# The Search for Extraterrestrial Intelligence…
## ACCELERATING THE COSMIC CONVERSATION



Image courtesy of SETI Institute
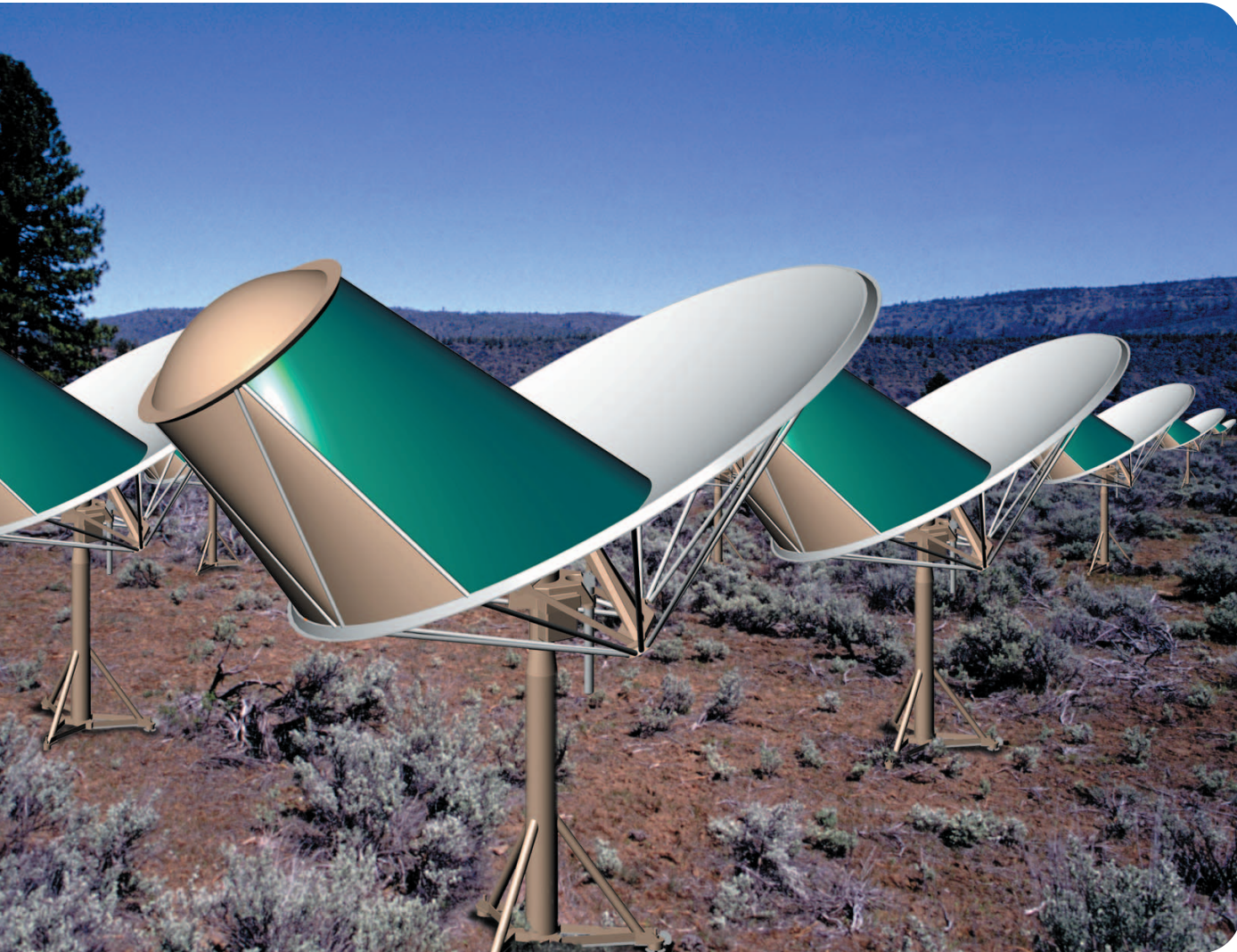
**ALL SETI, ALL THE TIME.** *It's one of the most persistently enticing sirens to beckon the SETI community: a major telescope that can be dedicated to the search. Despite the seductiveness of this idea, construction of an instrument designed to meet the requirements of full-time SETI has always foundered on the large costs. In the next few years, that situation is going to change. Thanks to the far-sighted benevolence of technologists Paul Allen (co-founder of Microsoft) and Nathan Myhrvold (former chief technology officer for Microsoft), a new telescope will be constructed that will allow a targeted SETI search to proceed 24 hours a day, 7 days a week. The new instrument, appropriately called the Allen Telescope Array, known formerly as the One Hectare Telescope, or 1hT, is a joint effort by the SETI Institute and the University of California, Berkeley. Because of its novel construction — an array of inexpensive antennas — it can be simultaneously used for both SETI and cutting-edge radio astronomy research.*

Tired of the alien-of-the-week as depicted by *Star Trek*? Jar-Jar Binks bugging you? Are you wondering where the real space sentients are, and if they are weirder than we can even imagine? You are not alone — and in all probability, we are not alone either. At least, that's what the folks at SETI — the Search for Extra-Terrestrial Intelligence — are betting.

If you were Jimmy the Greek, would you take the bet? If you knew as

**HOW MANY ETs?**

How many civilizations might exist among the stars for us to communicate with? Dr. Frank Drake developed an approach to estimate the answer, by calculating the odds of specific factors thought to play a role in the development of such civilizations.

The equation is usually written:

$$N = R^* \bullet fp \bullet ne \bullet fl \bullet fi \bullet fc \bullet L$$

Where

**N** = The number of civilizations in the Milky Way Galaxy whose electromagnetic emissions are detectable

**R\*** = The rate of formation of stars suitable for the development of intelligent life

**fp** = The fraction of those stars with planetary systems

**ne** = The number of planets, per solar system, with an environment suitable for life

**fl** = The fraction of suitable planets on which life actually appears

**fi** = The fraction of life-bearing planets on which intelligent life emerges

**fc** = The fraction of civilizations that develop a technology that releases detectable signs of their existence into space

**L** = The length of time such civilizations release detectable signals into space

Slightly different values for each of these values can lead to wildly differing results — from a few dozen civilizations to hundreds of thousands. But calculated this way, the wildest and least conservative estimate is that we're alone.

Image courtesy of Doug Vakoch
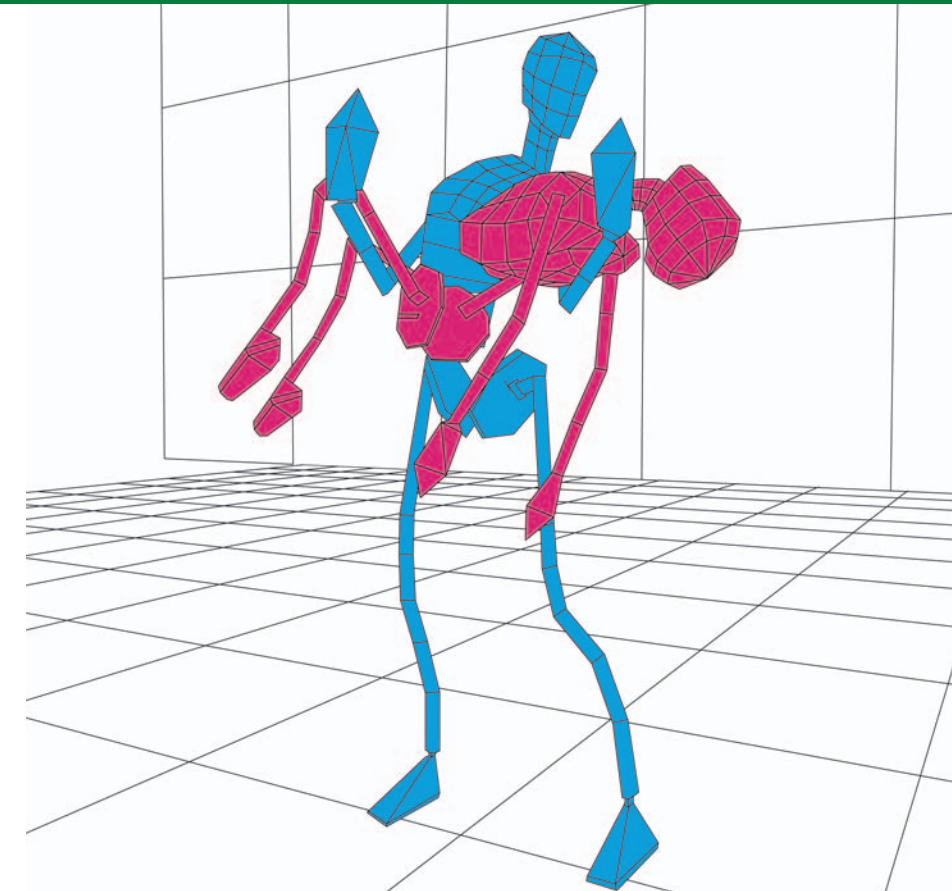


**THE VALUES ARE THE MESSAGE.** *For a generation, SETI researchers have looked to encode and decode messages written in the language of science. But how do we encode more abstract values, like altruism or beauty? Doug Vakoch, of the SETI Institute, is leading a community of researchers looking to answer this complex question.*

much about the universe as bookies know about horse racing, you could figure the odds. First, how many stars does our galaxy have? Of those, how many have planets? Of the stars with planets, how many include planets with thermal activity and water (characteristics enabling the evolution of organic life)? Where life emerged, how often did signal-generating intelligence evolve? Frank Drake, an eminent astronomer, neatly bundled the applicable assumptions into an equation which calculates how many stars might have detectable intelligent life. Unfortunately, the answer depends entirely upon your assumptions and the values you enter into Drake's equation: The answer could be a million — or none.

So we are propelled from Drake's Equation to Fermi's Paradox: Surely our situation is not unique; assuming other intelligent lifeforms evolved, why haven't we heard from them? Maybe they evolved — and self-destructed once they reached the nuclear age. Or perhaps they moved quickly through their radio and TV eras and are now using laser-based communication systems, or quantum broadcasting, or technologies as yet unimagined by us. Given that a billion-year age gap could potentially exist between their evolution and ours, their use of "magic" communication technologies is not at