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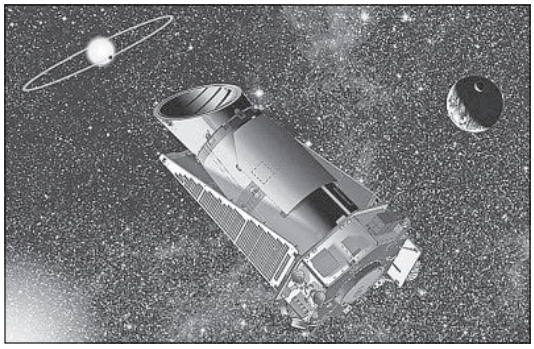
# The search for extraterrestrial intelligence

## My View

By Anthony J. Marolda



NASA photo

**An artist's conception of the Kepler space telescope.**

Carl Sagan was a popular astronomer who wrote "Contact." It was a novel about the Earth's first contact with a remote, alien civilization. The book was made into a movie in 1997 that starred Jodie Foster. The result of this exposure was that many people became aware of the possibility of intelligent life beyond Earth.

As a matter of fact, the search for extraterrestrial intelligence (SETI) is an area of serious scientific investigation and has been since 1961. That was the year that astronomer Frank Drake published his well-known paper where he provided an equation that estimated the number of active, communicative, extraterrestrial civilizations in our Milky Way galaxy. Harvard astronomer Howard Shapley did a similar estimate a few years earlier and speculated that there are 100 million worlds in the universe where life as we know it could have evolved. But, until the 1990s, we had no scientific evidence that planets outside our own solar system (exoplanets), even existed.

The first exoplanet found around a star similar to our sun was in 1995. Up to today, astronomers have identified 1,977 exoplanets, with more than half having been discovered in the last five years. Once a new planet is found, other scientists study it to learn more about its characteristics, including whether our type of life might be able to exist on it.

For example, in 2008, scientists analyzed the light coming from the exoplanet HD 189733 to determine the chemical components found in the planet's atmosphere. It was the first time an organic compound, methane, was identified on an exoplanet, along with water vapor and carbon dioxide. These discoveries are an indication to the scientists that life, as we know it, could exist on an exoplanet that has conditions similar to those found on Earth. The probability of finding intelligent life, therefore, has increased.

There are many active SETI operations around the world, searching for signs of intelligent civilizations beyond our own. Some of these organizations are supported by universities, others by governments and still others by private donations. Two examples of the academic type are the programs at Princeton University and the University of California at Berkeley. On the local scene, Harvard University has operated a SETI program since 1995. It is located at the university's Oak Ridge Observatory in the town of Harvard. When I lived in that town, I had several opportunities to visit the facilities, see the large radio-telescope with its banks of super-computers, and to interview some of the professional astronomers who worked there.

None of these programs has yet found any evidence of intelligent life elsewhere in the galaxy. However, a recent development has raised the hopes of some scientists. It came out of NASA's Kepler space telescope mission.

Kepler is a space craft designed to study thousands of stars in our Milky Way galaxy for signs of planets orbiting those stars. It was launched in March 2009. The NASA scientists are especially interested in identifying planets that might be suitable for earth-like life.

The spacecraft finds the planets, and much information about them, by recording the variability of the light coming from the star. If there is a planet orbiting the star, when the planet passes between the star and the Kepler spacecraft, it diminishes the star's light being recorded on Kepler's very sensitive sensors. The spacecraft then looks for the return of the same signal at a later time, corresponding to a full orbit of the potential planet around the star. In most cases for the exoplanets found, the return signal is measured in days, with the number depending on the size of the particular planet's orbit. They have ranged from 2.2 days to 242 days.

Using this technique over the last few years, the Kepler space craft has found more than 1,000 planets orbiting 440 stars. Some of the planets were indeed found to be earth-like in their characteristics. To be similar to earth, the planet has to be a solid, rocky mass and have an orbit around the star that is at the right distance to have surface temperatures where water can exist in its liquid form.

But here is what has the astronomers excited about the potential for finding extraterrestrial intelligence. One particular star, designated KIC 8462852 (which is about 1,500 light-years from Earth), exhibited extremely strange results during Kepler's measurements. Most of the planets discovered by the Kepler space craft showed less than one percent diminishment of the star's light as the planet passed by. Some of the signals seen over the last few years from KIC 8462852, however, diminished the starlight up to 22 percent, an enormous increase compared to the 1 percent diminishment of even a very large, Jupiter-size planet. The signals were also erratic in terms of their period.

Scientists considered many natural phenomena explanations for the odd, unexpected results, but none seemed to explain the observations. There are still some natural phenomena explanations to be explored, but now the astronomers are seriously considering the remote possibility that the cause is a megastructure created by an intelligent, alien civilization. Such megastructures, possibly a super-sized solar array, have been theorized to be the way advanced civilizations would obtain power, by capturing some of the energy released by their star. They would be "mega" versions of the solar power satellites I discussed in a recent My View column.

One of the SETI groups currently engaged in examining star KIC 8462852 is the SETI Institute of Mountain View, Calif., a private non-profit organization. They began their observations of KIC 8462852 on Oct. 16, just a few weeks ago. They are using their Allen (Radio) Telescope Array (ATA) to search for non-natural radio signals coming from the vicinity of the star. The ATA operates independently and on a continuous basis. If a signal that it receives appears to be of intelligent origin, it is identified by the automated analysis system. The system immediately alerts the scientists to check the characteristics of the reception and confirm its origin.

In case the potential civilization around KIC 8462852 is not broadcasting on radio frequencies, the SETI Institute is coordinating with the brand-new, Boquete Optical SETI Observatory in Panama. This facility, just opened last month, is searching the area around the star for brief, but powerful laser pulses that form an intelligent transmission from an alien civilization.

In the near future, we will learn the results of the SETI organizations examination of KIC 8462852. All of the scientists agree that the chance is remote that the erratic results of the Kepler space craft observations will be explained by the presence of alien-built megastructures around the star. But, until they come up with an explanation of a natural phenomenon that fits the data, they will continue to keep the alien megastructure concept as a working hypothesis.

*Anthony Marolda is a resident of Annisquam. He has a U.S. patent with an application in fusion power and has worked on the economics and technology of solar power satellites.*