

## Considering Cosmic CONELRAD

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Should SETI scientists be fortunate enough to intercept a microwave signal of clearly intelligent extraterrestrial origin, the detection will likely be made with a high-gain antenna such as the 1000-foot spherical reflector at the Arecibo Observatory. Since capture area translates directly to gain, and both of these vary inversely with beamwidth, one imagines that the extremely narrow beamwidth of the receive antenna will enable us to localize the point of origin of any SETI signal. In other words, a successful SETI detection will provide evidence not only as to the existence of ETI, but also reveal the neighborhood our cosmic companions inhabit.

Or so goes the conventional wisdom. Now, two scientists at the University of Hawaii at Manoa are suggesting that any microwave-emitting civilization might well disguise its location. In a paper submitted to the journal *Physical Review A*, Walter Simmons and Sandip Pakvasa hypothesize a scheme whereby extraterrestrial civilizations (and by extension, someday we ourselves) might communicate across the cosmos, without revealing their exact whereabouts.

Simmons and Pakvasa envision a means of splitting a transmitted signal into two components, which are then steered by two reflectors separated over a wide distance. The information content itself is encoded on the converging beams of photons, but transverse to their direction of propagation. The information can be recovered at the point of reception, but according to the Heisenberg Uncertainty Principle, the signal's point of origin can not. Thus, the transmitting civilization need not fear revealing its whereabouts to potentially hostile neighbors.

The whole idea is reminiscent of CONELRAD (an acronym for CONtrol of ELectromagnetic RADiation), a scheme practiced by AM broadcast stations in the US in the 1950s and '60s to prevent their carriers from being used as homing beacons by enemy (presumably Russian) bombers and missiles. When the alert was sounded, the idea went, all broadcast stations would go off the air, and citizens would tune to one of two assigned frequencies (640 and 1240 kHz) where emergency instructions would be broadcast from a

network of widely separated stations. Thus, instead of bombing New York (the location of which was presumably not known to them), the Russians would end up bombing American cornfields.

Those of us who were US-licensed radio amateurs during the Cold War remember CONELRAD well, if not fondly. We were required, whilst on the air, constantly to monitor the AM broadcast band, and to immediately cease transmitting should the AM signals suddenly disappear, lest we bring down the bomb directly upon ourselves. The whole CONELRAD game made about as much sense as the duck-and-cover drills practiced in grade school by this early Baby Boomer. Without enumerating its technological flaws, suffice it to say that CONELRAD died a much-deserved death, decades back. It serves today as a reminder of a paranoid period in human history. Thankfully, those bad old days of the Cold War are behind us.

Or are they? The public outcry following the transmission from Arecibo in 1974 of a demonstration interstellar message was intense. The desire to avoid drawing attention to Earth is one reason for the SETI community's general taboo on sending messages to the stars. And now, our respected colleagues in Hawaii are suggesting that ETI may be just as paranoid.

The whole concept of Cosmic CONELRAD raises three important questions: (1) Will it work? (2) Is it necessary? (3) Does it matter? Let's address them, each in turn.

(1) Will this scheme for disguising the point of origin of the transmitter actually work? At this point, I have to put it in the category of TNIE (Technology Not In Evidence). I suppose it may be possible. But if we expand our theories to include the *possible*, not merely the *known*, then anything is fair game. Like zeta waves, FTL (faster than light) travel, communication by quantum entangled particles, silicon-based life-forms, wormhole travel, and multiple parallel universes, this is great stuff for science fiction. But until someone actually discovers a given technology in the wild, or demonstrates it in the laboratory, it is purely speculative -- and designing our research around speculation is a dead end.

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OK, so some would argue that the whole of SETI is purely speculative. Let's examine that. It is based upon known principles. We know that nominally intelligent carbon-based life forms inhabiting watery planets with oxidizing atmospheres orbiting yellow dwarf stars are indeed a demonstrated possibility (albeit demonstrated only once so far). We have known since the days of Hertz that electromagnetic waves can be artificially generated, and detected at a distance. We know (through simulation, not merely speculation) the power levels and receive sensitivities required to detect them across interstellar distances. So none of this is TNIE. The only speculation involves whether others exist who have similar technologies, and the whole SETI enterprise is about designing and conducting experiments to determine whether they do.

As for the specific TNIE of disguising signal point of origin, Simmons (or some of his EE colleagues) could easily design a laboratory experiment to demonstrate the concept, in principle, on a small scale. But it is my belief that, over significant distances, interstellar dispersion will introduce enough scattering and diffraction to effectively mask (or at least introduce uncertainty as to) the exact position of origin anyway, so why would ETI bother?

(2) Even if we accept, for the sake of argument, that such technology can be made to work, is it plausible that the Universe is such a hostile place, making it necessary to take extraordinary measures to hide? It is plausible. Is it probable? Here my opinion is as valid (or as meaningless) as anyone else's. We can only speculate. Obviously, the Powers That Be in the International Academy of Astronautics think so, else we would not have the present plethora of position papers purporting to prohibit transmission. Nor would there be such heated debate every time someone launches a 'Signals to the Stars' scam. But maybe this is more a testimony to human nature than it is a reflection of the realities of the Universe.

(3) Now, the real question becomes, does any of this matter to SETI? Does the belief that it *may* be possible to disguise a signal's point of origin, and that *some* technologically advanced civilizations *may* choose to avail themselves of this particular TNIE, change in any way our rationale, motivation, or strategies for conducting the SETI enterprise? I think not, if our stated objective is to establish existence proof.

Let us assume that an unassailable signal has been detected, and independently verified beyond any reasonable doubt. Maybe it contains information content, and maybe not. Perhaps we can identify the star (or general neighborhood) from which it emanated, but perhaps not. Say we decide to send a response. Say we don't. None of this changes one fundamental fact: the detection has answered in the negative, once and for all,

that ages-old question that motivates our research;  
*Are We Alone?*

And isn't that what SETI is really all about?