

## Probus AO Talk

By Jeff Whittle  
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I am, of course, very honoured to receive this award – who wouldn't be? However, I don't for a moment think that I earned it on my own. Many other people were involved, and I'll come back to that.

I was working as an experimental physicist when I started programming in 1962. When I got my first program right first time, I figured that maybe this was something that I was good at, and, over a period of about five years, I did more and more computing and less and less physics. I gradually changed from being an experimental physicist to what I now jokingly call a "computerist".

For those who don't know, perhaps I should take a moment to explain what a computer program is, because that is central to what I will talk about. A computer program is a list of instructions - we call them lines of code - which each tell the computer what to do next. A computer program is a bit like a recipe – with each line of code like a step in the recipe.

However, unlike a recipe, computer programs typically have a few thousand steps, and millions of steps a second can be executed. Complicated programs can deal with complicated problems.

So, having started programming in 1962, in 1967 I joined the new computer centre at Monash University where I worked with a group of very bright and creative people. This was still the early days, and we worked on every aspect of computing. It was a wonderful learning opportunity, and I still use techniques today that I learned in the ten years I was at Monash.

In about 1980 I got a job with Newmont Mining Corporation. My first task was to convert a quarter of a million lines of computer code written for an old computer to run on a new computer. This involved changes of meaning and of syntax. From what I had learned at Monash, I wrote a translator which would input the old computer code and output the new code. This was much quicker and more accurate than doing it by hand. Over the next few years I worked on a range of programs for Newmont, each of which aimed to make mining easier, and more efficient.

To get at the ore, the mining industry uses two methods. If the ore is reasonably close to the surface, they get it out by digging an open pit. That is, a big hole which is open to the sky. If the ore is deep underground, they dig a shaft down to near the ore, and then dig tunnels out from the shaft to extract it.

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Open pits can be very big, and they typically cost hundreds of millions of dollars to dig. As an example of a really big pit: in the early 80s Ruth and I visited a pit in Utah that was two miles in diameter at the top and half a mile deep. It was awesome to stand at the bottom and look up!

With such huge costs involved, the mining industry needed a computer program to work out the best shape for an open pit. This is actually a very complicated problem, because it must take into account the shape of the ore body – which can be very irregular - the variation of quality of the ore body – which can also be irregular, the hardness of the rock etc. But, if we could save even a small fraction of the cost of mining by improving the design, that would be millions of dollars.

While at Newmont, I had learned that a method had been published in the 60s that would find the mathematically best shape for an open pit, but people had had great difficulty programming it. By the 80s, I had had about twenty years of programming experience, and I figured I could do it, so I offered to write it for Newmont. However, Newmont didn't want to spend the money. So, Ruth and I decided to develop the program as a private venture.

That was the start, and over about thirty years I wrote a series of ever more complicated programs to find the most profitable ways of doing more and more aspects of mining, not just designing pit shapes.

There are now two companies – Whittle Programming and Whittle Consulting. Whittle Programming, which we no longer own, has sold programs I have written to several thousand mining companies throughout the World. Whittle Consulting uses a later program I have written in its consulting. This can find the most profitable way of operating a whole mining complex, which might consist of multiple open pit and underground mines. For your interest this program contains 35,000 lines of code.

We have often been asked how much the mining industry has gained from our work, and that is very hard to estimate. However, as an absolute minimum, the value of a mine will be increased by ten percent by using these programs. If you apply that to the thousands of mines where our software has been used, the total improvement has to be many billions of dollars.

I said at the beginning that I didn't earn this award on my own. Just writing programs isn't enough. If the business is to succeed, someone must get out and sell the programs. Over the years, many people have been involved in selling our programs and spreading the word, and the first one to do that was Ruth. Although she had never done any marketing or selling before, she got out there and sold the programs in many countries, before handing the marketing over to a team. That is something I could not have done. Marketing is a skill I do not have.

Over the years we have been lucky to have had a lot of very talented and enthusiastic people working with us, and this has allowed us to grow the whole enterprise.

So finally, I wrote the programs, but many other people have been involved, and continue to be involved. Without their efforts, I would not be standing here.