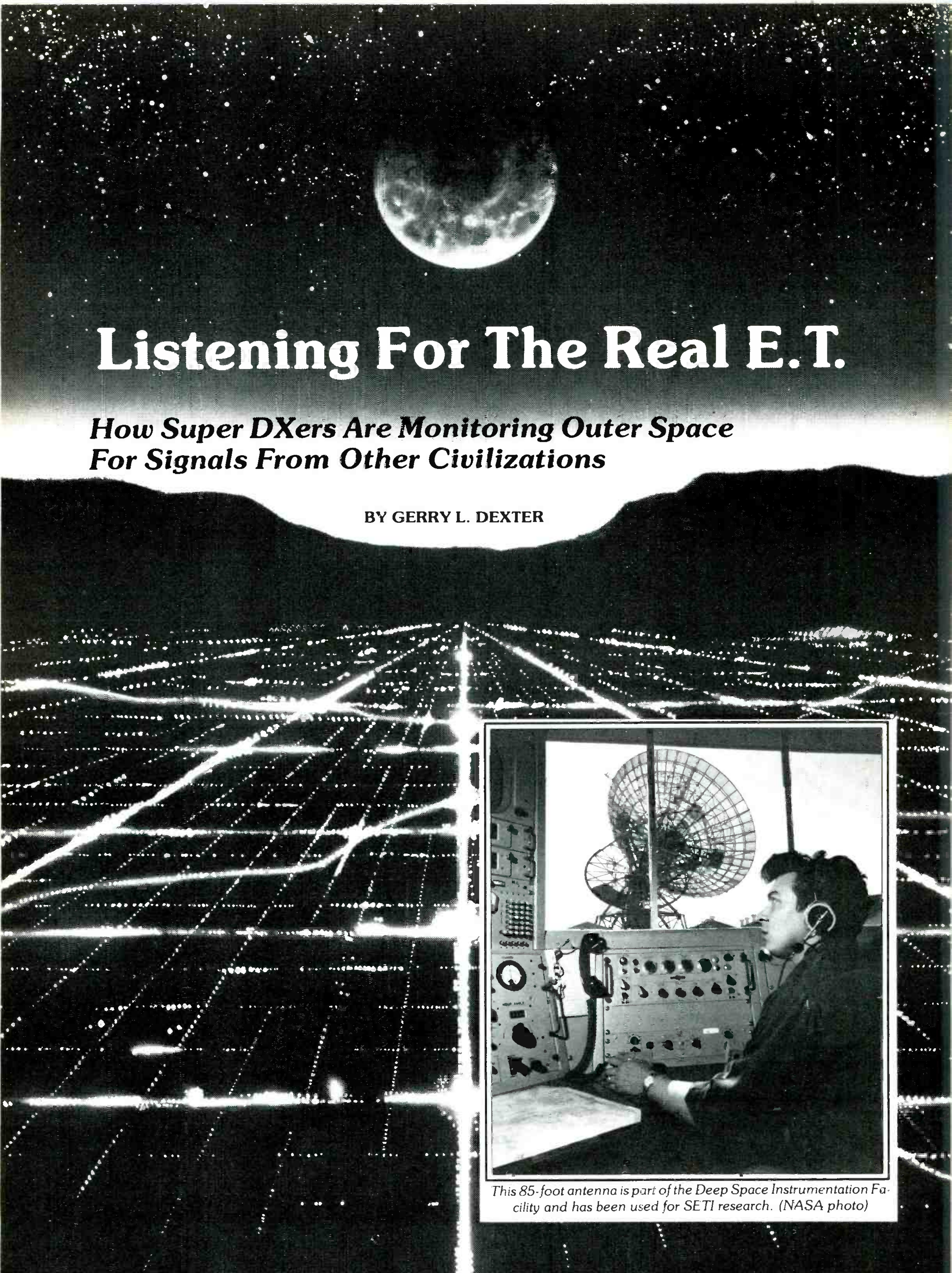


Listening For The Real E.T.

How Super DXers Are Monitoring Outer Space For Signals From Other Civilizations

BY GERRY L. DEXTER

This 85-foot antenna is part of the Deep Space Instrumentation Facility and has been used for SETI research. (NASA photo)

Might E.T. (extra terrestrial) *really* be out there somewhere?

Science fiction writers have, since the beginning, assumed intelligent life on other planets as a basic tenent for their writings. They've thought up everything from submarines to man on the moon to laser beams long before such events and inventions came to pass.

Are they right about "men from Mars" as well? Only a short while back most responsible scientists looked upon the possibility of life on other worlds with, at the least, raised eyebrows.

Today that attitude has changed. There are between 200 million and 100 billion stars in the Milky Way Galaxy alone. More and more scientists are beginning to see it as statistically likely that some of those stars must be like our own sun, with planets that are environmentally suitable for intelligent life to have developed—life intelligent enough to have built instruments for interstellar transmission and reception.

Add to this the belief that the basic building blocks of life seem to be universal. The sheer number of possibilities involved make it seem more reasonable to believe life exists elsewhere than to believe the Earth is unique in that respect.

The Search for Extraterrestrial Intelligence (SETI) is the overall term for monitoring efforts to try and make contact with any intelligent beings who might be sending signals in our direction.

SETI efforts, so far, have been negative. But the efforts have not been at all extensive and only a minute portion of the possible life targets have been explored.

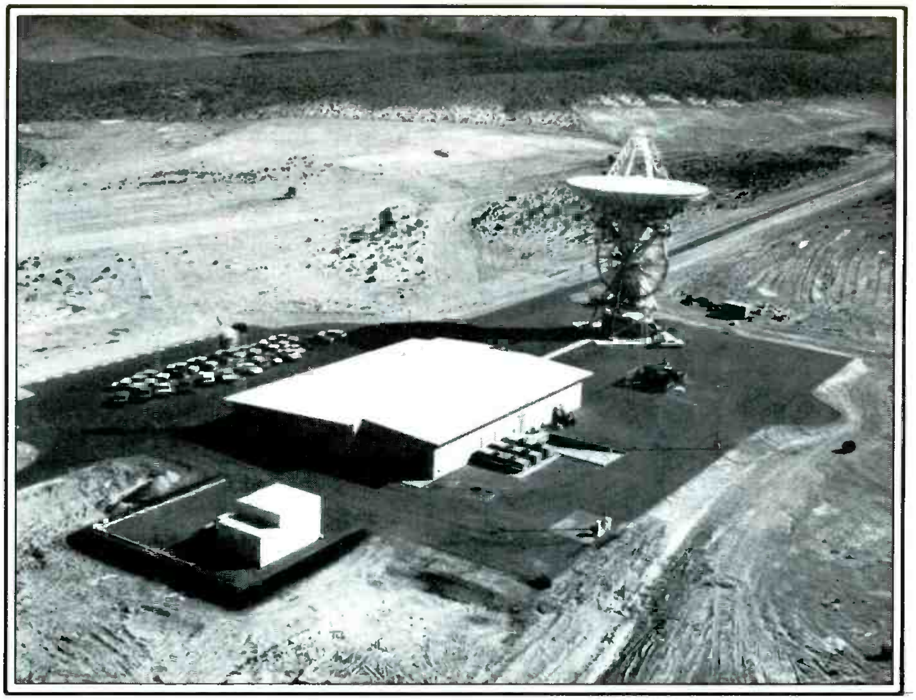
The National Aeronautics and Space Administrations's first SETI efforts began in 1960 at the National Radio Astronomy Laboratory in Virginia. Dubbed Project Ozma, the effort took up less than one-tenth of one percent of the astronomy laboratory's time and did not continue for very long.

Currently, NASA's Deep Space Network antennas are being used for SETI research. These are the same dishes that are used for communications with and tracking of space probes and exploration vehicles. These 85-foot antennas are located at Goldstone, California, Woomera, Australia and Krugeradorp, South Africa and can reach out for hundreds of millions of miles.

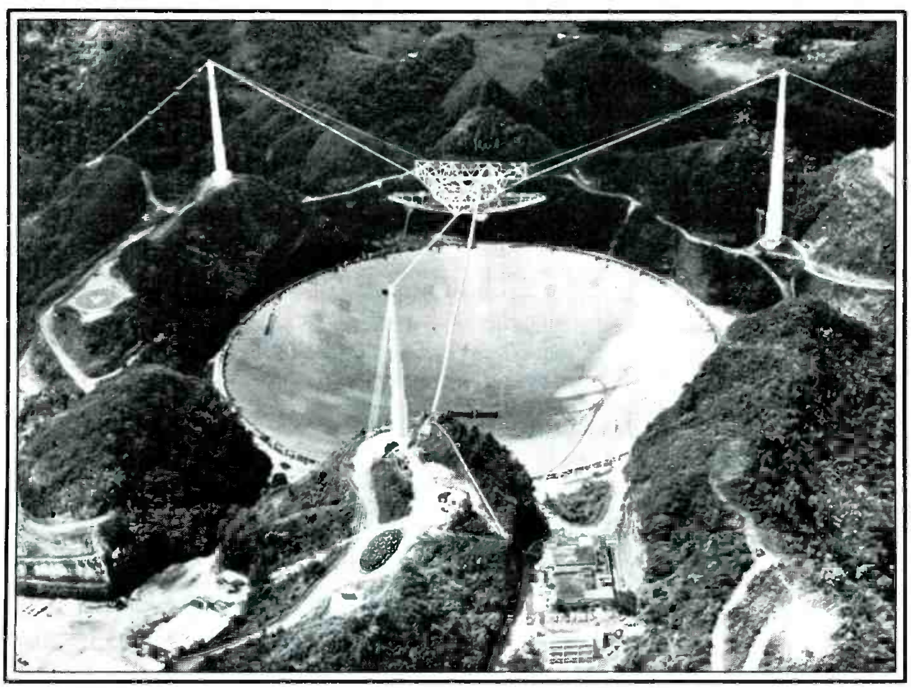
In 1979 NASA proposed a long-term SETI effort as a joint project for NASA's Ames Research Center, which would handle the science and program management and the Jet Propulsion Laboratory, responsible for the development of equipment and systems.

NASA plans an "all-sky" survey, concentrating on areas that look especially promising. At the same time the project will endeavor to map the sky and research man-made radio frequency interference.

The Jet Propulsion Laboratory is developing a super-cooled amplifier with an RF bandwidth some 10,000 times greater than that of an ordinary AM radio.



The Deep Space antenna at Goldstone, California. (NASA photo)



The 1,000-foot diameter antenna at the Arecibo, Puerto Rico National Astronomy and Ionosphere Center. (NASA photo)

NASA and Stanford University are also working on SETI investigations at the giant Arecibo radio telescope in Puerto Rico.

NASA's 1983 budget for SETI work was a modest $1.5 million. Later budgets have also been frugal.

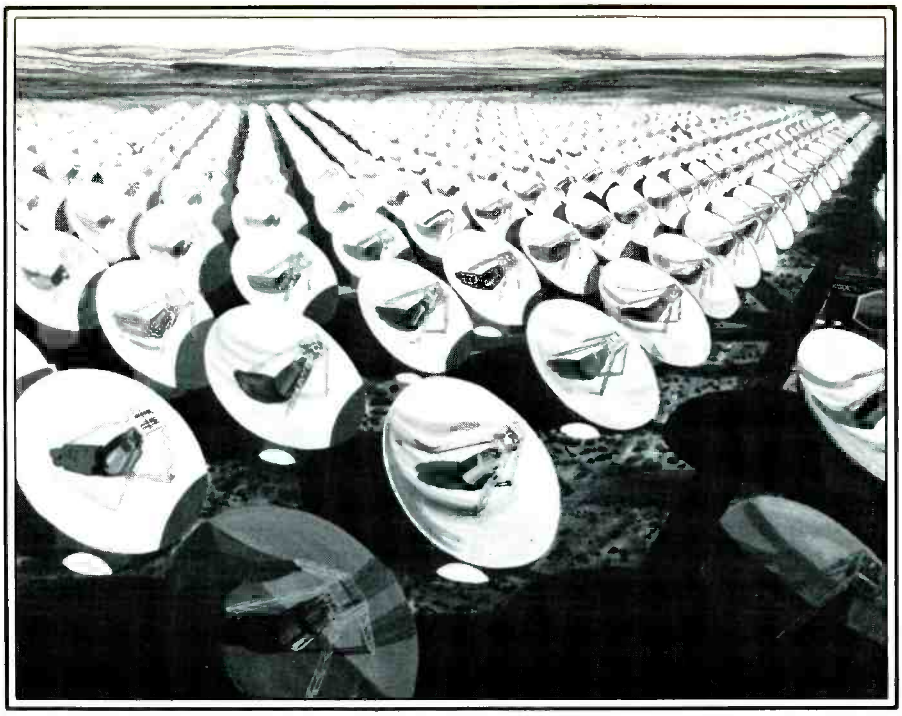
But NASA isn't the only group listening to the skies. Harvard University has also begun to do some SETI work.

Harvard physics professor Paul Horowitz, who is in charge of the project, says he "knows there is life out there and I'm pretty sure there are technological civilizations in communication with other technological civilizations, so I think it's a matter of when, not if, we establish contact."

An 84-foot radiotelescope at Harvard, which had been closed down for five years, has been reopened for this project, which is being funded by The Planetary Society.

The Harvard radiotelescope has a range of 1,000 light years, a distance that covers a million sun-like stars.

Horowitz is using what he terms a "Suitcase SETI," an advanced receiving system useable on existing radiotelescopes and easily portable. It can listen to 250,000 channels simultaneously.



Row after row of 100-meter dish antennas as seen by an artist's eye, would make up Project Cyclops. (NASA photo)

Receiver output is fed into a spectrometer which breaks the output into bandwidths from .01 to .03 Hertz.

This output, in turn, is tied into a computer system which analyzes, graphs, and highlights any suspicious signals and stores all the received data.

Most SETI efforts, including those at Harvard, concentrate monitoring in the 1.4 to 1.7 GigaHertz area. More accurately, it's 1.420 GHz, the frequency of the hydrogen atom, the most prevalent and abundant atom in the universe. This "magic frequency" is thought to be one of the most likely on which messages from other civilizations might be transmitted.

This 1.4 to 1.7 GigaHertz range (a GigaHertz is a million MegaHertz or a billion Hertz) is known as "the waterhole." The frequency range is fairly free of noise so artificial signals should easily stand out.

Horowitz operated his Suitcase SETI at the Arecibo facility in 1982 for about one month, checking some 250 stars. Results were, needless to say, negative.

The new effort will cover areas equal to 1,000 years' worth of effort of the 1960 vintage Project Ozma within sixty seconds time!

Horowitz says SETI monitoring is far less expensive than trying to go out and meet ETs face-to-face. He figures that, once communication is established, these intergalactic telegrams will cost about one dollar a word.

Karl Lind, who lives in the San Francisco area, is living proof that you don't have to have NASA or a university or a foundation behind you to DX the stars.

According to a January, 1983 *Newsweek* article, Lind is listening to signals from the area of Sigma Draconis, a star similar to our sun, some 18 light years distant. Lind uses a 6-foot dish antenna and an Atari home computer. It cost Lind approximately $15,000 to set up his galactic listening post.

All of these efforts are dwarfed by a SETI plan commissioned by NASA in the early 1970's, but so far, are not past the drawing boards.

Project Cyclops is a mind-boggling plan that envisions a microwave antenna system with a collecting area of from 7 to 20 square kilometers!

This would be achieved through the use of 1,000 to 2,500 antennas, each 100 meters in diameter and each separated from its neighbor by a distance of 300 meters.

Individual antennas could be controlled to act as one giant collector with adjustments made in antenna direction, phasing, and signal delays so that the received signals would add together.

The arrays would also be divisible so that antenna subsystems could be created that could be individually tuned and directed.

Located in the center of this gargantuan antenna farm would be a control and data processing building.

Underground service tunnels would lead out from the control building to each antenna element allowing for connection of coaxial cables, power distribution, and data/signal distribution to and from each antenna.

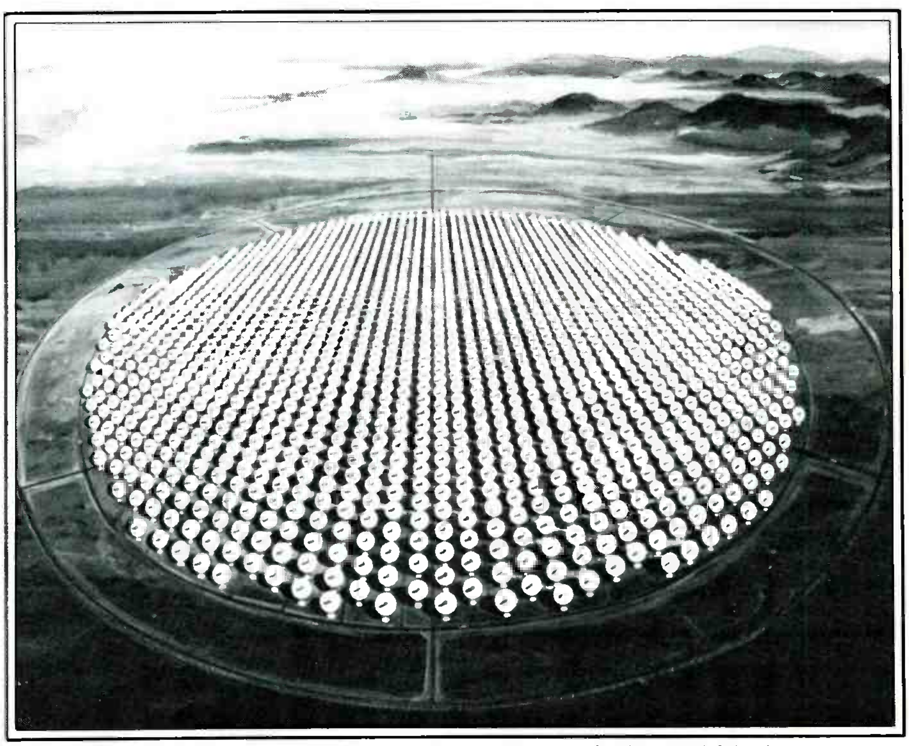
The installation would be placed at a low latitude, perhaps in the Southwestern United States. The site chosen has to be remote (as free as possible of interference), geologically stable, low in humidity, and have a calm climate with minimal wind.

Receivers used in the Cyclops project would cover the range of 500,000 MegaHertz to 3 GigaHertz.

Each heterodyne-type receiver would convert the received RF signal into an intermediate frequency for transmission to the control center. A synthesized, continuously checked local oscillator signal would be used for this purpose.

Special techniques would be used to reduce receiver noise to the minimum since receiver noise vs. coverage is inversely proportional—a halving of receiver noise doubles the effectiveness of the antennas.

Antennas would be remotely monitored from the control room to check parameters and provide automatic alarm systems in the event these parameters are exceeded.



Artist's conception of a complete Project Cyclops facility. (NASA photo)

Through a long series of stages and techniques, Cyclops operators would have a visual display of frequencies monitored.

Cyclops is also envisioned as a beacon, sending signals out to let any extra terrestrials know we are here. The designers suggest the installation of a 100 kilowatt transmitter at each of the antennas, giving a total power of 100 million watts, which could be monitored as far distant as 100 light years.

As an alternative beacon idea, Cyclops proposes the establishment of transmitters at the north and south poles, transmitting a continuous beacon into the depths of space.

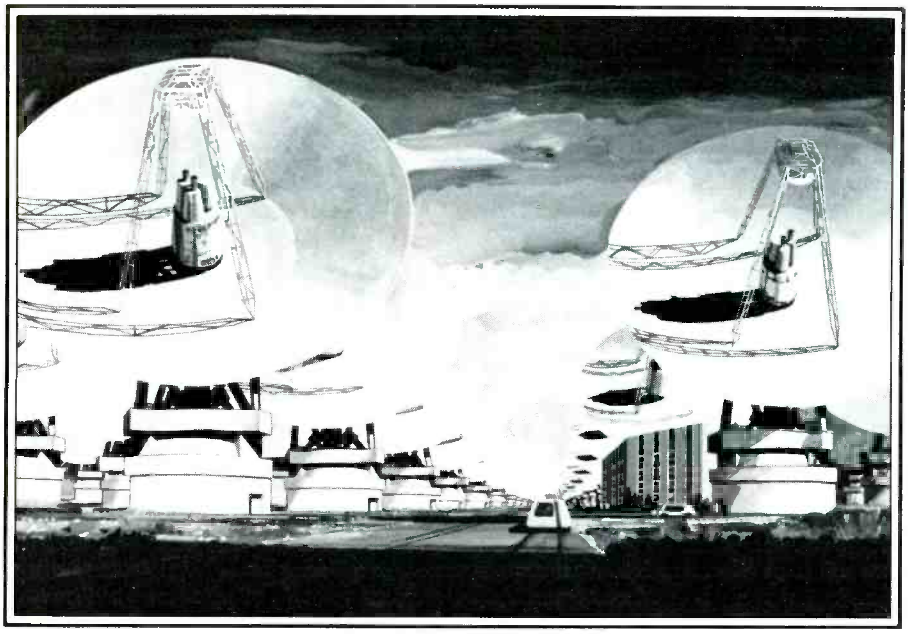
The Cyclops project calculated that, assuming television transmission on earth continues for another century, earth's electromagnetic radiation would be receivable at a distance of 100 light years. There are thought to be some 1,000 stellar systems within that range.

So what if contact is made someday? The Cyclops project paper warns there are potential hazards. Invasion from outer space perhaps; *War of the Worlds* come true. Or the strangers from space might try to exploit our planet or its population, or perhaps try subversion.

Perhaps the most likely prospect envisioned by the Cyclops creators is culture shock. A sort of global-wide inferiority complex as we discover we are pretty backward compared to civilizations existing in other star systems.

But, the good news is that, even if contact is made, it would initially be via a distance. And the long delays in sending and receiving messages would put off any physical contact for generations, if ever. That would give earthlings time to get used to the idea that we aren't alone and allow us to prepare for what would be the most significant moment in humankind's history—*Close Encounters of The Third Kind*—for real!

One day, perhaps in the not-too-distant future, some SETI monitor may well receive that electrifying signal that will indicate intelligent life does exist on a world out there and that earthlings may be part of a small corner of space advanced civilizations hadn't yet bothered about. PC



Artist's conception shows a ground level view of a part of the proposed Cyclops installation. Control building at lower right. (NASA photo)