) was possible within a very short turn-around time, allowing us to get new versions and enhancements to our clients quickly.

As ERM introduces ER Mapper on each new hardware platform, a CD-ROM will be cut, and distributed to all clients with software updates. Also, ERM will continue to promote ER Mapper through the CD-ROM media.

The entire concept, from start to end, was executed in less than four months. We received favourable responses around the world, with USA companies in particular being impressed. We now get asked what we are going to do for our next marketing concept, to beat CD-ROM's. You'll have to wait and see.

AUTHORS BIOGRAPHY

Mr Stuart W. Nixon is Founder and Managing Director for Earth Resource Mapping. His early days were spent on a 750,000 acre cattle station in the outback of Australia. After this unusual upbringing and following schooling in Perth, he spent ten years creating and managing large software development projects for computer companies. In 1989, he developed some new concepts in image-processing and founded Earth Resource Mapping to implement these concepts into what became the ER Mapper software product. Earth Resource Mapping has offices in Australia, USA and Europe, and distributes ER Mapper throughout a world-wide network of seventy five distributor offices.

New developments in airborne electromagnetics

by
Peter Jackson
Geoterrex

After magnetics and radiometrics, electromagnetics (EM) is the most commonly used tool in mineral exploration. The method involves the propagation of time varying low frequency electromagnetic fields through the ground. The electrical property of inductance and inductive coupling is of particular advantage, as this removes the requirement for direct contact and allows the system to be installed in aircraft. The method is based upon the study of the decay of the secondary electromagnetic fields and this enables the data to be interpreted in terms of information about the conductivity of the terrain.

Early systems were frequency domain systems but, in the 1960's, time domain EM systems were introduced. The first airborne TEM system was the INPUT (Induced Pulse Transient) system developed by Barringer in 1958 and was operated in Australia by Barringer Research during the 1960's. It was reintroduced in 1972 by Geoterrex Pty Ltd. With a time domain system, the primary field is discontinuous and the secondary field is recorded in the absence of the primary field. During the transmitter off-time, the receiver records the secondary magnetic field arising from the induced currents in the ground.

In 1989, Geoterrex introduced the GEOTEM system into Australia, a high speed digital system which replaced the INPUT system. Not only was the new system introduced, but the old aircraft was decommissioned and replaced by the now familiar CASA 212-200 aircraft. The CASA was chosen to provide a stable and cost-effective platform for the more advanced system. In addition, the CASA aircraft is a short take-off and landing (STOL) aircraft for use in the most remote locations and it has extraordinary climb and decent capabilities. This enables Airborne EM (AEM) to be used in some marginal areas in which it would have been previously necessary to use the more expensive alternative of a helicopter platform.

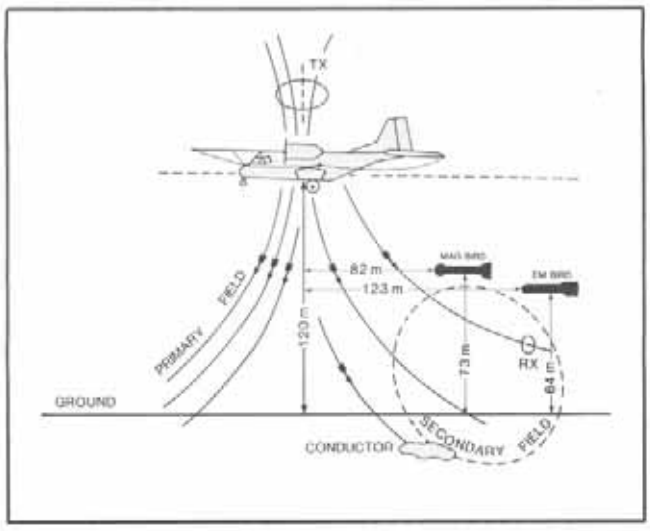


Figure 1: System Geometry

Over the years, EM systems have been modified and developed as the physics of the system and the induced responses have become more fully understood. This has been facilitated by the advances that have been built into AEM systems since the six channel INPUT system was originally introduced.

Today, the GEOTEM system has 128 channels, windowed into 20 programmable gates. Most commonly, 12 final channels are recorded at 125 Hz and 15 final channels at 75 Hz. These channels are an amalgamation of the 128 channels initially sampled per half cycle. Recent developments include recording of channels during the transmitter on-time period. These 'in-pulse' channels have been successful in discriminating very shallow variations in conductivities, eg salinity mapping and mineral exploration in very resistive environments.

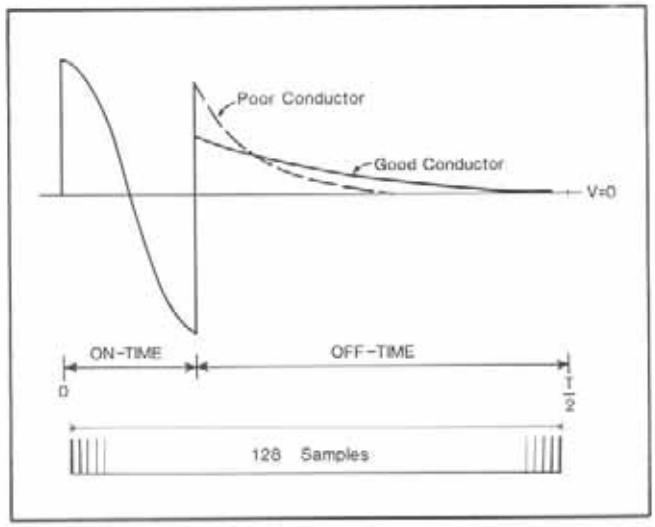


Figure 2: Sampling

With the flexibility of both selecting different base frequencies to suit ground conditions and arranging the multiple receiving channels, during on-time as well as during the conventional off-time, the AEM system can be focussed on the most diagnostic response characteristics of the sought-after target.

APPLICATIONS OF AIRBORNE EM

Airborne EM is routinely used in exploration for sulphides, however, it has many other applications, including:

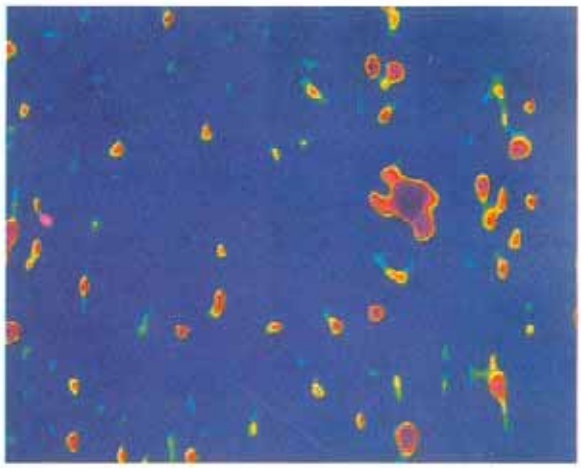
- Geological mapping
- Mapping structure

RECENT APPLICATIONS OF AIRBORNE EM

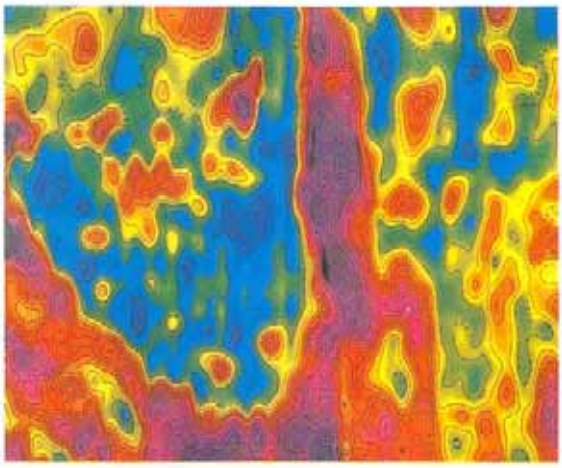
Example 1: Geological mapping (near surface, weak conductivity contrasts)

The addition of an on-time receiving channel brings a new dimension to the collection of GEOTEM data by displaying subtle conductivity changes in the upper layer. This can assist in surface **geological mapping** and structural interpretation when studied in conjunction with the conventional off-time data and the isomagnetic contours.

Compare the two upper figures. It is immediately evident that the on-time channel (right) is responding to near-to-surface, low apparent conductivity that is virtually undetectable on a typical early off-time channel (left).



CHANNEL 2 AMPLITUDE CONTOURS



ON-TIME CHANNEL AMPLITUDE CONTOURS

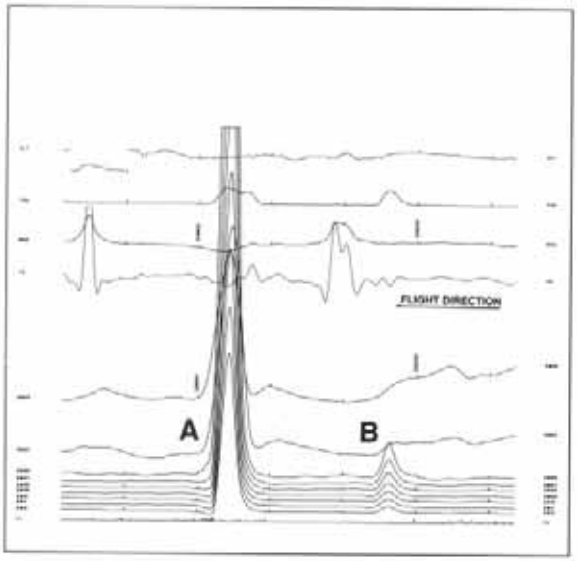


Figure 1. GEOTEM® PROFILE

Example 2: Kimberlites - Point Lake, NWT, Canada

- Note the pronounced GEOTEM response (anomaly A) recorded over the Point Lake kimberlite (figure 1). The trailing edge **negative** of this anomaly is characteristic of a GEOTEM response over a conductive flat-lying plate.
- A **magnetic low** (40 nT) is coincident with the Point Lake kimberlite (figure 3).
- The apparent **conductivity high** (17 mS/m) shown in figure 4 is coincident with the magnetic low. The high spectral content of the GEOTEM **on-time** channel and its geological mapping capabilities is also well illustrated.
- The "stripping" of the sediment response in the GEOTEM **off-time** (figure 5) reveals the presence of a second GEOTEM target (anomaly B).

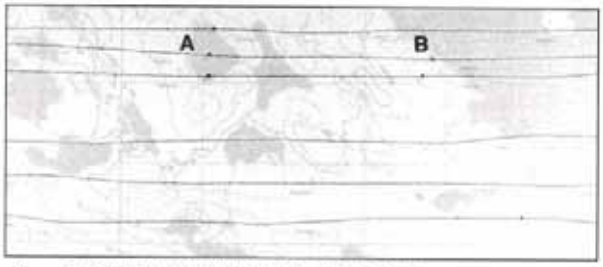


Figure 2. GEOTEM® ANOMALIES AND FLIGHT PATH

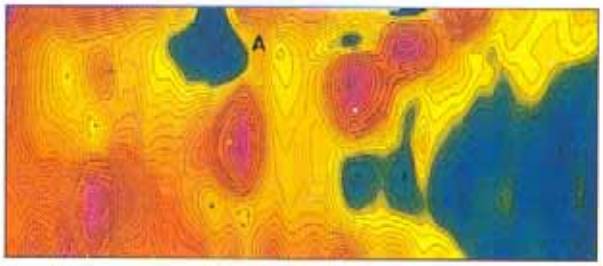


Figure 3. TOTAL MAGNETIC FIELD CONTOURS (nT)

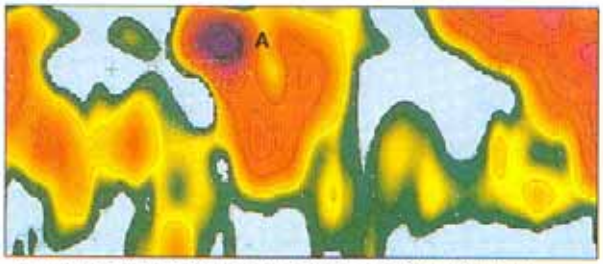


Figure 4. APPARENT CONDUCTIVITY (ON-TIME) CONTOURS (mS/m)

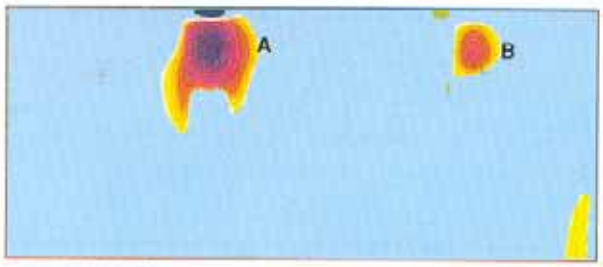


Figure 5. GEOTEM® CHANNEL 7 (OFF-TIME) AMPLITUDE CONTOURS (ppm)

- Ground water and salinity studies
- Kimberlite exploration
- Detection and mapping of graphite and carbonaceous shales
- Mapping of channels

(Examples of case histories are shown on the opposite page)

Base metals

Although AEM is well known as an excellent exploration tool for base metals, particularly massive sulphide ores, in many years, other targets have dominated our surveys. As figure 1 shows, the mid 1970's were dominated by base metal exploration and, again, there was a persistent increase in activity from the mid 1980's into the early 1990's.

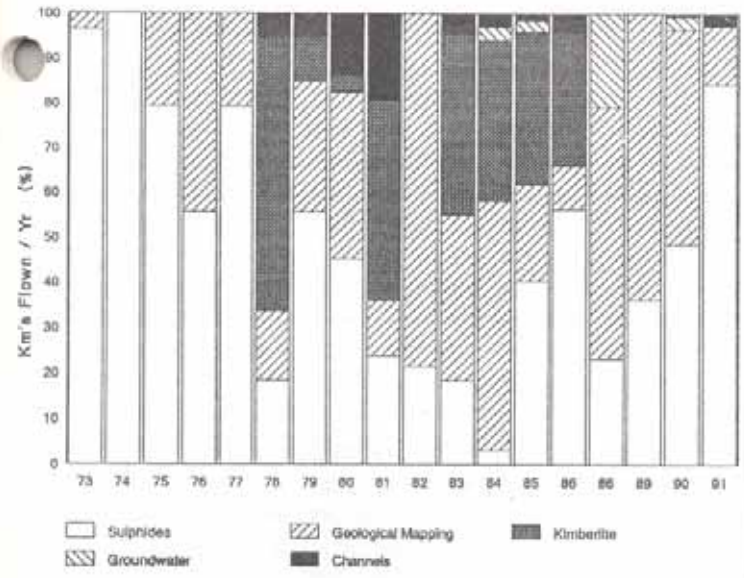


Figure 3: Primary objectives for INPUT/GEOTEM surveys in Australia 1972-1991

Geological mapping

Because the most common use of airborne EM data has traditionally been to locate discrete anomalous conductors associated with massive base metal sulphide occurrences, the geological mapping potential of AEM data has been somewhat overlooked. The use of cheaper methods (airborne magnetics and radiometrics) in Australia has generally prevailed for regional mapping. AEM data can, under certain circumstances, significantly contribute to the understanding of regional and local geological trends. Within thick sections of some Proterozoic sedimentary basins lacking magnetic signatures, AEM can actually prove more useful than magnetic surveys in geological mapping effectiveness.

AEM systems are sensitive to a wide range of conductivities and, where there is a significant conductivity contrast, it is possible to map lithological boundaries as well as identify structural trends. However, there is an additional dimension to this application in that it is possible to make quantitative depth estimations and give an indication of dip directions in certain circumstances.

Alteration zones/geothermal systems

Mapping alteration zones associated with epithermal mineralisation can be successful using AEM if conductivity contrasts are sufficient. In particular, the contrast between conductive clay alteration and resistive zones of silicification can aid in the mapping of alteration within the epithermal system. Associated geophysical parameters such as magnetic lows caused by magnetite-destructive alteration also assist. Surveys for alteration zones associated with uranium have been very successful.

Because of the highly variable nature of rock conductivity properties from region to region, each area of AEM surveying needs to be interpreted on its merits; for example, dolerites can be very resistive within the Mt Isa Inlier, but conductive in the Pine Creek Inlier. Comparison with the known geology is essential and particular attention should be paid to the distribution of recent alluvium and colluvium. Generally speaking, Phanerozoic cover in Australia tends to be more conductive than Proterozoic and Archaean basement.

Kimberlites

1983 to 1986 was a period of significant kimberlite exploration in Australia. It is quite likely we will see an increase in activity in this area in 1993/94 as 'diamond fever' raging in Canada filters through to Australia.

Not all kimberlites produce a magnetic response, so chances of detection are optimised by flying combined AEM/magnetic surveys. AEM often responds well to the weathered zones within kimberlites.

Graphites

The conductivity of graphites is generally much higher than the host. They occur in the sedimentary formations of the Precambrian, as well as in volcanic tuffs, often concentrated in shear zones.

The signature of graphites is generally similar to sulphides, with narrow, symmetrical anomalies with slow decay. They often occur in long multiple conductors lying in parallel bands. The conductivity is variable, but generally high. The detection of graphites assists in geological mapping applications and can also be very useful in the search for either Uranium or Gold.

Paleochannels

Another application for airborne TEM surveys is mapping paleochannels. The type of response varies depending on the form the channel takes, however, two main categories exist, namely; a conductive basement with less conductive fill, or a resistive basement and conductive fill. A typical response has suppressed early channel amplitudes, with raised late channel amplitudes, similar to a half-space response, but this will ultimately depend on the conductivity and geometric characteristics of the specific channel.

Groundwater and salinity

Surveys where groundwater assessment and exploration has been the objective have historically only made up a small proportion of AEM activity in Australia. However, this is not

to say that AEM is not an efficient tool for groundwater exploration, it has had a great number of successes worldwide. A number of hydrological problems can be solved using AEM, for example:

buried channels of coarse aquiferous (resistive) material in a clay (conductive) environment

- lenses of freshwater floating on brackish water
- interface between freshwater and brackish to saltwater, eg coastal areas, deltas, lagoons, salt lakes, etc

In addition, with the growing awareness of agricultural salinity problems, this area of activity is expected to increase throughout the 1990's.

NEW DEVELOPMENTS

New developments are continually being tested and implemented in both acquisition systems and data processing routines.

Some of the more recent developments and improvements include:

- **Acquisition systems**

The signal received by the towed-bird receiver is passed to an on-board data acquisition system. This system is used to control and command the synchronised operation of the ancillary equipment, as well as recording all the geophysical and associated data in real time. This data is recorded on to cartridges for in-field processing and final processing back at the main processing centre.

Analogue acquisition systems used whilst the INPUT system was in operation have now been superseded by more advanced digital acquisition systems. In May 1993, the MADACS data acquisition system used since 1990, when the GEOTEM system was introduced in Australia, was replaced by the more advanced GEODAS system. The GEODAS system (Geoterrex Data Acquisition System) has been developed in-house and customised for geophysical applications. Specific modifications were made to the basic system to interface with the various sensors, navigation and recording instruments. The GEODAS will be capable of recording all raw GEOTEM samples, as well as windowed data.

The system is based around a 486 processor, installed in a smaller and more rugged, rack-mountable unit specifically built to military specification for field conditions. The system software which controls this hardware and which interfaces with the operator was also developed in-house by Geoterrex personnel using the third generation languages now available.

- **In-field processing**

The level of in-field processing has been recently increased to include the production of a suite of products designed to facilitate data quality control and rapid follow up. Flight path data is processed and finalised in the field prior to aircraft demobilisation. This ensures that the survey coverage has been completely verified and permits the production of plan data products for evaluation. The AEM data can be spike edited and filtered so that the data can be image processed on site. This allows the data to be critically appraised for the purposes of both data quality control and first pass interpretation. One obvious advantage is that interesting anomalies can be followed up almost immediately and that survey coverage can be either augmented or altered based on the geophysical response of the area. The data can be plotted in the field as either stacked profile maps or contour plans. These products are used in conjunction with the automatic anomaly selections which are plotted on the aircraft flight path maps progressively during the survey.

- **Altitude correction**

Most AEM surveys are designed to be flown at constant aircraft terrain clearance. However, variations in the aircraft terrain clearance cannot always be avoided and these variations are often significant in rugged areas and in conductive areas. This can affect the signals measured by the system and lead to inaccurate data interpretation. Techniques have been developed that allow the interpreter to recognise the possible contributions of these effects to the measured signal. The processed channels of AEM data are corrected for any variations in terrain clearance and the corrected channels are presented on the final multi parameter profiles. By superimposing the corrected data over the original data, the profile presentation remains relatively uncomplicated and only those regions characterised by significant variations in terrain clearance are highlighted.

- **Anti-asymmetry function**

The configuration of the AEM systems is such that it commonly produces offset responses which are typified by a 'herringbone' pattern when viewed in plan form. Since AEM data is usually lagged for the alignment of responses over narrow vertical conductors, this characteristic pattern is diagnostic for the interpretation of conductors that are either flat lying or exhibit horizontal width. Although invaluable during data interpretation, this phenomenon has greatly inhibited the use of AEM data in plan form since the resultant pattern disguises geological trends can produce confusing plan presentations. To overcome these problems, routines have been developed to remove the herringbone effect such that the output data is well suited for geological mapping requirements and ideal for image processing applications.

- **Conductivity depth imaging**

The interpretation of AEM data can now be greatly enhanced through the construction of conductivity depth sections. Apparent conductivity and depth information can be derived from a series of algorithms applied directly to the AEM data and the output is displayed as colour sections analogous to cross sections of the earth.

- **Customised data processing**

The processing procedures outlined above complement the presentation and interpretation of AEM data. Other processes, such as amplitude decay indices, in-pulse data products and shaded colour profile maps, can also be used to maximise the amount of information derived from AEM data.

Geoterrex has flown over 2.5 million kilometres of INPUT and GEOTEM surveys and invests over 5% of its revenue in research and development into AEM. The State-of-the art GEOTEM system is available worldwide for mineral exploration and environmental appraisals.

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ASEG 10th Geophysical Conference

The Australian Society of Exploration Geophysicists is holding its 10th Geophysical Conference and Exhibition from 20th to 25th February 1994 at the Burswood Convention Centre.

The organising committee is planning the technical programme around the theme "Increasing the Resolution: Clearing the Haze". The format will comprise plenary keynote sessions, concurrent sessions, pre- and post- conference workshops, technical poster presentations and trade exhibition.

Papers cover a wide range of interests in the petroleum, minerals, environmental and geotechnical fields.

The conference will focus on the move, over the past few years, towards increased spatial resolution resulting in better target definition.

Special one day sessions on the Geophysical Signatures of West Australian Ore Deposits and Salinity and Environmental Monitoring with Geophysics will be held. Day registrations from people not directly involved in geophysics are welcome for these sessions.

Concurrent with the conference will be an exciting trade exhibition displaying the latest developments in geophysical and exploration technology.

An excellent social programme will allow for some relaxation and interaction between friends and colleagues.

For further enquiries contact:
Promaco Conventions Pty Ltd
Unit 9A/ 890-892 Canning Highway
Applecross WA 6153
Ph: (09) 364 8311; Fax: (09) 316 1453

More Information in coming editions of PREVIEW.

Geo Instruments Becomes A Manufacturer

With the demise of the very popular Finnish made hand-held susceptibility meter, Geo Instruments decided to attempt to fill the gap. As we were also agents for the Exploration digital only reading instruments, we observed a polarisation of user prefence for either a digital reading instrument of an analog readout. Thus we attempted to satisfy both camps by producing, in the one instrument, a digital display and a digitally simulated analog display.

After considerable design considerations and the production of several prototypes, which were evaluated and given to potential customers for feedback, Geo Instruments have now commenced production of the GMS-2 pocket Susceptibility Meter.

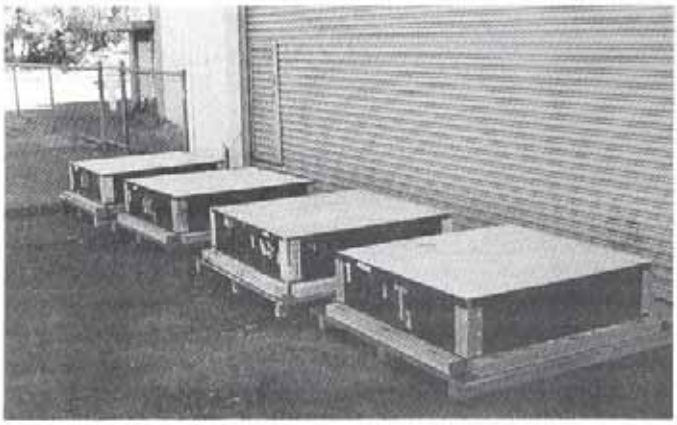
It has a number of features which do not exist in other such instruments on the market. For example, it operates entirely under menu control and can store more than 100 readings in memory for subsequent recall and display or for transferring to a computer via a unique RS-232 serial port. This serial port works on an optical principle, thus avoiding the need for a connector which could allow dust and moisture ingress. As all the software is contained in the one Eprom, any further improvements that may be required can be easily incorporated in existing units through the RS-232 port. The unit weighs only 300 grams and can fit into a shirt pocket.

Geo Instruments expect the instrument to be popular throughout the world and have already commenced exhibiting it through their network of SIROTEM agents in many parts of the world, including currently China and South Africa. Many orders have already been received from Australian customers.

GEO INSTRUMENTS

Update-Radiometric Calibration Facilities

Following on from the article in the previous issue of PREVIEW we would like to inform readers of the availability of the calibration pads in South Australia owned and operated by the Department of Mines and Energy (DME) and also to advise the concentrations of the four sets of pads built by Bruce Dickson at CSIRO, North Ryde in late 1992. The South Australian pads are one of these sets.



Kevron Geophysic's pads (1.0m x 1.0m x 0.3m) similar to SA DME pad construction.

In January 1993 the four DME pads were installed permanently at Whyalla Airport and are now available for use by anyone at any reasonable time. The four pads have been buried on the northern edge of the east-west taxiway in front of the Whyalla Aero Club building which is to the south of the hanger.

The pads are spaced with six metres between centres and are in order from east to west : Background, Potassium, Uranium and Thorium.

The pads have been used for system calibration by contractors flying the South Australian Exploration Initiative program in conjunction with the Birkitt Hill Dynamic Test Range 150 km to the NW of Whyalla.

Further details including access to the pads can be obtained from Terry Crabb at DME of SA on phone (08) 274 7610; Fax (08) 272 7597.

Bruce Dickson has provided the following table of concentrations for the four sets of pads built by him and his helpers.

	K percent	U ppm	Th ppm
B-pad	0.24 +/- 0.02	0.48 +/- 0.18	2.28 +/- 0.34
K-pad	5.84 +/- 0.17	0.57 +/- 0.35	1.37 +/- 0.56
U-pad	0.25 +/- 0.04	38.5 +/- 4.5	1.16 +/- 0.53
Th-pad	0.19 +/- 0.08	4.50 +/- 0.33	103.2 +/- 5.6

Details of the construction of these pads will be published in a forthcoming edition of Exploration Geophysics.

Paul Wilkes, Terry Crabb, Bruce Dickson

7th Australasian Remote Sensing Conference

1 - 4 March 1994, Melbourne, Australia

Theme: *"Mapping Resources, Monitoring the Environment, and Managing the future."*

Call for Papers

Deadlines:

Synopsis: July 16 1993
Final Manuscript: November 1 1993

Conference Theme:

Remote sensing has become an important tool for mapping the land and geological structure of Australia, and for studying its surrounding oceans. Remotely sensed information, in combination with GIS (Geographic Information System) technology, is a valuable aid for environmental management and for planning resource development. Together, they promise to revolutionise the management of information about our planet.

Remote sensing provides an effective way of rapidly assessing resources over large areas. This is particularly important in sparsely settled regions such as Australia.

Information gained from sensors on airborne and satellite platforms is vital in allowing us to probe the surface layers that cover much of Australia, in order to identify the underlying geological features that control the location of mineralisation.

The world is faced with the likelihood of climate change associated with the enhanced greenhouse effect. Climate change may have a significant impact on many fragile Australian ecosystems. This Conference aims to explore the relevance of remote sensing to current and future problems including the exploitation of natural resources and the long-term protection of the Australian and world environment.

Associated Conferences

The7th ARS Conference will be held in conjunction with three other remote sensing conferences:

- The Inter- Congress Symposium of Commission 5 of the International Society for Photogrammetry and Remote Sensing (ISPRS).
- The 2nd Australian Photogrammetric Conference
- The Pacific Ocean Remote Sensing Conference (PORSEC '94)

FIG XX (The Congress of the International Federation of Surveyors) immediately follows the Conference

For further details:
7th ARS Conference Secretariat
Ph: (03) 387 9955; Fax: (03) 387 3120
Email: 7arsc@dar.csiro.au

ASEG Meetings Questionnaire

ASEG NSW BRANCH, 1992

INTRODUCTION

The aim of the questionnaire was to improve the attendance at NSW branch meetings and tailor them to the interests of members.

The questions asked were:

1. Current employment.
2. Your branch of geophysics.
3. Are you a member of other professional associations?
4. Reason for ASEG membership.
5. How often do you attend conferences?
6. Your reason for attending ASEG meetings.
7. Meetings venue preference.
8. Timing of meetings:
   a) Preferred time of day
   b) Preferred day of week
9. During 1992 8 technical and 3 non-technical presentations are proposed: would you prefer more social or technical meetings?
10. Do other society meetings conflict?
11. Are you discouraged from attending meetings due to location etc?
12. How often should ASEG meetings be held?
13. On which topics would you like more talks?
14. Notice prior to meetings:
    a) do notices arrive in time?
    b) preferred amount of notice.
15. Which social events would you support?
16. What meetings do you propose to attend?

It was issued in June 1992, in conjunction with a proposed meeting schedule for 1992 (see Table 1). Additional comments were invited.

Table 1 PROPOSED 1992 N.S.W. BRANCH MEETING SCHEDULE

DATE	SPEAKER	ORGANISATION	TOPIC
30.1.92	None		A.G.M.
5.3.92	Prof. D. Oldenburg	Univ. British Columbia	New approaches in Geophysical Inversions
26.3.92	Ms.S. Mayo	Royal Flying Doctor Service	Wings for the Doctor
30.4.92	Dr.R. Yelf	Georadar Research	Ground Penetrating Radar
4.6.92	Dr. C Jenkins	Ocean Sciences Institute	Supersidescan Imagery N.S.W. continental slope
25.6.92	Dr. R. Withers	ARCO E.P.T.C.	Integrated Exploration of Volcanic covered areas
22.7.92	Dr. J. Boardman	C.S.I.R.O. Remote Sensing Unit	Sediment. facies analysis using Image Spectroscopy
28.8.92	Dr. G. Bradley	Consultant	Coal Geology of Mt Bastion Trans Antarctic Mountains
23.9.92	Various	Universities	Student Presentations
28.10.92	A. Prof. R. Evans	Consultant (ex NSW Univ.)	Geologist's view of hi-res seismic (N. Thailand)
25.11.92	(Dr. L Wyborn*)	(A.G.S.O.)	Christmas Dinner (G.I.S. Technology) * speaker invited later

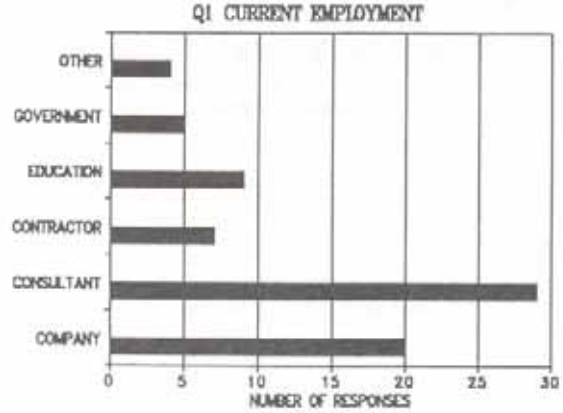
Sixty nine of 204 members responded, or 34 percent.

The format chosen was multiple choice. (More than one response anticipated for many questions.) The analysis was displayed graphically, in pie charts and histograms as per graphs Q1-16.

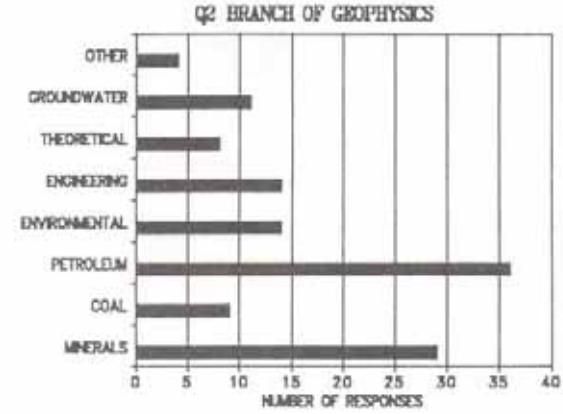
ANALYSIS

A) NSW BRANCH MEMBERSHIP PROFILE

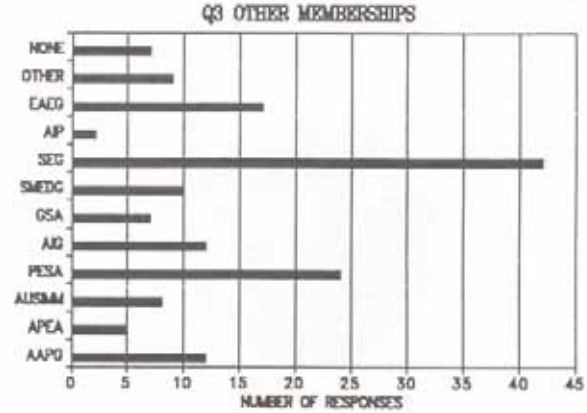
Members are mostly consultants, then company employees (graph Q1).



They are dominantly employed in petroleum, then minerals geophysics (graph Q2).

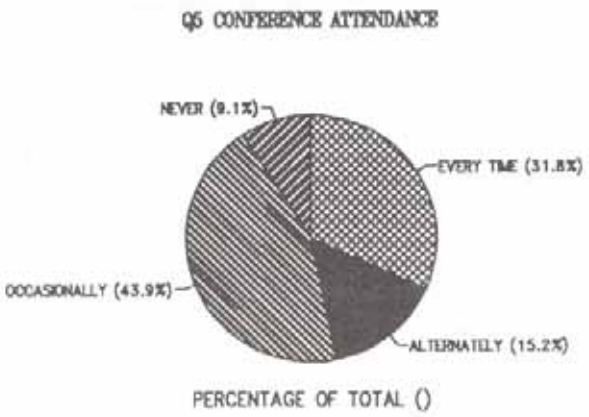


They also tend to be members of SEG, then PESA and EAEG (graph Q3).



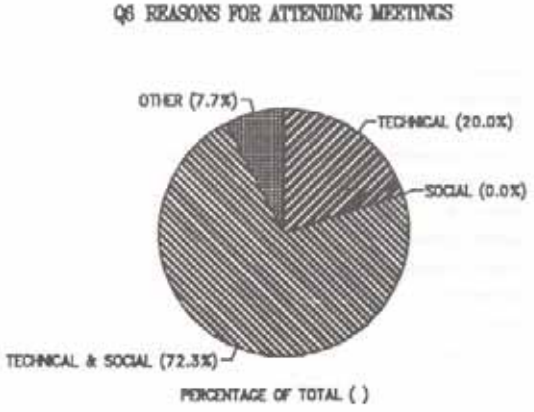
ASEG membership is held due to interest in publications, conference and meetings, although there is specific emphasis on receiving "Exploration Geophysics" (graph Q4).

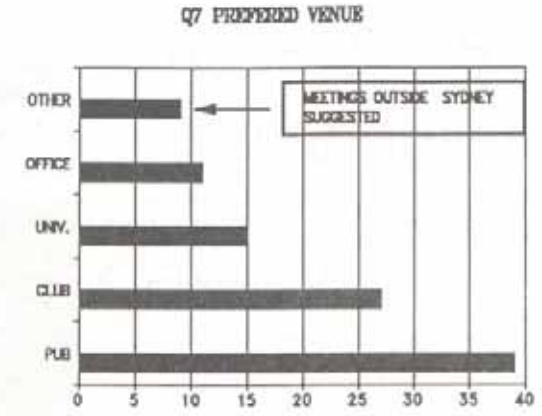
Only 9% of members haven't attended ASEG conferences. 32% attend every time, 59% attend alternatively or occasionally (graph Q5).

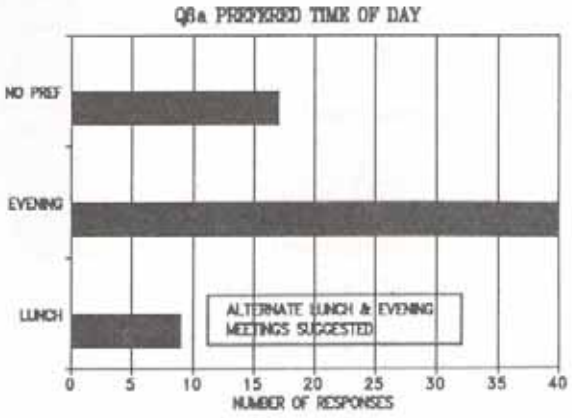


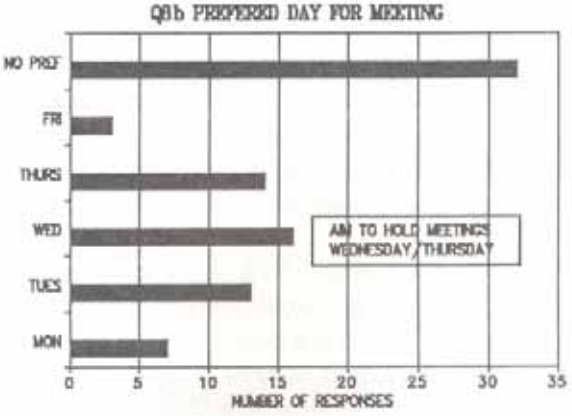
B) ATTITUDE TOWARDS MEETINGS

Meeting attendence does not seem to be considered as important as attending conferences or receiving "Exploration Geophysics" (graph Q4). Members attend meetings for both technical and social reasons (graph Q6). The preference is for meetings in pubs or clubs, with meetings in the evening favoured over lunchtime meetings (graphs Q7 and Q8a). There is generally no day of week preference, although a slight bias towards Wednesday and Thursday is seen (graph Q8b).









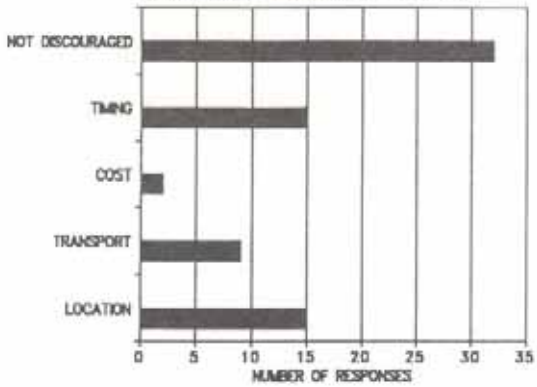
Most members were happy with the proposed technical versus social mix: 8 technical and 3 non-technical meetings were planned for 1992 (graph Q9).

There seems to be little conflict with other society meetings (graph Q10).

Q10 CONFLICT WITH OTHER MEETINGS

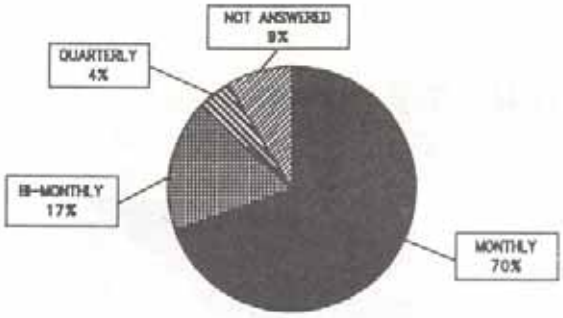
Members by and large are not discouraged from going to meetings, although location, timing and ease of transport are a consideration to some people (graph Q11).

Q11 DISCOURAGED FROM ATTENDING?



A majority support monthly meetings (graph Q12).

Q12 HOLD MEETINGS HOW OFTEN?



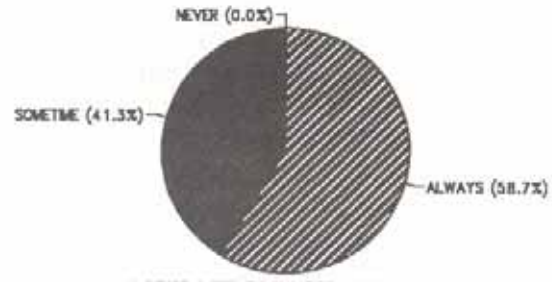
C) CHANGES TO MEETINGS?

More talks were requested on Petroleum, Environmental and Minerals topics (graph Q13).

Q13 MORE MEETING TALKS ON:

The notice of meetings could be improved. Only 59% always receive their notices on time (graph Q14a).

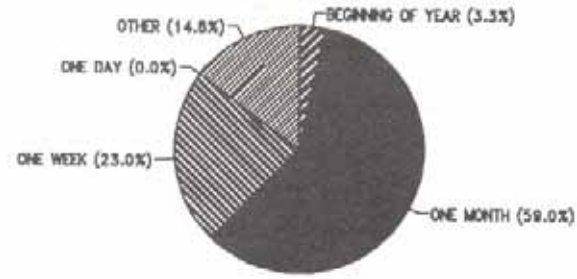
Q14a DO NOTICES ARRIVE IN TIME?



LOOKS LIKE ROOM FOR IMPROVEMENT !

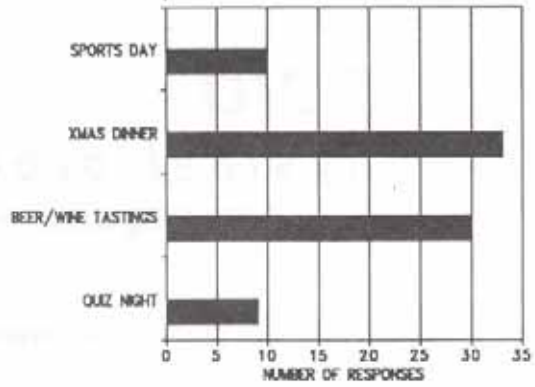
There was a preference for one month's notice of meetings, although two week's notice was also suggested (graph 14b).

Q14b PREFERED MEETING NOTICE



There was support for Christmas Dinner and Beer/Wine Tastings as social events (graph Q15).

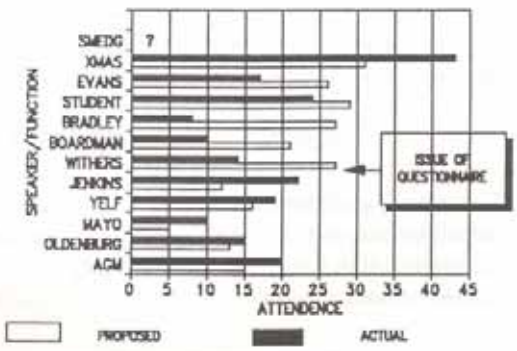
Q15 SUPPORT FOR SOCIAL EVENTS



D) HINDCAST VS FORECAST

The following observations were made based on graph Q16, which compared the actual attendance at meetings with the attendance forecast by the questionnaire:

Q16 MEETINGS ATTENDANCE PROPOSED VS. ACTUAL



- hindcast underestimates attendance, i.e. there were meeting attendees who didn't answer the questionnaire, some of whom were probably not ASEG members.

- forecast overestimates attendance i.e. the questionnaire was answered positively by people who subseqently didn't attend.

- The Christmas Dinner was an exceptional case, in being well attended, due to extensive canvassing by the committee.

- Attendance was at its lowest during mid-winter. Geophysicists were reluctant to leave their lairs for the Withers, Boardman and Bradley talks.

CONCLUSION AND RECOMMENDATIONS

Despite a high quality technical and social programme, meeting attendance through the year was very variable. In response to this it is proposed that the N.S.W. branch should:

1) Continue evening meetings in pubs and clubs, preferably on Wednesdays or Thursdays.

2) Provide one month's notice of meeting if possible.

3) Promote meetings via committee efforts.

4) Plan bi-monthly, not monthly meetings to maintain a reasonable executive workload and minimise notice costs.

5) Consider moving to a venue where pre-booking accurate numbers is not critical to the cost of the meeting and which is close to public transport.

6) Maintain ratio of 2 technical meetings to one non-technical meeting, total of 6, including the Christmas Dinner and AGM, which may also be addressed by technical speakers.

7) Aim to avoid conflict with other meetings.

8) Hold joint meetings with SMEDG, AUSIMM, PESA etc.

ACKNOWLEDGEMENTS

My thanks to Juliet Salmon of Bridge Oil Limited, and past secretary of the NSW branch, for her assistance in compiling and processing the questionnaire. This interpretation of the questionnaire does not necessarily reflect the views of my fellow N.S.W. branch committee members.

Nigel Jones
Past President,
ASEG NSW Branch

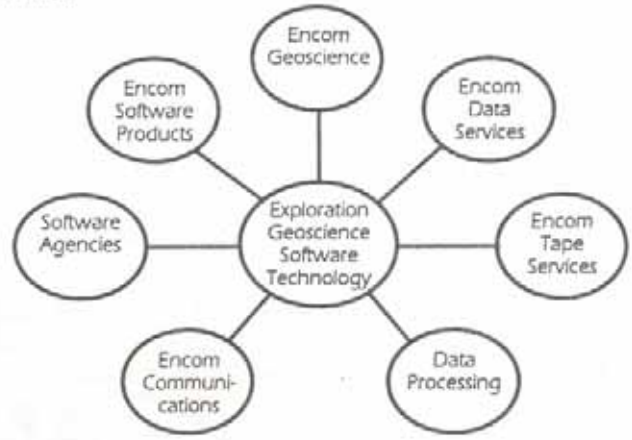
ASEG Corporate Sponsor Profile

ENCOM TECHNOLOGY PTY. LIMITED

INTRODUCTION

Encom was founded in 1984 by David Pratt and Ian Grierson to provide specialist geophysical and geological software and services to the exploration industry. The focus of the business was designed to take advantage of the emergence of workstation technology and move the emphasis away from the mainframes to dedicated interpreter-oriented systems. The business has grown steadily throughout this period and currently employs over 20 professionals including 8 geophysicists and 3 geologists. Encom's software engineers work as a team with their geoscientists for the development of key workstation and processing products.

Seven core business units provide specialist services and products that satisfy the needs of the industry in key niche markets.



Encom business units

Advanced computer technology is at the core of all Encom's services. Research and development is a strong driving force within the organisation which is reflected in the investment of 40% of gross revenues into new product development. With the strong support of the Australian exploration industry, Encom has been able to develop internationally competitive products. The export of software products and services is forming an increasing component of revenues.

Encom's head office is in Sydney with a production and sales office located in Melbourne.

COMPUTER HARDWARE Encom has built up a comprehensive suite of hardware and software products to support its business divisions. Encom operates several computer networks with a mixture of Unix and PC based workstations that provide plotting, printing, CAD, desk top publishing, imaging and 3D modelling services. The latest acquisition is a high performance Silicon Graphics workstation with Elan graphics that provides 3D real-time geological modelling and 24 bit image processing capability.

ENCOM GEOSCIENCE provides specialised geophysical consulting services to the petroleum and mineral exploration industry. Integrated interpretation of magnetics, gravity and remote sensing data is the primary focus of this division. In addition, this group provides additional skills in the area of electromagnetics, IP and DC electrical methods.

With access to the latest workstation technology for mapping, modelling and image processing, Encom Geoscience is able to provide a comprehensive suite of solutions for exploration geophysics problems.

DATA PROCESSING is provided by skilled geoscientists tosupport the operation of Encom Geoscience and direct client services.

Services include :

- seismic mapping and depth conversion
- digitizing and map generation
- log down-loading and decoding
- log displays
- synthetic seismograms
- 3D geological mapping of reservoir properties
- airborne geophysics data reduction and enhancement
- marine and land gravity data reduction
- image processing of satellite and geophysical data
- land-use and cadastral data integration
- high resolution shallow marine seismic.

ENCOM SOFTWARE PRODUCTS are developed for specific segments of the exploration industry and focus on the special skills of the organisation. Key products have been developed for magnetics and gravity modelling, transient electromagnetic modelling, aeromagnetic and gravity mapping, seismic mapping, log presentation, graphical GIS, CAD with geophysical mapping emphasis.

Encom develops software for the DOS, Windows and Unix X environment. Many other products are developed within the group to provide support for the service divisions.

SOFTWARE AGENCIES also complement the range of software services supplied by Encom. In order to support purchasers of these products, Encom endeavours to use the products as part of data processing or consulting services. In this way it is possible to provide a much greater depth of support for the products. Key agency arrangements exist in the following areas:

Stratamodel	- 3D reservoir characterisation
ER Mapper	- Image processing
Intrepid	- Airborne geophysical processing
Geopak	- RTI-CAD

ENCOM TAPE SERVICES was established to provide a comprehensive solution to the rapidly emerging market for tape storage, deterioration, transcription and reformatting. The geophysical industry has many special problems associated with the large volume of magnetic tapes that are held in storage.

Two major problems have emerged as major issues for the 90's: the rapid deterioration of many tapes recorded since 1980 and the transcription of long block seismic tapes to new, high density media. Encom has been able to rehabilitate a large proportion of deteriorating tapes with high data recovery rates. An archiving procedure has been developed that provides a low cost data management and archiving system, allowing long block seismic data to be archived with conventional data without the need to reformatthe information.

In order to reduce the cost of transport, tape transcription and archiving services are available in Sydney, Melbourne, Brisbane and Adelaide.

ENCOM DATA SERVICES provides data to the exploration industry in a range of specialised areas:

- Petroleum permit and well locations (GPinfo)
- Mineral tenement and land use data
- ACRES satellite image products
- 3rd party data maintenance and distribution.

ENCOM COMMUNICATIONS services the needs of companies that require support for networks, particularly the

difficulties associated with printer, digitizer and plotter support, mixed PC and Unix workstation environments. Long established relationships with equipment suppliers allows Encom to provide cost effective solutions for network, workstation and peripheral requirements.

INTERESTING PROJECTS

During the growth of any business, opportunities arise that can have a profound effect on the future course of that business. One such opportunity arose out of Encom's involvement in the mineral sand exploration industry. Encom developed micromagnetic analysis techniques for operation with high resolution, low altitude aeromagnetic surveys that helped to guide exploration in the discovery of several new mineral sand deposits.

This followed on to an off-shore exploration program that required the use of a high resolution, low cost seismic system integrated with magnetics, navigation, water depth and side scan sonar. No such system was available at the time and Encom were contracted to build a high throughput, high capacity data acquisition system that would replace conventional analog systems. This system was capable of collecting a record every 20 cm and up to 150 mbytes of data per hour continuously.

*Since such large volumes of 9 track tapes might sink the boat, alternative technologies were sought. Exabyte was chosen as the most suitable for real-time acquisition of high data volumes. The first three units were imported directly from the US and software was developed to drive them directly at the low level interface.

After collecting and processing many gigabytes of data Encom became impressed with the capacity and reliability of the technology. It became apparent that these units were ideal for replacing the ageing 9 track technology that had been astandard for so long.

The direct access capabilities of the drives led to the development of Encom's tape archiving procedures. Multiple 9 track tapes can be copied onto a single Exabyte with rapid access to any tape image.

An interesting outcome of early involvement with the Exabyte technology led to the development of a major business that was unrelated to the original project from which it evolved. Encom now operates tape rehabilitation and archiving services in four capital cities.

As a founding member of ASEG, David Pratt has played an active role in the development of the Society and believes that it has contributed significantly to the development of a highly professional industry. The Society has provided a forum for the free exchange of ideas, professional development that has encouraged all facets of our industry. The high quality of Exploration Geoscience and the ASEG conferences provides an excellent vehicle for this development. Encom is proud to be a Corporate member of ASEG.

Membership

New Members

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

Victoria

Andrew BOYD
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Mr Zis KATELIS
Schlumberger Seaco Inc.
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MELBOURNE VIC 3004

Blair SANDS
3 Pleasant Avenue
Doncaster Vic 3108

Andrew HEATH
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Eltham Vic 3095

Ms Suzanne HAYDON
452 Brunswick Road
West Brunswick Vic 3055

Duncan MASSIE
Monash University
Clayton Vic 3168

Keyu LIU
CSIRO - Geomechanics
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Glen Waverley Vic 3150

Majid KHAYOU
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McKinnon Vic 3204

Meaghan McDOUGALL
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Mitcham Vic 3132

John JESSOP
127 Stewart Street
East Brunswick Vic 3057

Christopher DURRAND
Deakin Hall, Monash University
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Department of Geology
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Mr Kalyan CHAKRABORTY
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Anthony KIELNIACZ
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C/- Key Centre Geology
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Robert BEATTIE
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Como WA 6152

Neil GOODEY
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Dianella WA 6062

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Roleystone WA 6111

Antony PRICE
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Ben JONES
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Noranda WA 6062

Christopher LEES
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Ilie MIHUT
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Dona MIHUT
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Josef HOLZSCHUH
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Alan WHITAKER
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JL Ligar Agung Ujung
No 46 Awiligar
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Change of Address

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

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John McMONAGLE
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Indooroopilly Qld
To: 209 Latrobe Terrace
Paddington Qld 4064

Barry BOURNE
From: 68 Second Ave
Claremont WA
To: C/- CRA Exploration
33 Commercial Road
Mt Isa Qld 4825

Peter HATHERLY
From: Aust Coal Industry
P.O. Box 83 North Ryde
To: CSIRO Division of Exploration & Mining
QCAT
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Kenmore Qld 4069

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Clarence Park SA
To: C/- Woodside Offshore Petroleum
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Perth WA 6000

Mr E.S. COLLINS
From: BHP Petroleum,
Collins St Melbourne
To: Hadson Energy Ltd
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West Perth WA 6005

Warwick GREVILLE
From: 15 Tintal Way
Bateman WA
To: HGS
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West Perth Wa 6005

John LAMBERTO
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To: QVI
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Aerodata Manager
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Floreat WA 6014

Ron CREAGH - Aerodata
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James CUNNEEN - Aerodata
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Floreat WA 6014

Andrew DUNCAN - Aerodata
From: 17 Emerald Tce Perth
To: 65 Brockway Road
Floreat WA 6014

Don Pridmore - Aerodata
From: 17 Emerald Tce Perth
To: 65 Brockway Road
Floreat WA 6014

Garry SPENCER - Aerodata
From: 17 Emerald Tce Perth
To: 65 Brockway Road
Floreat WA 6014

Sam BULLOCK -
World Geoscience
From: 17 Emerald Tce Perth
To: 65 Brockway Road
Floreat WA 6014

Dave ISLES-
World Geoscience
From: 17 Emerald Tce Perth
To: 65 Brockway Road
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Stephen LYNCH -
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To: 65 Brockway Road
Floreat WA 6014

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