

Galactic Colonization Limited By The Inability To Expand Exponentially

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Galactic colonization is likely to be limited by the Fermi Paradox. Image credit: NASA

(PhysOrg.com) -- For more than 50 years, many have taken the so-called Fermi Paradox to indicate that the existence of intelligent alien civilizations is an impossibility. However, a recent re-examination of the paradox points out that, rather than discounting the spread of an intelligent civilization, the Fermi Paradox merely points out that advanced civilizations with *exponential* growth are unlikely to exist.

Enrico Fermi speculated (during a lunch break) that the age of the universe, as well as its size, meant that there should be a number of advanced societies keeping Earth company, in a galactic sense. Growth of these civilizations would be exponential, Fermi implied, and therefore

if they existed, we would have encountered them already. Ergo, advanced alien societies must not exist, since their expansion hasn't brought them into the range of our detection.

A new take on the Fermi Paradox, though, changes the equation a bit. At Pennsylvania State University, two scientists suggest that the key to the paradox is the assumption that civilizations would colonize the universe at an exponential rate. Jacob Haqq-Misra and Seth Baum point out that finite resources preclude exponential expansion. [Technology Review offers a look at the problem of exponential growth:](#)

"The problem is that this kind of growth may not be possible, and they look at Earth as an example. For any expansion to be sustainable, the growth in resource consumption cannot exceed the growth in resource production. And since Earth's resources are finite, and it has a finite mass and receives [solar radiation](#) at a constant rate, human civilization cannot sustain an indefinite, exponential growth."

This means that, if we decide to colonize our galaxy, Earth's civilization will be unable to do so at an exponential rate. If you apply the realities of Earth to possible alien civilizations, then it becomes much more likely that there are other advanced societies out there. Like Earth, though, they are limited in their expansionary capabilities. Perhaps there are thousands of alien societies out there, just trying to effectively colonize their moons or settle on planets in their solar systems. It is possible that, if that is the case, the question of existence of intelligent alien life may not be answered in our life times.

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