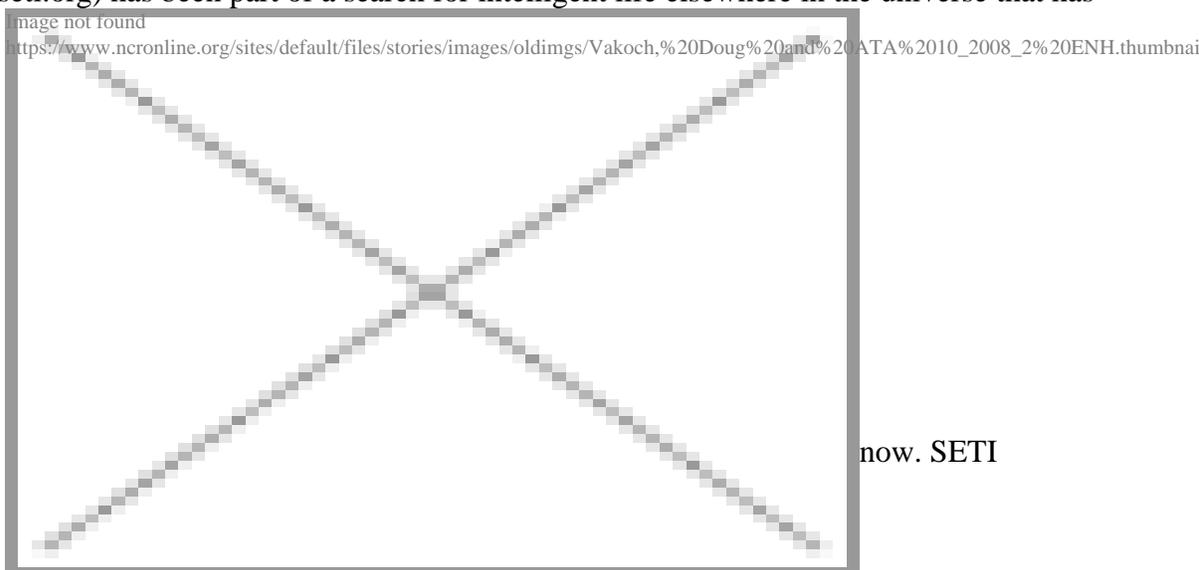


## How do we craft a message to the stars?

Rich Heffern | Dec. 30, 2010 Eco Catholic

Douglas Vakoch is the Director of Interstellar Message Composition at the SETI (Search for Extraterrestrial Intelligence) Institute in Mountain View, Calif.

The SETI Institute ([www.seti.org](http://www.seti.org)) has been part of a search for intelligent life elsewhere in the universe that has



been ongoing for 50 years

now. SETI

astronomers use big radio telescopes to search for electromagnetic transmissions from civilizations on distant planets. Its mission statement states: "We believe we are conducting the most profound search in human history to know our beginnings and our place among the stars."

Dr. Vakoch researches ways that different civilizations might create messages that could be transmitted across interstellar space, allowing communication between humans and extraterrestrials even without face-to-face contact.

Vakoch leads an international group of scientists, artists and scholars from the humanities, as they ponder how we could communicate what it's like to be human across the vast distances of interstellar space.

He has published widely in scholarly books and journals in psychology, anthropology, astronautics and the relationship between art and science. He is the editor of the forthcoming book *Between Worlds: The Art and Science of Interstellar Message Composition* (MIT Press).

I wrote a feature [story](#) [1] in *The National Catholic Reporter* on the SETI enterprise in 2006.

**NCR: In the news almost every week there are reports of new planets being discovered around stars in our Milky Way galaxy. Does this new information coming in bolster the quest that has been going on at the SETI Institute for evidence of extraterrestrial intelligence?**

Douglas Vakoch: We haven't been at this planet hunting game for long and already we've found so many. There are still many unknowns, but the more evidence we get about how likely planets are and whether the basic building blocks of life are present, it seems more and more likely there is life out there. The question is: Can we find concrete evidence?

There are two basic approaches to search for transmissions from extraterrestrial civilizations. We can conduct targeted searches, in which we focus on one star at a time, spending several minutes at each target systematically scanning a wide range of radio frequencies. The other approach is an all-sky survey, which is projected to be technologically and economically feasible in the next decade. With either approach the chances of success increased markedly if extraterrestrial civilizations are much older than ours. This asymmetry of lifetimes is commonly assumed to be a prerequisite for SETI to succeed. If indeed these civilizations we make contact with have even more slightly advanced technologies than humanity currently does, it seems plausible they would be capable of detecting intentional signals sent from Earth.

In the event we detect a signal that can be determined to be real evidence of intelligent life elsewhere, there is a protocol that will guide astronomers doing the search. It's been developed within the International Society of Aeronautics and the International Institute of Space Law.

If we find something that gives evidence of intelligent life, we would immediately check with other astronomers. Once it's validated by others, then the way science works is to tell the whole world, with the desire to make this as open a process as possible. It will be necessary to keep monitoring that signal around the clock. Once a number of astronomers are doing that, we couldn't keep the celestial coordinates and frequency of the radio signal secret even if we wanted to. We want hundreds of astronomers looking. We want independent analysis by others. .

Then the question becomes: Should there be a reply, and what should we say?

The consensus among astronomers is that it's too big a question to be decided just among astronomers. I lead an international team of scholars and experts from the arts, the sciences and the humanities to ponder how we might create messages that would represent Earth's diverse life and cultures.

**NCR: How would we begin to put together a message that would be understandable to an intelligence trillions on trillions of miles away from us?**

Chemistry is the same on planet Earth as it is on any other planet in the universe. Once you get to the point of knowing how to make a complex radio telescope for listening and transmitting at interstellar distances, you need to know some basic chemistry. Every other intelligent civilization will know, for example, that a boron atom has five electrons and six neutrons. We know that, they know that. There is an enormous amount of scientific knowledge captured in the periodic table of the elements, plenty of information to help extraterrestrials translate the messages we send. Plus we have mathematics, which will be another common denominator.

By emphasizing the link between music, math and physics, for example, we might communicate something about our aesthetic sensibilities. Having established a vocabulary of math and science, we can begin to explain something as seemingly abstract as the notion of altruism.

Rather than emphasizing our strength and wisdom in a message to more advanced civilizations, I suggest a more humble approach. I think the most powerful message that we could send to beings on another world is that we are a young civilization. We are in our technological adolescence. We are struggling. We are uncertain that we're even going to survive. And yet, we have enough hope that we are willing to send a message and listen, maybe a hundred or a thousand years, with the hope that we'll get a reply.

## **NCR: Why include artists on this team?**

We have artists for a good reason. If our effort is dominated by astronomers, physicists, and computer scientists, those who are needed to do the detection, then those types of people come with their own concerns.

Most messages you've seen in the past that have gone out to the stars speak of humankind as a scientific, technological species. For example, the Voyager 1 and 2 probes contained a plaque and a record album with instructions on its use.

If we receive a message from a powerful radio transmitter we assume they have some knowledge of technology. That's a possible starting point for a universal language but I think we need to go beyond that. If all we say is two plus two equals four, it's not going to make us sound very interesting.

If we only talk about what we have in common, what have we gained? There's value in knowing there are other beings out there but I think we can gain immensely if we can find out how they comprehend the universe, what they value about it, given their unique biological and cultural evolution. By bringing in artists and anthropologists we get insights into other things we might want to say to or learn about another civilization.

Some of our own aesthetic values, for example have mathematical expressions. If you look at some of the proportions found in nature that we consider aesthetically beautiful they can be expressed in mathematical ideas like the Fibonacci sequence of numbers. If we can communicate some of our mathematics that also gives us the starting point to communicate some of our values. The point of bringing together people from other disciplines is it forces us to question whether what we've been assuming for so long is actually true.

One participant at a workshop we held in France, physicist Lui Lam, suggested that any extraterrestrial capable of interstellar communication will recognize immediately the property of self-similarity, the principle behind fractals. Lam described a fractal known as the Sierpinski Gasket. If one starts with an equilateral triangle and cuts out a smaller equilateral triangle, one creates three triangles at the corners of the original. This process is repeated endlessly, yielding an image similar to patterns found in artworks as diverse as African Tuareg leatherwork and Italian cathedral tiling. Of importance for interstellar message design, the process of generating this pattern can be described by simple computer code.

Every two years NASA holds an astrobiology conference. In Texas last April, one of the speakers was John Traphagan, a University of Texas anthropologist, who reminded us that the whole assumption that we often make in SETI that with increased age comes increased technological capability may not be true. We look at what our advanced technology has brought about on Earth, and it's not always an advance that yields greater security, stability or quality of life. It may be that civilizations that live long enough for us to make contact with are ones that didn't continually grow exponentially but actually developed more modest and sustainable technologies.

In this business of searching for intelligent life, we talk about longevity, a useful tool for thinking about all the factors that we need to consider to find civilizations out there. When we talk about longevity in SETI we're not talking about a civilization's endurance per se but about the longevity of their ability to communicate or transmit. There might be wonderfully complex dolphin-like civilizations out there on other planets, but if they haven't developed technologies like big radio telescopes we're not going to know about them. We've had the ability to listen at interstellar distances for 80 years but our longevity can be seen as zero because we haven't been able to make ourselves known.

## **NCR: You have a background in comparative religions. How does this help you in your work?**

It helps when I consider the societal impact of detecting and communicating with intelligent life beyond earth. As you look at where the responses were coming from when people started taking this question seriously in the past 50 years, much of it was from Catholics. After Sputnik in 1957 there was a lot of speculation about the possibility of other beings that can go into space. Early discussions about extraterrestrial intelligence included consideration of their moral status. The Catholic response was to create typologies based on the Genesis story. Are there other worlds where there was no original sin? How do salvation and redemption work and what is their scope?

**NCR: Do you think that detecting intelligence beyond Earth will be disruptive to the world's religions?**

I suspect that won't happen. If you look at the relation between science and religion over the millennium you see a fruitful dialogue with religion often supporting science's discoveries.

A discovery of intelligence elsewhere in the universe speaks to our own place in the universe and how unique we are. People think the impact of discovery will be to diminish our sense of uniqueness. I think it will be the opposite. The more we learn about another expression of intelligence elsewhere, the more we will realize how different we are from any other being. Even if we have enough in common to make contact, we are still different. Another benefit is that it will give us a chance to think about how much our own view of the universe is a parochial one. Making an encounter with other cultures and even other religions will give us a way to look anew at our own beliefs.

We're not going to teach them a lot about science. If we look at how we've managed our own world we can find lots of ways we haven't done as well as we could. Yet those are fundamental aspects of who we are. If we are making contact with long-lived civilization, they may no longer have access to some of the things we use to define ourselves as human like mortality. Describing ourselves in our wholeness is perhaps the most interesting way to present ourselves.

### **NCR's Eco Catholic Blog**

Eco Catholic is an exploration of the green Catholic imagination and ecological spirituality. Contributors include Rich Heffern, NCR staff writer, columnist and author, and Carol Meyer, executive director of the Sustainable Sanctuary Coalition.

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