

Perth venture *Fractal*

Graphics makes the future clearer for mine managers.

USING FRACTALS TO FIND TOMORROW'S GOLD

Once, it would have been called magic.

With the aid of a crystal ball and a friendly wizard, a fairytale hero could see where the gold was hidden deep under a mountain—and learn of the dangers he must overcome to reach it.

It's still magic, but the crystal ball is a computer using some of the world's most sophisticated modelling technologies. The gold is—well, gold. Or copper or iron or silver or virtually any other mineral. And the dangers are the real dangers of mining, along with the sheer cost and labour it involves.

Mine managers of today have no friendly wizard to help them. But they

do have Fractal Graphics, a collaborative venture between CSIRO and the Western Australian company Port Mineral and Mining Services (PMMS).

“Fractal Graphics can build 3D models to enable resource companies to see—in advance and with reasonable certainty—the entire life of a mine from the day the first shovelful of dirt is moved to the day the earth is closed over it again,” says CSIRO's Dr Bruce Hobbs, who has been deeply involved in the collaboration. “The manager can plan his operations before work starts.”

The collaboration involves integrating technology developed within CSIRO with interactive modelling and

visualisation skills. Fractal Graphics' founder, geologist Nick Archibald, worked with his friend and colleague Bruce Hobbs to develop the idea of using fractals as a tool for expressing the behaviour of geological formations. The emerging discipline of fractal geometry, they reasoned, should be able to represent what happens when rocks fold, and to predict the formation and behaviour of orebodies.

That was a philosophical leap away from the traditional linear approach towards presenting geological data. In practical terms, the use of fractals, with their infinitely repeated patterns, allows modellers to extrapolate from bare data to create 3D models of extraordinary complexity and accuracy.

"There is plenty of data around on any minesite," explains Bruce Hobbs. "It comes in from drillholes, from seismic tests, and from surface and aerial surveys. Fractal Graphics is able to present that data so that it is of immediate practical use."

Which is putting it mildly. This is the sort of information mine managers crave—to know years in advance which way the orebody runs, how big it is, its grade, and how many tonnes of overburden must be removed to get at it.

Armed with this knowledge a manager can, for example, schedule operations to extract the premium oregrades first, a strategy that will give him strong cashflow upfront, when he needs it most. Ore which is less rich can be removed later in the life of the mine, when infrastructure has been paid for and costs are lower.

He can choose not only the quickest route to the ore but also the least hazardous. He can minimise the amount

of overburden that needs to be moved. He can plan mine development so that the least possible disruption is caused to the environment and rehabilitation of the minesite is rapid and effective.

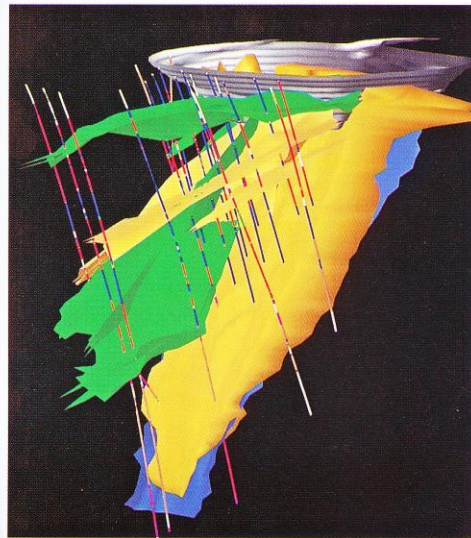
Associated software calculates the stresses on rock formations at every stage, and if dangers or obstacles emerge then priorities can be reordered. The system will tell the mine manager instantly how such changes will affect the day-to-day profitability of the mine.

Nick Archibald and Bruce Hobbs first met some 20 years ago at Monash University. Hobbs, then a professor at Monash, went on to pursue a career in science and eventually moved to CSIRO. Archibald established Port Mineral and Mining Services as a consultancy to some of the biggest miners in the business.

But their friendship and their frequent discussions continued. Both men felt that the mining industry was inadequately served by conventional methods of using data.

"What we hit on eventually was that, as the old adage says, 'a picture is worth a thousand words'," says Bruce Hobbs.

Today, Fractal Graphics is a thriving venture which brings benefit both to PMMS and to CSIRO. PMMS keeps tabs on the world's leading edge mining technology, while CSIRO pushes the science forward.



Three dimensional geological model of Kanowna Belle open cut gold mine in Western Australia, produced by Fractal Graphics



Oblique views through a three dimensional interpretation of Cowan 1: 100,000 sheet, Western Australia.

“CSIRO also helps us maintain down-to-earth links with industry,” explains Nick Archibald. “CSIRO’s contribution is more than simply one of research and theory. The organisation has unrivalled links with industry across the board. It is the CSIRO connection which keeps us at the top and enables us to drive our product directly. Without that, we’d be out of business in two years.”

Far from being out of business, Fractal Graphics is now a leader in 3D visualisation for mine management in Australia, offering its expertise as a bureau service to many big mining companies. Since the Australian mining industry is among the biggest and most advanced in the world, this means that the small Perth company is a leading edge practitioner even in global terms. Fractal’s system is crucial to the management of such major mine developments as Kalgoorlie’s Kanowna Belle gold mine, the Yilgarn Star gold mine, and Western Mining’s Perseverance and Kambalda mines.

The Awak Mas gold project in Sulawesi in Indonesia marks Fractal’s first direct step into the overseas market. In fact, the company is already making a major contribution to exports by

increasing the production efficiency of Australia’s mining industry.

“There is no doubt that Fractal

Graphics’ approach cuts costs, improves efficiency, and offers enormous advantages to planners,” says Bruce Hobbs. “It is a classic integration of CSIRO science and industry expertise, and it definitely represents the next generation in 3D visualisation.”

Fractal Graphics is working on a variety of projects involving Cooperative Research Centres (CRCs) in which CSIRO is also a partner. One project, with the CRC for Advanced Computational Systems, involves the possible use of virtual reality in a mining environment. Another, with the Australian Geodynamics CRC, is developing a 3D model of the top 10 km of the earth’s crust in the Menzies-Norseman area of Western Australia.

Hobbs believes that Fractal Graphics expertise could have new applications not only in mining, but also in the environmental, water and land use management industries.

“It could prove valuable in any field which relates back to the earth and its underlying geology,” he says.

KEY CSIRO CONTACT:

Chris Priday on tel (02) 9887 8247, fax (02) 9887 8183 or e-mail c.priday@syd.dem.csiro.au