

DR. SETI'S STARSHIP

Searching For The Ultimate DX

Quantifying Our Ignorance

A standard tool of the SETI trade is under constant attack, and although I enjoy a good argument as much as the next ham, it's clear to me that the detractors are clueless as to the very purpose of the tool they so eagerly denigrate. A case in point is a recent critique on the Forbidden Knowledge website (http://www.velocitypress.com/f_knowledge.htm) describing the Drake Equation as "a statistical analysis of the number of possible 'intelligent communicating civilizations' there are in the universe." This summary misses the whole point of a powerful scientific tool that is not really an equation at all in the strictest sense and was never intended for the solving. A brief history of the Drake Equation should help to illuminate its true utility.

The modern search for life in space began just over 40 years ago, when in 1960 Dr. Frank Drake, a young astronomer at the newly established National Radio Astronomy Observatory (NRAO) in Green Bank, West Virginia, launched a microwave scan of two nearby, sun-like stars. To no one's surprise, Drake employed the very best ham microwave practices of his day in seeking the ultimate DX. His Project Ozma search came up dry, but demonstrated practical techniques for seeking out intelligently generated signals from space.

A year after Project Ozma's brief tenure, Drake convened the first scientific conference devoted to modern SETI at Green Bank. The handful of scientists who assembled there called themselves the Order of the Dolphin, choosing recent studies of human-dolphin communication as a worthy metaphor for the challenge of interspecies communications on a grander cosmic scale.

On a blackboard, for discussion Drake chalked seven topics that would comprise the agenda for the week-long meeting. They included stellar formation, planetary formation, the existence of habitable zones, the emergence of life, the evolution

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The famous Drake Equation, which purports to estimate the number of communicative civilizations in the galaxy, was actually the agenda for the world's first SETI meeting in 1961. This plaque now graces the wall of the room at NRAO Green Bank, West Virginia that once held the blackboard on which the equation was first written. Analysis of the seven Drake factors constitutes a whole chapter in the author's interactive CD-ROM book *Tune In The Universe!* published by the American Radio Relay League and available at quality bookstores across this planet (and possibly other planets as well) and through both the ARRL and The SETI League websites.

of intelligence, communications technology, and the longevity of technological civilizations. Then Drake did something almost whimsical, something which assured his lasting fame: He strung together these seven factors into an equation.

The idea was to multiply seven unknowns together, and in so doing, to estimate N , the number of communicative civilizations in our Milky Way galaxy. The Drake Equation, as it is now called, appears in every modern astronomy textbook. It is a marvelous tool for quantifying our ignorance. It was never intended for quantification, but is quite useful in narrowing the search parameters. We still use it, not to seek a solution, but rather to help us in designing our searches for life.

Drake's seven factors are cleverly ordered, from solid to speculative. Today's astrobiology meetings are similarly sequenced. When first published, only the first factor (the rate of stellar formation)

was known to any degree of certainty. In the intervening decades, the Drake Equation has guided our research in an orderly manner, from left to right, so that today we have a pretty good handle on Drake Factors two and three (planetary formation and habitable zones). The remaining four factors are still anybody's guess, and it may well take decades more before our research begins to quantify those areas of our ignorance. However, the Drake Equation is most valuable in guiding our research, because it asks the important questions. It is still up to us to answer them.

Although the Drake Equation detractors miss the mark with regard to the intent of the tool, they do raise a valid point that is central to astrobiology: How can life, the chance result of a painfully long chain of highly improbable events, possibly have evolved elsewhere? One testable hypoth-

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esis, which the SETI experiment contemplates, is it didn't have to.

The odds of life evolving elsewhere may be pretty long indeed. The best chance for SETI success may depend on the idea that life did not evolve independently, but was seeded everywhere through the mechanism of *panspermia*. No bioastronomer has yet disputed the possibility that microbial life can successfully traverse the distance between the stars and thrive in a new planetary environment. Thus, life need not generate independently in disparate regions; a universe teeming with life merely requires one genesis event coupled with a transport mechanism. In research, that mechanism tentatively has been demonstrated by Chandra Wickramasinghe and the late Sir Fred Hoyle.

To me, microbial panspermia is a far more compelling explanation than the alien-progenitors-in-spaceships scenario, because it does not require that we warp the laws of nature or contemplate technologies not in evidence. Perhaps we really *are* all brothers beneath the skin.

Were it not for Drake's Equation, today astrobiologists would not even know which of these assumptions to attack. As it stands, Drake has given us a handle on where to start. Meanwhile, there remain those who quibble about quantifying seven factors that Drake intended us merely to contemplate. They help us to establish a low value for at least one Drake Equation factor—the fraction of life forms that manifest intelligence. ■