

OUTER SPACE

IS ANYBODY OUT THERE?

Forget the Mekon, ET and The Thing From Outer Space. It is now respectable to consider whether there is life on other planets. ROBIN MCKIE, Our Science Correspondent, reports on efforts by scientists to contact extra-terrestrial life—and the evidence they are looking for to prove there is life elsewhere.

DEEP IN SPACE, two Russian probes are hurtling towards Halley's comet. Launched a few days ago, Vega 1 and 2 will soon be joined by European and Japanese spacecraft which will investigate this rare and exotic object as it sweeps across our skies next winter.

All are expected to return valuable information — for comets are believed to be the five billion-year-old debris left over from the formation of our solar system. From that evidence, scientists hope to learn how planets were formed.

Such knowledge is not sought purely for academic reasons, however. Research into planets will also help resolve a far more perplexing and fundamental question. Put simply, it is: Are we alone?

The solution to this puzzle rests on the study of planets. At present, the only life we know is based on Earth—a planet. Logically we should search for other living beings on other planets, scientists argue.

Such an investigation faces major obstacles—in particular the vast distances between us and the stars. We need telescopes to see our sister planets, Uranus and Neptune, and they are only two and three billion miles away. The nearest stars that might have planets are at least 60,000 billion miles away.

Shrugged aside

No telescope in use can peer effectively across the void, although scientists are designing increasingly ingenious instruments to overcome the problem. This year, they had their first signs of success when the orbiting infra-red telescope, IRAS, provided the first indirect evidence that one or two nearby stars have primitive planetary systems. The results from the Halley probes should add much to this growing pool

of the huge range of possible radio frequencies have all conspired to defeat these attempts.

As a result, scientists have attempted to find a way to cut through this galactic babble in a bid to pinpoint particularly promising stars for special attention. They may soon get their wish when the European Space Agency launches its probe, Hipparchus, in 1986.

Named after the ancient Greek astronomer, the probe will plot the position of 100,000 nearby stars with an accuracy 10 to 100 times greater than currently possible. The aim is to aid traditional astronomical research.

The benefit to SETI hunters may be even greater. For the first time, they will be able to detect the slight effects that planets have on distant stars.

These should appear as microscopic 'wobbles' caused as the planets orbit and pull stars slightly out of position. 'The effect is infinitesimal,' explained Professor Alex Bauxenberg, of the Royal Greenwich Observatory. 'Nevertheless, Hipparchus will have such carefully designed and accurate optical instruments it will be able to detect these tiny "wobbles" from Earth.'

A survey of the sky will produce many promising 'wobbly' stars, it is hoped. Then the SETI hunters will turn to their next technological marvel—the Space Telescope—to take their search a stage further.

A giant telescope, even by ground-based standards, it will become the most powerful observatory ever created when it is fired into orbit by the Space Shuttle in 1986. Outside Earth's atmosphere, which obscures and clouds starlight, it will allow astronomers to peer 10 times further into the universe than they can at



DAVID MANSELL

Waiting for the call : Radio telescopes, like this at Cambridge University, can eavesdrop on space.

the foreseeable future. We may find oxygen-rich worlds, but there is no guarantee that life will have evolved to an intelligent level or that it might want to communicate. Aliens could have evolved beyond an understandable stage or could have destroyed themselves in a nuclear holocaust.

To have a chance of detecting a civilisation, many promising stars will have to be surveyed before we have a good chance of finding one that is talkative. Even then, we would only pick

traints on scientists. It will certainly be hard for them to hold meaningful conversations with aliens when there are 50 year gaps between sentences.

Nevertheless, there are so many promising stars in the galaxy — many millions may support life — that we shall have plenty to listen to when waiting for answers, say enthusiasts like Professor Carl Sagan.

Professor Sagan, a leading SETI campaigner, has been highly successful in promoting extra-terrestrial searches as a

instance, we may have been placed in quarantine while aliens wait to see if we 'grow up or blow up.'

Such speculations are impossible to answer at present, as are concerns about how aliens might appear and act. All that scientists will say is that they expect their chemistries to be keours and be based on carbon.

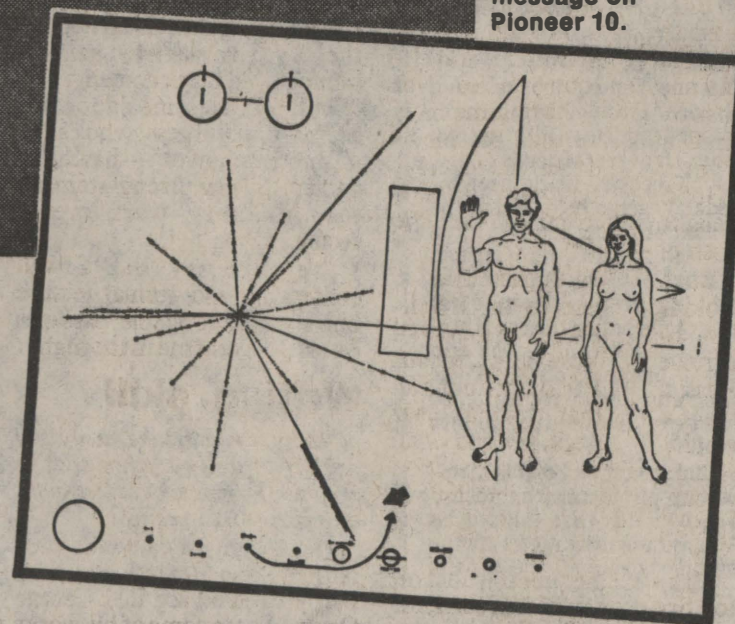
On the other hand, depending on conditions on their planet, intelligent beings could evolve from insects, reptiles, plants or quite unimagined creatures.

is a more interesting, practical matter — for scientists agree that any alien civilisation we detect will probably be more advanced than ours.

'We are going to be in shock,' says Lewis Thomas, the noted US biologist. 'We will end up feeling smaller than ever.'

Indeed, humans could well give up the ghost in determining our own fate and could increasingly rely on our advanced neighbours to provide for us technologically.

Others such as NASA scient-



Earth's call signs : Above, the Arecibo message, which assumes aliens share an understanding of prime numbers. But it even foxed Earth scientists. Below, the more obvious message on Pioneer 10.

universe, we might just turn in on ourselves, becoming more and more contemplative and egocentric,' he said.

In general, though, most

have direct evidence that civilisations do not have to destroy themselves or blow themselves up,' said Professor Roy. 'That would be quite subtle.'

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These developments herald the beginning of a scientific revolution. In the past, scientists simply shrugged aside the issue of extra-terrestrial life. There was no effective way of, and therefore no point in, studying the problem, they said. Now things are changing.

America's National Aeronautics and Space Administration (NASA) recently overcame years of Congressional opposition and secured approval for a major search for extra-terrestrial intelligences (called SETI). Similarly, the conservative and respected International Astronomical Union has also agreed to set up its own permanent SETI committee.

'Scientists are slowly overcoming their reserve and prejudices,' said one SETI-enthusiast, Professor Archibald Roy, of Glasgow University's astronomy department. 'Within two or three years the hunt should be on in earnest. Then we can expect to make contact very quickly, probably within a decade,' he added.

It sounds absurdly over-confident. But derision should be tempered with the knowledge that Professor Roy also faced doubts, even ridicule, in 1964 when he bet £1 that men would land on the Moon that decade. At 1,000 to 1, his wager won him £1,000 five years later.

This time, however, Professor Roy will not win his cash so easily. Bookmakers, like the William Hill Organisation, are now far more cautious and only offer 10 to 1 against us discovering alien life in the next 10 years. The notion of an imminent 'close encounter' seems to be taking root.

But how might it occur and what kind of signal can we expect? The most likely answer is a radio signal. On Earth, we have been pumping out increasingly powerful radio, television and radar broadcasts for the past 60 years. Deep in space, an alien scientist may have already picked up the faint echoes of an early TV sitcom or cowboy film and may have concluded — rather oddly — that it is a sign of intelligent life.

Similar signals have been sought by Earth's scientists, who have already carried out more than 30 SETI hunts using giant radio telescopes. The vast distances involved, the barrage of background natural radio noise, the number of possible targets (there are about 100 billion stars in the galaxy) and

become the most powerful observatory ever created when it is fired into orbit by the Space Shuttle in 1986. Outside Earth's atmosphere, which obscures and clouds starlight, it will allow astronomers to peer 10 times further into the universe than they can at present.

The Space Telescope will be able to observe extremely faint objects, including remote planets that will only be detectable by the very faint light they reflect from their intensely bright parent stars.

Armed with the Hipparchus surveys as guides, astronomers will use the Space Telescope to observe different planetary systems. It will strain the



Could aliens look like this? A projection of what intelligent beings would look like if descended from dinosaurs

instrument to its limits. Nevertheless, most astronomers accept that it is up to the task. Indeed, some even believe it could carry out spectroscopic analyses which would show up the presence of various chemicals on these planets.

'The discovery of oxygen would be an obvious, dramatic breakthrough,' said Professor Roy. 'On Earth, it is produced by plants. If we find it on another world, we can assume that life exists there.'

Other scientists believe such analyses are beyond the range of the Space Telescope, despite its power. Instead, they argue that life will only be detected by turning new, extremely powerful radio telescopes, equipped with computer-aided all-frequency scanners, towards the most promising planetary systems, in order to detect broadcasts. This is how NASA intends to hunt for aliens.

Either way, human ingenuity will have reached its limit for

standable stage or could have destroyed themselves in a nuclear holocaust.

To have a chance of detecting a civilisation, many promising stars will have to be surveyed before we have a good chance of finding one that is talkative. Even then, we would only pick them up if they deliberately send out signals to alert the galaxy to their existence. We are unlikely to spot stray broadcasts.

But would we recognise their work as that of intelligent beings? The answer, says Professor Frank Drake, of Cornell University, New York, is an emphatic 'yes.'

Aliens would use a language based on a universal concept — mathematics. In particular, he believes they would exploit prime numbers. (A prime number is one that is indivisible by any number except itself and one. For example, both 23 and 73 are prime numbers.)

Aliens, says Professor Drake, would expect us to recognise prime numbers as well and would send out their signals in strings of dots and dashes that add up to a prime number. We would realise this and would arrange these strings into layers, slowly building up a small grid or picture that would contain a great deal of information.

Professor Drake has already used this system to tell the universe about homo sapiens. In November 1974, with a giant radio telescope at Arecibo in Puerto Rico, he sent out a powerful series of radio pulses made up of a string of 1679 dots and dashes.

The number 1679 is 73 times 23 — both prime numbers. Decoded, the signal produces a picture like the one reproduced above, top right. It contains crude images of Earth's position in the solar system, the shape of the human body, the structure of DNA and other features.

Today that signal has travelled more than 10 light years from Earth. For all we know, an answer may already be speeding back to us across space.

What we will make of it — if and when we receive it — is still uncertain, despite Professor Drake's work. When he first tested out his signal on a conference of leading scientists, only one managed to decode it.

On another occasion, during a test broadcast of the Arecibo message, scientists printed it upside down, producing a picture not of a human, but of a six-legged creature with a tail. Clearly, we are going to have to be very careful or we will end up with a very funny idea of our alien neighbours.

On top of this, delays between sending and receiving signals will pose severe res-

concerns about how aliens might appear and act. All that scientists will say is that they expect their chemistries to be like ours and based on carbon.

On the other hand, depending on conditions on their planet, intelligent beings could evolve from insects, reptiles, plants or quite unimagined creatures. Most scientists leave this realm to science fiction writers. However, the question of human reaction to the discovery of extra-terrestrial intelligence

concerns Lewis Thomas, the noted US biologist. 'We will end up feeling smaller than ever.' Indeed, humans could well give up the ghost in determining our own fate and could increasingly rely on our advanced neighbours to provide for us technologically. Others, such as NASA scientist Gerald McLaughlin, argue that a failure to discover alien life could also have an unfortunate effect. 'When we realise that we are alone in such a vast

Bit players

Their unofficial leader, Dr Frank Tipler of Tulane University, New Orleans, believes this because he reckons intelligence to be such an extremely unlikely end product of evolution. 'It was a very rare chance indeed that led us to develop technological prowess. There are countless other routes for evolving life to take.'

In Britain, Dr Tipler is supported by the British Interplanetary Society vice-president, Dr Tony Martin. 'For the past decade scientists like Sagan have been running around saying that the galaxy is filled with intelligent beings. But where are they?'

'Many of these civilisations will be far more advanced than ours, which means they should have colonised the galaxy long ago. Obviously they have not, for we have found absolutely no trace of them, despite all our searching.'

In general, most scientists reject such 'human chauvinism,' as Sagan terms it, and back the notion that intelligent life exists elsewhere, although there is disagreement as to its prevalence.

Within this group, Professor Roy falls into the most extreme category — the Uriah Heep school of astronomers. 'I believe that we are just an ever so 'umble form of galactic life. I am sure civilisations are ten a penny round the cosmos,' he said. 'Indeed, in the vast cathedral of this universe, it is surely very peculiar to argue that we are its heroes. We are much more likely to be just bit players.'

We have not yet made contact for any number of reasons, say Professor Roy and others. For

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In general, though, most scientists expect the forthcoming searches for extra-terrestrial intelligence to have fruitful results. 'If we find life is commonplace, then we will

have direct evidence that civilisations do not have to destroy themselves or blow themselves up,' said Professor Roy. 'That would be quite salutary.'

'On the other hand, if we find that we are alone, then we will appreciate just how rare and precious is life. We might start to look after it a little better.'