Cosmic Optimism

Our galaxy is likely to contain an increasingly large number of advanced civilizations.

IN PAST COLUMNS I've touched on how the accelerating changes happening on our planet compare to other dramatic chapters in Earth's history (*S&T:* October 2011, page 16), and the perspective we gain imagining the relics of our time after another 230-million-year galactic orbit has passed (April issue, page 16). Here, I'll consider the implications of this evolving view of time for SETI (the search for extraterrestrial intelligence).

A time-tested tool for discussing ET intelligent life is the Drake equation, which allows us to estimate the number of communicating civilizations (N) in our galaxy given knowledge about several astrophysical variables and educated guesses about others. We're rapidly learning the actual values of some factors that were wild guesses in 1961 when Frank Drake first framed the question this way. We now know that most stars have planets, and soon we'll know the frequency of potentially habitable planets.

Many discussions have concluded that regardless of the other variables, N hinges crucially on the value of L, the average lifetime of a communicating civilization. It's difficult to discuss the question of longevity without projecting our fears and expectations for our own future. The original SETI theorists Carl Sagan, Frank Drake, and their colleagues were greatly influenced by the Cold War threat of nuclear annihilation. Do all communicating civilizations blow themselves up after 100 years? If so, L will be a small number, around 100 years. Or do some civilizations transcend their primitive warlike tendencies and develop into a peaceful, mature, long-lived state lasting millions of years?

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But it's a mistake to assume that L is closely tied to our own longevity. Most acorns do not become trees, but a forest is dominated by trees. Our civilization may just be an acorn, but are there any trees in the galactic forest?

In the April issue I discussed the possibility that the current Anthropocene period could signal a planetary transition to a sustainable civilization. We're well aware of ways our technology could backfire on us, so technological intelligence surely isn't always conducive to long-term survival. But science and technology are giving us the ability to understand and predict our world. One can imagine reaching a stage where we have a deep understanding of nature, a deep self-understanding, an ability to forestall natural disasters such as asteroid impacts, and ultimately the capacity to spread out beyond the solar system to make our civilization invulnerable to any calamities on the Earth or Sun. Even if most civilizations at our stage are doomed to self-destruct, some small fraction could make the transition to quasi-immortality.

This possibility completely changes the equation. If this transition to immortality is possible, even if it's extremely unlikely, then the Drake equation is inappropriate for the phenomenon it seeks to explore. Why? Because it's a "steady-state" equation. The very definition of L as an average lifetime contains the implicit assumption that the total number of civilizations is constant, and they are created as fast as they are destroyed. In my view, there is no L, really, because I don't see the origin and destruction of technological civilizations as a steady-state phenomenon.

If just a tiny fraction of civilizations make it to this quasi-immortal state, then N is *increasing* over time and the galaxy must be increasingly permeated with intelligence. This is not an opinion, it's a calculation, and it leads me to what I call "cosmic optimism." I don't know if our long-term prospects are great, but I think the prospects for intelligence are great. So there is plenty of hope for the future of advanced civilizations. Whether we get to be a part of that future in the long run is up to us. ✦

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