

**THE RATIONALE FOR ACTIVE SETI.** Douglas A. Vakoch, SETI Institute, 189 Bernardo Avenue, Mountain View, CA 94043; dvakoch@seti.org.

**Introduction:** For over a half century, astronomers involved in the Search for Extraterrestrial Intelligence (SETI) have sought evidence of distant civilizations through their technosignatures. With the exception of a few symbolic intentional signals sent from Earth, past SETI work has been passive. A sustained Active SETI project is proposed in which powerful, information-rich signals are transmitted to nearby stars, with the intent of eliciting a response.

**Detectability:** It is often assumed that any extraterrestrial intelligence (ETI) sufficiently long-lived to make contact with us will also necessarily be far advanced in technology [1]. However, it is possible that some extraterrestrial civilizations will employ search technologies comparable to our current or near-future level. That is, some civilizations may sustain SETI over long timescales by keeping sensitivity at a modest level. For such civilizations, a powerful beacon from Earth may make our technosignature detectable for the first time.

*All-Sky Survey.* One such scenario would entail an extraterrestrial civilization conducting a continuous, omnidirectional search for beacons using technology comparable to that already available on Earth [2]. It has often been assumed that to be successful, transmissions from Earth would need to be continual over timescales of millennia. Instead, if we assume that ETI will conduct a continuous omnidirectional search, then only periodic transmissions from Earth could be sufficient to be detectable even by a civilization with limited technological capacity, as long as its search was sustained over long timescales.

**Economic Exchange:** An alternative rationale for conducting an Active SETI project calls into question the assumption that ETI is altruistically transmitting signals for our benefit, without requiring anything of us in advance. However, perhaps interstellar communication is a sort of economic exchange, in which civilizations share valuable information with one another in a multigenerational form of reciprocal altruism [3]. We see examples of reciprocal altruism in a variety of species on Earth, and such behavior can be modeled with game theory, for example, with the Tit for Tat scenario. But in every case of reciprocal altruism, one party needs to take the initiative; someone needs to make the first gesture of generosity. Many SETI scientists have argued that the more advanced extraterrestrials should take the burden of transmitting for our benefit. Perhaps ETI *should* do this from our perspective, but *will* they? Active SETI calls into question the assumption that advanced ETI will necessarily transmit signals to initi-

ate contact. Instead, Active SETI tests the hypothesis that for at least some extraterrestrial civilizations, the burden of making first contact lies with younger civilizations such as ours, which arguably have the most to gain from an interstellar exchange. One advantage of Active SETI over Passive SETI is that the former is a truly experimental science, rather than a merely observational science. Therefore, the hypothesis that *de novo* transmissions from Earth can increase the chances of receiving a signal from ETI over long timescales can be tested by targeting selected stars with intentional broadcasts, while leaving other stars untargeted.

**References:**

- [1] Shostak S. (2013) *Intl J Astrobiology*, 12, 17-20.
- [2] Ekers R. et al. (2002) *SETI 2020: A Roadmap for the Search for Extraterrestrial Intelligence*, Mountain View, CA.
- [3] de Vlader H. P. (2013) *Intl J Astrobiology*, 12, 53-62.