A night sky photograph showing the Milky Way galaxy and a comet streaking across the sky. The Milky Way is visible as a dense band of stars and dust, stretching from the upper left towards the center. A bright comet with a long tail is visible in the lower right quadrant. The foreground shows dark silhouettes of mountains or hills.

Astrobiology

The search for *alien* life

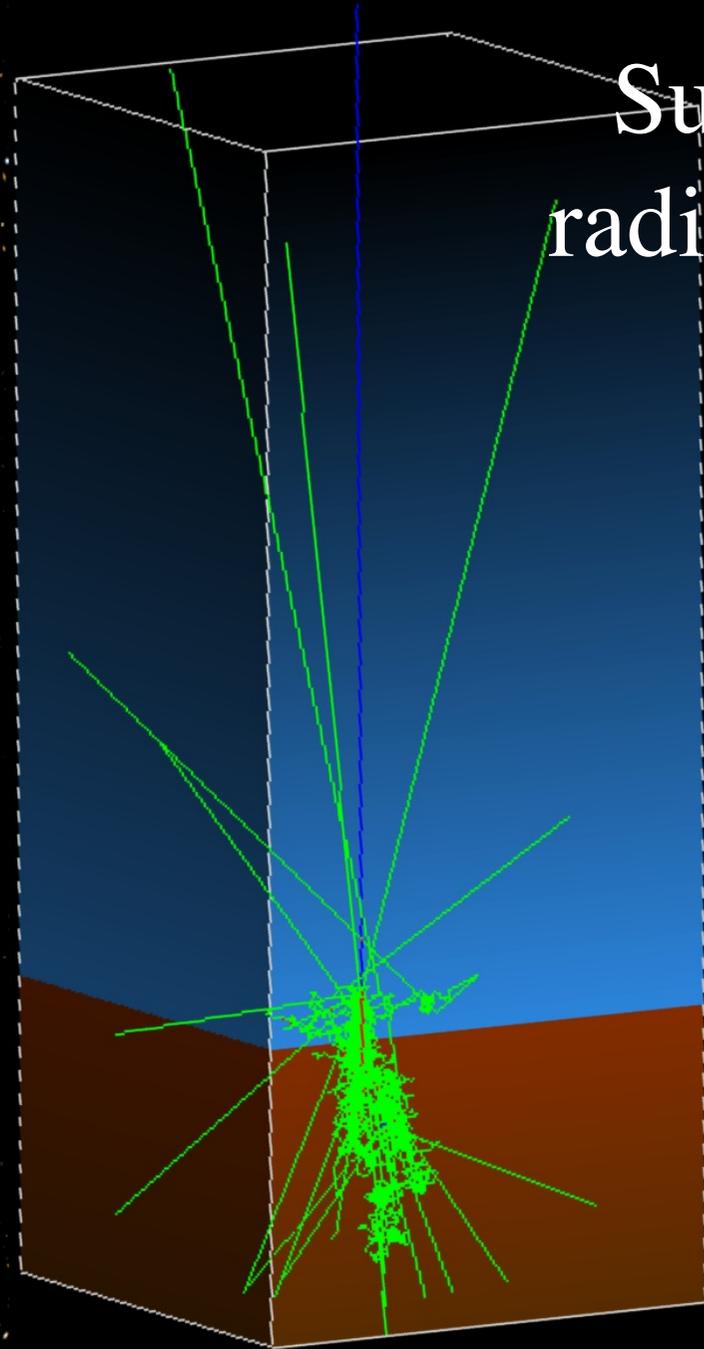
Dr. Lewis Dartnell
Centre for Planetary Sciences
University College London

Twitter: [lewis_dartnell](https://twitter.com/lewis_dartnell)

Subsurface cosmic ionising radiation environment of Mars

or

'Martian Death Rays'



Life could be lurking in Mars' frozen sea

THE DAILY TELEGRAPH
TUESDAY, JANUARY 30, 2007

By Roger Highfield
Science Editor

SPACE probes looking for life on Mars must dig deeper to have any chance of success, according to new research. And they should start in what is thought to be a frozen sea of ice known as Elysium.

Unlike Earth, the Red Planet is not protected by a global magnetic field or thick atmosphere and is bombarded by radiation from space.

For cellular life to have any chance of surviving such high radiation levels it would have to be several metres below the surface - beyond the reach of even state-of-the-art drills.

A team from University College London has been studying cosmic radiation levels at various depths on Mars and has published its findings in the journal *Geophysical Research Letters*.

Lewis Dartnell, the lead author, said: "It just isn't plausible that dormant life is still surviving in the near-surface of Mars in the face of the ionizing radiation field."

"Finding life depends on liquid water surfacing on Mars, but the last time water was widespread was billions of years ago. Even the hardest cells could not possibly survive the cosmic radiation levels for that long."

The team found that the best places to look for life would be within the ice at Elysium, because the frozen sea is relatively recent and so has been exposed to radiation for a relatively short time.

Water also provides a shield of hydrogen to protect life from destructive cosmic radiation particles.

Mr Dartnell said: "We have found that this suspected frozen sea in Elysium represents one of the most exciting targets for landing a probe."

Other ideal sites include recent craters, because the surface has been exposed to less radiation, and the gullies recently discovered in the sides of craters, as they are thought to have flowed with water in the past five years.

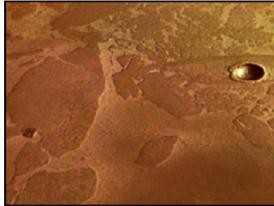
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Last Updated: Monday, 29 January 2007, 16:12 GMT

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Frozen sea may harbour Mars life

A frozen sea found on Mars is one of the most promising places to look for life on the Red Planet, scientists say.



Elysium's frozen sea may be one of the best places to look for life

But planned missions designed to search for microbes below the Martian surface will not drill deep enough to find living cells, the UK team has said.

Researchers at University College London say that microbes in the first couple of metres of Martian soil would be killed off by intense radiation.

Life might survive deeper down, where conditions are more benign, they think.

But these depths were beyond the reach of drills envisaged for missions to Mars, said Lewis Dartnell, from UCL's Centre for Mathematics and Physics in the Life Sciences & Experimental Biology (Complex).

"It just isn't plausible that dormant life is still surviving in the near-subsurface of Mars"

Lewis Dartnell, UCL

Enlarge Image

Scientists find new clue to life on Mars

The Guardian | Tuesday January 30 2007

Ian Sample

A vast, dust-covered ocean of ice is the most likely place to discover life on Mars, according to a team of British scientists.

The frozen ocean was captured by cameras aboard the European Space Agency's Mars Express probe, which revealed an expanse of pack ice just north of the Martian equator, in Elysium, a region strewn with dormant volcanoes. Dust kicked up by violent storms appears to have settled on the icy surface, outlining fragmented ice rafts covering an area as large as the North Sea. The water is believed to have seeped up from fissures several kilometres beneath the surface, perhaps carrying ancient microbes with it, before freezing some 5m years ago.

Research by a team at University College London suggests microbes trapped in the ice could be protected against lethal ultraviolet light and intense cosmic radiation that penetrates the thin atmosphere and bleaches the surface. By modelling the radiation striking the planet, and the effect it would have on microbes found on Earth, the scientists calculate that intact organisms may be lodged within the ice at a depth of 7.5 metres.

The study is likely to make Elysium a priority for future missions, although no probes have yet been built that are capable of drilling to such depths. Lewis Dartnell, lead scientist of the study, published in *Geophysical Research Letters*, said: "What we really want to find are cells we can thaw out, feed up and grow in the lab. The long-term survival [prospect] of cells is much better in this frozen sea in Elysium than anywhere else we've seen."

In December, scientists spotted what may be the first signs of liquid water on Mars, which had frozen into icy trails after bursting out of crater walls. This boosted hopes that life may be able to exist in the warm depths of the planet, but the sleeping sites will be difficult to investigate.

Tuesday, January 30, 2007

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News

OUT OF THIS WORLD with VINCE SOODIN

Martians 'hiding' on red planet

January 30, 2007

COMMENT ON THIS STORY

MARTIANS maybe hiding underground on Mars to stay alive, new research suggests.

Scientists could have burrowed below the red planet's surface to avoid deadly radiation above.

Scientists led by the University College London say microbes need to drill deeper into the planet if they want to find signs of life.

Lewis Dartnell, lead author of UCL report, said: "Finding hints at life once existed - proteins, DNA fragments or fossils - could be a major discovery in itself."

But the Holy Grail for astrobiologists is finding a living cell at what we can warm up, feed nutrients and reawaken for studying.

It just isn't plausible that dormant life is still surviving in the near-subsurface of Mars in the face of the ionizing radiation field. Finding life depends on liquid water surfacing on Mars, but the last time water was widespread was billions of years ago. Even the hardest cells could not possibly survive the cosmic radiation levels for that long. The team found that the best places to look for life would be within the ice at Elysium, because the frozen sea is relatively recent and so has been exposed to radiation for a relatively short time. Water also provides a shield of hydrogen to protect life from destructive cosmic radiation particles. Mr Dartnell said: "We have found that this suspected frozen sea in Elysium represents one of the most exciting targets for landing a probe. Other ideal sites include recent craters, because the surface has been exposed to less radiation, and the gullies recently discovered in the sides of craters, as they are thought to have flowed with water in the past five years."



Aliens ... maybe underground

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SkyLab, America's first space station, began with crippling problems created by an incident during its May 1973 launch. High temperatures

Must dig deeply to seek life on Mars, new report says

AMERICAN GEOPHYSICAL UNION NEWS RELEASE
Posted: January 29, 2007

WASHINGTON - Probes seeking life on Mars must dig deeply into young craters, gullies, or recently exposed ice to have a chance of finding any living cells that were not annihilated by radiation, researchers report in a new study. One promising place to look for them is within the ice at Elysium, site of a recently discovered frozen sea, they say.

Current probes designed to find life on Mars cannot drill deeply enough to find living cells that may exist well below the surface, according to the study. Although these drills may yet find signs that life once existed on Mars, the researchers say, cellular life could not survive incoming radiation within several meters [yards] of the surface. This puts any living cells beyond the reach of today's best drills.

The study, to be published 30 January in the journal *Geophysical Research Letters*, maps cosmic radiation levels at various depths, taking into account surface conditions in various areas of Mars. The lead author, Lewis Dartnell of University College London, said: "Finding hints that life once existed - proteins, DNA fragments, or fossils - would be a major discovery in itself, but the Holy Grail for astrobiologists is finding a living cell that we can warm up, feed nutrients, and reawaken for studying."

The UK's best selling astronomy magazine

Astronomy

April 2007, £3.25

INDEX

life with

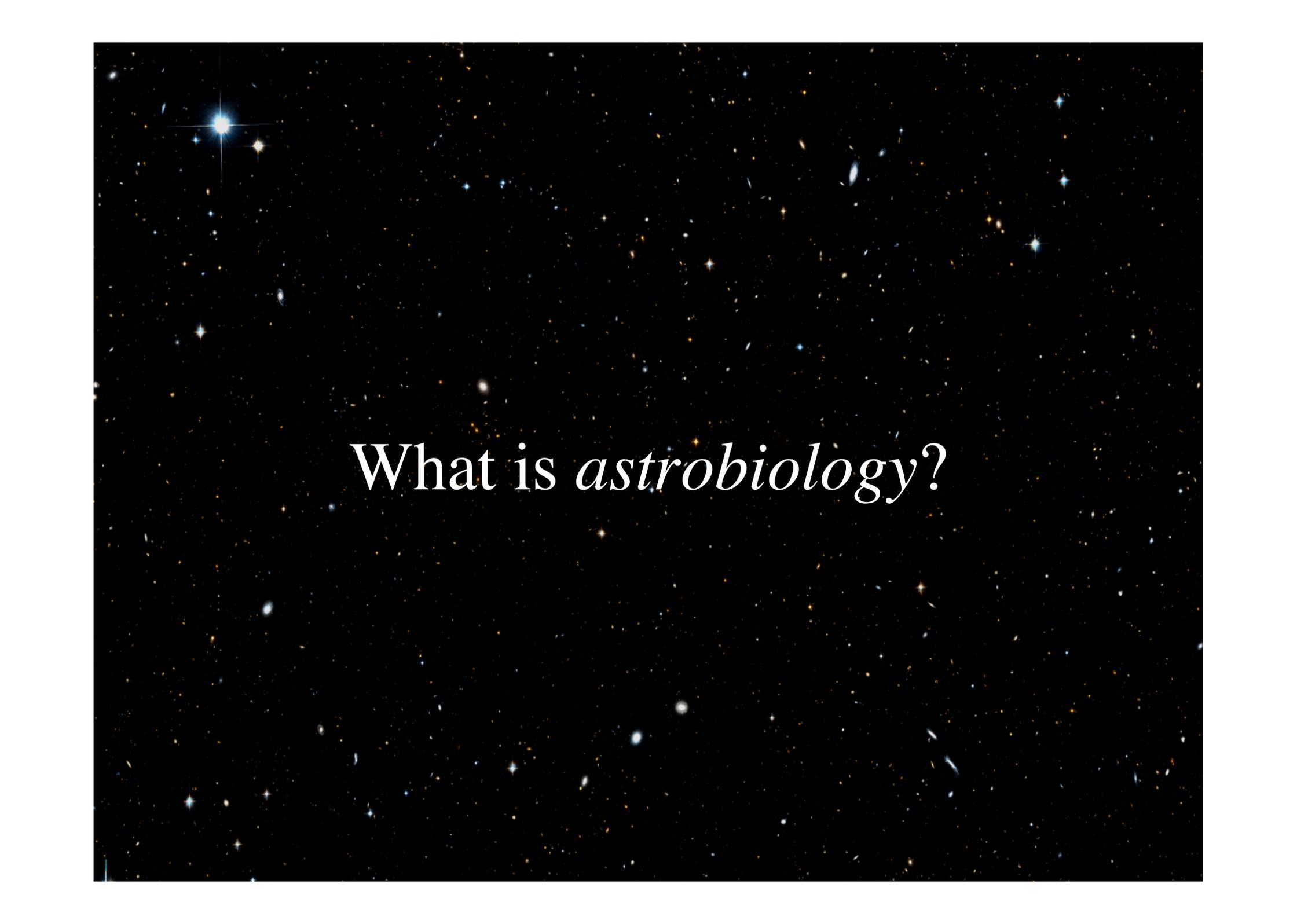
Icy lakes may be the best refuge for Martian life

Planetary scientists have announced that the icy lakes such as the one recently discovered, near Elysium Planitia at the Martian equator, may be the best places to find any signs of Martian life. Mars is buffeted every second by high doses of radiation that is likely to kill any life that has not found suitable shelter. This new research suggests that a layer of ice may be all that is needed to preserve any primitive cells. The eggs of scientists modelled several kilometres on Mars for where life may be lurking, and the model for life beneath a layer of ice came out on top. Lewis Dartnell from University College London and lead author of the paper

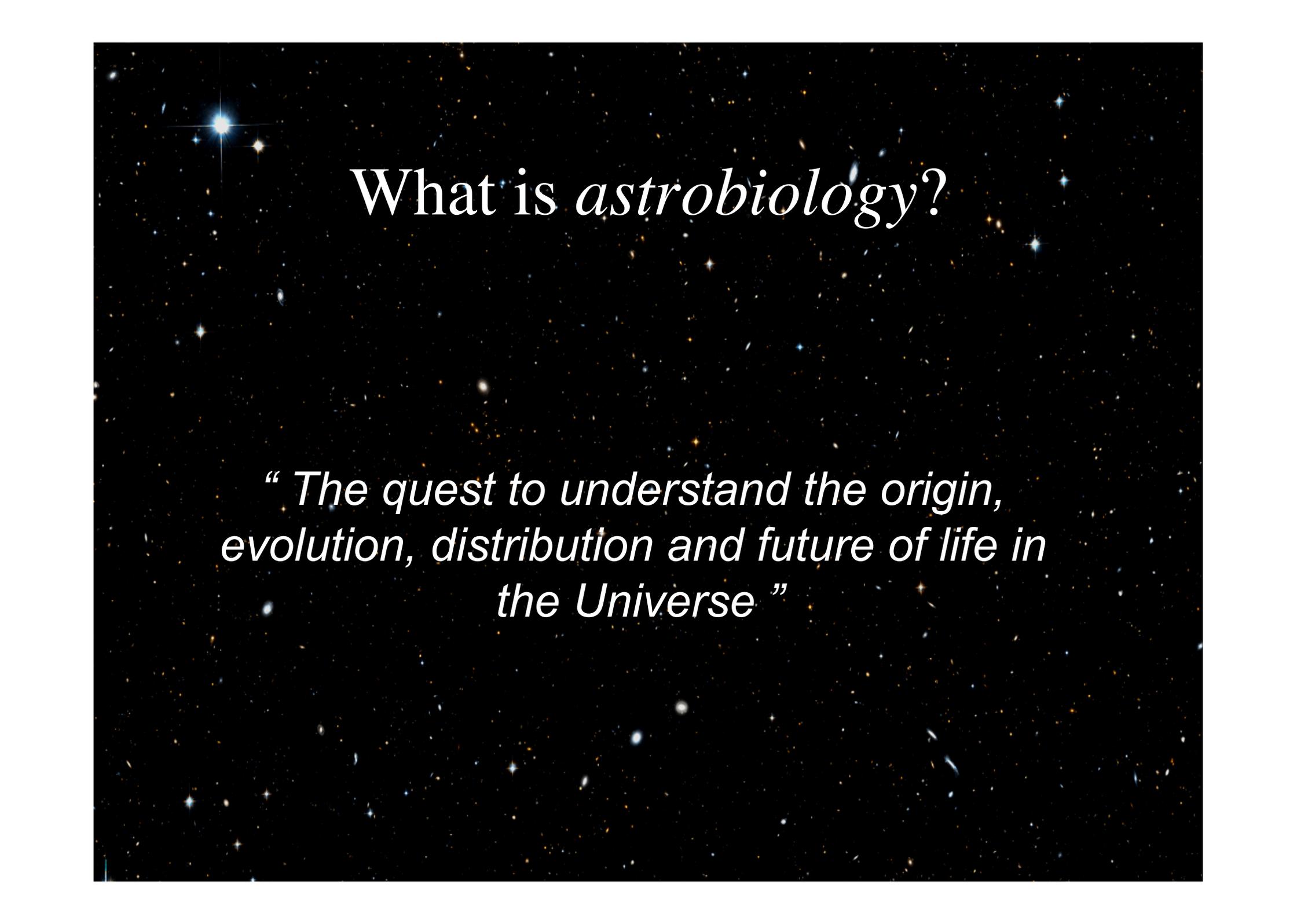
describing the research believes that the results may help direct the future robotic exploration of Mars. "Although finding biosignatures, or signs of previous life, would obviously be ground-breaking, the Holy Grail for astrobiologists is to find surviving cells that can be reanimated with a little warming and some nutrients and be studied alive," he says. But radiation from space would destroy any life near the surface of Mars. "It just isn't plausible that dormant life is still surviving within the first couple of metres below the surface." Finding dormant microbes may prove quite tricky for the next generation of Martian drilling missions, such as

ESA's ExoMars, which will drill down two metres. But according to Dartnell, at many locations across Mars the chances of finding life at that depth is slim and future missions may have to drill down several kilometres to find anything. The advantage of the Elysium location is that it is a geothermal hot spot and may allow conditions for life closer to the surface. "Our research tells us that the next generation of Mars landers will need to drill deeper than two metres, or else land in very inaccessible locations such as the bottom of recent impact craters or sites of recent liquid water flow," says Dartnell.

Underneath dark ice in the Elysium region of Mars may be habitats for native Martian life. Image: ESA/DLR/FU Berlin/G. Neukum



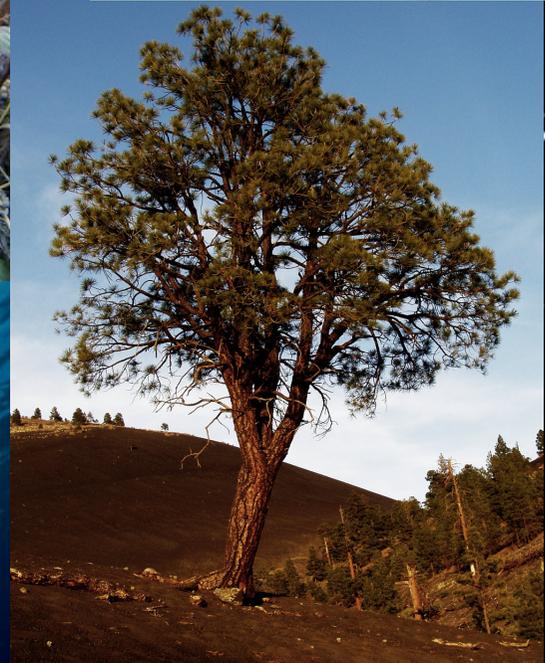
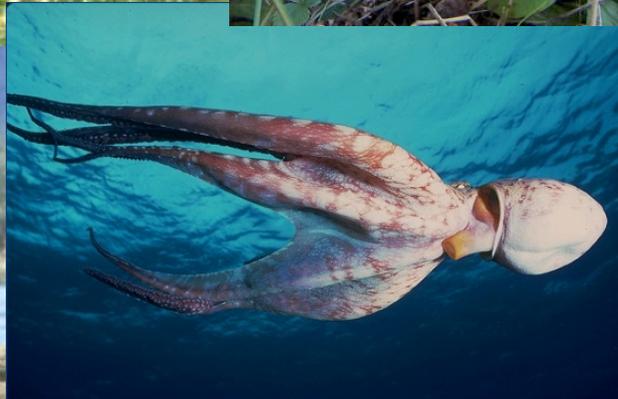
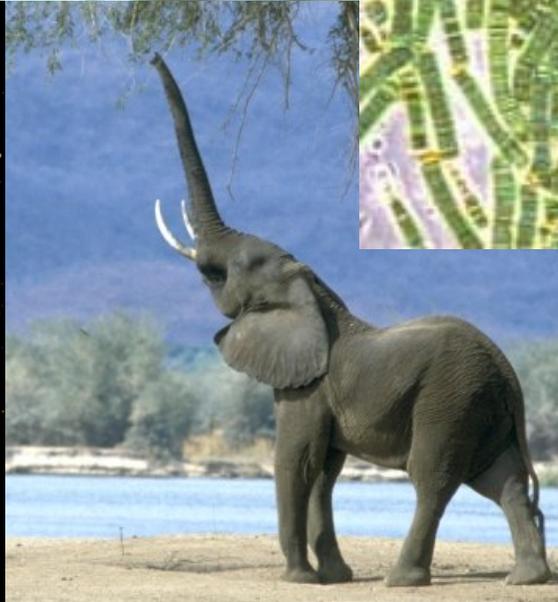
What is *astrobiology*?



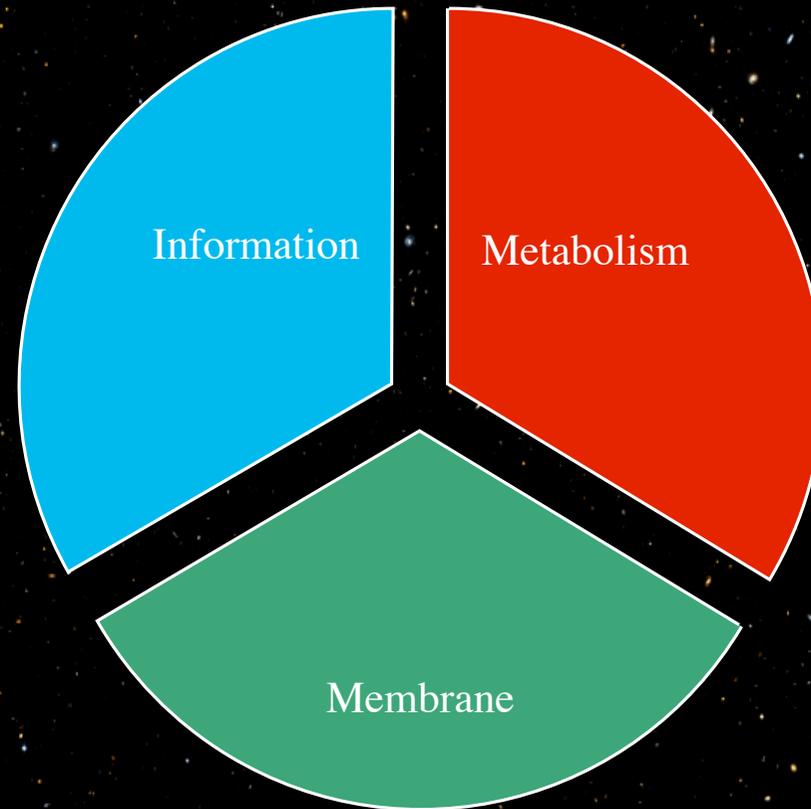
What is *astrobiology*?

“ The quest to understand the origin, evolution, distribution and future of life in the Universe ”

What is 'life' ?

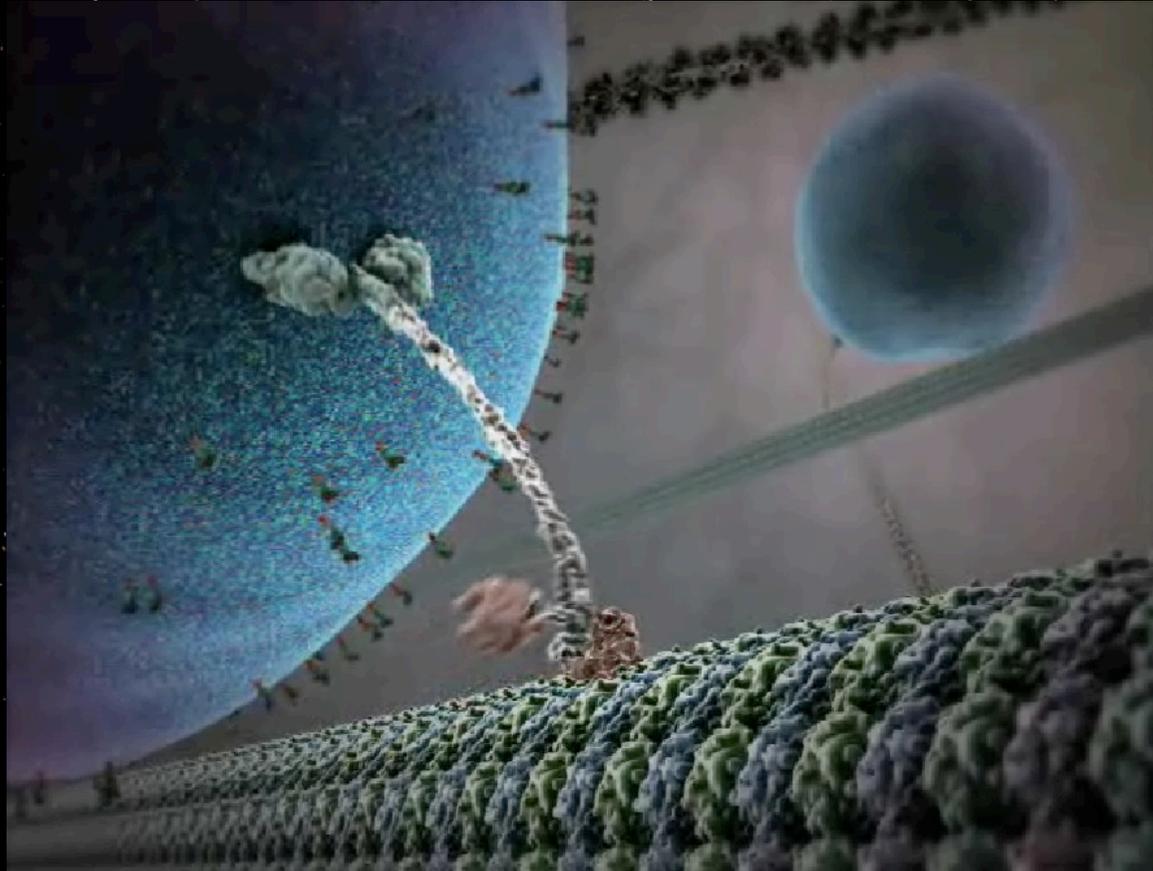


What is life?

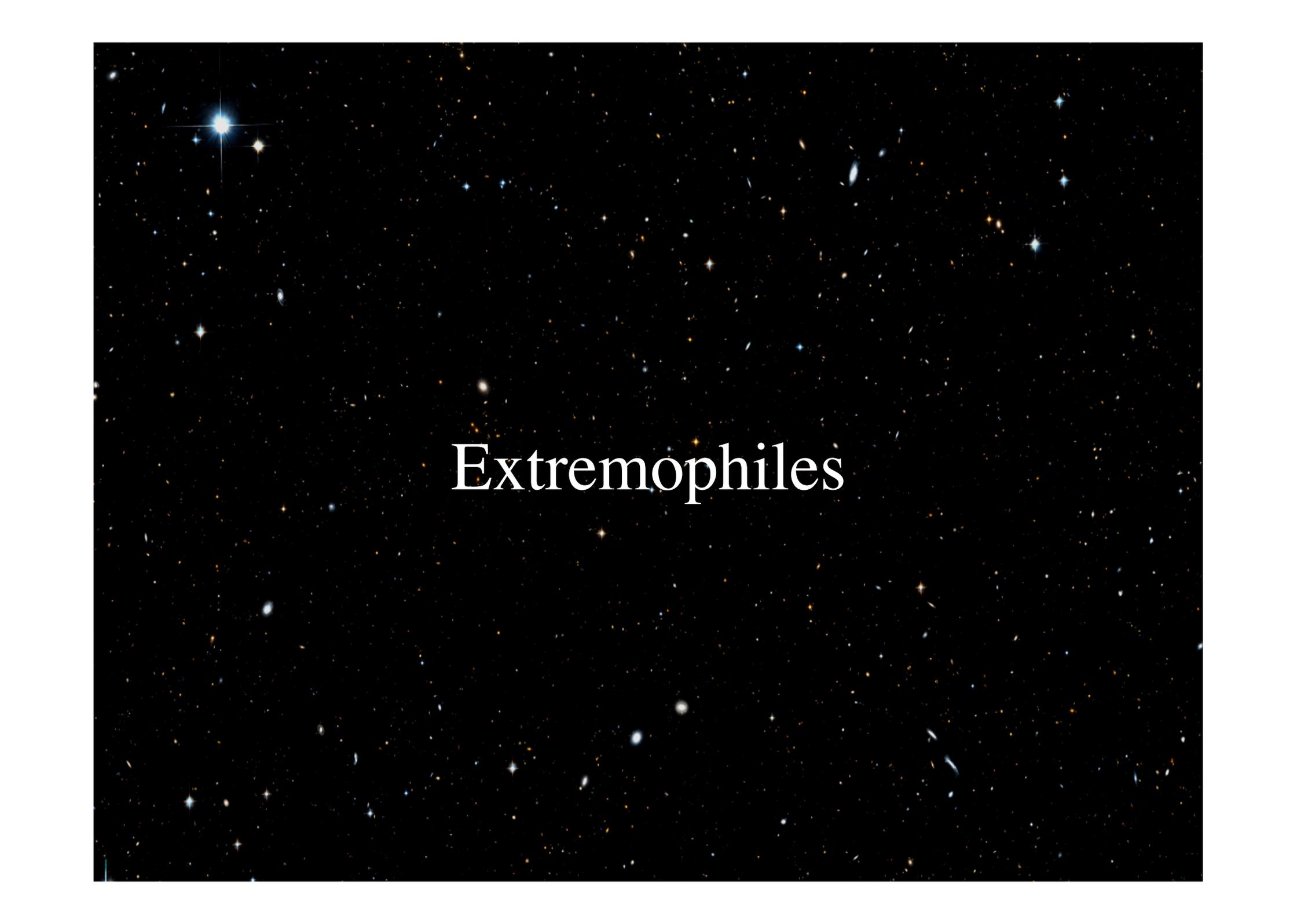


A self-sustaining system able to process information and extract energy from the environment to maintain its own complexity and replicate.

Complexity of life

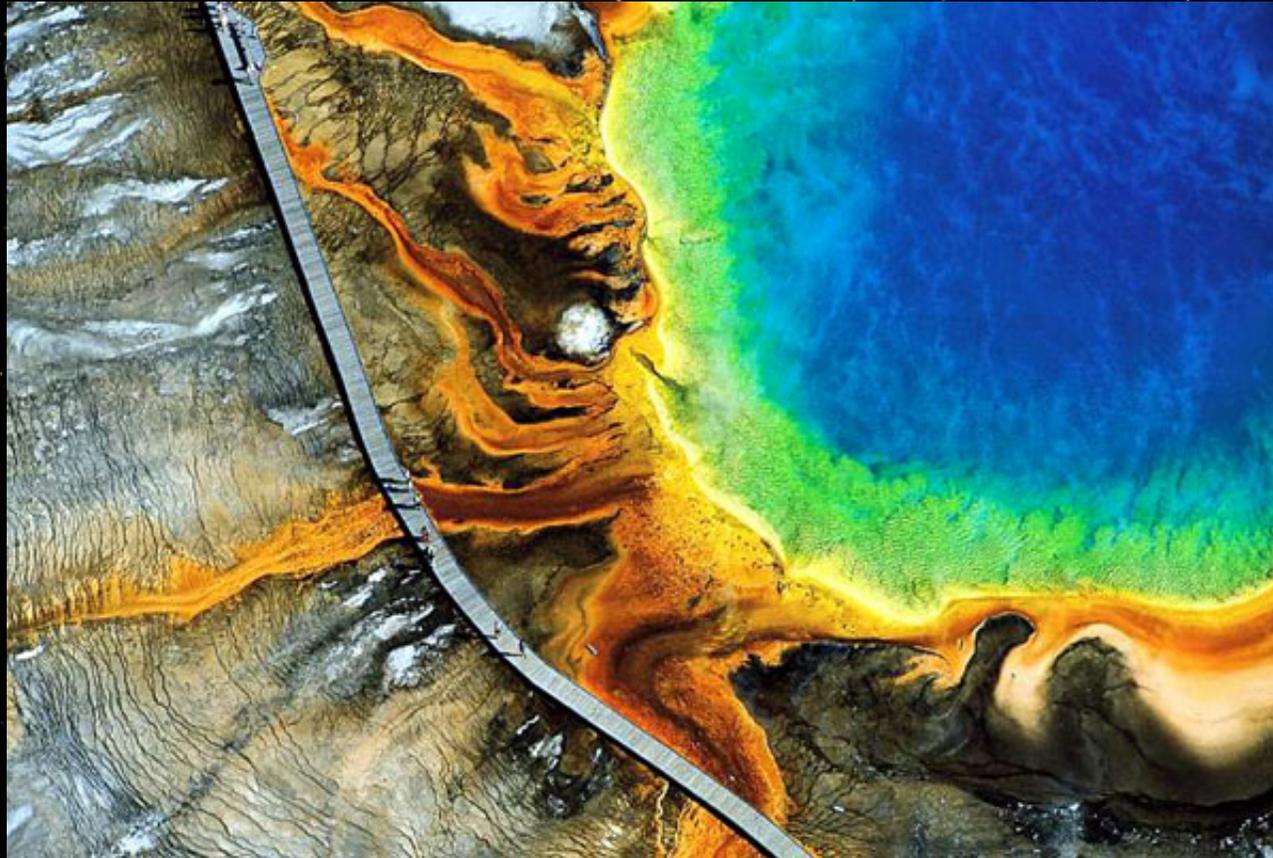




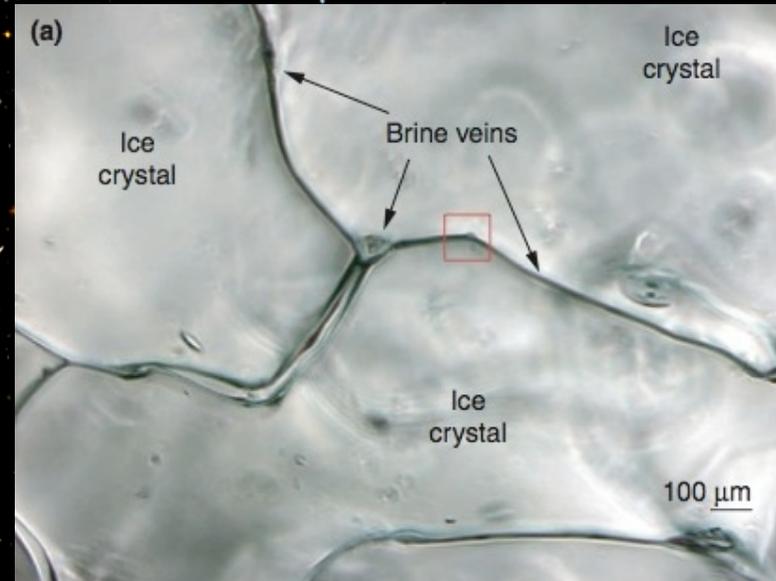
A vast field of stars in space, with the word "Extremophiles" centered in white text. The stars are of various colors, including blue, white, and yellow, and are scattered across a dark background. The text is in a serif font and is the central focus of the image.

Extremophiles

Thermophiles & Acidophiles



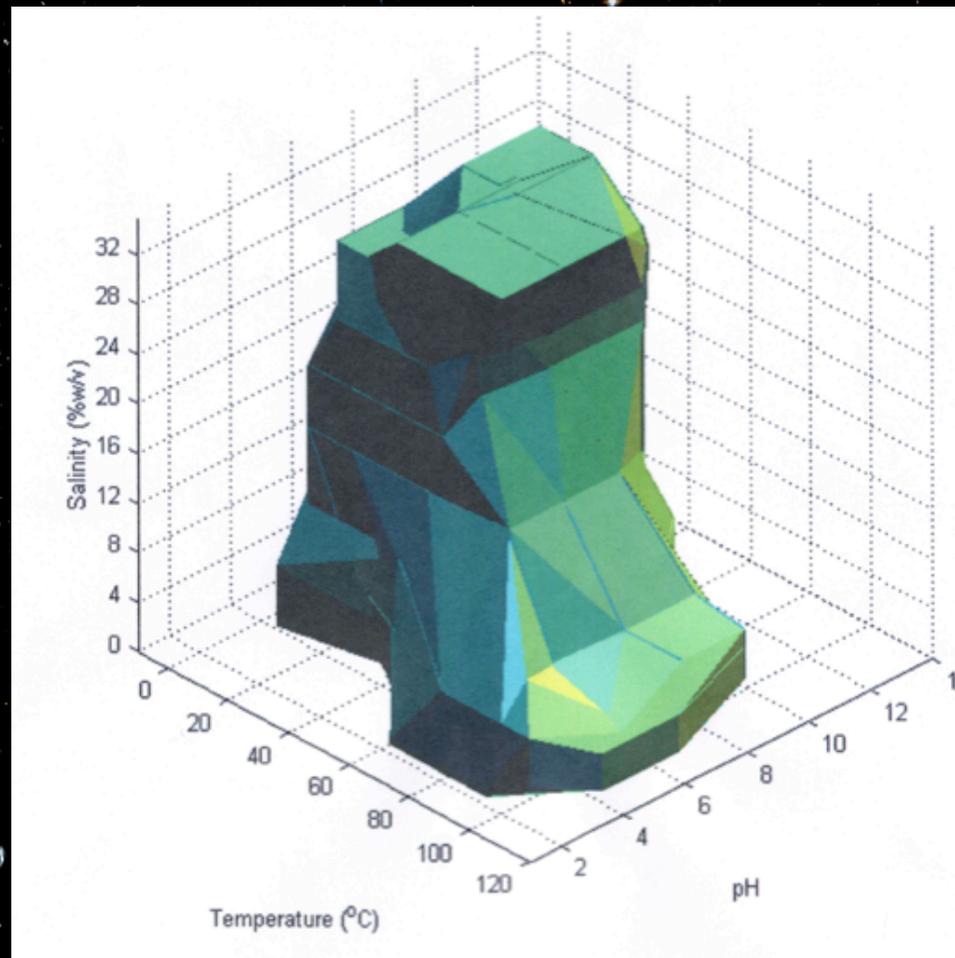
Psychrophiles



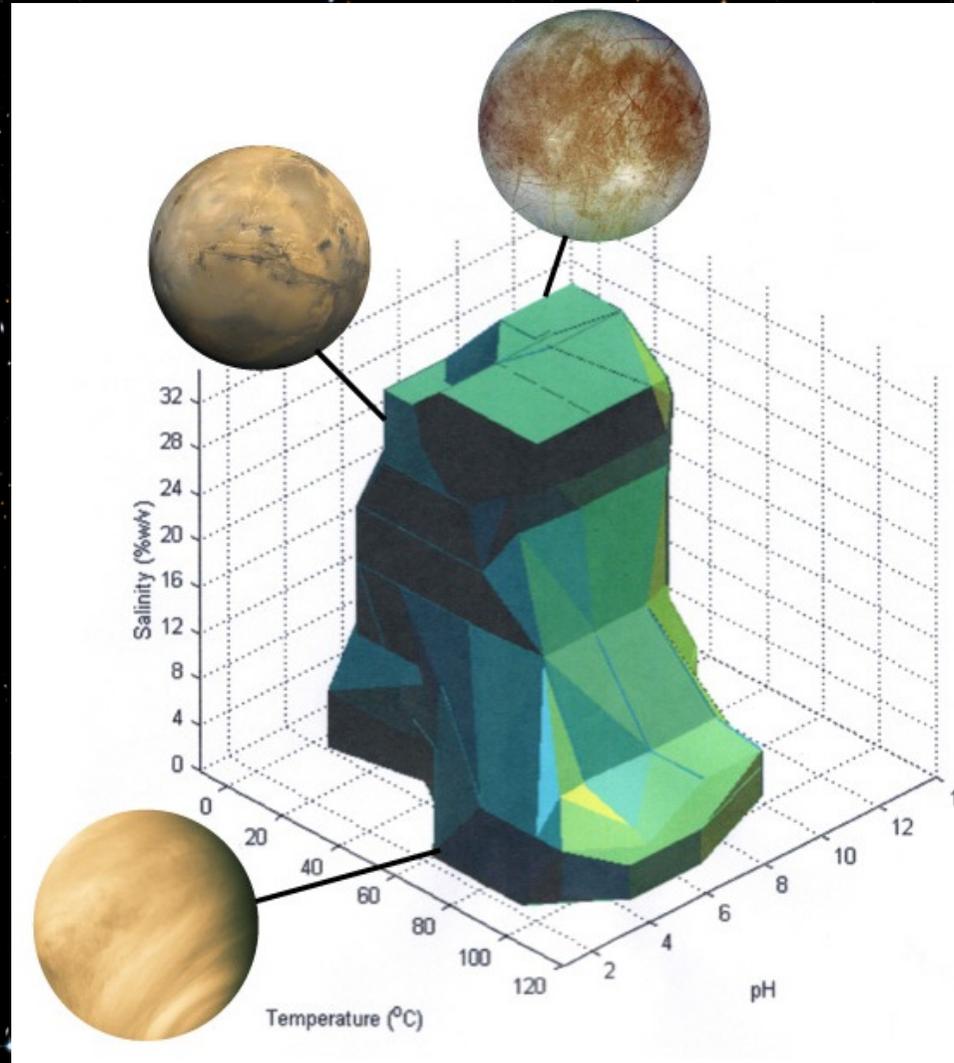
Methane worm

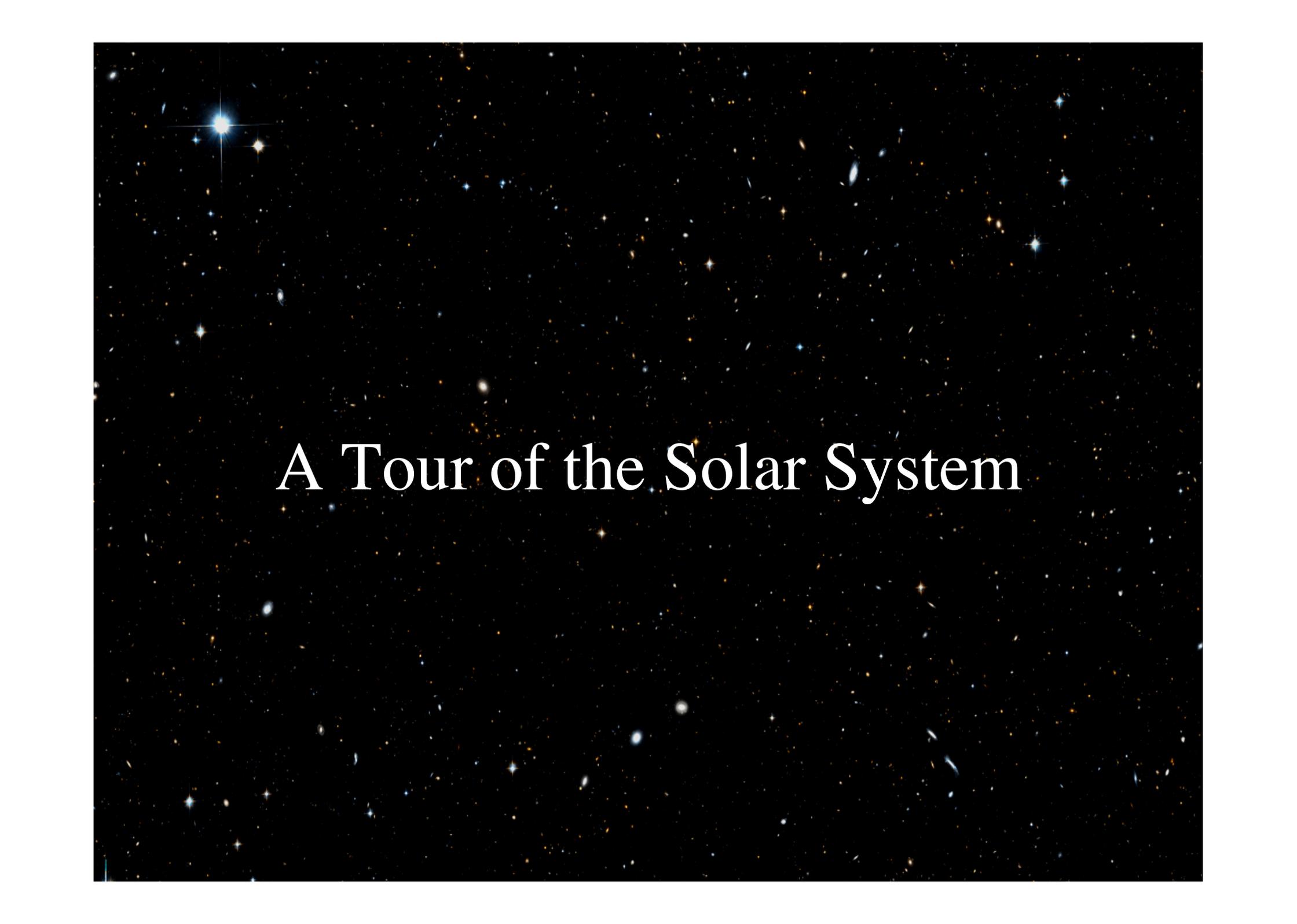


Envelope of life

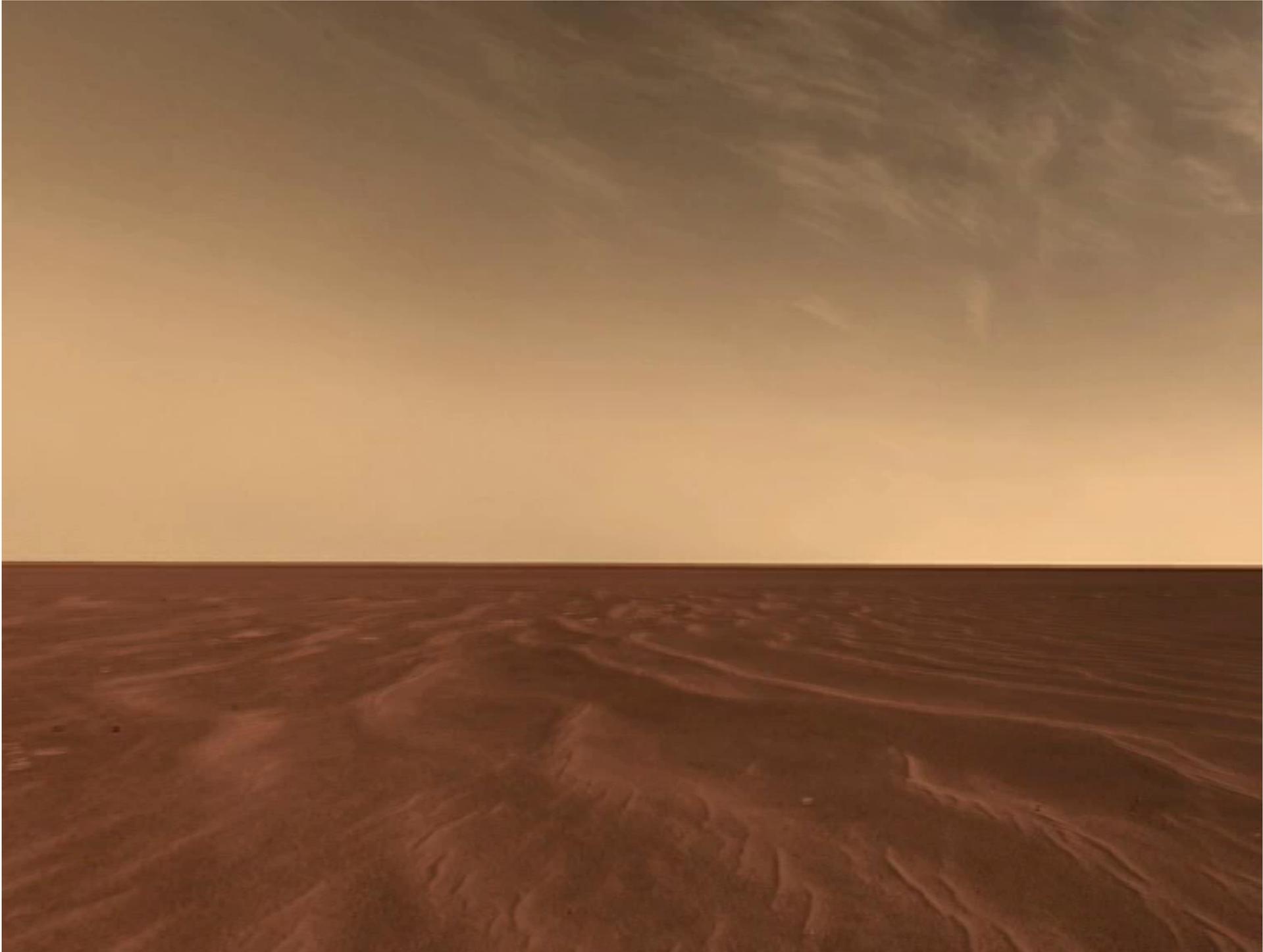


Envelope of life



A deep space photograph of a star field, likely the Pleiades, with the text 'A Tour of the Solar System' centered in white serif font. The stars are of various colors, including blue, white, and yellow, set against a dark black background.

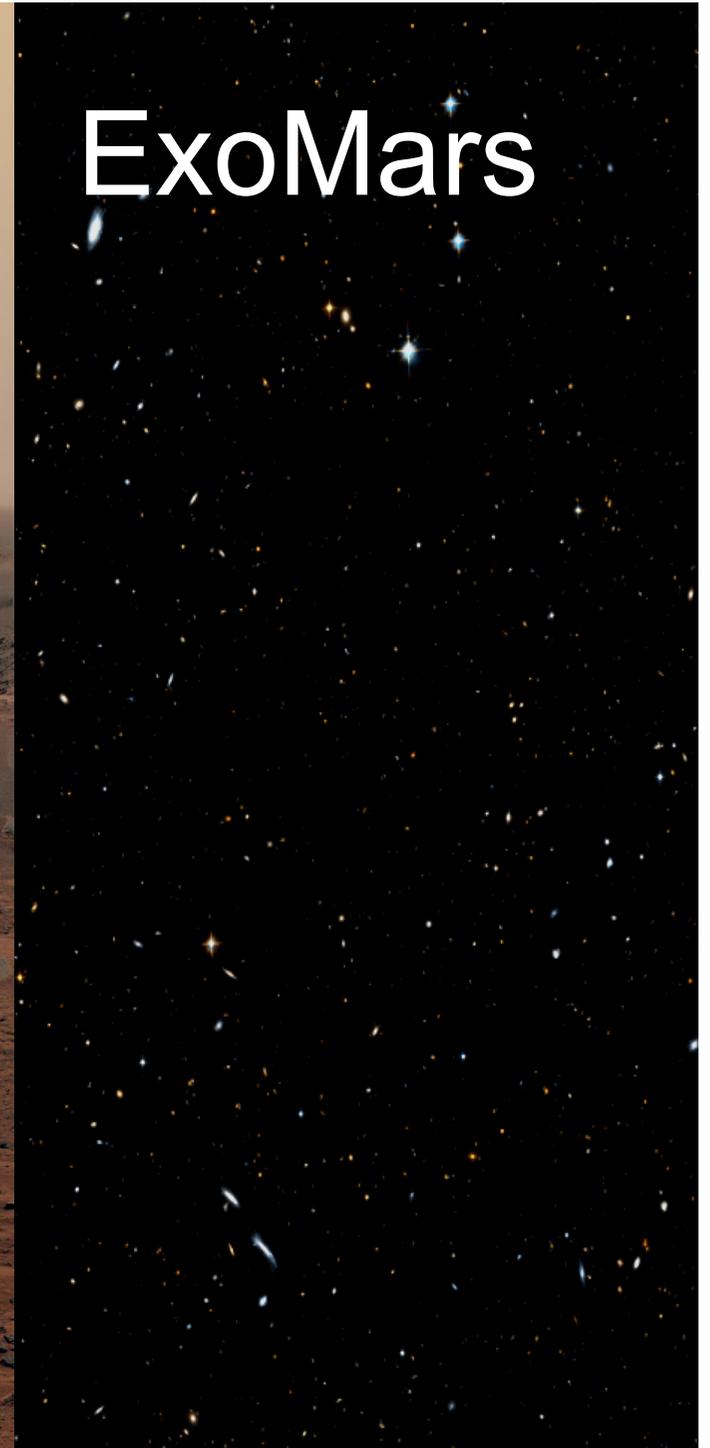
A Tour of the Solar System



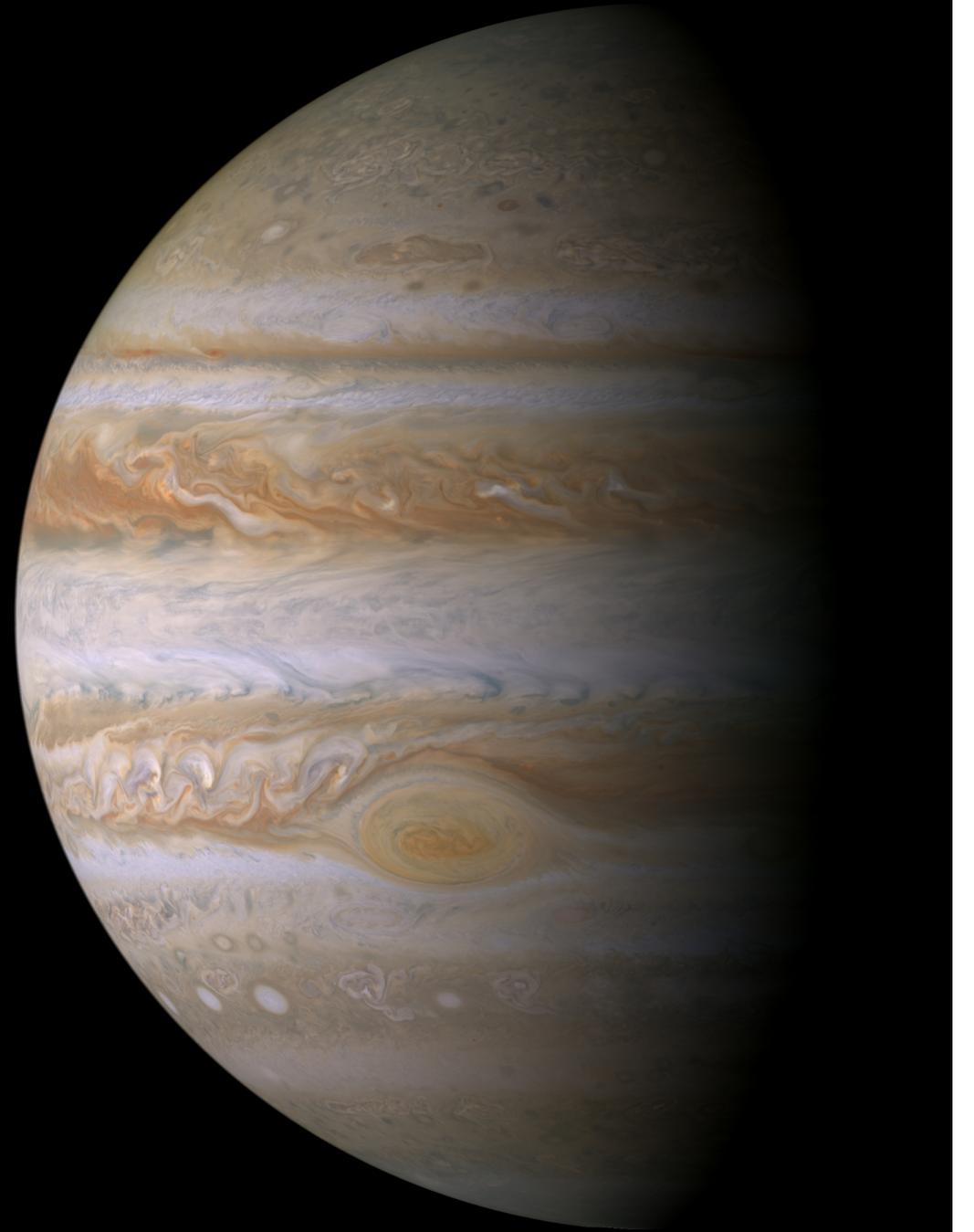
Mars



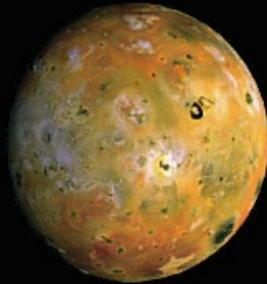
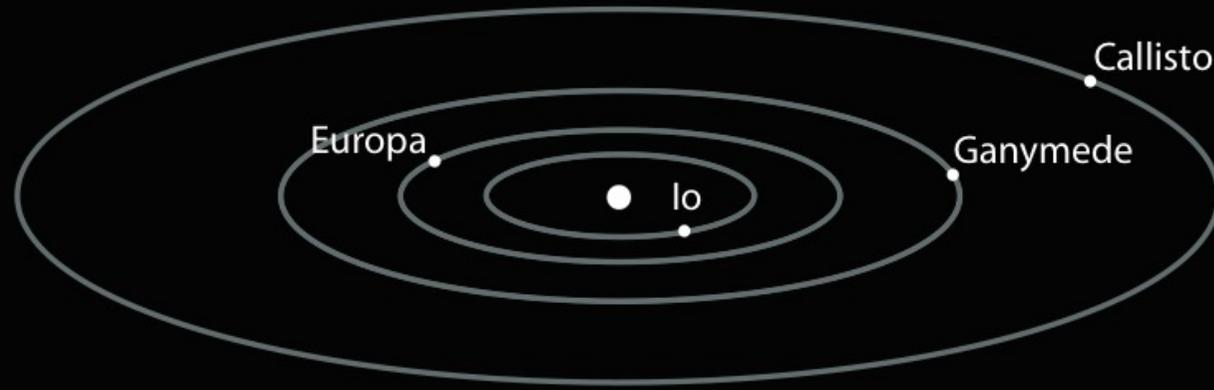
ExoMars



Jupiter system



Galilean satellites



Io



Europa

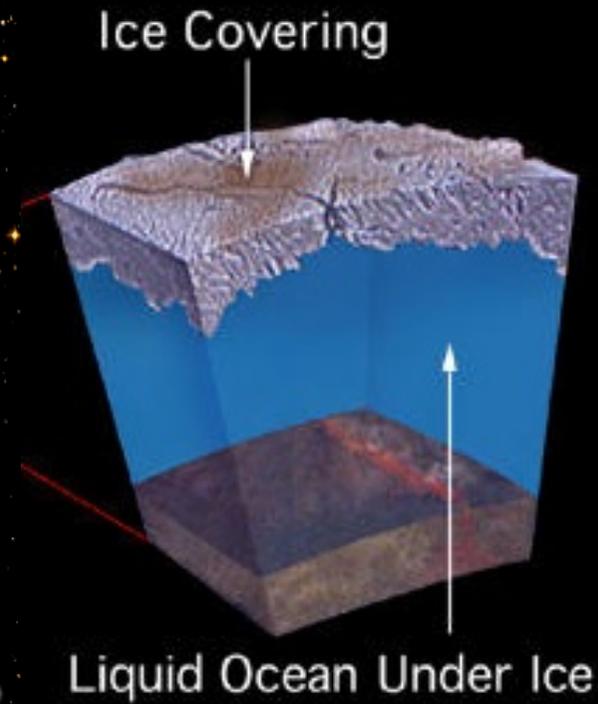
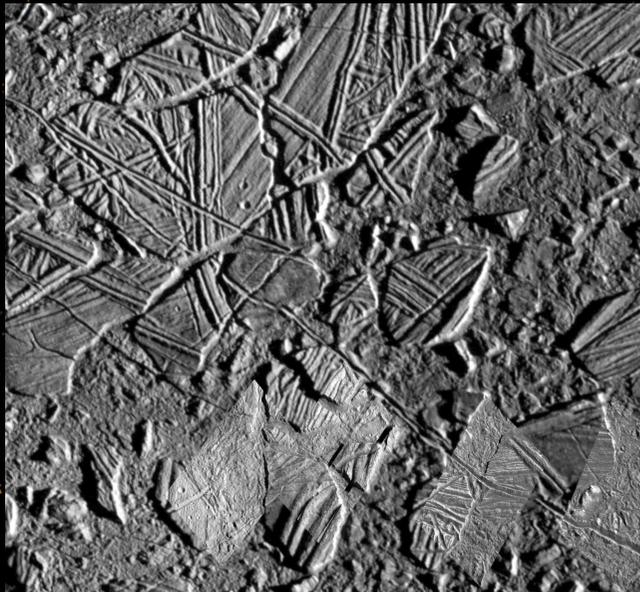


Ganymede



Callisto

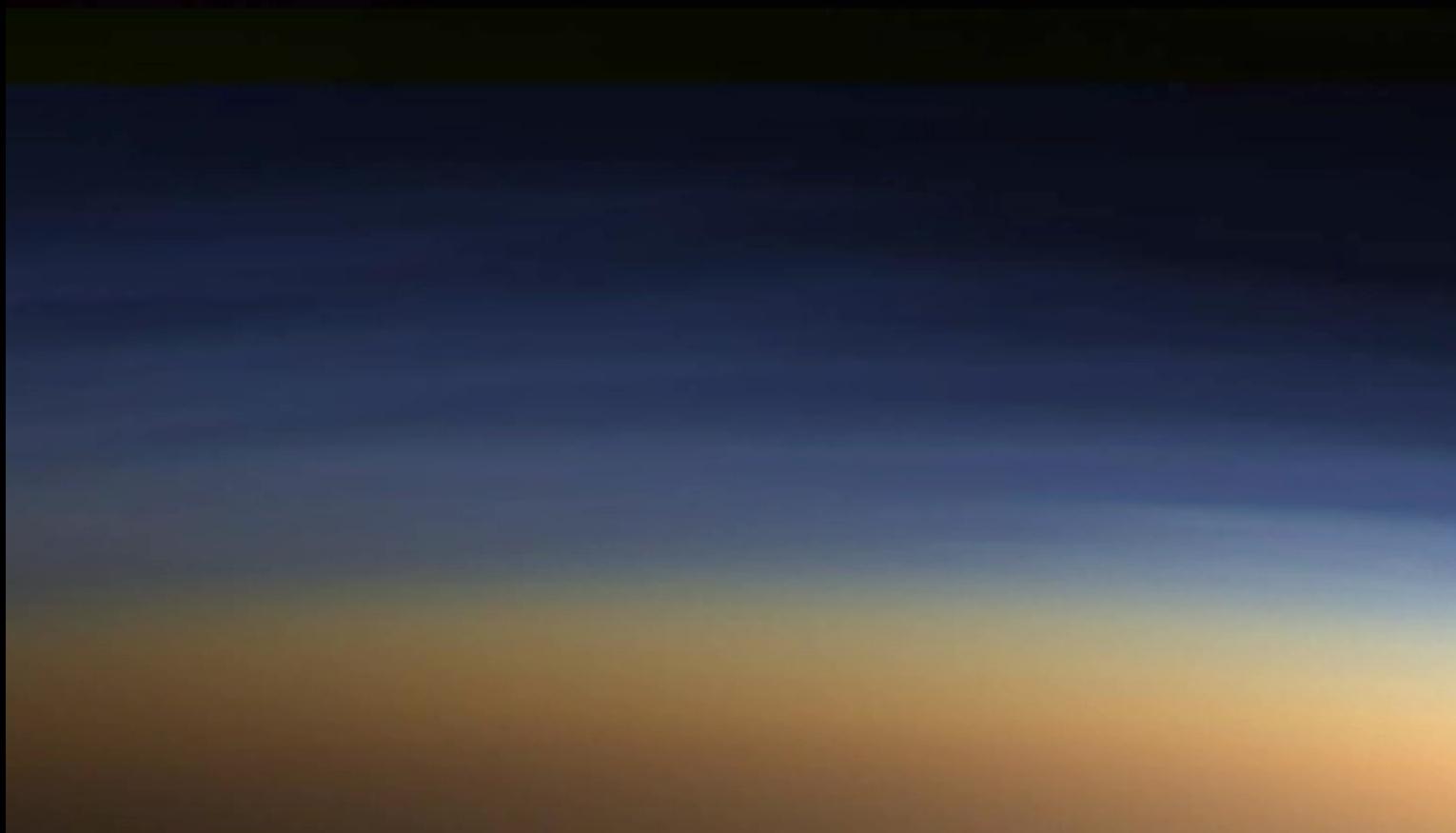
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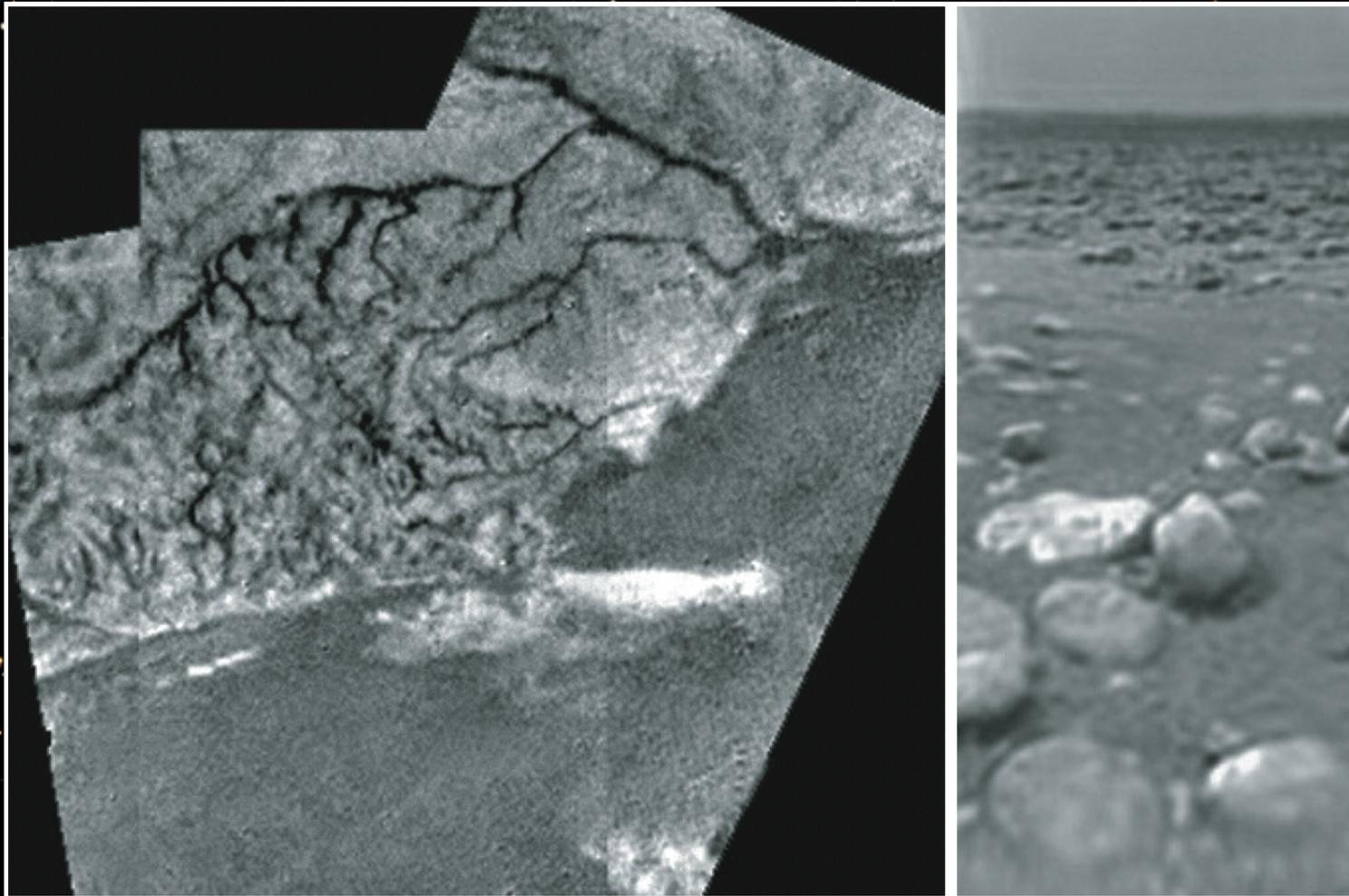
Saturn system



Titan



A Hidden World

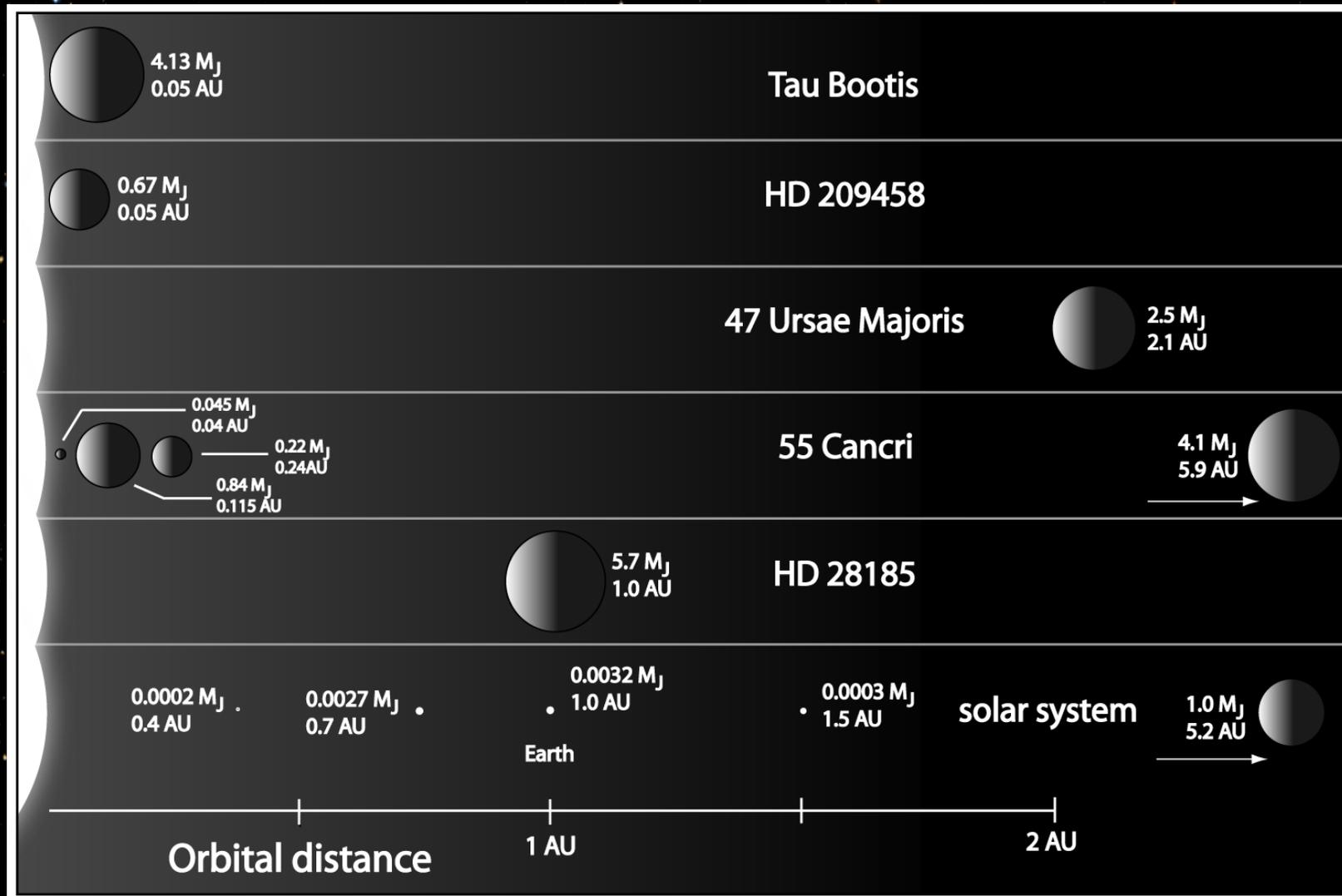


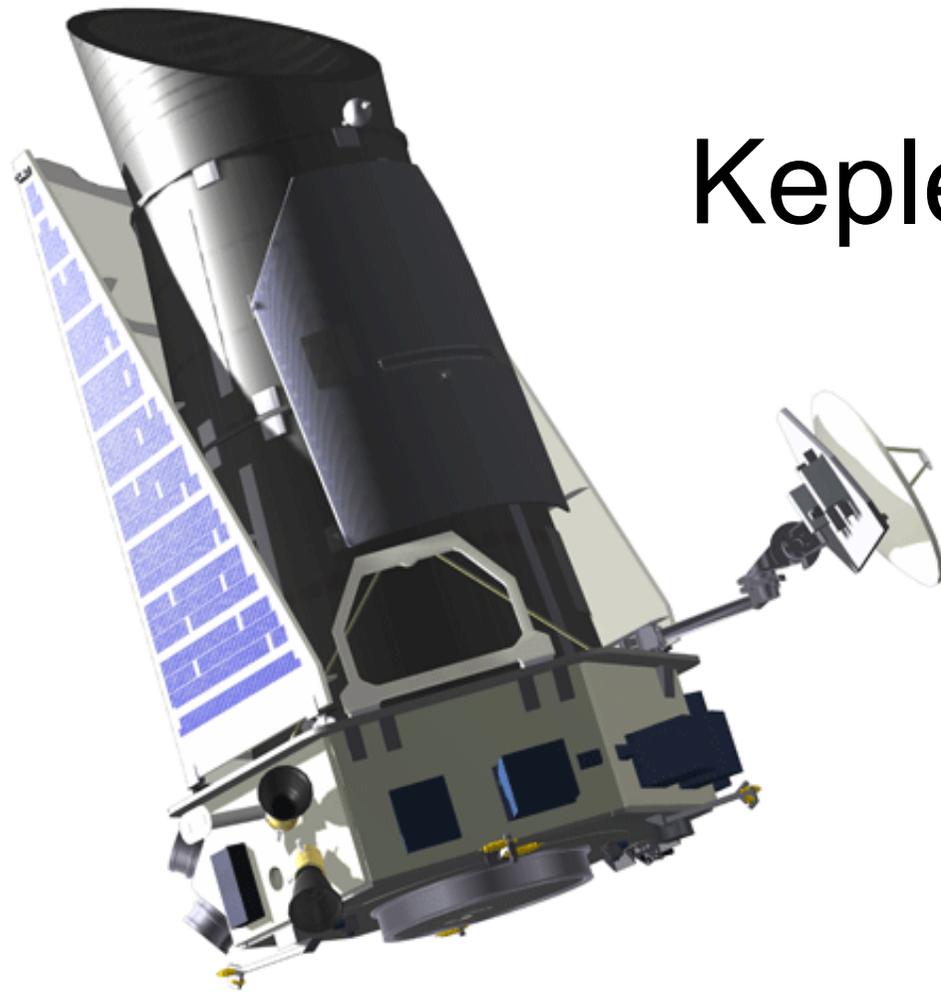
Our local galaxy



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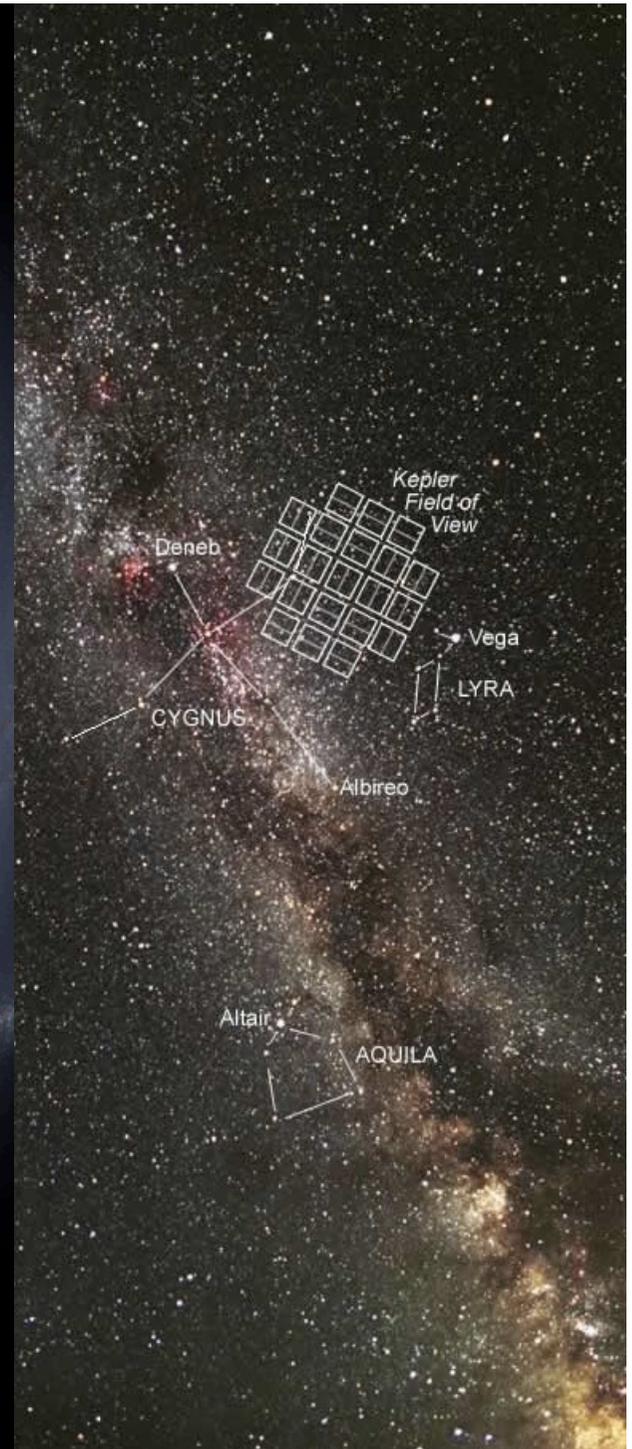
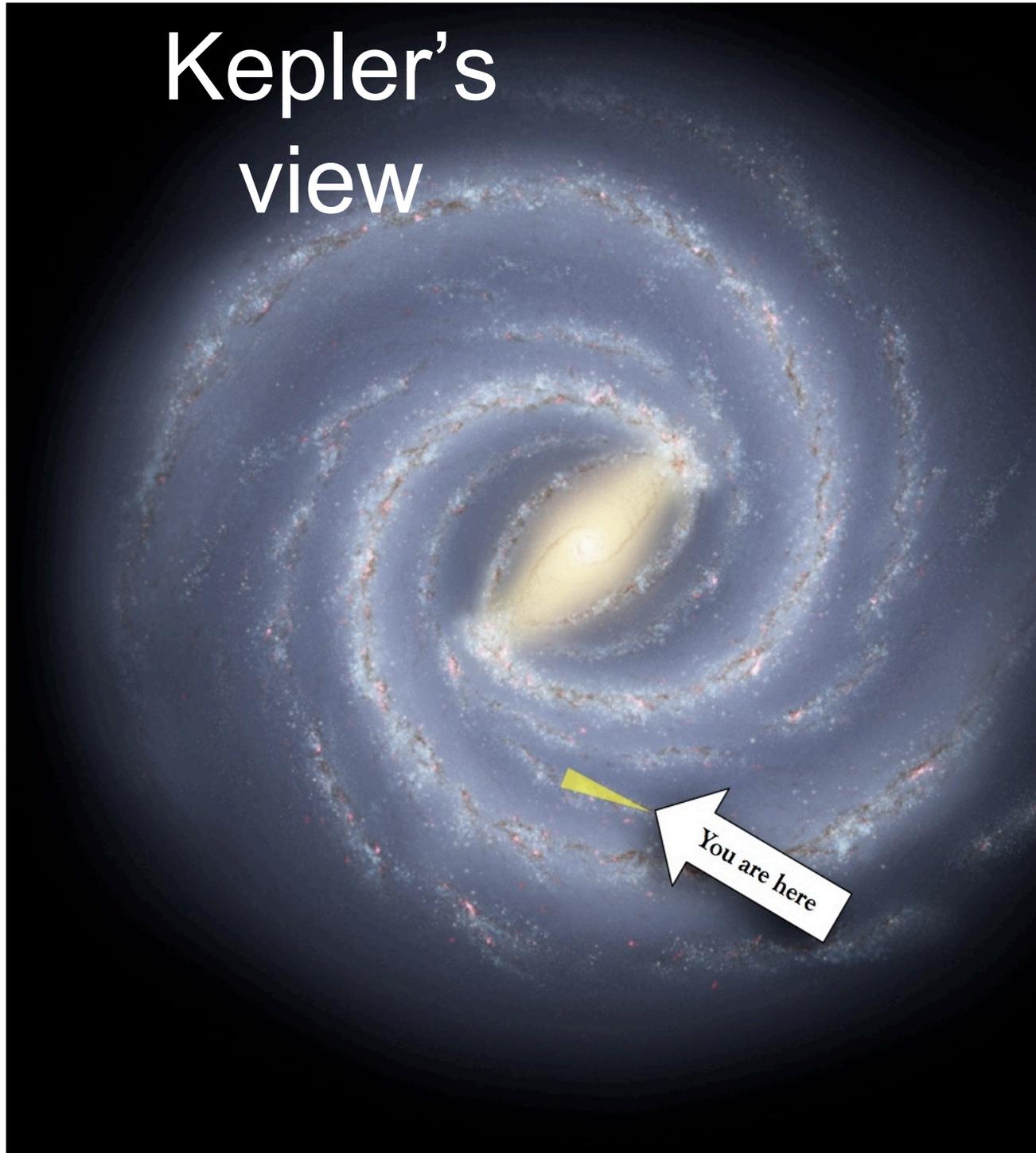
Alien solar systems





Kepler

Kepler's view





A Second Earth

Hubble Deep Field





... questions ?

