

Unearthing prospects

How can explorers meet the challenge of the weathered blanket of rock, soil and sand, known as the regolith, that covers two-thirds of the Australian landscape? **Ross Storey reports**

Australia's considerable potential to discover many more world-class ore deposits, using technologies to 'see through' the regolith, was a key focus of a major international conference in Perth recently.

Some 730 geologists from around the world – hundreds more than expected – attended the five-day Society of Economic Geologists' SEG 2004 meeting, *Predictive Mineral Discovery Under Cover*, at the University of Western Australia.

It was the first time that the SEG had held its biennial conference outside North America.

Between presentations by international experts, several leading economic geologists spoke about the challenges and opportunities posed for mineral exploration in Australia.

John Dow, Managing Director of Newmont Australia, said that new geophysical tools were enabling sub-surface features to be observed that had never been seen before.

"The geochemical techniques being developed may be less direct, but there's no question that they are seeing through the cover as well," he said.

"For me, airborne geophysics is the most effective tool because it covers huge amounts of terrain quite quickly and is one of the best ways to understand sub-cover geology. We can use the geochemistry more specifically for targeting once we know we are in the right terrain."

Mr Dow said the acquisition of geological data, especially using airborne gravity techniques, was expensive. Some state governments had taken the initiative to provide industry with pre-competitive geoscience data derived from their own



Teck Cominco's **John Thompson**: Every mineral deposit is unique, so there's no 'cookbook' recipe

surveys, as an incentive to do the follow-up work.

"These data greatly assist private companies to narrow down their areas of interest, focus their expenditure and reduce the risk of failure," he said. "It is seen as a real benefit to those of us doing greenfields exploration."

Noted international consultant Jim Franklin said the regolith in Australia was quite thick and the processes that had operated within it had tended to obscure the signals of mineralisation.

"This makes it doubly difficult to identify where mineralisation might occur," he said.

"You also have some areas that are geophysically challenging because they are deep and the signal diminishes. On top of this, Australia has all this saline groundwater around which causes some problems with certain types of geophysics."

These problems were not insurmountable, but required continuing technology development.

"Once you've cracked through some of these problems, the results will be valuable throughout the equatorial districts of the

world," he said. "There are large parts of South America and Africa which could benefit from the application of these technologies."

Dr Franklin said that numerical modelling programs being carried out in Australia would provide a better explanation of areas of potential, but would be less likely to directly target mineralisation.

"You have to go to a more direct technique and that means using the regolith and its own characteristics and then targeting specialised geophysical methods that will see deep," he said.

"To do this, which is very important, you need strong and well developed, high quality datasets and the development of new technology that sees through regionally and allows you to interpret the geology. For example, high quality magnetics and gravity data are key things that are required and always have to be improved.

"With better quality and narrow spacing, you'll see with more precision what the geology is telling you and then you have to 'ground truth' that geology as best you can, which may require drilling."

Many times, this involved compiling available information and making maps.

"That's the first thing you have to do," he said. "Then you have to develop the technologies that allow you to target the most prospective zones. If you don't do that, you've got too big a country and it's too hard."

John Thompson, Chief Geoscientist with Teck Cominco, said that attempting to explore through cover – particularly deep cover – remained at the high-risk end of exploration.

"It's done best when you understand what you are looking for and when you have some good technology to see the kind of target that you are expecting," he said. "The key is to use a relevant combination of technologies.

"The basic knowledge comes from understanding the geology of the region; whether you can see that directly, away from cover, and extend it under cover, or interpret it from regional geophysical datasets.

"You then combine this understanding with techniques to see directly through the cover, such as geochemistry in some situations, or even direct sampling through the cover to get to bedrock.

"Every mineral deposit is unique, so there's no 'cookbook' recipe. The key for me – and this is one of the reasons why we like Australia – is the people. It's having good people with strong skills, who are well trained and have solid experience to use the technologies and interpret the data produced."

There was still a good pool of people in Australia but there was some concern about how long this would be maintained.

"There's a need for everyone – industry, academia and government – to look at ways to resolve the growing shortage of qualified, experienced people and to make sure we maintain the skills, both here and elsewhere in the world," he said.

Newmont's **John Dow**: Airborne geophysics is the most effective tool because it covers huge amounts of terrain quite quickly



SEG Executive Director Brian Hoal said that Australia had a unique advantage with its geologists.

"When you look at people who say they are geologists here, you find they actually know a whole lot about other areas of the broader geosciences, geophysics and geochemistry," he said.

"These are precisely the kind of tools being used to work in the regolith environment when seeking hidden deposits.

"This versatility makes Australia somewhat unique. If the Government gets behind them with the right sort of structure, a lot can be achieved."

But Mr Hoal sounded a warning about a worrying global trend.

"From the SEG's perspective, we see there really is a crunch coming with student numbers," he said. "There has been a big drop across the world and it is a situation that corporations should have identified and taken pre-emptive steps to resolve.

"Even though commodity prices are looking good – we are clearly in a boom right now – this human resource issue is definitely going to be a problem."

Michael Leshner, the Chair in Mineral Exploration Research and Professor of Economic Geology at Laurentian University in Ontario, Canada, believes that Australia has only 'scratched the surface' with its mineral deposits.

"There's still a lot of potential in the greenstone belts and there's been a large number of new deposit types and classes first identified in Western Australia," Professor Leshner said.

"What's important in 'seeing through' the regolith is that we have the backdrop, in Australia and Canada, of knowing what the deposits look like in near-surface areas where we have already found them. We can apply that information to understanding things under cover.

"One of Australia's strengths has been extremely detailed geological work by companies like WMC Resources, which has promoted a corporate research culture. That's allowed us to develop some really excellent geologically based models for exploration.

"On the Canadian side, there have been advances made in geochronology, in precisely dating different parts of the greenstone belts, and unravelling some of the complexities."



www.geoconferences.org

They said it

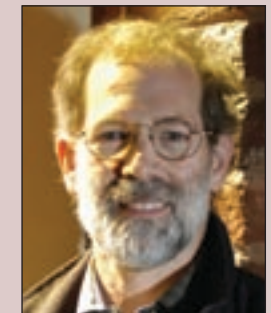
You've got to learn to love the regolith because you'll either be buried in it, or scattered on it. – *Charles Butt, CSIRO Chief Research Scientist*



Australia has plenty of 'needle in the haystack' situations and it's really going to depend on technology – that is what's going to find the new

stuff. We know very little about the commodities to be looking for in the future. They won't necessarily be the same as today. – *Brian Hoal, SEG Executive Director*

There's a tremendous amount of science out there that does the job of seeing through the regolith in varying degrees. The problem is the ability to interpret the data that's generated, and turning that data into realistic targets that can be tested. The key issue is having the best people available, with the most experience, to apply the technologies. – *John Thompson, Teck Cominco Chief Geoscientist*



Quite a lot of work has been done in developing geophysical techniques to see through deep cover in Australia and

parts of Canada. Once you understand the sub-surface geology, you can apply exploration models. The real challenge is to think outside those models and discover similar deposits that formed in different ways and/or in different geological environments. That is where research is particularly important, in establishing which features are fundamental and which are not. – *Michael Leshner, Professor of Economic Geology and Chair in Mineral Exploration Research at Laurentian University, Ontario, Canada*

The prospectivity of the Australian geology means that there will be other deposits found deeper than we've been able to see before. – *John Dow, Newmont Australia Managing Director*