This week we have one of the ASEG's Foundation Members and the Manager of Research and Development at Tensor Research, David Pratt.

1. **For how long have you been a geophysicist?**
   Not long enough, but I am a Foundation Member of the ASEG.
2. **What do you like most about being a geophysicist?**
   The problem solving is addictive and every day you go to work, it feels like I am opening a new detective novel. Fieldwork in remote areas of the country, learning new skills and working alongside colleagues with interesting and diverse skill sets also rate highly.

Cape York gold reef

3. **If you weren't a geophysicist what would you be?**
   I thought that I wanted to be an electrical engineer, but I took up geology as a hobby during high school and managed to land a university scholarship with the NSW Geological Survey as a geologist.
4. **What is your best interview tip?**
   Good research on the target organisation before the interview and be upfront about your limitations as well as your skills. It does not help either you or the

employer if later you find out that you cannot meet their expectations. An obvious eagerness to learn and work in a team environment will help.

5. **What's one thing that we wouldn't know about you?**
   Sport: Sea kayaking. Used to do the 400 km Murray Marathon and 111 km overnight Hawkesbury River Marathon and still kayaking 2 to 3 times a week.

Kayaking in Antarctica

6. **What are you reading at the moment?**
   "The story of Tom Kruze, Postman of the Birdsville Track" by Kristin Weidenbach. The Birdsville Track is one of those great 4WD destinations which I have driven from Maree to the flooded Cooper Creek where we then kayaked for two kilometres along the flooded track. The rest of the track is waiting to be completed.
   "The 99% Invisible City, A field guide to the hidden world of everyday design" by Roman Mars and Kurt Kohlstedt. This book in many ways is like geophysics by trying to understand all the services that are out of view and the street markings that go with them. Of course, geophysics now features heavily in finding out what lies beneath.
7. **What made you decide to be a geophysicist?**
   In 2nd year at Sydney University under Don Emerson all budding geologists learnt about geophysics and I was hooked. Only one problem though, I had signed on to the Geological Survey of NSW to become a geologist, so I had to convince the boss that they needed another geophysicist and to my surprise

they wanted to expand their geophysical team and agreed to the change. It probably helped when my colleague John Bishop, also a trainee with the Survey wanted the same outcome.

8. **What's your most treasured textbook?**
   At university, it was "Interpretation theory in applied geophysics" by F.S. Grant and G.F. West but much later, "Potential Theory in Gravity & Magnetic Applications" by Richard J. Blakely.
9. **Your funniest or worst field memory?**
   A trip to the coastal heathlands of Western Australia from Esperance to Perth with a client to review the mineral sands geology after completion of a regional airborne geophysical survey. This was full-on wildflower season and the camera was in action. But it was in pre-digital photography days and when I arrived home found that the film canister was missing. That is never inserted! While the field trip was absolutely amazing, I did not know whether to laugh or cry. I finally made up for it in 2018 with a 4WD trip specifically timed for the WA wildflower season. We drove the Great Central Road from Uluru across to Laverton, up to Winton and then zig-zagged through gold mining and wheat growing country until arriving in Esperance. My favourite place was the Coal Seam Conservation Reserve.
10. **Your most respected geophysicist?**
    There are quite a few competing for that position, so I want to pick at least two and both have Gold Medals from the ASEG. David Clark has made an amazing global contribution to our understanding of magnetic rock properties, their geological context, rock chemistry and the underlying theory. Richard Lane's contribution to our profession has been very well covered by our colleagues in recent times and I greatly miss the opportunity to continue some of our common research interests. He has stimulated many discussions and ideas that have since been put into practical use in our software.
11. **What do you do in your spare time?**
    What spare time? Boating, fishing, reading and few exploration projects with friends. I even bought a couple of Gem Systems magnetometers and applied them to one of our gold projects where we did 1500 kilometres at 5 metre line spacing. Even though the geology is outcropping, it was difficult to map and the magnetic data allowed me to produce a new geological map covering the important structures that controlled the mineralisation along with a better understanding of alteration zones and changes in the geological formations.
12. **What is a challenge you have overcome and how did you do so?**
    There have been many, but one that had a huge impact on my career was

during my honours year under Don Emerson. I chose to study the thickness of the Kurnell sand dunes using Schlumberger electrical soundings. In those days, desktop computers hadn't been invented let alone inversion so we had to use electrical sounding type curves. I had been using sounding curves with the NSW Geological Survey but, the Kurnell dunes presented a significant problem. The dry sand on the surface of the dunes was so resistive that it required 4 decades on the apparent resistivity sounding curve and the published curves (from Europe) only had 3.

Fortunately, Mooney and Orellana had just published in Geophysics the theory for a new method for calculating the sounding curves. This became my first serious go at programming and after several hundred debugging kilometres walking between the Edgeworth David Building and Physics Department the program worked and I had my 4 x decade sounding curves. But, the impact on me was much more! The computer allowed me to solve a problem that prevented me from completing my honours project. It was as though I had been riding a bicycle my whole life and someone just presented me with a Porsche. That feeling has always remained and after graduating I quickly registered for a M.Sc. under Don to gain access to a computer and work on a solution for 3D resistivity and IP modelling.

Sadly, the iconic Kurnell dunes have long disappeared as the sand was used in Sydney's concrete construction industry.

13. **What is a challenge that you see in geoscience today, and how do you see the community overcoming it?**

Meaningful collaboration with our colleagues in geology, geochemistry, engineering, drilling, research and education to reverse the declining numbers working in exploration companies. Geophysics is largely treated as a service like assaying rather than an important member of an integrated team. Geological knowledge is an important skill for a geophysicist as it has a dramatic impact on the weighting of anomalous results in exploration. This is essential in small exploration companies where you must be multi-disciplinary.

The Frank Arnott, next Generation Explorers Award (NGEA) is designed to encourage undergraduate and postgraduate research collaboration across multiple disciplines in the context of an international competition. The most recent contest was completed at the Canadian PDAC Conference with an Australian team from UWA taking out second prize.

I am encouraged to see BHP and Rio Tinto supporting the NGEA award and rapidly expanding their geophysical teams after a long period with only small teams.

Tanami campsite on the way to the Granites

14. **What reaction do you mostly get when you tell someone that you are a geophysicist?**
    Most of the time it is a positive reaction and they want to know more about what it is and why. The UK Time Team series helped a lot of people understand more about geophysics.
15. **When you are asked what you do - what do you do?**
    I generally say I am like a geologist why studies the physical properties of the rocks rather than their chemistry and mineral composition. It is generally easy to go on to explain the electrical, magnetic, density and velocity properties that allow us to see deep into the earth. Many want to join me in the field after a brief explanation.
16. **What is the best way that the ASEG could let the public know about geophysics and its benefit to the everyday life?**
    Promoting the new age minerals required to develop and support a green future will get more attention than conventional mining applications along with the satisfaction of problem solving.

17. **Where do you think exploration geophysics will head in the next 10-15 years?**

    Everything we do in geophysics is ultimately about drilling a hole for geologist to get their hands on a physical piece of rock. The science of understanding the rock chemistry and the local mineral potential has come a long way. As exploration goes deeper for minerals, we need to improve drillhole instrumentation and interpretation techniques so that the value of the hole can be extended way beyond the hole.

    I am concerned that the range of skills required to solve the instrumentation, modelling and inversion problems may be difficult to find after the loss of so many skilled members from our profession. The rapid decline in geophysics as a subject being taught in Australian universities makes no sense as we explore deeper beneath cover. Hopefully this will evolve into an undergraduate degree in geology and post graduate specialisation in geophysics.

18. **Given a choice, would you prefer extra mentoring on the science, your career or the how to handle/explain exploration geophysics and its benefits to the community?**

    Yes. After graduating, I found the field of geophysics and publications were so extensive, that I found it difficult to develop a perspective and sense of direction in my early career. I spent a lot of time reading and trying to understand SEG/Geophysics and EAGE/Geophysical Prospecting journals. There were no mentors in my early days to help develop a clear focus on what was relevant to our exploration industry. It doesn't help when there are probably more than 1000 different papers on how to interpret a magnetic anomaly.

    Professor David Boyd published a paper on the interpretation of aeromagnetic data in Mining and Groundwater Exploration Geophysics, 1967 where he clearly set out some sound geological principles for geological interpretation of the magnetic data. At the time, everything I had read consisted of a description of the anomalies without relating it well to the underlying geology. Our profession has come a long way since then but more needs to be done as the search for world-class ore bodies becomes more challenging.

19. **Do you think AI will take over your job or will the human element remain vital to exploration successes?**

    AI, like inversion is a tool that can add value to our work. If AI is seen as the answer, then the exploration failure rate is likely to increase. In the case of AI, the old adage of "garbage in – garbage out" becomes "garbage in – enhanced

garbage out". But who will know other than those that master the tools correctly?

Our industry has been using AI methods for more than 30 years, but the machine learning component is relatively new and has a lot of promise for reducing the labour component of repetitive tasks. When we do inversion, we normally build a geologically constrained model and use inversion to refine the detail. Machine learning also builds a model through repetitive training, but you can not query it in the same way as an inversion model and if it encounters a geological situation outside its training suite, then the results may have large errors or even invalid.

However, in the case of geophysical inversion it may be possible to train the AI system to learn how to perturb the model to test the limits of equivalence and estimate uncertainty in a more effective way than normal inversion statistics. The communication of uncertainty to geologist is one of our industry's biggest challenges.