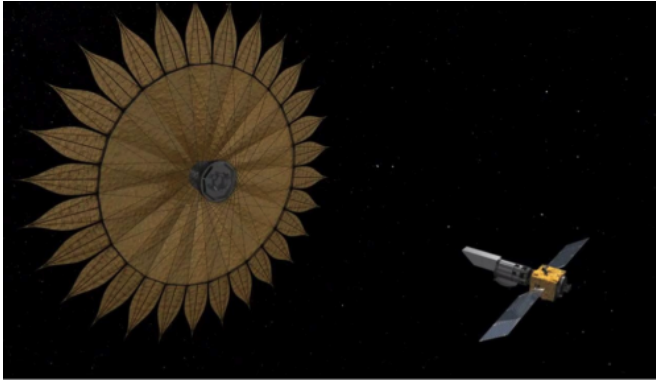


# James Webb and the search for life beyond Earth

16 July 2014, by Lindsey N. Walker



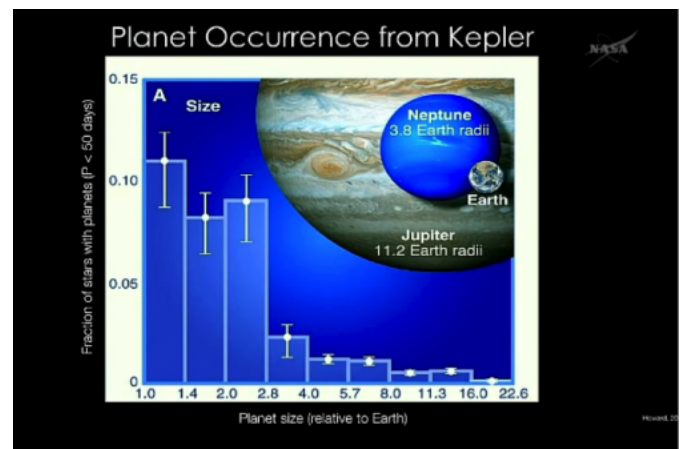
A sunflower-shaped 'starshade' launched to space with a simple telescope could help scientists on the ground hunt for another Earth. Credit: NASA/JPL/Caltec

"Do we believe there is life beyond Earth?" asked former astronaut and NASA Administrator Charles Bolden. "I would venture to say that most of my colleagues here today say it is improbable that in the limitless vastness of the Universe we humans stand alone."

The panelists included NASA's chief scientist Ellen Stofan, NASA's associate administrator and former astronaut John Grunsfeld, senior project scientist for the James Webb Space Telescope John Mather, and NASA's Jet Propulsion Laboratory director of astronomy and physics Dave Gallagher. Key speakers also included Matt Mountain, director of the Space Telescope Science Institute and Sara Seager, planetary scientist at MIT.

Before the invention of the telescope, before every continent was on a map, even before the revelation that Earth was not the center of the Universe, humans have wondered at the possibility of life beyond our planet. Now, scientists know there are 100 billion stars in our galaxy alone (one of 10 billion galaxies in the mere observable Universe), and 10-20 percent of these stars could have earth-size planets within the habitable zone. Science has arrived, for the first time in human history, at the crux that will push the world to expand from the question, "is there extraterrestrial life" to the question of "how can we find it?"

NASA, spearheading Earth's pursuit of distant life, hosted an open panel discussion at its Washington headquarters Monday with leading scientists to put the physics into the philosophical. The topic of alien life is not merely for the lovers and dreamers of science fiction. Space missions, specialized telescopes, and unprecedented technological advances are underway at NASA to find signs of life, and eventually, extraterrestrials themselves.



Planet occurrence from Kepler. Credit: NASA

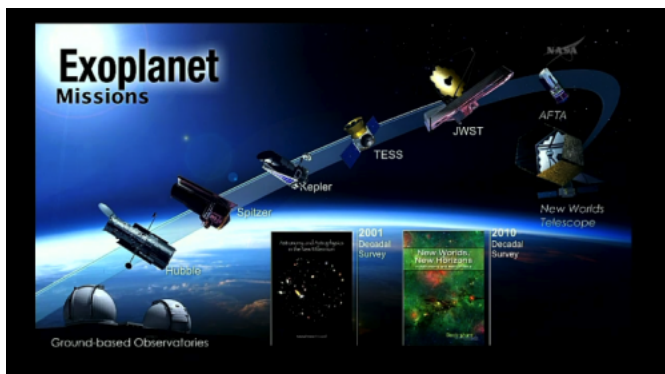
Much of the discussion centered around the groundbreaking James Webb Space Telescope (JWST)—to be launched four years from now. It will be able to look for biosignatures of, not only liquid water, but also the atmospheric gases such as oxygen that might indicate the presence of life. Larger than the famous Hubble Telescope— and

larger even than the spaceship designated to carry it into space—the JWST provides the most accurate and expansive images of any telescope ever made.

"We have our first chance, our first capability of finding signs of life on another planet," said Sara Seager in reference to this telescope.

Although the JWST is a critical advancement in the search for life, the panelists explained it is not enough. Even given its unmatched immensity, the probability of finding extraterrestrial life with it is very slim. "To actually find evidence of life will take another generation of telescopes," said Matt Mountain.

One obstacle hindering the discovery of new planets is the brightness of the stars themselves. Earth, for example, is 10 billion times fainter than the Sun. The reflection of light waves given off into space from the surface of the planet is so minuscule in comparison to our star's brilliance, that it is barely detectable. One solution to this problem, as Seager explained, is the development of a "Starshade". Shaped like huge sunflower, the idea is to manipulate the light from distant stars away from their planets so only the planet is visible to the [space telescope](#). The project is still in its early stages.

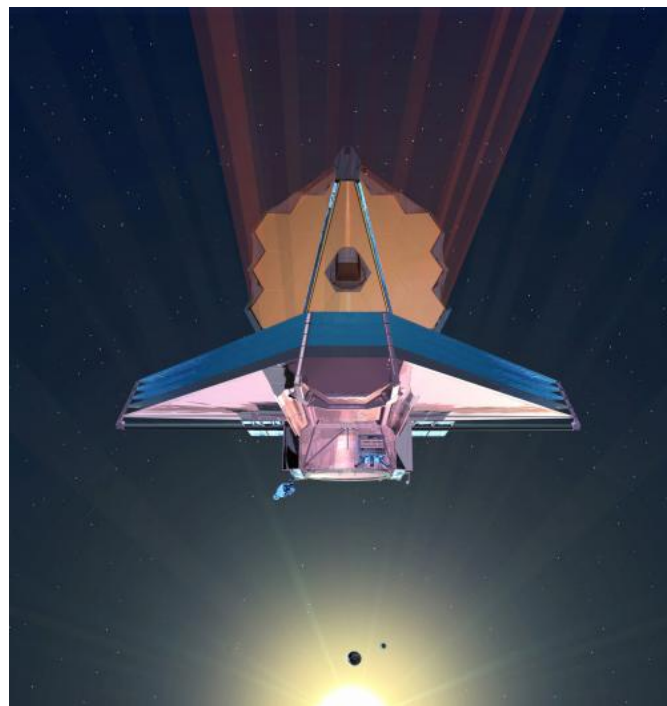


Exoplanet missions. Credit: NASA

John Grunsfeld explained that the efforts in the search for life are focused on our basic and limited understanding of what sustains life itself —Earth.

Astronomers are seeking earth-size planets orbiting in the "goldilocks zone"- the distance from a star that is neither too hot nor too cold for liquid water to pool. The quest for this second Earth, referred to as Earth 2.0, is where the search begins.

As technology allows for telescopes to become larger along with the spacecrafts to transport them, our map and understanding of the Universe will also expand.



A December 2007 artist conception of the James Webb Space Telescope in space. Credit: NASA

"Just imagine the moment, when we find potential signatures of [life](#)," Mountain said.

"Imagine the moment when the world wakes up and the human race realizes that its long loneliness in time and space may be over—the possibility that we're no longer alone in the Universe."

*This story is republished courtesy of NASA's Astrobiology Magazine. Explore the Earth and beyond at [www.astrobio.net](http://www.astrobio.net).*

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