Life in the universe? Almost certainly. Intelligence? Maybe not

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Fisher Professor of Natural History Andrew Knoll describes the beginnings of life on Earth. Photograph by Stephanie Mitchell/Harvard News Office

(PhysOrg.com) -- We are likely not alone in the universe, though it may feel like it, since life on other planets is probably dominated by microbes or other nonspeaking creatures, according to scientists who gave their take on extraterrestrial life at Harvard recently.

Speakers reviewed how life on Earth arose and the many, sometimes improbable steps it took to create intelligence here. Radio astronomer Gerrit Verschuur said he believes that though there is very likely life out there — perhaps a lot of it — it is very unlikely to be both intelligent and able to communicate with us.

Verschuur presented his take on the Drake equation, formulated by

astronomer Francis Drake in 1960, that provides a means for calculating the number of intelligent civilizations that it is possible for humans to make contact with.

The equation relates those chances to the rate of star and habitable planet formation. It includes the rate at which life arises on such planets and develops intelligence, technology, and interplanetary communication skills. Finally, it factors in the lifetime of such a civilization.

Using Drake's equation, Verschuur calculated there may be just one other technological civilization capable of communicating with humans in the whole group of galaxies that include our Milky Way — a vanishingly small number that may explain why 30 years of scanning the skies for signs of intelligent life has come up empty.

"I'm not very optimistic," Verschuur said.

Verschuur was a speaker at "Crossroads: The Future of Human Life in the Universe," a three-day symposium sponsored by the Harvard-Smithsonian Center for Astrophysics (CfA), the Smithsonian Institution, the Harvard Origins of Life Initiative, and the Cambridge Science Festival.

The event kicked off with a showing of a popular science fiction movie, "Colussus: The Forbin Project," before diving into more serious material. Topics included finding habitable planets, the rise of artificial life, human travel to Mars, and the idea that life might have a self-destructive streak. Speakers included Verschuur, J. Craig Venter, Freeman Dyson, Peter Ward, Andy Knoll, Dimitar Sasselov, Maria Zuber, David Charbonneau, Juan Enriquez, and David Aguilar.

Sasselov, professor of astrophysics at Harvard and director of the Harvard Origins of Life Initiative, agreed with Verschuur that life is

probably common in the universe. He said that he believes life is a natural “planetary phenomenon” that occurs easily on planets with the right conditions.

As for intelligent life, give it time, he said. Though it may be hard to think of it this way, at roughly 14 billion years old, the universe is quite young, he said. The heavy elements that make up planets like Earth were not available in the early universe; instead, they are formed by the stars. Enough of these materials were available to begin forming rocky planets like Earth just 7 billion or 8 billion years ago. When one considers that it took nearly 4 billion years for intelligent life to evolve on Earth, it would perhaps not be surprising if intelligence is still rare.

“It takes a long time to do this,” Sasselov said. “It may be that we are the first generation in this galaxy.”

Several speakers hailed the March launch of NASA’s Kepler space telescope, which is dedicated to the search for Earth-like planets orbiting other stars. Several Harvard-Smithsonian Center for Astrophysics faculty members, including Sasselov, are investigators on the telescope mission.

Sasselov said he expects Kepler to quickly add to the 350 planets already found orbiting other stars. By the end of the summer, he said, it may have found more than a dozen “super Earths” or planets from Earth-size to just over twice Earth’s size that Sasselov expects would have the stability and conditions that would allow life to develop.

If life did develop elsewhere, Andrew Knoll, the Fisher Professor of Natural History, used the lessons of planet Earth to give an idea of what it might take to develop intelligence. Of the three major groupings of life: bacteria, archaea, and eukaryotes, only the eukaryotes developed complex life. And even among the myriad kinds of eukaryotes, complex

life arose in just a few places: animals, plants, fungi, and red and brown algae. Knoll said he believes that the rise of mobility, oxygen levels, and predation, together with its need for sophisticated sensory systems, coordinated activity, and a brain, provided the first steps toward intelligence.

It has only been during the past century — a tiny fraction of Earth's history — that humans have had the technological capacity to communicate off Earth, Knoll said. And, though Kepler may advance the search for Earth-like planets, it won't tell us whether there's life there, or whether there has been life there in the past.

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