

# Is anybody out there sending?

## An international group of scientists urges monitoring for extraterrestrial signals

There are about 200 billion stars in our galaxy. Some of them have planets. It is possible, and some scientists think highly probable, that conditions favorable to life and the ultimate development of intelligent creatures exist on some of those planets.

Science fiction authors have played with these ideas for decades. Now they have become a serious topic of scientific investigation. The topic is formally called communication with extraterrestrial intelligence (acronym: CETI), and it was the subject of an international conference held three weeks ago at the Byurakan Astrophysical Observatory in Soviet Armenia. The meeting was sponsored by the U.S. and Soviet Academies of Science; the Armenian Academy was the host. As well as astronomers and biologists, the conference included historians, anthropologists, cryptographers and other specialists. Most of the attendees were from the United States and the Soviet Union, where interest in CETI is highest.

**The Russians** reported that they had been listening for extraterrestrial signals and had recorded some that seemed suspiciously like what they were looking for. An array of radio telescopes at four locations in the Soviet Union received a number of simultaneous pulsed signals, but the pulses came only in the daytime. Since inhabitants of a distant planet would hardly be able to time their emissions for daytime hours in the Soviet Union, the observers conclude that the pulsed signals come from some unknown process in the earth's atmosphere.

Meanwhile, American scientists had just completed the Project Cyclops summer study (SN: 6/26/71, p. 435) at the National Aeronautics and Space Administration's Ames Research Center under the leadership of B. M. Oliver of the Hewlett-Packard Corp. The American group suggested that the most sensitive and most versatile piece of equipment for CETI studies would be a large array of thousands of radio telescopes forming a collecting surface of several square kilometers. The international conference endorsed this suggestion, placing it first on the list of desirable equipment. (NASA officials stress that as far as the agency is concerned the summer study was an exercise in solving a problem in systems analysis; the agency has no plans to

build such a giant telescope.)

Work in CETI concentrates on receiving (and possibly exchanging) messages from other civilizations. Scientists assume the signals will come by radio since that is the most efficient means of communication that we know, and any civilization at or above our technological level should have discovered it.

If there are other civilizations that have radio, two possibilities follow: A civilization may want to communicate with others and therefore put up a large beacon transmitter sending some kind of recognition signal at high power. Or a civilization may not be trying to communicate, and the only way to find it is to eavesdrop on its domestic signals.

Radio telescopes now operating could pick up beacon signals. They are what the U.S. Project OZMA looked for 10 years ago, and they are what the Russians are now looking for and will continue to look for with better and newer equipment. The largest radio telescope in the Soviet Union is being built at the Crimean Astrophysical Observatory. It will consist of 1,000 metal plates set in a ring 600 meters in diameter. Part of its observing time will be routinely used in CETI searches.

*If you don't know the language, send a picture. B. M. Oliver's hypothetical interstellar message comes as a stream of zeros and ones. The total number of bits (1,271) is the product of two primes, 31 and 41, and gives a clue how to arrange dots and blanks in rows and columns. The proper arrangement yields a picture of erect bipeds that reproduce sexually.*

At left, a column of symbols represents their sun and planets. The figure points to the fourth, on which they live. The waves beginning at the third-planet symbol indicate that it is covered with water. At the top of the picture are diagrams for carbon, hydrogen and oxygen atoms, indicating an organic chemistry similar to ours.

The Search for Extraterrestrial Life (Interstellar Communication). Ed. by A. G. W. Cameron, W. A. Benjamin, 1963

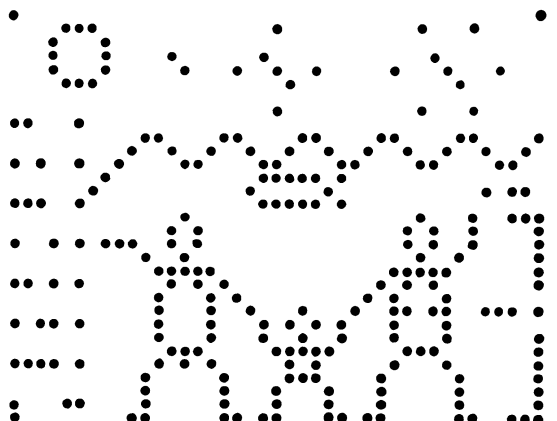
The array envisioned by the Ames study group is designed for eavesdropping as well as looking for beacons.

First an optical survey of stars similar to the sun (spectral classes F0 to K9) would be made to determine which of them might have planets. The telescope would then point at one after another and sweep over a wide band of frequencies looking for a signal.

**An alternate method**, which would avoid the necessity of changing direction, would be to point at the nearest external galaxy, M31 (the Andromeda nebula). There might be as many civilizations broadcasting there as in our galaxy, and for us all those signals would come from the same direction.

The cost of such an antenna array, is undetermined. It would be a large project, which would incidentally include development of ways to mass produce large antennas. Charles Seeger of New Mexico State University estimates about \$5 billion for the package.

The international conference agreed that the cost is large but not prohibitive in a world economy at its present stage, when the possible benefits of tuning in on a superior civilization are considered: "The practical and philosophical significance of a successful contact with

[illegible]

an extraterrestrial civilization would be so enormous as to justify the expenditure of substantial efforts," says one of its resolutions. The resolution also points out that less ambitious projects can be initiated at modest cost. The equipment could also be used for many other studies in radio astronomy.

So important is the search, the conferees felt, that it should be done in the name of all mankind and be subject to international coordination. The con-

ference suggested formation of an international committee to coordinate national programs and promote progress and named Frank Drake (U.S.A.), N. S. Kardashev (U.S.S.R.), Philip Morrison (U.S.A.), B. M. Oliver (U.S.A.), R. Pešek (Czechoslovakia), Carl Sagan (U.S.A.) and I. S. Shklovsky, G. M. Tovmassyan and V. S. Troitsky (U.S.S.R.) as an interim working group.

Why should any civilization look for

others? Says Sagan: "All they need is one Margaret Mead."

If another civilization were found and a message sent, it might be centuries before a reply was received. "It's not what you might call snappy dialogue," quips Sagan. But Seeger expresses the feeling of many, when he says he would be content if the discovery were made and a message sent in his lifetime. His great-great grandchildren might receive the answer. □

## NRC auto emissions study: Scope too limited?

Scientific advisory committees have frequently been criticized for being more responsive to governmental and corporate powers than to the public interest. A closely related issue is whether committees often are too narrowly restricted in scope.

Last year, for instance, a National Research Council committee on sulfur oxide pollution summarized the technological problems in admirable detail. But it made only a tiny venture into discussing the more serious problem of funding for research and development—and there it succumbed to some corporation shibboleths that would not have stood up for a moment if a knowledgeable economist had been present (SN: 7/31/71, p. 82).

The automobile and its role in American society is a far broader question than sulfur oxide pollution. But the NRC has now announced the appointment of what appears to be yet another narrow-purpose committee—to study the technological feasibility, or lack thereof, of auto companies' meeting 1975 and 1976 emission standards.

The committee was established under the 1970 amendments to the Clean Air Act, the same ones that established the emission standards. NRC spokesmen maintain that the limited function of the committee is strictly according to its limited mandate from Congress. But the fact is that NRC and its parent, the National Academy of Sciences, could, if they wished, establish their own mandate, one that would go far beyond the one supplied by Congress. In fact, it is valid to ask whether the new committee even fulfills the Congressional mandate. Whether the auto companies can meet the emission standards is surely in part a technological question; but the larger and more important question certainly will be: Can money be found to pay for the expensive emission-control devices, and, if so, who will pay,

consumers or the auto companies? Desperately needed here is a study of some possible tradeoffs. For instance, would halting annual style changes be a viable way of paying for the emission controls?

The committee's membership right now appears to be predominantly technological. Of its 15 members, 8 are from industry (although none are from the automobile industry), 5 from academia (mainly from technologically oriented departments) and the rest from entities (such as Stanford Research Institute) somewhere in between.

There are no economists. But, says J. E. A. John, executive director of the committee, economists may be appointed later. "The broader economic issues are of concern to the committee," he says. The committee will make no "value judgments"—annual style changes vs. emission controls, for instance. But, he adds, "Cost is a prime consideration, and I think all the facts will be laid out."

**Committee chairman** E. L. Ginzton of Varian Associates was unavailable for comment, but J. A. Hutcheson, retired Westinghouse vice president and vice chairman of the committee, insisted that the committee, in general, brings together "a combination of talents pertinent to the problem at hand." And he, too, claimed there would be full consideration of economic factors.

Hutcheson referred back to the "mandate" of the committee. "The requirements imposed upon us by Congress and by the Environmental Protection Agency [which will make decisions on extension of deadlines for emission controls] are the ones we are dealing with," he says. Thus it is difficult to tell from the two committee officials' statements to what degree economic factors will be given consideration. If an economist should be appointed to the committee, it will be significant whether he is one critical of conven-

tional corporate values—such as Harvard's John Kenneth Galbraith—or one who is a spokesman for such values.

Urgently needed is a systems study, conducted by representatives of *all* relevant disciplines, including the social sciences, of the effects of the automobile on American urban life. Such a study could outline the real choices. Conceivably one of them would be to restrict autos in urban areas and substitute urban mass transit. Such a choice might make the emission controls, although desirable, of far less importance than now.

"I'd be all for this kind of study," says Hutcheson. He adds that Academy is "just in the process of getting cracking" on creating a broad-based Division of Transportation, which could make such studies.

But it may be that Congress will have to be the catalyst. Scientific advisory committees traditionally have advised executive agencies exclusively, often leaving Congress in the dark—especially when study results were controversial. Although Congress established the vehicle emissions committee, an aide to Sen. Edmund Muskie (D-Me.) says the provision for the committee slipped into the 1970 amendments during a conference committee hullabaloo over deadlines for emission standards, and the Senate representatives let it become part of the bill in order to buy other concessions from House conferees. But Muskie and others, says the aide, will certainly now insist the committee's work be meaningful.

Congress and the people are demanding a larger role in technological decision-making. The NRC bows to this trend in a Sept. 21 invitation to the public to comment on the auto emission studies. But it admonishes prospective comment writers that the "Academy is concerned solely with the 'technological feasibility' " of emission controls. □