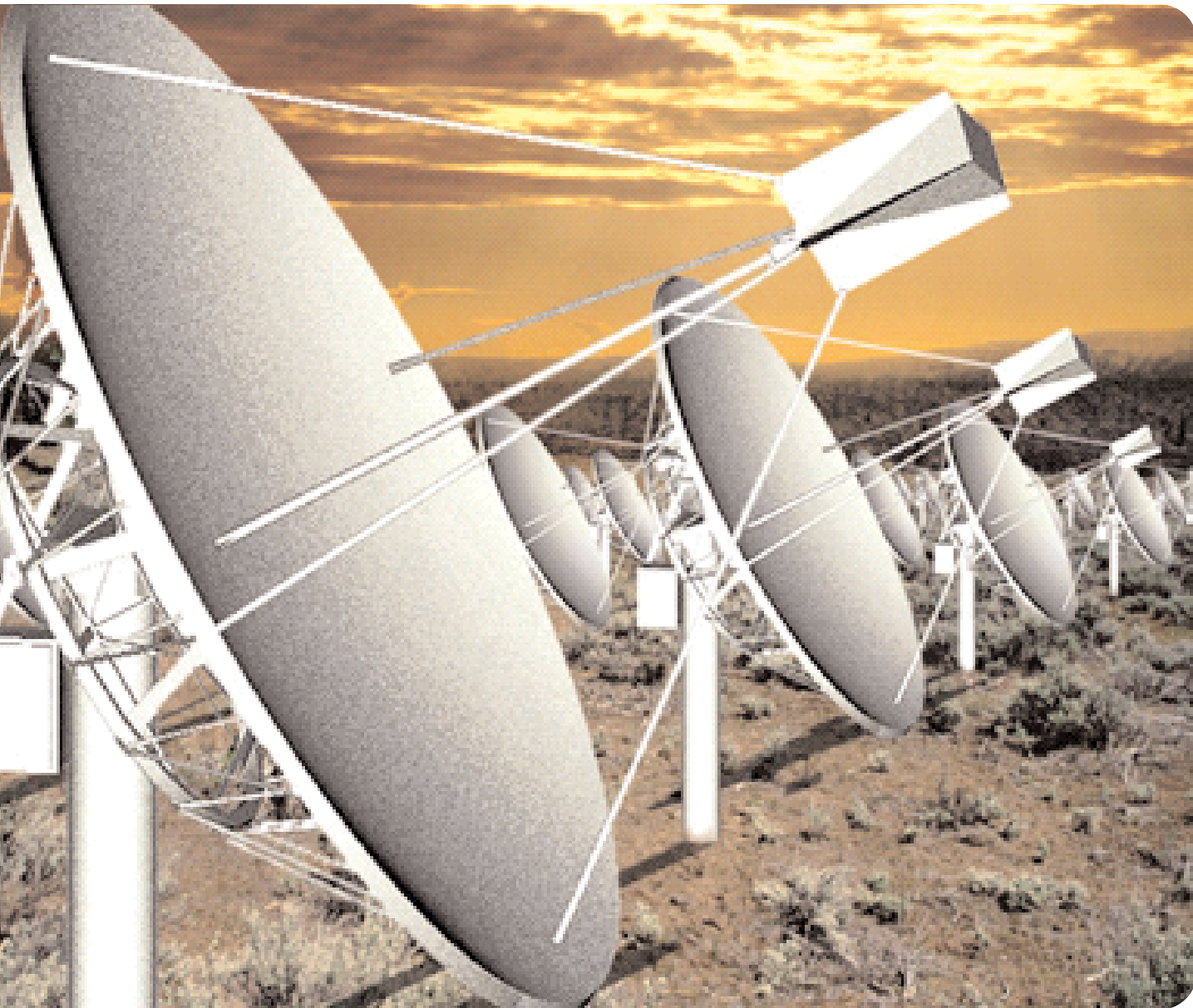


The Search For Extraterrestrial Intelligence...

ACCELERATING THE COSMIC CONVERSATION



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.

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:

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

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.

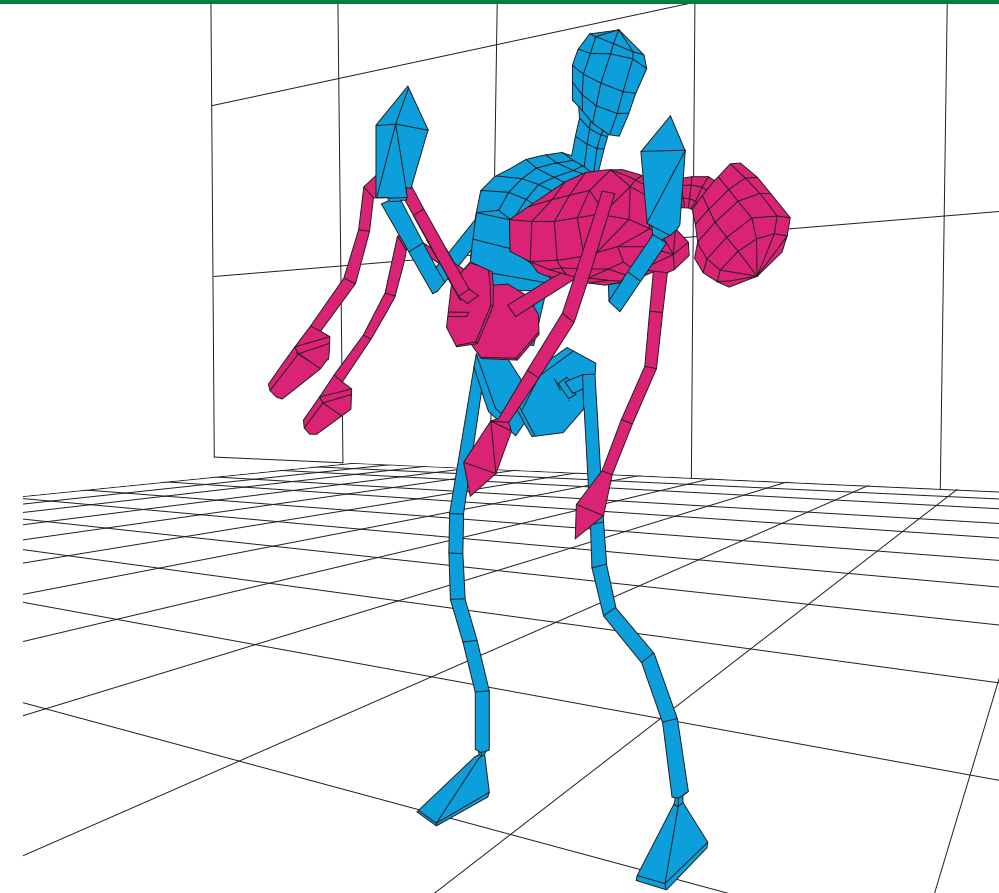
fl = The fraction of suitable planets on which life actually appears.

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.



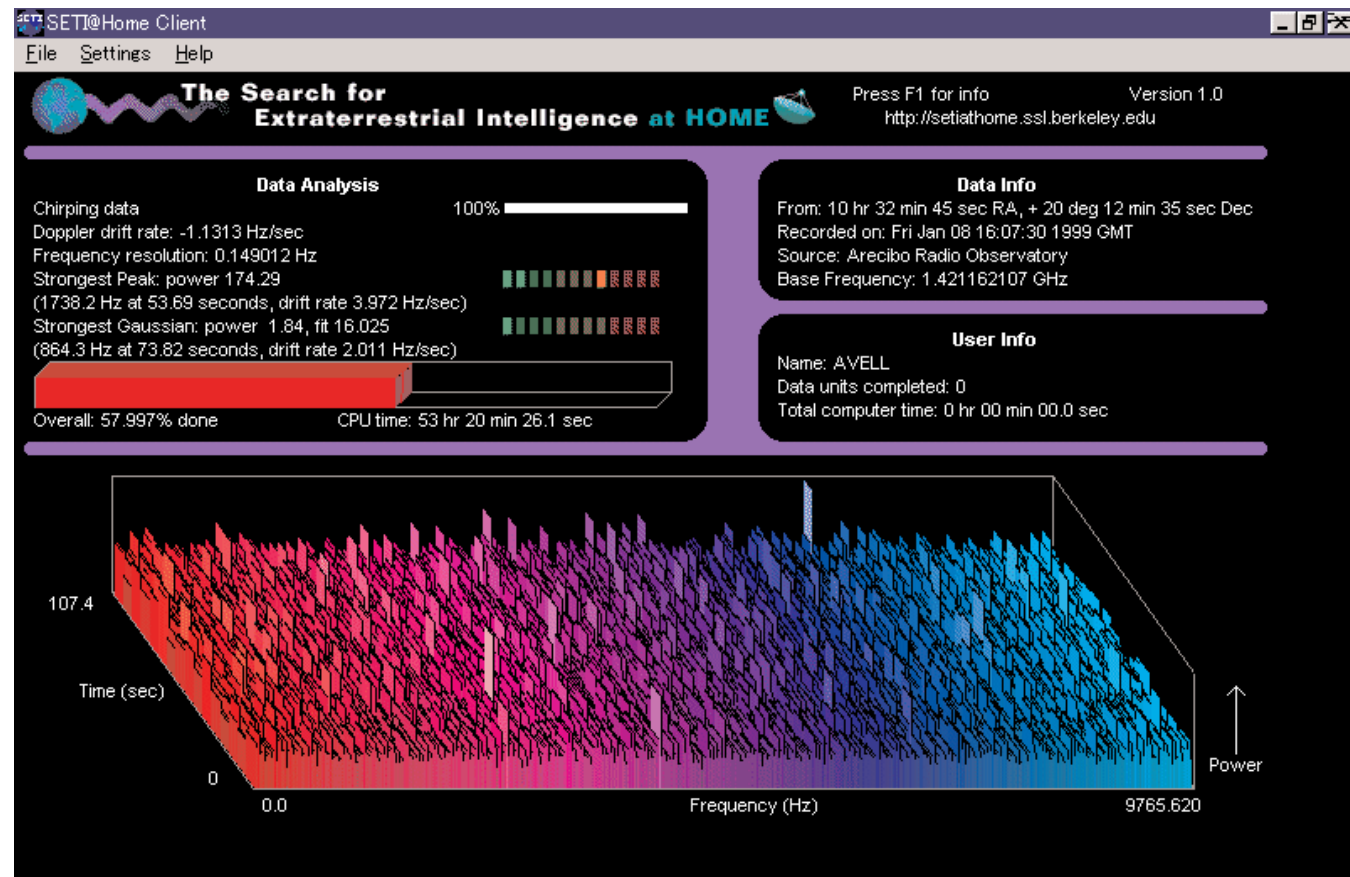
THE VALUES ARE THE MESSAGE. For a generation, SETI researchers have looked to encode and decode messages written in the language of science. But how do we encode more abstract values, like altruism or beauty? Doug Vakoch, of the SETI Institute, is leading a community of researchers looking to answer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

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 wierder 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 Extraterrestrial Intelligence - are betting.

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



SETI ON YOUR COFFEE BREAK. *The SETI@home project, which began operation in April 1999, uses Internet distributed computing to help identify signals from the stars. Small segments of data from the Arecibo radio telescope are downloaded by SETI@home program, which typically runs as a screensaver, then they are processed and returned to researchers at UC Berkeley. In its first 2 years of operation, SETI@home has attracted 3.5 million users from around the world, and together they have contributed over 890,000 years of computer time to analyzing radio data.*

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 all unlikely (any sufficiently advanced technology is indistinguishable from magic; Arthur C. Clarke).

Thus we need to be clever in scanning stars. Our strategies include focusing on wavelengths which the universe leaves “quiet,” making it easier to hear artificial

signals; wide-field surveys which scan big sections of sky; targeted searches which focus only on 1,000 nearby “sun-like” stars; and “piggyback” searches of data collected from ordinary radio astronomy — which borrow processing power from thousands of volunteers’ desktop pcs via the SETI@home screensaver. In the next decade, our search will expand in two dimensions. First, the new Allen Telescope Array in northern California will provide 24/7/365 SETI radio scans via 350 linked 6-meter dishes. Second, projects like COSETI (Columbus Optical SETI) will re-invigorate the search for optical messages beamed at Earth via

high-energy, pulse lasers.

On August 15th, 1977, Dr. Jerry Ehrman looked through a stack of printouts from Ohio State University’s Big Ear Radio Observatory and printed “WOW!” next to a strong signal spike. Unfortunately, that signal never recurred. If it had, what would have happened? Think the movie “Contact” rather than “The X-Files:” any potential “hits” are double-checked against a data-base of potential Earth-based signal sources, and then referred to other radio telescope observatories for independent confirmation. If confirmation occurs, international protocols for next

CULTURES OF THE IMAGINATION



How do we develop protocols for contact with alien cultures, when we don’t know any yet? We could combine cultural observation strategies developed by anthropologists with the exploration of “cultures of the imagination” (COTI). Sound like fun to you?

You can play, too, by attending CONTACT, an annual conference that combines cutting-edge updates on space science and space exploration with role-playing alien contact.

Featuring an eclectic mix of anthropologists, space scientists, physicists, NASA engineers, science fiction authors, and artists as participants, COTI teams at the conference extrapolate a future human space-faring society, and “evolve” an alien society based on a plausible planetary environment. The human “first contact team” then tests out possible communications protocols with the newly met alien society.

steps — and possible responses — are being jointly devised by astronomers, diplomats, and space lawyers.

Once we receive an interstellar message, we must interpret it, and respond. In both deciphering alien messages, and designing our own for transmission, we need a clearly understandable reference point. For example, the Rosetta Stone gave us Greek and Egyptian script alongside Egyptian hieroglyphs; Mayan glyphs were understood first in reference to numerals and their calendar. In sending greetings via Voyager and the 1974 transmission from Arecibo, we included numerals, chemical formulae, and stick figures depicting the human body. (see graphic) But starting with math and the elements of the universe does not ensure cross-cultural understanding. Doug Vakoch, the SETI Institute’s “Interstellar Message Group Leader,” has been working with scientists, artists, and schoolchildren to

create messages conveying human intention as well. And every year participants at the CONTACT conference explore different protocols for human communication with alien cultures.

But let’s be honest with ourselves. While we find us endlessly fascinating, that could just be Terran narcissism. What’s to say a billion-year-old, highly evolved, intelligent species would find us any more interesting than we find the average earthworm? Or, culturally, any more understandable or admirable? Our home definitions of progress might not be shared by the galaxy. Yet whatever the communication difficulties and cultural barriers involved, the effort alone transforms us.

PROVOCATIONS...

Would contact with ETs lead to less violence on Earth?

Could ETs one day contact us through the Internet?

—Wendy Schultz



OTHERWORLDLY PALEONTOLOGY.

Rooted in cutting edge science and his own imagination, artist Joel Hagen envisions the skeletons of alien civilizations. Hagen’s work is informed by the science, and in turn influences that science.

WANT MORE?

THE SETI INSTITUTE

www.seti.org

SETI AT HOME:

setiathome.ssl.berkeley.edu

DRAKE’S EQUATION, EXPLAINED AND COMPUTED:

www.seti.org/science/drake-bg.html

www.msnbc.com/modules/drake/default.asp

SERENDIP (SEARCH FOR EXTRATERRESTRIAL RADIO EMISSIONS FROM NEARBY DEVELOPED INTELLIGENT POPULATIONS):
<http://seti.ssl.berkeley.edu/serendip>

SPACE.COM’S SETI CHANNEL:
www.space.com/searchforlife/index.html

ASTROBIOLOGY AT NASA
<http://astrobiology.arc.nasa.gov/>

THE CONTACT CONFERENCE:
www.cabrillo.cc.ca.us/contact/