

Disbelieve if you can



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A word of congratulation is due to all students who presented papers at the recent Perth ASEG Conference. There were 120 student registrations, with 26 students presenting oral papers and 34 presenting posters. Special congratulations to the six students who gained best paper/poster awards in the minerals, petroleum and environmental-geotechnical streams, and also to Andrew Pethick of Curtin University who won the award and cash prize for Best Student Paper in Exploration Geophysics in the past year (see details of all Awards elsewhere in this issue).

After recently accepting the role of editing a page for *Preview* on Education, I have been contemplating what advice has influenced my career choices, and whether such advice may be useful to the current generation of students. The words in the title here are remembered as a trademark of Sam Carey AO, Professor at the University of Tasmania 1947–76. Carey was one who advocated and developed Wegner's theory of continental drift through the time when it was regarded as geological heresy in North American academia, up until approximately 1965. Senior and emeritus members of ASEG and our various geosciences departments will remember stories of those years when students were

discouraged by academic hierarchies from spending time on 'rubbish'.

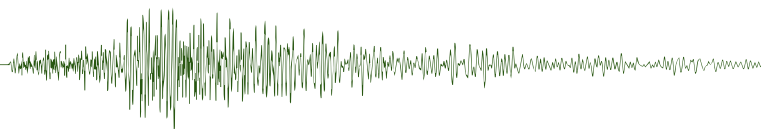
In 1969 the great geophysicist and one of the founders of modern seismology, Sir Harold Jeffreys, published a letter in *Nature*, decrying recent publications on the new 'plate tectonics', pointing out that he had demonstrated that the anelastic properties of the Earth indicated it behaved as a Lomnitz solid (having a property of logarithmic flow under stress). Since his numerical models showed that a Lomnitz solid cannot support convection, then Jeffreys argued that plate tectonics without a mechanism was fallacious. With a measure of undergraduate brashness based on erudition acquired in my physics major and first-year geology, I waved the issue of *Nature* at Carey after a lecture, seeking explanation. He spent 45 minutes on an in-depth discussion on evidence for fluidity of the Earth over geologic time, and of differences between observational evidence and mathematical models. It stimulated my interest sufficiently that I continued on to gain degrees in geophysics, although paradoxically I never worked in solid-earth global geophysics.

I recall at my first geosciences conference, held at ANU in Canberra in February 1972, one session on what had by then become the accepted science of plate tectonics developed into a discussion. The legendary Professor J.C. Jaeger (the first professor of geophysics in Australia) reminisced that when the then young research fellow Ted Irving arrived at ANU in the 1950s to develop his science of measurement of palaeomagnetism and movement of continents, Jaeger advised him 'When you visit other universities, don't tell them you believe in continental drift, or they will think you a rat-bag and they won't tell you where the outcrops are.' The exception, of course, being when visiting Sam Carey in Tasmania. Irving's work over a decade became a cornerstone of the new plate tectonics, and his PhD submission to Cambridge University in 1954 (which had been failed, because

apparently the examiners could not accept the idea of rock-solid continents moving on the Earth's surface) was replaced by award of a meritorious ScD in 1965.

Healthy disbelief of established wisdom was again demonstrated in the 1980s when I was involved in early trials of the new 'in-seam seismic method' whereby channel waves (analogous to Rayleigh and Love surface waves, but trapped in a low-velocity coal seam) were developed for detection of faults in coal seams. BHP trialled the method in collieries in NSW, and the data was processed by both the British National Coal Board and the German equivalent, these being two groups who had parallel but quite separate major programmes in this emerging technology. Processing by the German group failed to find a known target, because models produced by the distinguished father of German exploration seismology Professor Theodor Krey predicted that the useable frequencies would be at relatively high Airy wave frequencies, and filters were set accordingly. Perhaps due to a characteristic fabric of Sydney Basin coal, wave attenuation wiped out the Airy-phase signals. The British approach was more pragmatic; open the filters and see what can be found. Their result imaged up reflections using less-attenuated relatively low frequencies that corresponded more closely to a guided head-wave in the coal seam than to a true seam wave, and a decade of in-seam seismic methodology followed in Australia. (It ended when in-seam drilling technology made those seismic methods redundant).

Richard Feynman, the Nobel-prize winning nuclear physicist, might have been addressing students when he said 'Science is the belief in the ignorance of the experts'. Models today are an essential and growing part of our geophysical practice. But the most significant advances will probably happen when today's students understand their observations sufficiently well to break then reconstruct the models. *Disbelieve if you can*. And may we professors know when to stand back.



Students wowed with earthy programmes at ASEG Perth

The student events at the ASEG-PESA 2015 conference consisted of a programme for high school students, kindly sponsored by Woodside, and a variety of events for university students. The activities were well received and valuable to all who participated.

High school student day

On Tuesday 17th February the high school student day kicked off at 9:30. We had attendance from four schools with a total of 48 students, with one keen school driving up all the way from Bunbury, about 2 hours south of Perth. After a brief introduction from Darryl Harris at Woodside, Koya Suto presented his infamous Hitchhikers Guide to Geophysics, which gave the students a well-rounded introduction to geophysics.

After a short morning tea break it was straight on to some hands on experiments. This was coordinated by Dominic Howman from Curtin University and run by a small army of student volunteers from KEGS (Kurtin Exploration Geophysicists Society), GPX Surveys and Geoscience Australia. On the lawns at the entrance to the convention centre, the students conducted a GPR experiment where they found pipes and ground water. They learned that GPR can even be used to find bodies, enabling some geophysicist to moonlight in forensic work and assist graveyard managers to manage plots (did you know that bodies are not always below their headstones?). A handheld spectrometer unit was used to

demonstrate the principles of radiometric surveys, and that larger versions of this instrument were used in the airborne surveys that make up the radiometric map of Australia. Inside, the students learnt about magnetic bodies using a fluxgate magnetometer and a pen plotter that sounded like it was going to take off at any moment. One student bravely put their phone in the clutches of the instrument and got themselves a magnetic profile of an iPhone. In the last experiment, the students measured the conductivity and magnetic susceptibility of four different core samples. This was followed by conductivity and magnetic measurements of three boxes containing sand, brass and iron, and they were able to work out what was in each one.

There was a quick lunch and then the students had a tour of the exhibition halls. Thank you to HiSeis and Terrex who respectively brought in a Univibe and a Harvester receiver truck, as part of the demonstrations, and thank you to all the booth holders for taking time to engage with the students.

After the tour, there was a presentation by Prue Leeming on *Life as a Geoscientist*. There were photos from across the world where Prue has worked and it certainly reinforced the idea of travel (and adventure!) as a given in our industry.

Feedback from the students and teachers was excellent. As I was taking a group from the indoor to the outdoor experiments, one of the students said 'I didn't know anything with the word

science in it could be so interesting'. And from another school, all 14 students said they would consider a career in the geosciences. Thank you to Woodside and all the volunteers who made this day such a positive experience for the students.



High-school student Jake Wood gains 'X-ray eyes' using a GPR under the tutelage of Dominic Howman.

University student events

This year's ASEG-PESA conference had a range of activities on offer for university students. There were mock job interviews, a mentor programme, a *Careers in Geoscience* presentation, and a Student Social Function and EAGE GeoQuiz.



Student Day Volunteers (L-R): Mark Lowe, Dominic Howman, Dane Padley, Aldo de Rooster, Danny Husodo, Adrian Noetzli, Sandy Jones, Rebecca Tung, Rebecca Abel, Zenon Platritis, Xiuping Liu. Missing: Tristan Kemp (Geoscience Australia), Jay Ridgewell (Curtin University).

The *Careers in Geoscience* presentation was hosted by Kathlene Oliver (ASEG WA Branch President) and there was a range of presentations across academia, industry and government. Thank you to the presenters Chris Elders (Curtin University), Kerrie Deller (Woodside) and Millicent Crowe (Geoscience Australia). Students who attended the session found it extremely valuable, and many stayed on to ask questions and chat with the presenters.

The mock job interviews were an opportunity for students to practice their interview skills and get feedback on their performance. The calibre of the candidates was very high and several of the interviewers said if given the opportunity they would have hired one or two on the spot! Thank you to Marina Costelloe and Murray Richardson (Geoscience Australia), Kate Dodd (Apache), Richard Haines (Haines Surveys) and Audrey Leonard (Woodside) for helping to provide this invaluable opportunity.

A number of students made use of the mentor programme. Thank you to Kim

Cook for introducing the students to industry professionals, all of whom provided excellent career advice and guidance, and helped to bridge the gap towards industry for the students. I encourage more students to take advantage of this programme the next time it is run.

The Student Social Function and EAGE Geoquiz, sponsored by the ASEG, was held on Tuesday night at Bob's Bar on the rooftop of the Print Hall. Over 60 students attended from across Australia and internationally, as well as representatives from DownUnder GeoSolutions, Terrex, Geoscience Australia, and Woodside. The EAGE Geoquiz donated a first prize for the winning team to attend the 77th EAGE Conference and Exhibition in Madrid (1-4th June 2015). Needless to say there was fierce competition and a very close finish – the top three teams had points of 717, 729 and 731.

Congratulations to Aaron Girard, Benjamin Witten and Lee Tasker from UWA for taking out the prize. A spot prize for a genuine Akubra hat (thanks to

DownUnder GeoSolutions) was won by Simone de Morton. Thank you to Rachel Moo (EAGE) for your tremendous organisation, Professor Peter Lloyd (EAGE) for the witty antics as Quiz Master and Gerard Wieggerink (EAGE) for providing the ASEG the opportunity to run the EAGE Geoquiz and all the hard work behind the scenes. It was a pleasure.



Troy Thompson (DownUnder GeoSolutions) with (at left) student Simone de Morton, winner of the Akubra hat.

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Careers in Geoscience Session.



Winners of the EAGE GeoQuiz travel prize: from left, EAGE's Gerard Wieggerink, prize winners Aaron Girard, Benjamin Witten and Lee Tasker, EAGE's Rachel Moo, Quiz-master Professor Peter Lloyd, and organiser Adrian Noetzli.