

AUSTRALIAN SOCIETY OF



EXPLORATION GEOPHYSICISTS

Number 27

August 1990

Perth, Western Australia

Registered by Australia Post

Publication No. WBG2390

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INTRODUCTION

Recently two important decisions were made by the Federal Executive. Firstly, the ASEG Secretariat is to remain in Perth next year. A President elect for 1991 will be announced shortly. Secondly, a move is being made to formalise the council meetings, held every two years at the conferences. There will still be time for joke telling and it is also an opportunity for members of council to express views, make constructive criticism and to develop and share values of national concern to the Society.

The South Australian Branch's wine offer is out so get your orders in quick.

I'd like to draw your attention to the fact that Waveform's new address is advertised in this issue and I'm sorry it did not make the last one.

Storage Technology of Australia Pty Ltd have informed us that the SEG tape is now available through their Perth office, Tel (09) 242 2288.

Thank you to all those people who provided us with short technical articles this month.

I shall be on holiday next month and so the October guest editor of Preview will be Andre Lebel.

Regards
The Editor

PREVIEW is a registered publication of the Australian Society of Exploration Geophysicists, circulated to a membership of approximately 900.

Artwork by The Chamber of Mines and Energy of Western Australia Inc.

Printed by Wainwright Art Studio, 107 Cambridge Street, Leederville WA 6007

ASEG BRANCH NEWS

A.C.T.

The ACT Branch of the ASEG will be holding the August monthly meeting on Tuesday, 21 August 1990 at the Polish Ex-Servicemen's Association Club, Tobruk House, Moore Street, Civic (next door to the RSL Club). Drinks will be available from the bar at the club from 5.00 pm with the meeting and seminar commencing at 6.00 pm.

The guest speaker for the meeting will be Colin Simpson (Bureau of Mineral Resources, Canberra). The title of the seminar talk will be "Remote Sensing of Natural Hydrocarbon Seepage, Palm Valley Gas Field, NT, Australia.

Following the meeting Colin will be the guest of the branch for dinner at the Lantern Restaurant in the RSL Club, next door to the Polish Club.

Reminder! Tentative bookings have been made with the School of Tourism and Hospitality to use their boardroom and catering facilities for two ASEG meetings during the later half of 1990. A normal monthly meeting will be held on Wednesday 12 September with a booking for dinner made for 25 people in the school's La Cafe, with a 3 course buffet style meal, cost \$12 per person (wine extra). Bookings are now being taken.

The second booking has been made for dinner, using the restaurant, for Tuesday 20 November, cost \$20 per head (including wine with subsidisation by the ASEG). The late November meeting will be a Christmas function held jointly with the ACT Branch of GSA, with bookings available for a maximum of 45 people. Speakers for both meetings are yet to be finalised. To ensure the above meetings are a success please make a note of the dates in your diaries.

Kevin Wake-Dyster
Hon. Secretary

N.S.W.

Following the success of the inaugural Student Night of 1989 the NSW Branch will hold their second annual Student Night of 1990 on Wednesday, 26 September at the Rugby Club, Crane Place (near Circular Quay), Sydney at 5.30 pm

Students will present talks covering topics ranging from seam waves to saline scalds.

Students to Speak:

- Don Scott: The University of New South Wales, "Multi-Electrode Array Resistivity of a Saline Scald - Yass, NSW"
- Karen Odling - The University of Sydney, "Possible Origin of the Bedoult High, NW Shelf, Australia"
- Lisa Muller - The University of Adelaide, "Multivariate Statistical Analysis of Seismic Data Applied to the Delineation of Reservoir Facies in the Birkhead Formation, Sturt Field, Lake Hope Block, Eromanga Basin."
- Robert Hewson - Macquarie University, "Seam Waves in the German Creek Mine".

Preparations are again underway for the branch Christmas Party. The evening of Thursday, 29 November has been booked at the Lord Nelson in the Rocks.

Scott Gagen
Secretary

S.A.

The SA Branch held the inaugural "Sequence Stratigraphy School" in the Eric Rudd Lecture Theatre at Adelaide University on 4-5 July. The workshop, which was led by Rob Kirk, went off without any problems and was well received by the 20 registrants. The workshop was organised by a committee from the local SA ASEG and PESA branches.

The workshop was not only a technical success but a financial one as well, with the

establishment of a South Australian branch workshop fund of \$600 plus a small profit to be divided between the SA branches of the ASEG and PESA.

The workshop was followed by an evening meeting at which Rob showed an interesting series of slides on the subject of "Seismic versus Geological outcrop patterns".

The SA branch Wine Committee have selected this year's vintage for selling to members and an order form is available in this PREVIEW. By the look of the committee members the day after the selection, no possible supplier or variety went untasted in the search for the right wine!



The monthly evening meeting is to be held on the ground floor of 101 Grenfell Street on Wednesday 15 August. The speaker will be Nick Sheard and his talk will be "Case Study: Downhole, Surface and Airborne EM over the Grassmere Area, Broken Hill".

Nick should provide an entertaining talk so it is hoped that both the hard rock and petroleum sides of the membership will attend this meeting.

Nick Fitzgerald
Secretary

QLD

Three short videos were presented by Barry Long of Velseis Pty Ltd at the August meeting which was very well attended by the local members.

The first was a promotional video by Kembla Coal and Coke on the high resolution seismic acquired by Velseis for KCC in rugged gorge country near Wollongong. Although more environmentally orientated than technical, it gave a very good overview of the difficulties involved with seismic acquisition in this difficult and environmentally sensitive area.

Also shown were a Velseis hardware video (with the odd subtle plug) and a video shot by Barry on some aspects not covered in the KCC video - logistics, hardware and the heliportable capabilities of their shot-hole rigs and much of the recording equipment.

Much to the disappointment of many members present, Barry kept true to his promise to KCC and, despite some cleverly disguised snooping, refused to reveal any key acquisition parameters for the Wollongong contract.

Queensland censorship laws forbid the disclosure of the contents of videos shown by Barry at a private viewing later that night!!

Next Meeting: The next meeting is scheduled for Wednesday 29 August at the Minerals and Energy Club of Australia, MacArthur Chambers, on the corner of Queen and Edward Streets, Brisbane.

The topic will be "Gold Mining and Geophysics" presented by Colin Barnett of Newmont Exploration Ltd.

My apologies to members who were inconvenienced by the incorrect address shown on the notice for the last meeting.

Brenton Oke
Secretary

VIC

At the July meeting Dries Gisolf from Shell presented a very interesting talk on "Off-End Seismic Data Acquisition in the Eromanga". Using this geometry the crew achieved excellent production rates, with no loss of quality.

The previous month Gary Gassoway from the Terra Linda Group discussed omniphones.

Next month Greg Beresford from Melbourne University will be discussing "Wave equation Datuming".

David Gamble
Secretary

W.A.

The beer tasting evening was attended by about 25 members, some of whom may not remember much about the evening!! The most accurate palates belonged to our member of British descent, who "guessed".

A Student Evening is planned for 24 October. The ASEG/PESA golf day is planned for 23 November at the Royal Fremantle Club.

The next technical meeting will be on 20 September. Speakers will be:

David Isles: on Geophysics in China.
David has a video from his recent trip.

Dr Ed Purdey: Esso distinguished speaker for 1990. Ed will be discussing carbonate reefs.

An industry sponsored technical evening is planned for October on Ground Probing Radar.

Euan Clarke
President

SEG CONTINUING EDUCATION COURSES

The following is a list of SEG's Continuing Education courses scheduled in conjunction with the SEG Annual Meeting in San Francisco this year:

22-23 SEPTEMBER
Borehole Gravity Surveys

22-23 SEPTEMBER
Shear Waves and Anisotropy in Exploration Seismology

23 SEPTEMBER
Electrical Methods Applied to Energy Exploration

23 SEPTEMBER
Seismic Tomography

For further information contact Peggy Bach, Continuing Education Co-ordinator, Society of Exploration Geophysicists, PO Box 702740, Tulsa, Oklahoma 74170-2740, USA.

Southern Geoscience Consultants

8 Kearns Crescent
Ardross, Western Australia 6153

PC-IP AN INTERACTIVE DIPOLE-DIPOLE MODELLING PROGRAM

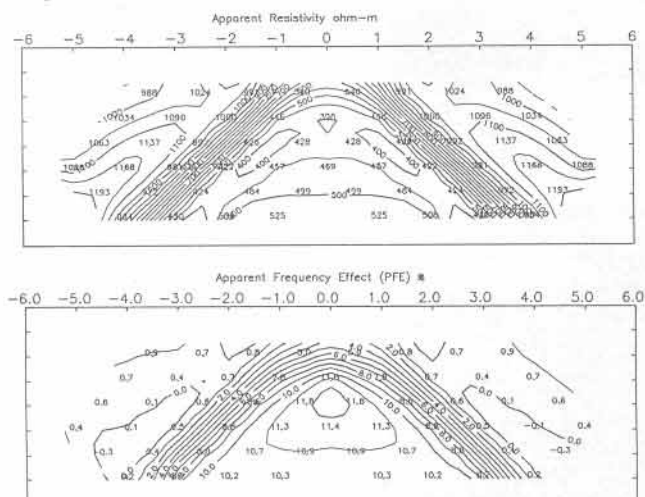
PC-IP

The software is based on Rijo's finite element algorithm.

Features of the software include:

- **interactive operation**
- **graphical input and editing of bodies**
- **multiple bodies of arbitrary cross section**
- **allows topographic variations**
- **screen/printer pseudosections of apparent resistivity, pfe and metal factor**
- **output xyz files in a format suitable for input to SURFER (Golden Software) for contouring etc.**
- **runs on any IBM compatible with 640k RAM available**
- **run times are less than 3 minutes on a 386 machine with a math co-processor**
- **multiple help screens**
- **full colour**

The software is available as a single machine licence (\$1,800) or a multiple machine licence (\$5,500). Examples of output are shown in the accompanying figures.



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Mining Engineers Play a Secondary Role in the UK

Article Reprinted from UK Mining Journal

In the United States, we are told, a serious shortage of mining engineers and geologists could develop because the number of students enrolling at mining schools over the past 12 years has declined by more than two-thirds (MJ, January 13, 1989, p33). In the UK, the principal of the Camborne School of Mines, Dr Peter Hackett, recently referred to the crisis in education and the fact that a reduction in funding has halved the number of university departments offering mining/mineral engineering courses.

Part of the problem in the UK is that the domestic industry is contracting; witness the successive reduction in the needs of British Coal whose workforce has reduced from 700,000 to 80,000 over the past 40 years, and the closure of all but one of Cornwall's tin mines. In addition, many of Britain's former colonies, which provided gainful employment for many a Cornish miner in days of yore, have developed their own educational establishments. To a lesser degree, students are deterred by poor job prospects and pay, and mining's tarnished image. In the US, where mining remains of paramount importance to the economy, recruitment problems are due very much to adverse public perceptions and the association of mining with environmental damage.

The mining industry has become increasingly alert to the implications of dwindling numbers of graduates and RTZ's Chief Executive, Derek Birkin, has warned more than once of future difficulties in recruiting and retaining the best mining engineers. Mining companies, he believes, have yet to convince society that they are wealth creators and not despoilers of the environment. Slow off the mark initially, perhaps, mining companies and the professional institutions are now well aware of the urgent necessity for a major public relations campaign. To be most effective, however, their message must reach the younger generation, via the secondary schools.

Through the media, school-children in advanced industrialised countries like the UK are well aware of the need to save the whale - and rightly so - and many are probably better informed about issues such as acid rain, depletion of the ozone layer, toxic waste and global warming, than their parents. But because most raw materials are mined and processed in far away places, few pupils are aware of quite how essential mineral resources are to their every day lives.

In England, the dubious status of earth sciences as taught to secondary school students, 11 to 18 year olds, is exemplified by the dilemma facing teachers under the new National Curriculum. According to the May edition of Report, published on behalf of the Assistant Masters and Mistresses Association (AMMA), the debate is whether earth science "should go to the scientists or the geographers - or both". Implicit in the current global debate on the environment and sustainable economic growth is a knowledge of the Earth and its resources and as the AMMA article observes, "pupils usually have a real interest in the way the Earth works and the fascinating things that can be found on and near its surface...considering such things as the need for raw materials, the need for energy resources and safeguarding the future of the planet."

At the secondary level, therefore, would it not be more appropriate to include earth sciences and geography as components of an environmental science/studies course? This would certainly provide a better understanding of mining's role in society for those who will eventually be making the key decisions. It might also help level the pitch for the industry in its PR campaign.

Seismic Reflections from the base of the Greenstones?

On 5 July 1990 the Curtin University Geophysics Research Group field trialled the seismic reflection method on greenstones. A mining company (which prefers not to be named) had previously agreed to allow a drill hole to be used as a shot hole for this seismic experiment. The field party of two staff and three students laid out the recording spread over a distance of 650m, between two operational open pits. Twenty six traces were recorded at 25m intervals with 12 geophones at each station. The drill hole was located at the 10th station. We couldn't lay out a longer spread because there wasn't any more space between the pits.

The particular saddleback greenstone belt we were working across trends approximately north-south, and is covered with a variable thickness of weathered clay, overlaid by a thin veneer of laterite. At the location of the shot hole, the drilling rig had run a 50 degree inclined hole into the upper clay layer, estimated to be some 40m thick. After laying out the spread in the east-west direction, an 8kg charge was loaded 32 metres into the hole. A 12 second record (FFID 10 in Fig. 1) was taken by the Sercel 96 channel instruments and the monitor record suggested side-swipe from all directions - possibly noise from working trucks and drills either side of our spread. Possible reflection events within the 2-3 second band were seen, as well as near surface refractions and reflections.

The crew then decided to load a larger charge of 12kg to try to enhance the events (and to see what a bigger bang might look like). This charge could only be loaded to 25m at 50 degrees so it was loaded with a degree of trepidation. The charge was fired producing FFID 12 of Fig 1. There was no signal enhancement. We then opted to go for a little charge of 1kg because we were running out of explosive. This was loaded to 18m and fired. The result was the pleasing record FFID 13. Reflections appear at 2.2, 2.4 and 2.6 (multiples?) and at shallow depths. A 500gm charge was then fired at 21m with the 2.2 second event still evident. We then picked up the spread and left for home in the dark.

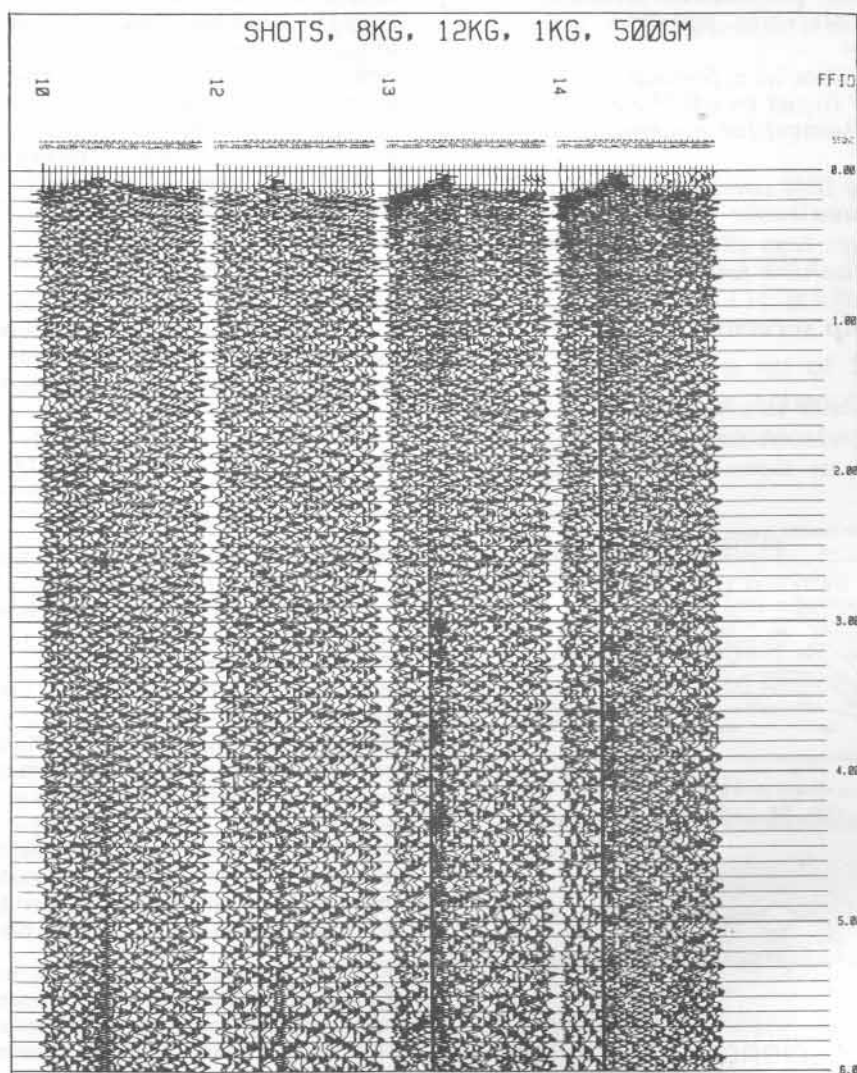


Figure 1: The four shot records.

The records were stacked (after shot static correction) to enable consistent events to be enhanced and this produced Fig. 2. The first 3 seconds were expanded to produce Fig. 3.

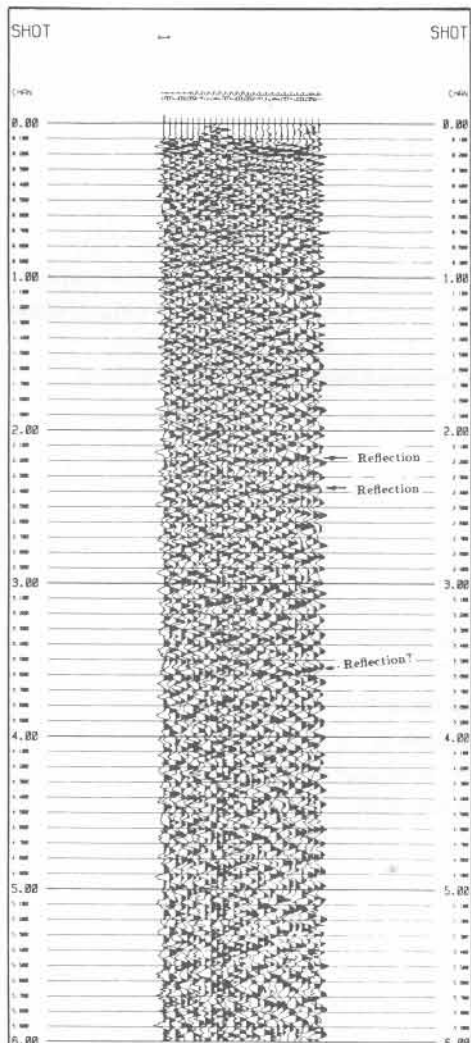


Figure 2: Six second records stacked

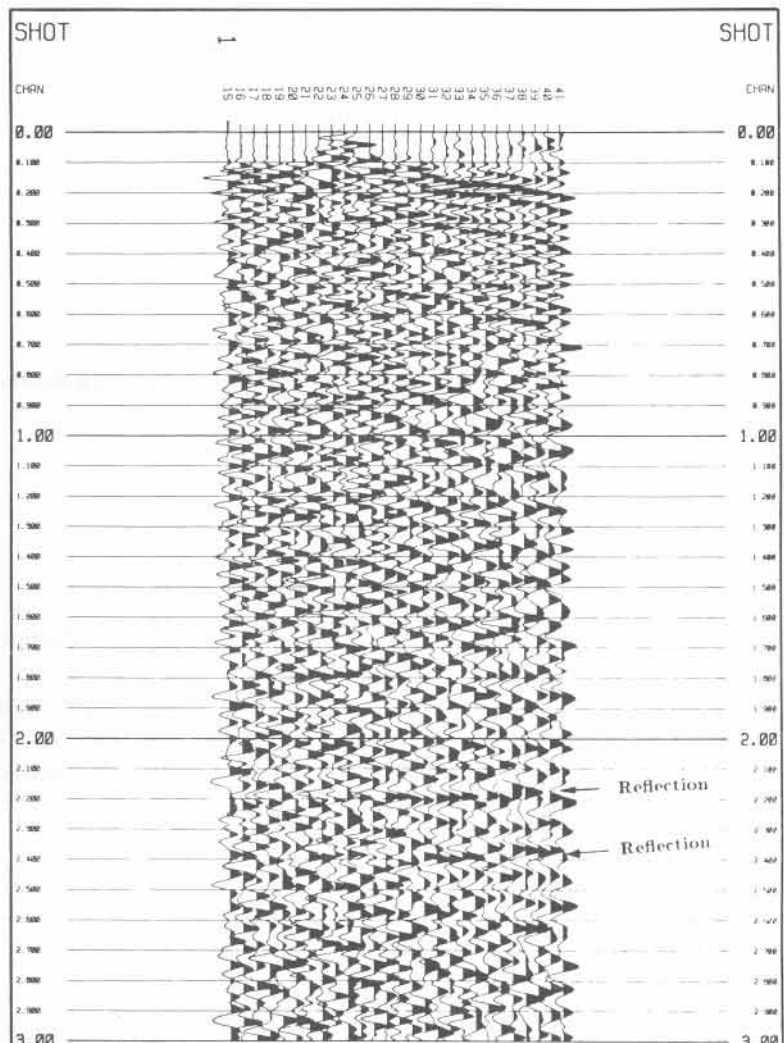


Figure 3: First three seconds expanded

Reflections are observed at 2.2, 2.4 and 3.6 seconds. Assuming all are reflections and an average greenstone velocity of 7km per second, we are looking at events at 7km, 8.5km and around 12km. Is the base of the greenstone at 7km? A good possibility, according to Simon Wilde, our Curtin greenstone specialist.

So what are the deeper events? The event at 3.6 seconds dips - a velocity change, real dip or side-swipe?

Thanks team - Staff member Andie Lambourne, Honours Students Sofia Bartoszewicz, Rob Elliott-Lockhart, and Rob Han for the start of a new research project which will see us back there soon recording conventional 2D lines, followed by probable trips to Southern Cross and Kalgoorlie. Anyone interested in tagging along?

Brian Evans
Senior Lecturer in Geophysics
Curtin University, Perth , Tel: (09) 351 7092

CANADIANS STUDY SOVIET TECHNIQUE FOR GEOPHYSICAL EXPLORATION

Reprinted from an article in the Northern Miner, 22 June 1990, Page 16.

Canadian mineral explorationists are getting a close look this summer at a Soviet geophysical exploration technique. Since first broaching the subject during a trip to Moscow in 1983, Harold Seigel, president of Scintrex Ltd, has been trying to set up a test of three methods of mineral exploration developed by the Soviets. All three methods fall under the heading of geoelectrochemical.

An agreement was reached earlier this year and, as a result, 10 Soviet scientists and their equipment have assembled in Canada to demonstrate how the technique works.

A group of 12 Canadian mining companies as well as the federal and Ontario governments are paying the cost of setting up the demonstration, about \$500,000.

During the summer, the Soviet delegation and Canadian observers will test the three methods on six tests in Ontario and Quebec. They will look at known mineral deposits, including gold, polymetallic and nickel deposits, and determine how successful the technique might have been in locating them.

"They (the methods) appear to have the potential to detect the presence of mineral deposits under conditions of overburden cover or depth of burial which would normally render them undetectable by standard Canadian exploration technology," says Seigel.

All three methods are based on detecting hidden ore deposits through the aureole or halo of mobile metallic ions above them, he says.

Seigel says it is the first time, to his knowledge, that such a group of Canadian companies have co-operated to this extent on an exploration project. Each participant will be entitled to a confidential copy of the test results, probably available by November. If there is sufficient interest, Scintrex, which has organised the demonstration, will establish a service company to market the technique in Canada.

SYDNEY CONFERENCE 1991



All members should have received a First Call for Registration by this time (and, yes, we did have the omnipresent typo on the Registration form after 65 proof reads - early registration ends on October 31, 1990 not 1989)! This is just a short update to information already provided.

The response to the 'Call for Papers' was excellent and the Technical Programme is now near finalisation. In the order of 170 papers have been accepted for oral presentation; provision has been made to accommodate up to 80 poster papers. Some very interesting material will be presented.

The invited keynote speaker programme has been finalised. The format of the conference is slightly different from previous ones in that each day will commence with a plenary session, with 3 keynote speakers - speaking towards specific themes. This list of keynote speakers includes seven Executives/Managers from well known petroleum and mineral companies and technical leaders in the computing, education and geoscientific fields.

Eight streams have been arranged:

Petroleum Exploration	15 sessions
Metalliferous Mineral Exploration	8 sessions
Coal, Groundwater & Engineering	4 sessions
Regional, Crustal & Geothermal	6 sessions
Geoscience Education	3 sessions
Management and Finance	2 sessions
Computer Application	4 sessions
Theoretical Research	1 session

Sessions will generally consist of 4 papers; up to 6 sessions will run concurrently.

The Exhibitors response has been particularly ingratiating. The initial allocated area for the Exhibition was completely taken up, by some 60 exhibitors in 110 booths and 2 premier rooms. Arrangements have been made to accommodate additional exhibitors and we have now expanded into additional, proximal facilities.

The Committee is currently preparing the next Call for Registration, which should be distributed just after mid September. This Call will contain the Preliminary Programme. In registering, don't overlook the Breakfast on the Tuesday of the Conference; the speaker will be Harry Butler - whom we trust will be his usual, stimulating self. The next priority is trying to organise the Sydney weather - we're certainly open to suggestions!

*Wes Jamieson
Conference Co-Chairman*

RESEARCH FOUNDATION

Donations

The ASEG Research Foundation formally commenced its function on 25 September 1989 when a meeting of the Research Foundation Committee was convened during the Melbourne ASEG Conference.

The aim of the ASEG Research Foundation is to support research into **exploration geophysics**, via approved research projects at B.Sc. Hons. and M.Sc. level in Australian tertiary institutions. In order to do so, we invite financial contributions from members, companies and other professional societies. The ASEG Research Foundation is an Approved Research Institute, consequently *all contributions are tax deductible*. In addition, of course, all contributions will be acknowledge in "Preview".

With your support, we will raise sufficient funds to support some research projects in 1990, our first full year of operation. Naturally we hope for major contributions from companies and professional societies, however, individual contributions from members are invited as a tangible way of showing your support for this initiative. Simply fill in the attached slip, enclose your cheque and return to the address marked.

Further to those names published in the June issue of Preview, the following people/organisations have contributed to the ASEG Research Foundation:

- J I Denham
- CSIRO
- G. Thomas
- Solo Geophysics
- Dr G Buselli
- P Fullagar
- D Pratt
- Velseis
- Sagasco

Thank you very much to all the above.

Joe Cucuzza
Secretary



DONATION TO ASEG RESEARCH FOUNDATION

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

NAME:.....

ADDRESS: (for receipt purposes)

AMOUNT OF DONATION: \$

SIGNATURE:.....

Do Not Detach - To be completed by ASEG Research Foundation



ASEG RESEARCH FOUNDATION

Receipt of Donation to Approved Research Foundation

Received from

The Sum of
dollars being a donation to the ASEG RESEARCH FOUNDATION

\$

In accordance with Income Tax Assessment Act S73A, this
donation to the ASEG Research Foundation is tax deductible.

Signed:.....

(This form should be retained for tax purposes)

NEWCASTLE EARTHQUAKE 28 December 1989

Reprinted with kind permission from "Geophysics Down Under", June 1990, Newsletter No. 11, Page 4-6, by Kevin McCue, BMR, Canberra (distilled from a paper by McCue, Wesson and Gibson)

It was just a matter of time before an earthquake occurred close enough to an Australian urban area to cause damage and loss of life. Time ran out on 28 December and 12 people died in the ruins - the Newcastle Workers Club collapsed claiming 9 patrons, and another 3 were trapped under the rubble of toppled parapets in Beaumont Street, Hamilton.

The Magnitude 5.6 earthquake was some 30 times smaller than the January 1988 Tennant Creek NT earthquake. Unlike most of the earthquakes in the Lachlan Fold Belt, which occur at very shallow focal depths, this earthquake ruptured rock of unknown age and type below the Sydney Basin sediments at a focal depth of 11 km. The error in this estimate of focal depth is about 2 km, since clear depth phases were observed on seismograms of the Scottish Lownet array.

The extent of the damage can be attributed to a number of factors: the age and quality of the brickwork and mortar, the closeness of the epicentre to the city, and the underlying poor foundation materials. Most of the buildings damaged were of brick and one to three storeys high, constructed in the 1950's or earlier using lime mortar. Very little modern brickwork failed, and no engineered reinforced concrete or steel buildings of modern design suffered structural failure. Some of the damaged buildings had been damaged by an earlier earthquake in 1925, and the repairs undertaken then are still visible.

The computed epicentre, near the suburbs of Boolaroo and Cardiff, is about 15 km WSW of the Central Business District, although the location errors are high. The uncertainty is due to a lack of close seismographs in every quadrant, except southwest of the epicentre where the Sydney Water Board have three recorders to monitor dams supplying water to Sydney, in particular the Avon and Warragamba dams. The nearest BMR station to the west is at Cobar and to the north at Armidale.

The Hamilton, Junction and Central Business District (CBD) areas, which sustained the worst damage, are all built on low-lying filled or reclaimed swamp. Buildings in the nearby suburbs built on the more resistant conglomerate ridges suffered much less severe damage, although closer to the epicentre. Despite the poor quality of the foundations and high water table, there was no evidence of liquefaction or even widespread foundation failure; this may be attributed to the low magnitude and short duration of strong shaking.

There was no evidence of surface faulting, which was no surprise given the depth of the focus and relatively small magnitude of the main shock. The smallest earthquake to have caused surface faulting in Australia was that at Marryat Creek in South Australia on 30 March 1986. This magnitude MS 5.8 earthquake produced a 13 km long boomerang shaped fault, but it occurred at half the focal depth of the Newcastle earthquake. What was a surprise was the lack of aftershocks.

Most other recorded earthquake of this size in Australia has been followed by at least a dozen or more aftershocks, including other earthquakes in the Sydney Basin in 1961 and 1973. Aftershocks of the Tennant Creek earthquake are continuing to this very day. Kevin McCue and Bill Greenwood from the Australian Seismological Centre BMR, and Vaughan Wesson and Tony Corke from the Seismology Research Centre at Phillip Institute of Technology, installed a ten-station portable network in the Newcastle area on 29 December; the first station was established 12 hours after the main shock. The only aftershock recorded, a magnitude ML 2.1 event, was about 34 hours after the main shock on the evening of 29 December. It was felt in Hamilton and nearby suburbs such as Adamstown and caused near panic. It too was at greater than normal depth, 13 km, and had an epicentre close to that of the main shock.

Another small earthquake occurred and was felt in the Newcastle area on 23 February 1990, but it proved to be shallow and located 30 km west of the main shock. A number of other 'events' have been reported and written up in the media as earthquakes but were not recorded on the nearby instruments in Newcastle. Following

one of these notable events, high flying RAAF aircraft were observed by many people. The inference is obvious.

Following an initiative of the former Minister, Senator Peter Cook, four seismographs have been purchased for permanent deployment in the Hunter region of NSW, and an extra seismologist is being recruited to install the equipment and analyse the data. Other cities in Australia are at similar risk to Newcastle, and discussions with our State counterparts have taken place to improve the level of monitoring, including the installation of strong motion recorders which can be used as tools by both seismologists and engineers.



Australia's first earthquake fatalities: Newcastle Worker's Club.

10.28 am, Thursday, 28 December 1989

OBITUARY

Regrettably Dr I R Qureshi died on 22 June 1990 after a short illness. Dr Qureshi was a Senior Lecturer in Applied Geology at the University of NSW. He was an active member of the ASEG and had been a member of the Society since 1977. The list of some of his publications, below, show how numerous his technical contributions have been to the field of geophysics.

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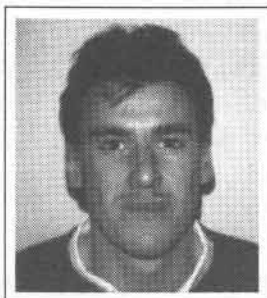
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GEOPHYSICS AT THE UNIVERSITY OF WESTERN AUSTRALIA

The University of Western Australia has recently appointed Dr Mike Dentith as lecturer in geophysics following the retirement of Mr Hugh Doyle.

Mike graduated from the University of Nottingham in the UK in 1984 with a degree in Geology. He went on to do his Ph.D. at Glasgow University where he worked, in conjunction with the Tricentrol Oil Corporation, on crustal structure in central Scotland using seismic reflection and refraction data.



On completion of his Ph.D. in 1987, Mike took up a position as a Research Fellow at the Memorial University of Newfoundland and worked, in association with Petro-Canada Resources, on the application of section balancing to the interpretation of seismic reflection data. He also worked on deep crustal seismic reflection data recorded on the Grand Banks, offshore Newfoundland, refraction/wide-angle reflection data recorded in the Gulf of St Lawrence - both recorded as part of the Canadian Lithoprobe project - and on potential field modelling of Caledonian/Appalachian suspect-terranes boundaries. After two years at Memorial University he moved to the University of Western Australia.

Mike's appointment coincides with an expansion in geophysical teaching and research at the UWA. A palaeomagnetic laboratory has been established within the Geology Department, and the appointment of a research fellow to work on potential field modelling is anticipated next year.

The geophysics course structure at the UWA is also being revised. Previously, geophysics was approached from a maths/physics angle and was treated as a specialist subject suitable for study by only a minority of students. In the future, the geophysics courses will be completely integrated into the geology degree programme and will emphasise the use of

geophysics as a tool for the solution of geological problems. As a consequence of this, the 3rd year elective geophysics courses will be re-organised on the basis of geological applications, the intention being to encourage geology graduates to study those aspects of geophysics relevant to their geological interests. Solid earth geophysics has been transferred to a new "Tectonics" course. The existing mathematical geophysics course remains unchanged, apart from the greater geological emphasis in the constituent geophysics courses.

Geophysical research is initially concentrating on providing a geophysical component to ongoing geological research projects within both the UWA Geology Department and Key Centre for Teaching and Research into Strategic Mineral Deposits. Such projects include potential field modelling of greenstone belt structure and the interpretation of seismic data from the Canning Basin. In addition, a co-operative UWA Curtin University project is planned on the Perth Basin.

1991 ASEG-GSA CONFERENCE AND EXHIBITION

A Video Room will be operating at the 1991 ASEG-GSA Conference in Sydney. Suitable video material to be shown will include resource development projects, documentaries on petroleum, mining and environmental issues and educational videos.

If your company has any interesting videos for screening at the Conference, please contact the Committee through Barry Smith, on (02) 488 9588.

EXTRACTING SHEAR WAVE INFORMATION FROM SEISMIC DATA

A principal challenge posed to exploration seismology in the 1990s is to provide geological information directly from seismic data. Instead of providing processed sections with peaks and troughs defining layer boundaries, exploration demands products which deal directly with the physical properties of the target layers. Such products may be, for example, maps showing the continuous variation of Poisson's ratio as a function of depth and horizontal position. This information will greatly assist the reservoir engineer in assessing physical properties such as fracturing, lithology, porosity and permeability.

One of the key properties to be extracted from seismic data is shear-wave velocity. A multi-year research effort at Curtin University named the Seismic/Lithology Project - under the industry sponsorship of BHP, WAPET, WMC, Woodside and MERIWA - is focussing on the problem of extracting shear-wave information from converted waves on surface reflection data in a fashion similar to standard CMP stacking.

Figure 1 shows raypaths for a converted wave which began life as a P-wave, was converted to an S-wave as it travelled downwards in the second layer, but was converted back to a P-wave upon reflection. One notices immediately that the asymmetry in downgoing and upcoming travelpaths results in reflection points which are not midway between source and receiver. Figure 2 gives the travelttime curve for this event (marked E). Its amplitude behaviour - as well as that of the other converted wave event F - is markedly different from the primary P-waves, also shown. When the appropriate RMS velocity is used to NMO correct this event, it is not flattened at the longer offsets (Figure 3).

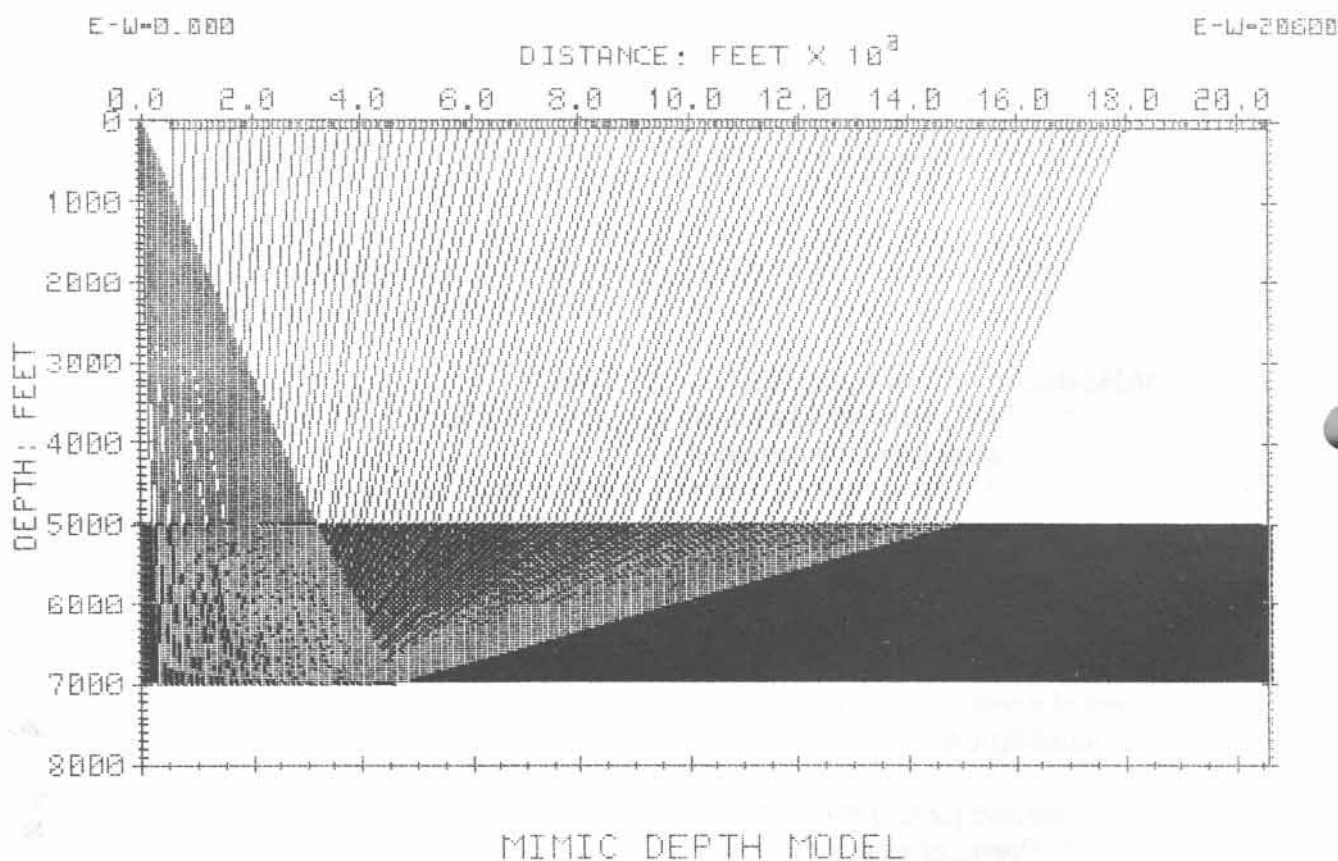


Figure 1: SIERRA raytracing for converted-wave event PSPP

Furthermore, it is clear from Figure 1 that gathering an ensemble of traces from adjacent shot gathers cannot produce a CMP gather as there will be no common mid-point. Thus, an entirely new stacking approach is needed for rays with asymmetric travel paths (Mueller, 1989). We have presently developed a binning strategy to stack converted-wave data and will follow a procedure recently devised by Prof. Robert Stewart at the University of Calgary.

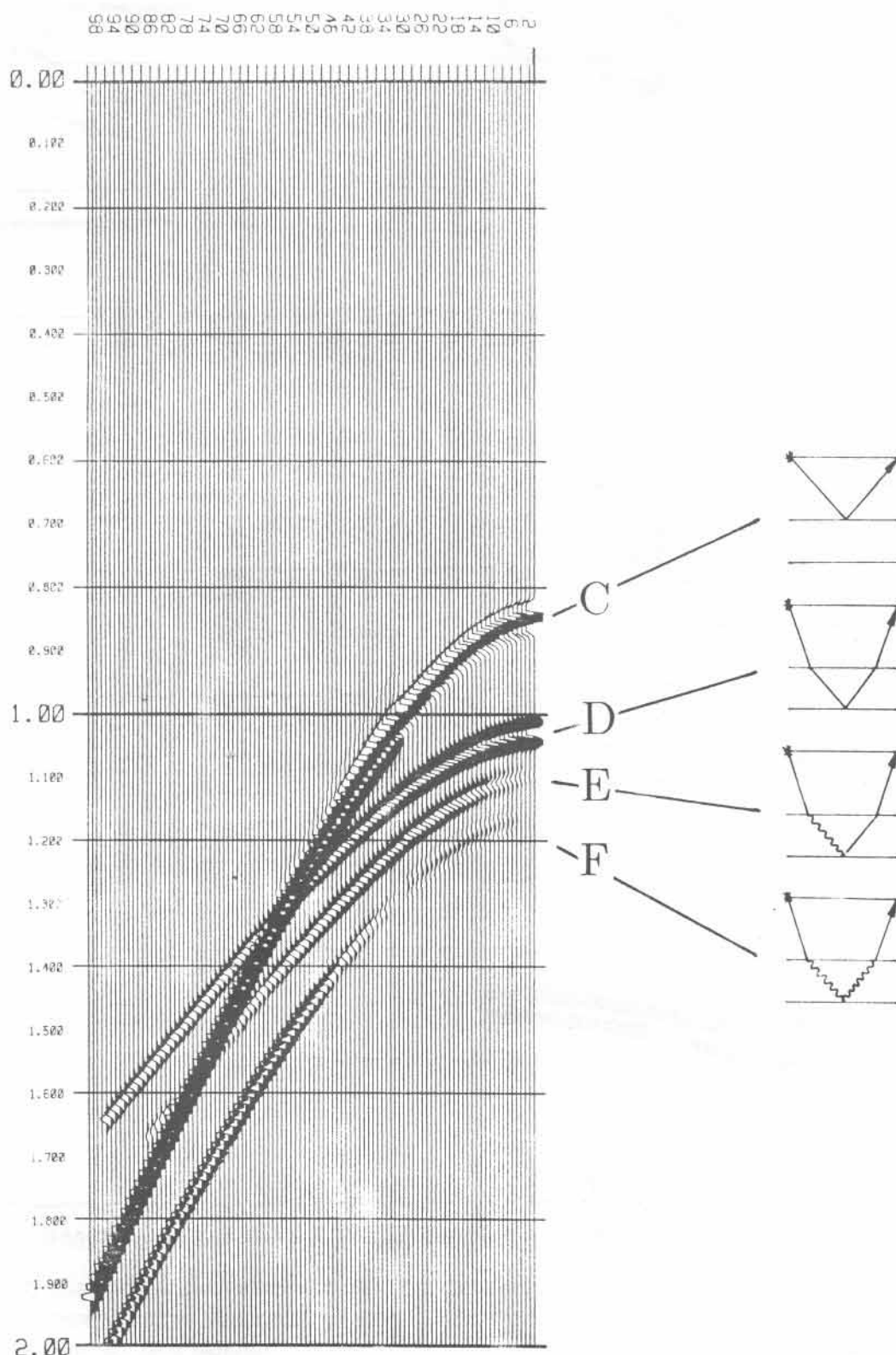


Figure 2: Travelpaths and times of the primary reflection events.

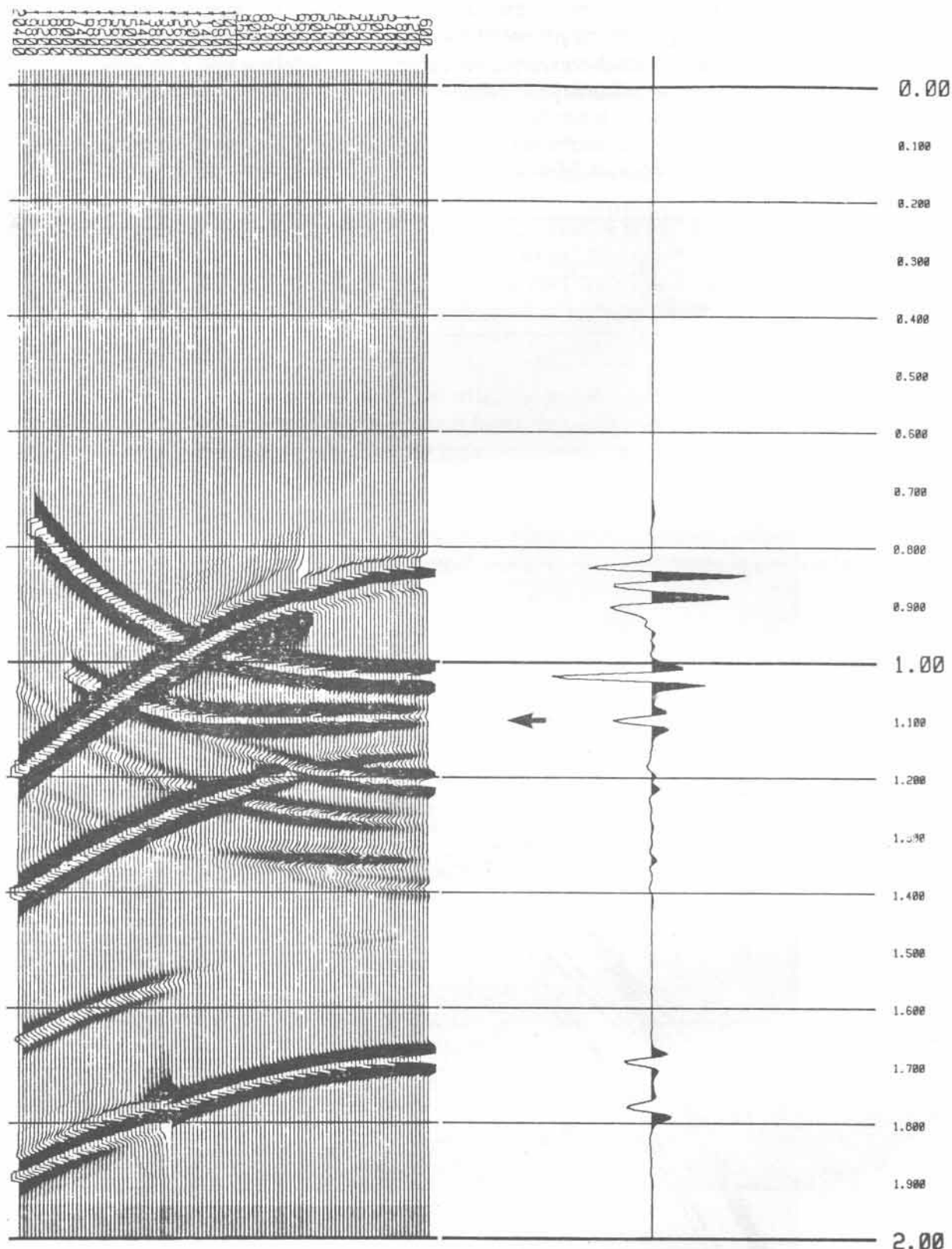


Figure 3: The PSPP reflection (Event E), NMO corrected and stacked

Velocity determination is crucial to success in stacking. Another Seismic/Lithology sub-project deals with estimation of local velocity in the vicinity of the wellbore by using transmitted waves on offset VSP data. Figure 4 shows the offset-VSP geometry and indicates the variable and, usually unmeasured, orientation of the VSP tool from depth to depth. Re-orientation of the tool is accomplished by maximising first-arrival energy in the horizontal plane at every level. A second rotation - this time in the vertical plane - serves to separate transmitted wave-modes onto the rotated axes.

VSP GEOMETRY

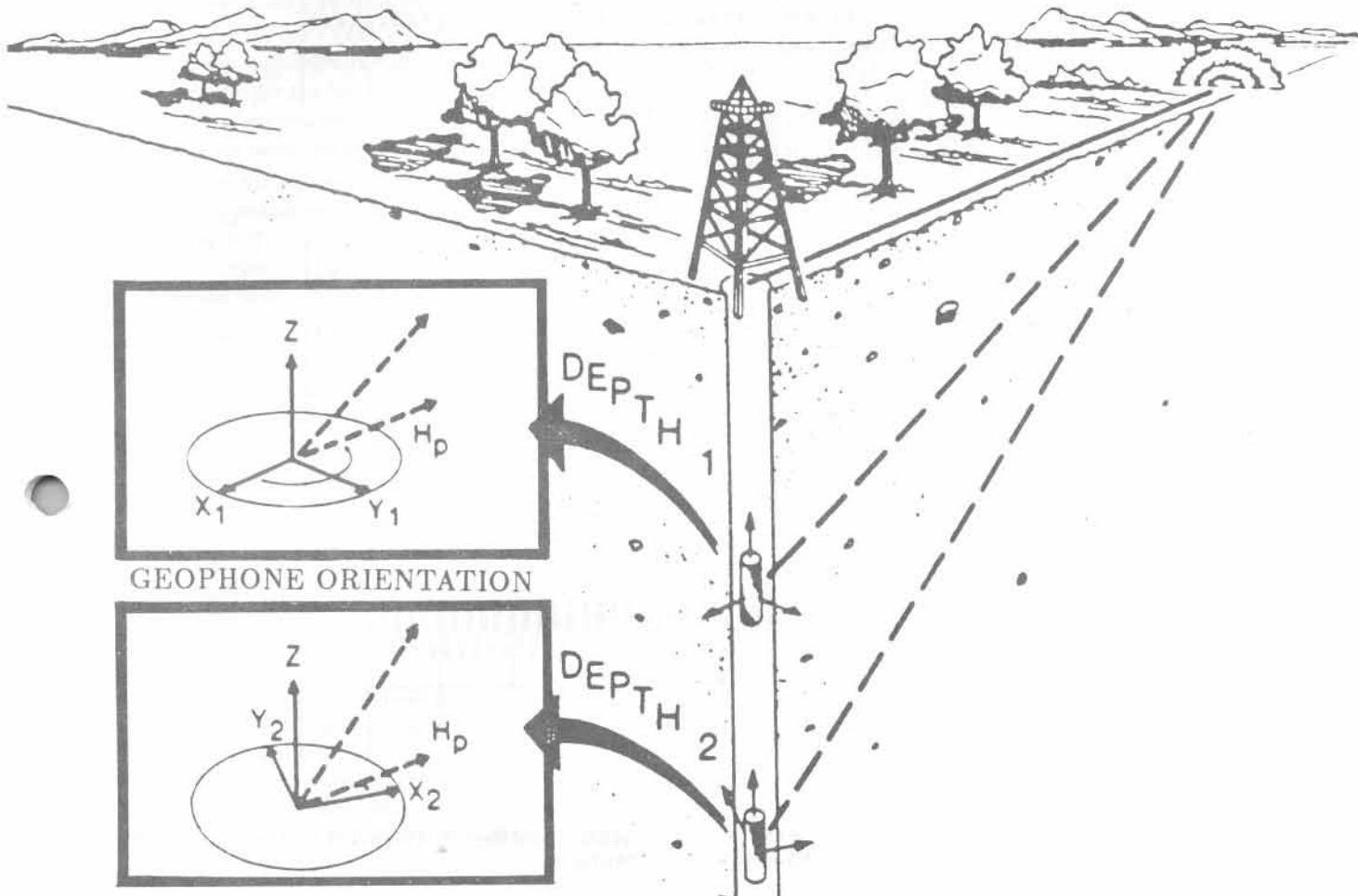


Figure 4: Orientation problem when recording three component VSP data.

(DiSiena et al 1981)

Figure 5a shows a triad of synthetic traces which would be recorded for a P-wave event having an arrival azimuth of 45 degrees and making a vertical angle of 45 degrees. After horizontal correction (Figure 5b) and vertical rotation, P-,SV-,and SH waves fall along new co-ordinate directions (Figure 5c).

If an apparent velocity between adjacent geophone locations is determined then the combination of apparent velocity and arrival direction gives a local material velocity in the vicinity of the wellbore. For the case of a multipath first-arrival, mode separation will not be possible but local velocity determination may continue to be (Windhofer and Young 1991).

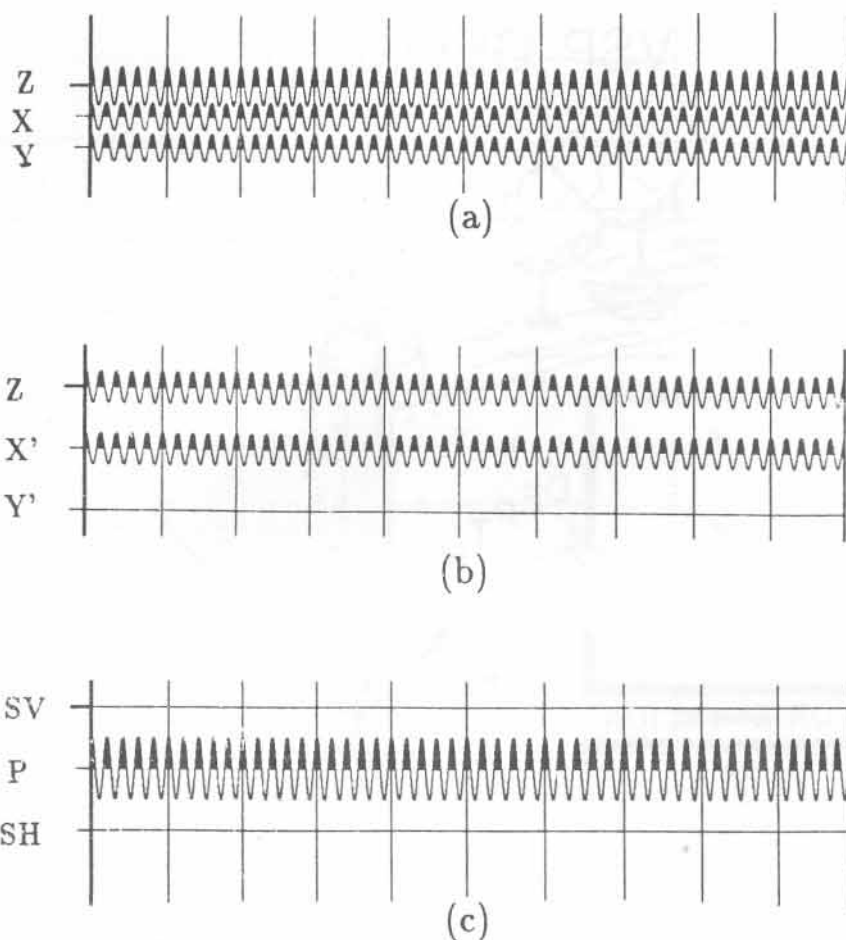


Figure 5: Three component test data set, (a) unrotated, (b) after horizontal correction and (c) after vertical rotation

Future research in the Seismic/Lithology Project will treat the conversion of converted wave images into depth maps and optimal means for combining the high resolution of VSP measurements with the lateral continuity of surface surveys. Those seeking further information on the project should contact Mr Joseph Cucuzza, APIRA, Melbourne (03) 654 8844.

*Dr Roger A Young
Exploration Seismology Centre
Curtin University, Perth WA*

References:

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LETTERS

Dear Mr Embleton

Re: Jim Frazer Letter on ASEG Seismic Interpretation Workshop

Jim's Workshop suggestion for education is a good one but is not new except for the low cost factor. I believe Dr Bill Stuart contacted me and several others about two years ago to talk about the same concept.

We did support his idea but could not afford to share the cost. Jim's suggestion probably offers greater scope but I don't see why ASEG Federal Executive need to duplicate the effort for organising the facility the National Centre perhaps already have.

I suggest you talk to Dr Bill Stuart.

Yours faithfully

Bimal R Banerjee
General Manager

Digital Exploration Limited

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SPECIAL PUBLICATIONS

#1. THE GEOPHYSICS OF THE ELURA OREBODY.

Proceedings of the Symposium, edited by DW Emerson, Sydney, 1980; 205p - A complete case history - highly regarded by explorers, it consists of a collection of papers with discussion, on the exploration, discovery, evaluation and testing of a large massive sulphide orebody in deeply weathered and conductive terrain near Cobar, NSW, Australia. Price \$31.00

#2. **MAGNETIC EXPLORATION MODELS** incorporating Remanence, Demagnetisation and Anisotropy, by DW Emerson, DA Clark and SJ Saul, 1985: 122p - A unique presentation of magnetic computational techniques for forward modelling 15 types of simple yet important geometric bodies ranging from the monopole through thin and thick sheets to the triaxial ellipsoid. Its purpose is as a working compendium of techniques primarily designed to teach and to impart some understanding of the magnetic response of basic models. This is the only available collection of rigorously treated MAGMODS and comes with HP41C programmes and worked numerical examples. Price \$25.00

#3: **DOWNHOLE ELECTROMAGNETICS** edited by ET Eadie & G Staltari, 1987: 105p - Consists of case histories, TEM theory and short notes presented at a Workshop on this subject held in Melbourne in 1985. It provides an excellent summary of the technique and its utilisation in Australia. Price \$40.00

Continued page 24

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J A Withers	Associate	VIC

Unknown addresses

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last known address: Schnabel Engineering
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last known address: Royle/Rumph Exploration
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C A Foss

last known address: 49 Jalan Ulaki
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Mr M D McNicol

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last known address: 83 Clarence St
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Mr M V Browne

last known address: U8/40 LeHunt St
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Please contact Paula Sinclair (09) 325 2955 if you are able to provide a current contact for any of the above.

Change of Address

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new address: c/- Hadson Energy
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Earth Resource Mapping

new address: 316 Churchill Avenue
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#4: **Volume 19, Issue 1/2**, 400p - ASEG/SEG Conference and Exhibition - Adelaide, February 14-28, 1988. Extended Abstracts. Edited by MP Middleton. Price \$45.00.

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