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Earth

Kepler-186f



f

Earth

Venus

Mercury

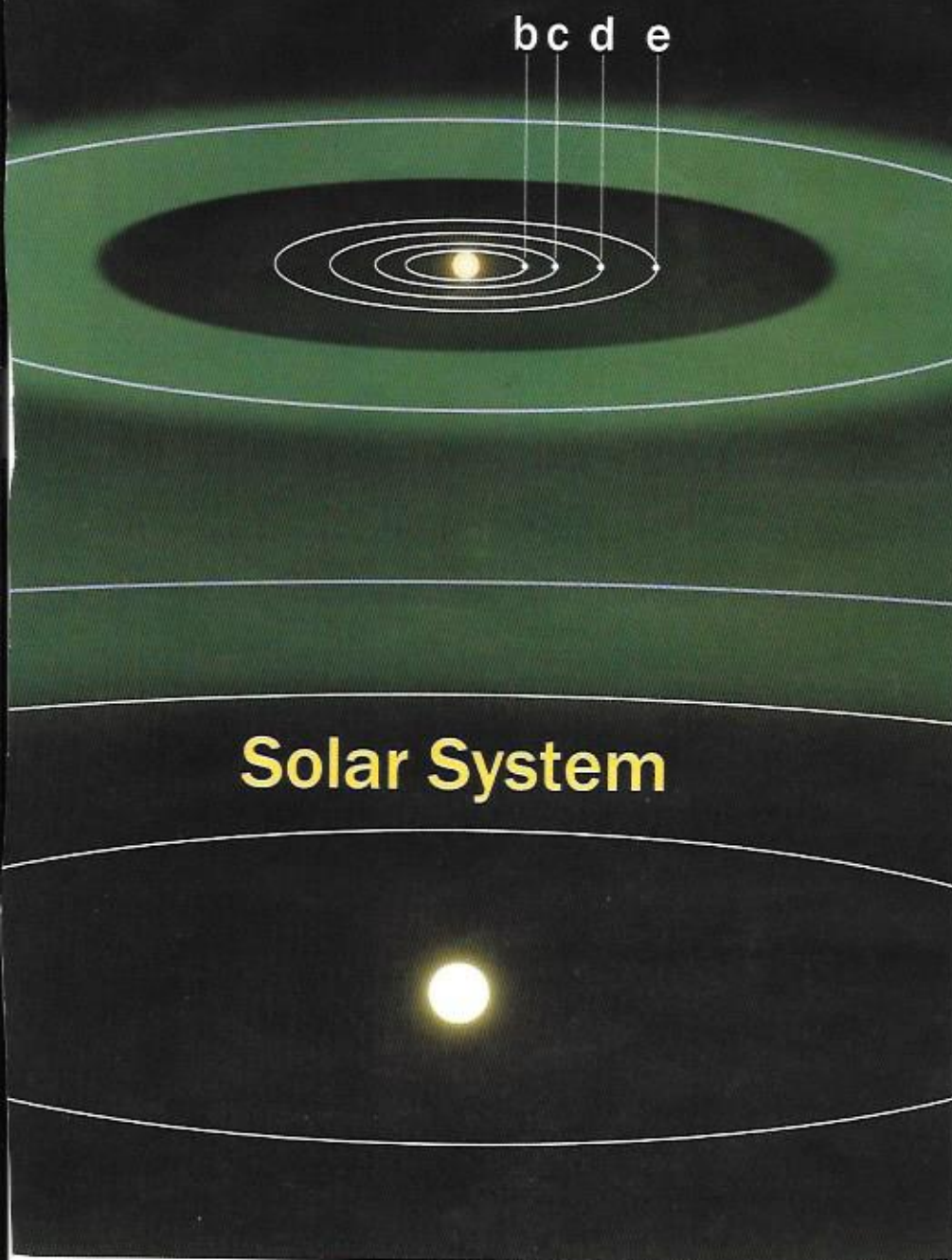
The diagram compares the planets of our inner solar system to Kepler-186, a five-planet star system about 500 light-years from Earth in the constellation Cygnus. The five planets of Kepler-186 orbit an M dwarf, a star that is half the size and mass of the sun.

(Image: NASA Ames/SETI Institute/JPL-Caltech)

Have Scientists Discovered Another Earth?

Report By: Henry M. Holden

Kepler-186 System



Solar System

THE CENTURIES-old quest for other worlds like our Earth has recently been energized by the excitement generated over the discovery of hundreds of planets orbiting other stars.

One of those planets in particular has scientists' keen attention. Early measurements indicate that there is a 70 percent chance that it is rocky, like the Earth, which scientists say is a necessary ingredient to support life, and probably is just the right temperature to sustain flowing water.

The planet, about one third larger than Earth, basks comfortably in the heat of its own sun. In other words, it is about as close to Earth as any planet we know of.

The Kepler Spacecraft, a \$600-million space observatory was launched by NASA,

in 2009, with the objective of determining how frequently Earth-like planets occur around the Milky Way galaxy, particularly "alien" planets that are around the same size as Earth in the "habitable" regions of their parent star.

The Kepler Space Telescope, which simultaneously and continuously measured the brightness of more than 150 000 stars, is NASA's first mission capable of detecting Earth-size planets around stars like our sun. By January this year, Kepler had discovered its 1 000th alien planet, further building the prolific exoplanet-hunting mission's status as a space-science legend.

"We know of just one planet where life exists – Earth," said Elisa Quintana, research scientist at the SETI Institute at

NASA's Ames Research Centre, in Moffett Field, California. (SETI stands for the search for extraterrestrial intelligence).

"When we search for life outside our solar system we focus on finding planets with characteristics that mimic that of Earth. Finding a habitable zone planet comparable to Earth in size is a major step forward."

NEW EARTH-LIKE CANDIDATES

Through Kepler, scientists have discovered eight new candidate planets – planets though not yet 100 percent verified – in the so-called "Goldilocks zone," where their surface temperatures are neither too hot nor too cold to sustain flowing water.

Unlike previously discovered planets outside the solar system, these candidates orbit stars much like our own sun.

Researchers have longed believed the existence of, and have been searching for, an Earth twin. Kepler may have discovered a genuine Earth twin – an Earth-size planet in the habitable zone of a sun-like star.

In an alien world that orbits a distant star in the constellation of Lyra, it may be the most Earth-like planet ever found outside the solar system.

The planet, Kepler-438b, is more Earth-like in the amount of energy it receives from its star, and in its size.

Kepler 438b, is about 12 percent larger than Earth and circles a dwarf star that bathes it in 40 percent more heat than our planet Earth receives from the sun.

That energy measure does not necessarily translate into an accurate gauge of temperature range, because of atmospheric variations.

A planet like Venus, with a dense atmosphere, for instance, could be much hotter than expected. If it has no atmosphere at all, it could be very cold.

Kepler 438b, about 500 light years away, completes an orbit around its star every 35 days, making a year on the planet pass 10 times as fast as on Earth.

A second planet, Kepler-442b, is 1 100 light-years away and about one-third larger than Earth; its chance of being rocky is 60 percent and it completes one orbit every 112 days. It also gets about two-thirds as much light as Earth.

The scientists give it a 97 percent chance of being in the habitable zone.

Both Kepler-438b and Kepler-442b orbit red dwarf stars that are smaller and cooler than our sun.

"We don't know for sure whether any of the planets in our sample are truly

Milky Way Galaxy

habitable," said David Kipping, an astronomer at the Harvard-Smithsonian Centre for Astrophysics. "All we can say is that they're promising candidates."

As Kepler continues to scan the universe for an Earth-like twin, it will no doubt find new candidates. Previously, the two most Earth-like planets known were Kepler-186f, which is 1,1 times the size of Earth, and Kepler-62f, which is 1,4 times as big.

"Kepler-186f, might be called 'a cousin of Earth,'" said one university professor who keeps a database of planets outside our solar system, "but 438b and another recently discovered planet are "brother and sister-in-law. We are getting closer."

"Kepler-438b and neighbour planet Kepler-442b are the best candidates we have so far for Earth analogues," said astronomer Willy Torres, of the Harvard-Smithsonian Centre for Astrophysics, a co-author of a paper in "The Astrophysical Journal" describing the new planets.

All that remains is for scientists to confirm that they are truly planets. Kepler can be fooled by binary stars, or two stars orbiting each other, for example.

"These new Earth-sized candidate planets in the water-friendly zone of their stars are super-exciting," said Lehigh



Above: An artist's rendering of what our galaxy might look as viewed from outside our Galaxy. Our sun is about 25 000 light years from the centre of our galaxy. The cone illustrates the neighbourhood of our galaxy that the Kepler Mission will search to find habitable planets.

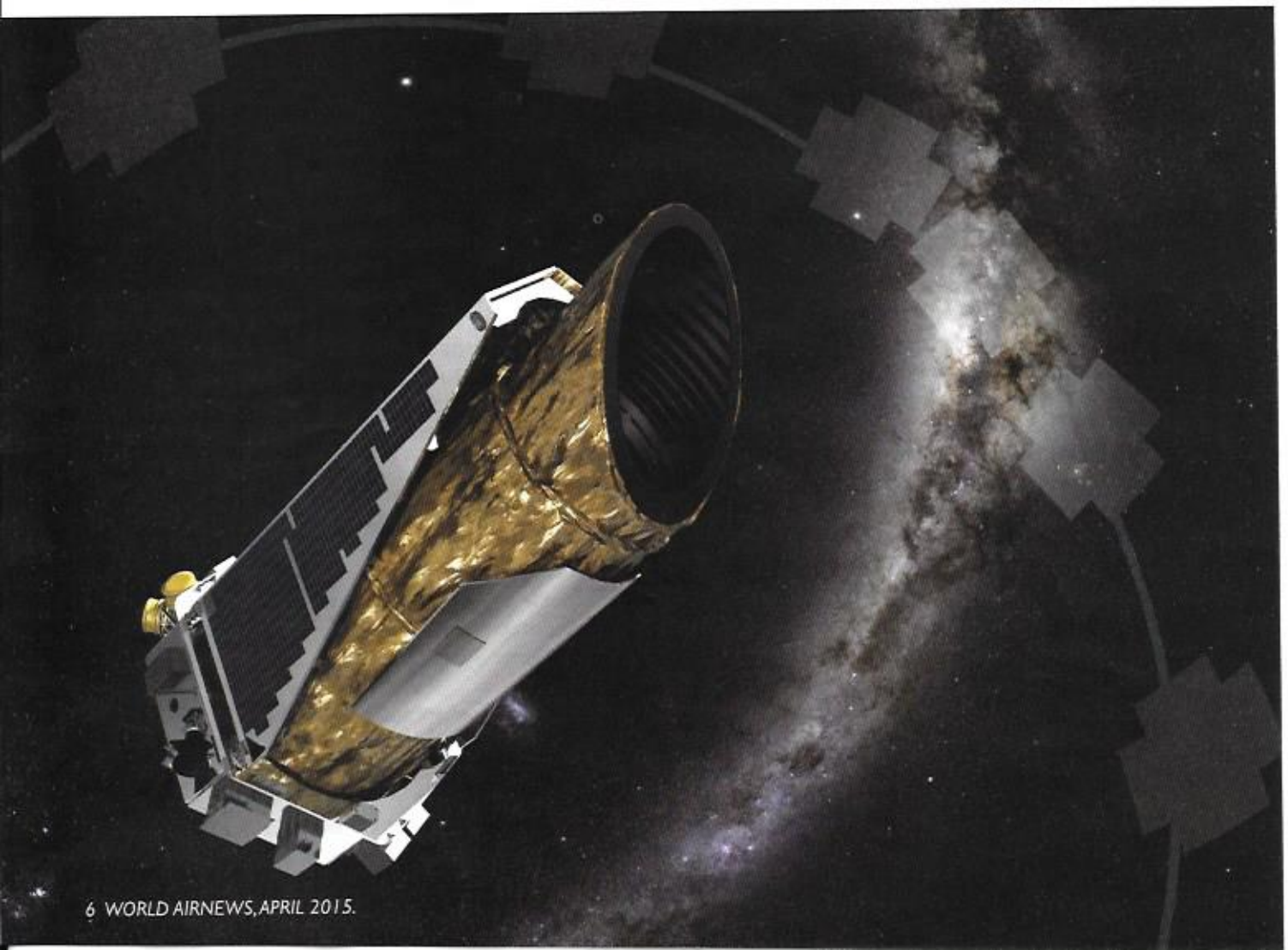
(Image: Jon Lomberg).

Below: This artistic concept shows NASA's planet-hunting Kepler spacecraft operating in a new mission profile called K2. Using publicly available data, astronomers may have confirmed K2's first discovery of star with more than one planet.

Image: NASA Ames/JPL-Caltech/T. Pyle.

University astronomer, Joshua Pepper. "And those numbers are only going to increase as time goes on. We're only going to find more and more of these."

Mario Livio, senior astrophysicist with the Space Telescope Science Institute said: "We now realize that there are billions of habitable planets in our Milky Way galaxy."

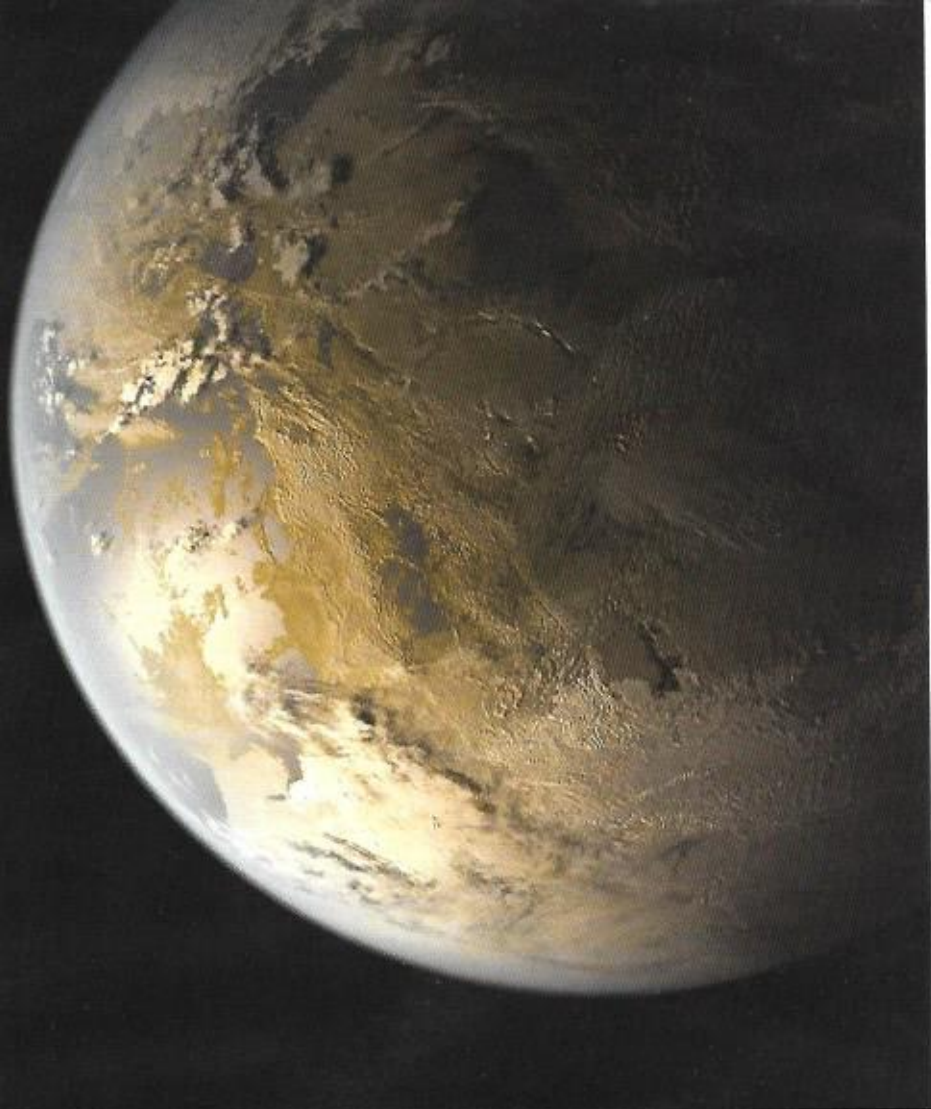


This image: The artist's concept depicts Kepler-186, the first validated Earth-size planet to orbit a distant star in the habitable zone.

(NASA Ames/SETI Institute/JPL-Caltech)

Below: Of more than 1 000 verified planets found by NASA's Kepler, eight are less than Earth-size and in their star's habitable zone.

(NASA Ames W Stenzel)



The next step will be "to characterize the atmospheres of such planets in an attempt to identify biosignatures, compositional and thermo-chemical imprints that could have been created only by living organisms," Livio said.

"Given that the existence of life on Earth has remained our last bastion for being special," he added, "the eventual detection of extrasolar life — or the evidence that it is extremely rare — would constitute a true scientific revolution."

WHY THE SEARCH?

Why, some people ask, are we searching the universe for other life forms? Are some of us obsessed with the prospect of alien life?

Or, are we afraid of being the "last bastion for being special"?

Our world is filled with scary stuff. We fear the collapse of the Euro, where the next war will start, and some fear aliens landing on Earth.

It's called negative news, and negative news gets our attention. We read stories of "near miss" asteroids and "close calls" with comets, and constant chatter about aliens or extra-terrestrial life.

Some scientists say any fears about



alien life forms are foolish.

They contend that life, in its simplest form, perhaps a single-celled prokaryotic type cell (lacks nucleus etc.), swimming in a primeval soup began on planet Earth, and that intelligent life evolved from this.

Suppose it happened the other way

around? Suppose an intelligent life form exists on Kepler -438b and they discovered us 500 light years ago.

And suppose this intelligence is capable of speed-of-light travel and they set off to explore our planet 499 years ago.

We are about to see the end of civilization as we know it any day now. →