Book Two

SUNDAY FEATURES

A COOEE IN THE COSMOS

The absence of evidence is not evidence of absence, Wilson da Silva finds.

IN A SMALL restaurant in rural Parkes last week, a happy crowd of Australians and Americans ate, drank and danced into the night. They were astrophysicists, engineers and technicians out for a good time. But what they were celebrating was a little unusual — six months of searching for aliens in outer space.

It had been five months since the scientists of Project Phoenix began scanning the stars above the dusty sheep country of central western NSW for radio signals from beyond the earth. Project Phoenix is the most detailed search yet for life beyond the earth, and the first leg of a planned 10-year program to search the cosmic haystack of the universe for that one, tiny needle of a radio signal.

In their heart of hearts, the scientists did not expect to find anything so early into the program. After all, in the five months, they covered the merest fraction of their planned search area. But they did come across a number of interesting and unusual signals. None was clear enough to meet their rigorous standards for the definitive alien signal. None withstood the hard-nosed scrutiny of the team, which in the end must explain them to the rest of the world and withstand the intense quizzing of the scientific community. But the scientists are not fazed.

"The absence of evidence if not evidence of absence," says Associate Professor David Blair, of the University of Western Australia, one of the participants in the search. "It's way too early to be saying there's nothing out there. There a whole lot more searching to do; there's really 10 years worth of work there before you can start to question if we really are alone."

The researchers know that in a universe so big and with so many possible frequencies to search, the odds were against them from the start. Even if there are a dozen alien civilisations out there broadcasting TV and radio signals into space, it could take scientists nearly 1000 years — listening to every likely frequency — before they found even the first of them. These are long odds.

Faced with such a gargantuan search, they employed some very smart technology. First, they built the world's fastest information processor to run an automated search. Coupled to the 64m dish of the Parkes radio-telescope, it began panning the sky in February. Day and night, the computer picked through 28 million channels, processing 75 billion floating point operations (or calculations) a second — almost four times faster than existing supercomputers.

Project Phoenix, an international undertaking conceived in the United States and kicked off in Australia, was originally to be part of a $US100 million search for extraterrestrial intelligence program to be run by the American space agency NASA. Under development since 1972, the high-tech instrumentation began a 200-hour test run on the 500th anniversary of Columbus's arrival in the Americas in 1992. The next year, funding was cut by the US Congress — not even the support of Vice-President Al Gore, five Nobel laureates and the US Academy of Sciences could save it.

In its place, supporters of the concept, backed by wealthy computer entrepreneurs like David Packard of Hewlett-Packard, and Gordon Moore of microchip-maker Intel, pitched in to establish the private Search for Extra-Terrestrial Intelligence (SETI) Institute. With a $7.1 million budget, it opened its offices in July last year, installing $2.1 million worth of equipment at Parkes.

Bobbie Vaile is a talented young astrophysicist at the University of Western Sydney. She also has a brain tumour. Doctors have twice given her terminal deadlines, and twice she has beaten them, the last in March this year. The irony of searching for life off the earth while facing her own mortality is not lost on her.

Vaile, one of the participating Australian scientists, is one of the believers in the value of Project Phoenix. Her stoic determination to live has served her well in the project. Vaile is searching for signals she's not sure are there. But if they are, she doesn't know the frequency they will be on nor when they'll be transmitted, nor even what direction they'll be coming from. It takes a dogged determination to face these odds, to ignore-the critics and get on with the job, day in and day out.

One of the things that drives her is the potential force for good an eventual discovery might become. "It won't matter what gender, colour or race you are, or what sport you play. None of that will rate. It would be the single thing that would be most unifying for the human race. And the change in perspective will be irrevocable," she says.

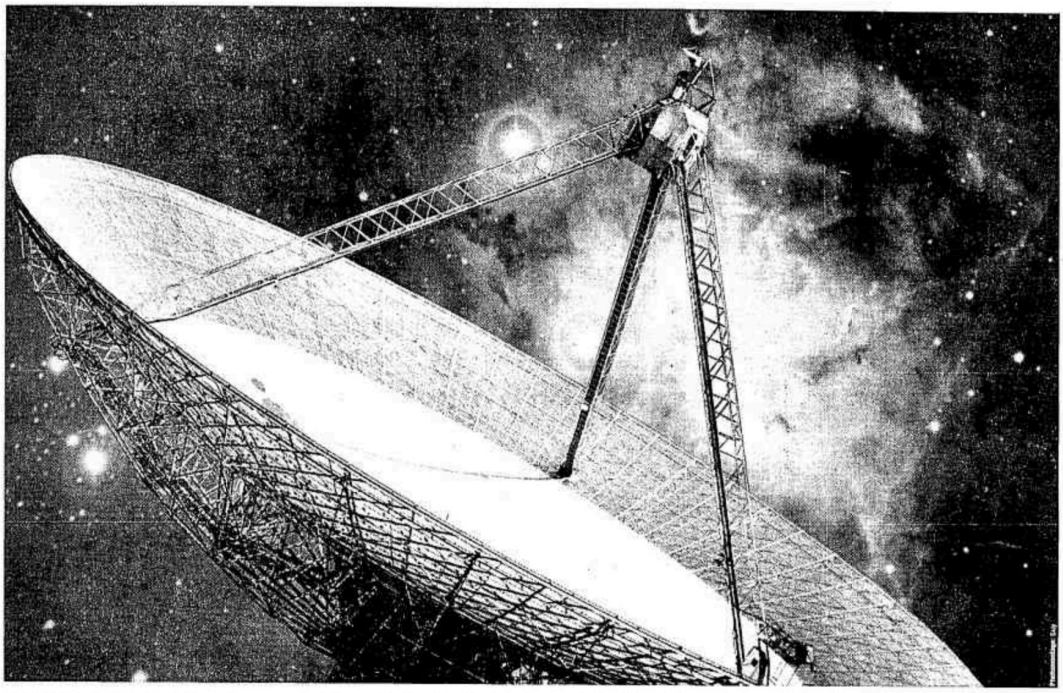
Project Phoenix is a little like that: the researchers may be doing science, but they also end up tackling some very big philosophical questions: is there life elsewhere in the universe? If so, has it developed intelligence as we have? Has it created technology that mastered its world, as we have? And — most intriguing of all — did it have the same problems of pollution and war, and overcome them ... or did it wipe itself out in a nuclear or environmental holocaust?

"We have a number of problems on this planet right now: people are starving; there's war; are we going to wipe ourselves out with pollution or destroying the ozone layer?" asks Dr Ray Norris, a project astrophysicist.

"The chances are that another civilisation, while it might not have exactly the same problems, will probably have confronted similar problems. The interesting thing is, if this civilisation is more advanced than us, then we know it's been through all this and hasn't wiped itself out, it's made it through. And that gives us a ray of hope — yes, mankind can survive."

Norris is a thirtysomething hot shot in radiophysics. A British-born, Cambridge-educated astrophysicist respected in his field, he is also a true believer in the search. Look at it his way — when you consider that the earth is one planet out of nine orbiting around a rather average sun, which itself orbits a rather ordinary galaxy of a hundred billion suns, and that there are millions upon millions of other galaxies in the universe ... well, you'd have to be a bit obtuse to say with certainty there's nothing out there. Or so he argues.

The concept is fine in principle. But reality is a lot more complex. Some biologists say life on earth has arisen through such a quixotic mix of chance and chaos that it is unlikely to be mirrored anywhere else in the universe. As for intelligent life, well, you can just forget it, they say. Some cognitive scientists, who specialise in thinking processes, say that human brains are such bizarre and quirky instruments, such a mish-mash of our evolutionary past, that we can never, ever hope to understand alien signals even if we do detect them.



Bobbie Vaile: a true believer in the value of Project Phoenix.

Ray Norris: "It could give us a ray of hope — mankind can survive."

THERE is, however, a growing band of scientists, including some big-name heavyweights, who believe that the chances of intelligent life beyond earth are high enough to make a search not only legitimate, but very worthwhile.

Professor Lawrence Cram, head of astrophysics at the University of Sydney, is one who doubts a signal will ever be found. But that doesn't mean we shouldn't be searching for them, he says: "We have no basis for saying definitely that humans are the only intelligent life in the universe. We do know some things about the conditions under which human beings can exist and evolve. On balance, the majority of scientists think that our knowledge of those conditions make it probable that living organisms and probably intelligent organisms — live elsewhere."

Others, like Carl Sagan, the noted American space scientist and one-time TV science personality, believe it likely that the universe is humming with intelligent life. We may never meet them — the distances between the stars are simply too massive for interstellar travel.

This doesn't, however, stop us from chatting via radio. And any electronic transmissions are a sure sign of intelligence. "Radio technology is inexpensive, likely to be discovered early in the evolution of a technological civilisation, readily detectable and capable of transmitting enormous amounts of information," Sagan says.

In the past 35 years, there have been some 60 search projects conducted in the US, Russia, France, Australia, Argentina and Canada; most have been sporadic stints of perhaps two weeks with equipment cobbled together, while others have been more serious. None has brought to bear the kind of computing firepower of Project Phoenix. And none has yielded definitive signs of intelligent life, although there have been 435 so-called "candidate signals" detected. These were interesting but unclear, and drifted off or stopped.

When you consider the difficulty of the feat, it's not really surprising nothing definitive has been found. The universe could be buzzing with hundreds of civilisations and we would still miss their radio traffic. Why? Just the enormity of it all. Take for example, the number of potential "sites" on the radio spectrum that would have to be listened to, just to be sure. Searching the whole spectrum, between 300 megahertz and 300 gigahertz, the number of possible "sites" is around 300,000 billion billion. Stopping for just one second to listen to each of them would take 10,000 years.

Luckily, there is a narrower band (between 1 and 10 gigahertz) where scientists think they are more likely to find something. This is purely because within this band, the universe is relatively quiet — that is, not full of the hiss and pop noises stars usually make. It is still quite big — all of the search programs conducted so far, for example, have covered less than one thousand billionth of the "sites" that could be searched.

In order to make the task more manageable, Project Phoenix researchers have targeted their search area: over the 10 years of the program, they plan to listen to the nearest 1000 stars that might harbour suitable life-bearing planets. These are middle-aged stars like our sun, three billion years old or older, which have had enough time to develop a brood of planets with life on them.

There have been more than a few false alarms during the Australian stint. Every now and then, the high-powered computer would lock on to something so strange that it stood out from the background. The scientists then conduct a number of standard checks to weed out local interference, like car phones or microwave ovens. If the signal stays, they activate the second dish, Mopra, a remotely operated radiotelescope some 200km away. Mopra takes a peek; if it hears exactly the same thing, the scientists know the signal isn't local.

Then they check for satellites making a pass overhead, or other such possibilities. If the signal remains interesting, they keep coming back to it, analysing and cataloguing it. In every case, they either found a plausible explanation or the signal drifted off. This "chasing down the signal" technique has weeded out thousands of otherwise interesting candidates, although five have intrigued the researchers enough to survive three separate observation runs before eventually drifting.

On the other hand, if a transmission is made after the initial five-minute listening window given to each frequency, there's no way to tell. It is lost forever. The computer has to move on.

Yet, even at this rate, the SETI Institute expects to take until the year 2000 to have made the briefest of visits to the targeted 1000 stars.

The Australian leg of the project scanned the first 200 of the candidate stars, which are only visible from the Southern Hemisphere. Later, the SETI Institute plans to use the Arecibo radiotelescope in Puerto Rico, a giant dish 330m in diameter whose parabola blankets a whole valley; another two radiotelescopes in France and Britain are also under consideration. But for the moment, the SETI Institute plans to review the results of the Australian leg of the program, see what mistakes they made and what they can learn, before starting phase two.

DESPITE their determination and the high-powered technology, Professor Ron Eckers believes the chances against the search are as high as one billion to one. Eckers is the director of the Australia Telescope National Facility, a group of seven telescope dishes of which Parkes is a part. Although sceptical himself, he does not object to the research project.

"They can now do a search that is a million times better than what could be done before, but I think we are still far away from having a reasonable chance," he says. Consider the possibility, he says, that aliens might not use radio at all, but indulge in some intergalactic "sky-writing". "The number of ways an intelligence might manifest itself is probably greater than we can imagine."

What impact would a discovery have? Scholars widely agree that there would be a great deal of culture shock, especially if we could decode the transmissions.

While Bobbie Vaile thinks an eventual discovery is positive, others are not so sure. Many scholars point to parallels in human history that are not comforting: less developed civilisations have been on the losing end of the equation almost every time. Most worrisome of all, a civilisation's self-confidence can be shattered, triggering a breakdown of initiative and the rise of a cargo cult.

Some argue that the consequences are so potentially devastating that we should shut down all search programs, and halt all future broadcasts — such as the one made in 1974 when American scientists sent a 169-second message with the powerful Arecibo radiotelescope in Puerto Rico aimed at a distant galaxy. At the time Michael Michaud, a high-ranking official at the US State Department, called the exercise "a political act". Sir Martin Ryle, a Nobel laureate and then U.K. Astronomer Royal, wrote to leading astronomers arguing that it was a hazardous folly to reveal our existence and location to the universe. For all we know, he said, "any creatures out there are malevolent or hungry" and once they knew of us, "they might come to attack or eat us".

The truth is, if you're worried about revealing our location to potential bands of marauding aliens, it's already too late, says Professor Frank Drake, a noted American astrophysicist: "The deed is done, and repeated daily with every television transmission and every radar signal." By now, civilisations some 50 light-years away are receiving our first television broadcasts. Radio has reached even further.

If one day we did pick up a stray television broadcast from another planet, could we ever decipher its meaning?

Here debate is hottest. The basic assumption of SETI proponents is that the laws governing the universe are the same everywhere. If so, we may be able to communicate by referring to those things we have in common with extraterrestrials — physics, mathematics, and so on, and build a rudimentary "language" of sorts. Right?

Not everyone is so optimistic. Professor Nicholas Rescher, a philosopher at the University of Pittsburgh, contends that extraterrestrials are extremely unlikely to have any type of science that would be recognisable to us, despite sharing the same universe. They will be very different organisms, with different needs, senses, and behaviour; they will live in planets strikingly different from our own. Maybe even in environments where science and technology are not needed for survival.

ARTIFICIAL intelligence pioneer Marvin Minsky, of Boston's Massachusetts Institute of Technology, disagrees. He argues that intelligent extraterrestrials "will think like us, in spite of different origins". This is based on the idea that all intelligent creatures seeking to solve problems would be subject to the same ultimate constraints — limitations on space, time and resources. Because of these pressures, extraterrestrials will evolve thought processes and communication strategies close enough to our own for us to understand them. SETI proponents largely agree with Minsky, choosing also to believe that there is some "convergence" in the interpretations of the physical laws in all galactic civilisations.

Even if the cosmos ends up being silent, this is in itself a powerful discovery, argues Carl Sagan. "It would speak eloquently of how rare are the living things of our planet and would underscore, as nothing else in human history has, the individual worth of every human being."

Sydney University's Lawrence Cram agrees. "I think an increasing demonstration that we are alone will have an impact on the collective consciousness and the part humanity has to play in the world. The obligation will be on humanity to protect our natural environment."