



*Jeff and Ruth Whittle  
Whittle Programming Pty Ltd*

*"...when your name  
becomes a verb."*

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ON a frosty September morning in 1961, Jeff Whittle, a research physicist at the top-secret Atomic Energy Research Establishment at Harwell, 20 kilometres south of Oxford, studied the Manchester Guardian at the kitchen table. His wife of six years, Ruth, six month's pregnant with their fifth child, placed his breakfast before him. The three toddlers were asleep and the eldest child, Robin, 5, splashed in the bathroom wash-basin getting ready for school.

Jeff, taking a fork of kippers, folded the paper and frowned at a small paragraph at the bottom of the world news on page six. It told of Russian troops amassing on the Turkish border. The couple for a number of years had had the occasional sleepless night because of the world situation; Russian sabre-rattling, that sort of thing.

Ruth sat at the table, sighed and poured tea.

Jeff looked directly over at her, pointed to the paragraph and said: "You, my dear, are going to Australia." Ruth, who merely wanted to flop out and not exert herself too much for the next three months till the baby was born, peered with mild astonishment at her bespectacled and serious husband.

"I beg your pardon?" she responded in surprise. Going to Australia wasn't on her schedule. Jeff explained: he had access at work to documentation on the effects of atomic warfare. It wasn't particularly secret, but frankly, in the event of a nuclear war, England was no place to be. It was too small; no chance of getting away. The thing most didn't understand was that the atmospheres of the two hemispheres didn't



much mix. A nuclear war was more likely in the northern hemisphere. The couple had seen what had happened in Hungary around the time Robin was born and it worried them.

Always quick at making decisions, some 16 days later Ruth and the children were in Australia and Jeff followed within the month after selling the house.

Why Australia? Jeff had a cousin and an uncle and aunt in Melbourne, people he had never met, and another cousin at Yallourn in charge of the briquette works. Melbourne would be a base. He had sent his Yallourn cousin an 80-word telegram, saying they were on their way, had funds and could he meet Ruth at the airport, which he did. Jeff didn't actually think nuclear war likely, merely sufficient to warrant moving the children to a safer place. Years later, they would tell friends that apart from it being their best decision, they should have migrated earlier. Ruth arrived with a few precious bundles and stayed in various hotels including the Prince of Wales in St Kilda, then experiencing its glory days.

Jeff, who had grown up in the north of England, had won a BSc(Hons) in physics from Manchester University in 1950 and had started at Harwell two years later, began jobhunting among government departments in Melbourne as soon as he arrived. He sought work as a health physicist, because his Harwell work had been with the Medical Research Council. He even tried Ford, but no luck. The company took him to lunch and talked about things he didn't understand, such as sport. Being unknown, jobhunting wasn't easy. Eventually he started with the Department of Supply, Maribyrnong, as an experimental physicist working on xerography, laser development and holograms. In 1963 he made one of the nation's first holograms.

Almost exactly a year after leaving England, Jeff had his first contact with computers. Faced with the prospect of completing a particularly complex calculation, he sought an alternative to sitting at a desk with a calculator for many months. A Ferranti Sirius computer became available on a bureau basis and he did a two-day course on it, his first experience at programming. The Ferranti had a memory of 12,000 bytes and a memory access time of four milliseconds, very slow. However, through his involvement with advanced mathematics he took readily to programming and got his first program right. Jeff spent the next five years progressively doing more and more computing and less and less physics.

He changed jobs in 1967, joining Monash University's computer centre as a programmer, staying 10 years. He founded the university's computing contracts group, working for outside organisations. It concentrated mainly on examination computing, particularly distribution of HSC papers, examinations and compiling results. Jeff's group ran a tight ship, they had to. It was good training. On the one hand they worked closely with high-flying academics and on the other had in their hands the future of 35,000 students each year.

In June, 1977, Ruth and Jeff made their first major decision, one that would change the course of their lives: they set up a partnership, Whittle Programming. The company employed Jeff to engage in computer programming consultancy operations. Ruth, with a BA(Hons) in French from London University, had attempted programming and found she was totally immune to computers. She would maintain the administration side of the business. Jeff's first consultancy was a two-year contract heading a team writing a pathology system for the Hospital and Charities Commission.

In 1979, he had his first contact with mining, the second event that would hone the combined abilities of the couple and make them a unique world combination: Jeff won a contract with Newmont Australia, it lasted five years. The work, because of its technical complexity, totally absorbed him. Originally, the company had advertised for a full-time programmer and Jeff persuaded them to take on a consultant instead, initially for six months: the task was to move several hundred programs from one machine to another. He learned the various techniques concerning mining computing and perceived a need in designing open pits. Jeff's work didn't involve pit design programs, but the modelling side of mining.

In the 1970s, Placer in Canada had written a pit design program, but it was known within the industry it had cost an arm and a leg, several hundred thousand dollars. A team of programmers spent months writing it. It took them a long time to get it right.

Jeff was convinced he could write such a program far less expensively. He suggested it to the company, but because of the Placer experience, Newmont Australia didn't want to take the risk.

The couple decided to do it themselves, knowing the risk to be double-ended. The children had grown up, which meant they could concentrate. To keep a little money rolling in, Jeff still did consultancy work and, simultaneously, spent the next six months writing Three-D.



An enormous amount of information is compiled when designing an open-cut pit. Geologists drill holes at the mine site. They measure the grades of material in such holes, generally at half-metre intervals. They may drill 100 or 500 holes, drawing several hundred samples from each; this adds up to a lot of information, far more than anyone might retain in their memory. There are many reasons for reducing that information and getting it into manageable form. Eventually, having decided what the ore body looks like from these drill holes, geologists and mining engineers would consider they had varying grades of ore. The fact they have a drill hole at one point with ore and another at a further point, doesn't necessarily mean that a hole drilled at an intermediate point has ore. There is a need, however, to assume some form of continuity. Some ores are not continuous.

The entire process of gathering the information and making sense of it is called modelling. Engineers model the ore body. When it is modelled they then have the problem of deciding how to mine it. If they are considering an open-pit mine, the facet in which the Whittles are involved, the engineers have to find a shape that will fully maximise the mine's profit.

Given a very simple ore body, which is vertical, constant grade and dimensions, there is a balancing depth at which the mine does not make any further profit because the deeper the pit the longer the strips of waste that have to be taken out if the slopes are to be maintained.

Slopes are another thing altogether. Engineers have to decide by examination of the rock what sort of slope the mine will support. If the slopes are too steep they fall in; make them too shallow and money is wasted. Slopes also vary with direction and position.

The model is generally divided into blocks, where for each block, which might be five metres by 10 metres or even bigger, the engineers estimate what the grade of gold is, or whatever is being mined in that block. The model might comprise 100,000 of such blocks or even a million. Given the blocks and the slopes required, there are various rules of thumb used for designing the shape of a pit, but they are very inaccurate. There is one important algorithm that was published in America by mathematicians in 1965, four years after the Whittles came to Australia. It was a brilliant paper, but difficult to program, mainly because there was so much data, certainly in those days because computers in terms of memory capacity were so small. Mainframes were only 20K. Up till then the ore body was simplified, often more

than reasonable: that is designers would simplify its shape. There was a rule-of-thumb that allowed engineers to estimate a bottom-of-the-pit stripping ratio. A stripping ratio is that between the amount of waste mined to each tonne of ore. So the tonnes of waste are calculated against tonnes of recovered ore. A practised eye might look at a pit and say that the average stripping ratio is, say, five-to-one. Then the grade of a block is calculated against the grade of ore, which is good enough so that when processed the ore pays not only for its own processing but the mining and stripping ratio as well. Once the ore is identified it is mined, with the pit being built around it.

At this point Three-D reveals its worth as an open-pit optimization computing tool. It gets the calculations right, doing away with guess-work. The difference in mining between getting the calculations right and almost getting them right represents a saving of millions of dollars.

Mining is a highly expensive exercise. Sometimes somewhere between \$10 million and \$100 million is spent digging a hole. If the cost can be reduced by even five per cent then it represents a great deal of money. Some top engineers have a good gut-feel experience and are able to do good designs. However, they are not as good as an infallible computer program.

After Jeff wrote his first program, working on a small \$1000 IBM XT personal computer in his tiny study in the couple's unpretentious two-storey, brick veneer North Balwyn home, Ruth took over as marketing director. She got into it fairly easily, having done voluntary work. She found herself to be a good communicator and organiser. When Jeff said he was going to become a consultant she learned how to type on an old typewriter. The couple couldn't afford a word processor until much later. When the time arrived to begin selling the software, she borrowed a copy of the World Mining Directory and started typing a mailing list of the names and addresses of every large corporation engaged in open-pit mining. A separate list was compiled for consultant mining engineers, various bureaux, mining institutions, geological societies and professors at universities. Within the first month she sent out a single-page double-sided A4 handbill to 700 targets, addressed to chief mining engineers and other individuals telling them about their wonderful new tool for open-pit optimization.

The marketing play represented a large investment for the couple. At that time the program was not called Three-D, but the Whittle



Programming Lerchs-Grossmann Package. It wasn't renamed Three-D until they had the concept of Four-D, an enhancement and refinement of Three-D.

"Much further down the track," Ruth says, "Jeff explained another development to me. I can remember the precise time. It was in the bedroom, where we hold many of our board meetings. We talked about naming this new development and the term fourth dimension came into it and I said why don't we call it Four-D and we will call the earlier one Three-D? What happened is we really didn't christen the first baby until the second was conceived."

After the mailers were sent off the couple waited six weeks and, deciding that the mining companies were slow in responding, Ruth sent off a shorter letter addressed this time to managing directors. The letters comprised only a couple of paragraphs because she believed company chiefs didn't have time for anything longer. The letters said the Whittles had written to chief mining engineers about their brilliant new tool and they were sure that such chief engineers had discussed it with their chief executives. It raised ructions because a few telephoned to say that they had not heard about the software. Please send details.

Heartened, the couple installed an answering machine in the passage of their home and a fax in Ruth's study. They then sat by the phone. Meantime, they had elected Newmont Australia their best test site and gave the company a copy in exchange for running it. They had also sold a nominal-fee licence to use the program for teaching and research to Laval University in, Quebec, Canada, in June, 1986.

The Whittles waited 12 months before getting their first sale in July, 1986. It appeared in the mail in the form of a \$US5000 cheque from a company they had never heard of, APIRSA, in Seville, Spain. They packed up the software, comprising two five-and-a-quarter inch discs containing source code, put them in the mail and went out and had a very expensive lunch. The software was written in Fortran and the buyer could compile it on his own machine. Now, since most people run the program on PCs of some form, they send precompiled versions.

"That was our first sale," Jeff says. "It was pretty exciting. It then started to sell. I was still consulting and we were gradually getting more and more income from Three-D sales and less from consulting. This rewarded my work in writing Three-D and that financed my experience of seeing what people throughout the world were doing with it; seeing them run it over and over again. This led to the writing of Four-

D, which deals with economics and time, both of which affect a pit enormously. It also does all the things that Three-D does, but in a compressed fashion. It takes account of the fact that, for example, we might be designing a pit that won't be finished for five years and the final design should depend on what the price of gold is in five years' time, yet we don't know that. We have to find compromises that will still be a good pit even if the price of gold wanders around in this range, whatever the range is that one chooses. So we start taking account of the economic and time sensitivity of pits, which is very complicated."

From a sales perspective, Three-D has a flat price regardless of where it is used. The price of Four-D is graded according to its application, ranging from \$US12,000 to \$US20,000. Whittle Programming so far has sold 70 units of Three-D and 14 of Four-D to mining companies; teaching and research institutions have 25 sets of Three-D, while 10 interfaces to non-Whittle mining packages have been written. Many open-pit mines around the world are now using the Whittle Programming Lerchs-Grossmann Packages, known as Three-D or Four-D. Sales have been made in countries such as Spain, Canada, Papua-New Guinea, Brazil, Mexico, Zambia, Ethiopia, Australia, Germany, the United Kingdom, Dominican Republic, Chile, Poland, the US, Yugoslavia, South Africa, Indonesia, Morocco, Malaysia, the Philippines, Ghana, India and Portugal.

While at the house, the fax started and Jeff said: "There's another order for Three-D. We don't get excited anymore. In one day we had an order for two copies. It has become very busy lately. One evening recently we went off for dinner and the theatre. When we came home we found three messages on the answering machine and five faxes on the carpet. There were two orders for Three-D and one for a rental."

They now have an agent to help with sales.

"They approached us," Jeff says. "I had very close contacts with Datamine, whom I knew through Newmont. We gave Datamine a licence to build Three-D into their package as a series of commands. They were our first agents. Not too long after that we also got a call from a company in Canada. Neither of our packages do modelling. You must do your modelling first. There are many packages that allow you to do that. Companies selling generalised mining packages have become our agents and sell our software alongside theirs. We are not in competition with them, but our software enhances theirs."

The aim and vision of Whittle Programming is to provide the

highest level of customer service. The company puts a great deal of effort into it. Marketing has been the toughest challenge, trying to get people to believe the software can perform as claimed, particularly Four-D. Ruth and Jeff have given as many presentations as possible and ensure customers have strong follow-up support in using either program. The company's customers become their best salesmen.

Whittle Programming's philosophy on computer excellence and success comprises carrying out the sorts of things that are inherently difficult and that can only be achieved through very high standards of programming. The company's two products are inherently complicated, far more so than compilers for example, not so much that the programs are big, because there are many that are larger, but that the concepts within them are inordinately complex.

"We plan and constantly replan," Jeff says. "Being just the two of us, those plans are only rarely written. We are constantly adjusting our path and planning evolves not by accident, not blindly. We plan marketing exercises and are in the process of planning one for next month. We are giving a seminar to launch the new version Four-D in Perth. We are constantly looking ahead a year."

In 1987, Ruth entered Four-D in the Australian Information Technology Awards, sponsored by the Australian Computer Society and Computer Weekly. It won the software product of the year award. Whittle Programming also won a major trophy in the 1989 Australian Small Business Awards.

Although too modest to admit it, Jeff is the world expert on open-pit optimization. He is the only person in the world who works on nothing else. From an ego point of view that doesn't bother him - but he is often asked to give talks and that's good marketing.

"I feel we are pretty safe as far as fearing copyists is concerned because the whole point of our company is we have a product that is unique. We don't want any competitors and I think we are safe because of our prices, for example, \$US5000 for Three-D. It would be very difficult for someone else to make money selling Three-D now, starting from scratch. Look what it cost Placer in the 70s, several hundred thousand dollars. How can you make money out of selling it for \$US5000? You can't. In its complexity, Four-D is something like the square of Three-D. Sure, we charge two or three times as much for Four-D, but someone starting from scratch now to write Four-D? I know I wouldn't want to do it, considering the enormous amount of time it

took."

"What has come together, and it is partly by chance is, one, I am an experienced programmer, but there are plenty of those; two, my maths are pretty strong, which you need for this; three, I have been programming for this length of time and am not in management, but still programming. If I have to describe myself it would be professional programmer, with the word professional underlined two or three times. I am not a computer enthusiast anymore. I used to be. It is a serious profession as far as I am concerned; it is a craft and I am pretty good at it. If I was not I could not have written these things. I really think it is very unlikely that anyone else is going to write a similar software package. Look at what Ruth has done, our name is so well known world-wide in such a relatively short time."

Ruth, sitting in a comfortable chair in the couple's lounge room, looked over at Jeff, beamed, and said: "You know you have made it when you become a verb. I heard it recently. I was talking to one of the consultants and he said some companies won't advance funds to buy a mine unless it has been Whittled."

*Author: John Wilson*