# "Hello," said earth. "Is anybody there?"

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Sometime around the year 25,974 A.D., in a distant globular star cluster known to earthlings as Messier 13, it could just happen that one of the resident life-forms will detect an unusual radio signal beaming faintly in from the depths of space. After ruling out pulsars and other possible natural causes—a task that is abruptly abandoned when the same complex signal is detected several more times—the being may report to its learned colleagues, who in turn will mount a major decoding project. If they succeed, a towering triumph even though the code was designed to be easily broken, they will have their prize: the first radio "hello" from earth.

Speculation on a message to space is decades old. In 1960 Project Ozma listened for several months with the 85-foot radio telescope at Green Bank, W. Va., but that short-lived effort was only in case They were talking to Us. A pair of outbound messages were sent in the form of small, aluminum plaques on the Pioneer 10 and 11 spacecraft, the first man-made probes whose paths will take them out of the solar system (SN: 2/26/72, p. 135). But transmission of a deliberate radio message—the most detectable medium of available technology—had never been attempted until last Saturday, Nov. 16.

The occasion was the dedication of the newly resurfaced radio telescope at Arecibo, Puerto Rico (SN: 11/16/74, p. 309), which, as the largest such instrument in the world, is also a logical choice for sending earth's greetings to the stars.

Thanks to Arecibo, the historic hello was a mighty shout indeed, far and away the most powerful signal ever sent from earth. Equipped with a 450,000-watt transmitter, the 1,000-foot-diameter antenna was able to further focus its power to what officials called the equivalent of 25 times all the man-made electricity ever produced on earth.

The intended listeners are the population of whatever planets may orbit the estimated 300,000 stars in Messier 13. The cluster was chosen partly because it contains enough stars to give a reasonable chance of providing an audience—"I would say there is about a 1 in 2 chance of there being a civilization in Messier 13," says Cornell astronomer Carl Sagan—and partly because it will just fill the width of the signal beam when the message arrives, so that no power is wasted.

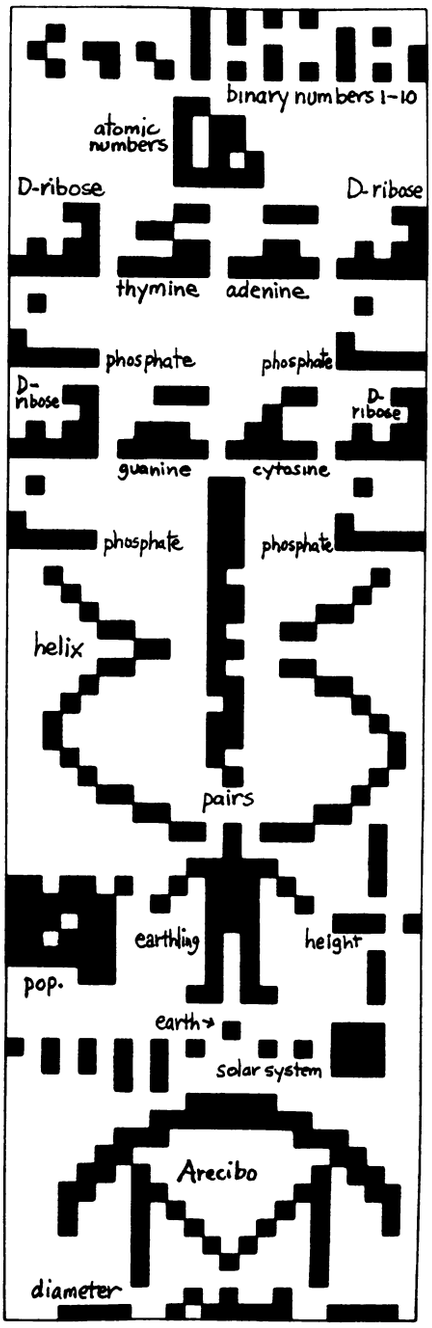
Yet for all its power, the message will be a long, long time *en route*. Astronomers studying the cluster are seeing light that left it some 24,000 years ago, and earth's astrogram will take just as long to go the other way. If earthlings are still here to receive the reply, they will be roughly our great-×-1.6-×-$10^3$-grandchildren.

What do you say to an alien? And more important, how do you say it? Earthly languages are out, and Messieran ones are unknown. That leaves numbers and pictures, plus the hope that a civilization advanced enough to receive our message will recognize representations of fundamental structures and mathematical relationships. Frank Drake and other staff members of the National Astronomy and Ionosphere Center of Cornell University tackled the problem, using an approach that had already been explored by Drake, B. W. Oliver and others (SN: 10/2/71, p. 223).

The first part of the problem was to devise a radio code that could be used to present information that was other than numbers, without depending upon verbal language. The group's solution was to use binary numbers—numbers written with only two symbols, such as dots and dashes or ons and offs—to send a message that could be assembled into a grid 23 characters wide and 73 rows long, totalling 1,679 characters. The hope is that advanced aliens would recognize that 1,679 is the product of two prime numbers (numbers divisible only by themselves and 1), and would thus have a clue to reconstructing the grid.

The message itself begins simply with binary numbers from 1 to 10, followed by a series representing the atomic numbers of hydrogen, carbon, nitrogen, oxygen and phosphorus. Next comes a series of groups showing the number of atoms in the components of the DNA molecule, arranged in DNA's ladder-like pattern—the first part of a fundamental description of earthly biology. Beneath the DNA ladder is a schematic representation of a partial double helix, with a binary number down the center showing the approximate number of "base pair" information units in human DNA. Below this number is a simple figure of a human being, bracketed between the number 4 billion (the approximate population of the species) and the number 14 (expressing the height of the pictured earthling as a multiple of the message's 12.6-centimeter wavelength). Next, a schematic of the solar system, followed by one of the Arecibo telescope, its diameter also shown in wavelengths—2,430 of them.

The message will be repeated automatically whenever the telescope is not being used in other work. Will it be answered? □




*The message▲ as transmitted in binary▼*