

- Mark your confusion.
- Purposefully annotate the article (1-2 mature, thoughtful responses per page to what the author is saying)
- Write a 250+ word response to the article.

(If you are a teacher or student who would like to modify this Google Doc, go to File > Make a Copy. I cannot and do not respond to Share requests -- my apologies!)

Why are more countries becoming interested in Mars?

By *The Week* Staff, July 26, 2020

Three countries just launched unmanned missions to the Red Planet in hopes of finding evidence of life. Why the fascination with Mars? Here's everything you need to know:

Who's going to Mars?

The United Arab Emirates kicked off a trio of missions with the July 19 launch of its orbiter, Hope. China followed four days later with Tianwen-1 (literally "Questions to Heaven"), a three-pronged mission that includes a lander, a rover, and an orbiter. NASA concluded the fireworks on July 30 with Perseverance, designed to put the largest, most sophisticated rover yet on Mars. Each of the new missions will arrive at Mars in February, with both NASA and China looking for evidence that there is current microbial life under the surface or that such life once existed there. Such a finding would be "extraordinary" and indicate life may exist in many other places in the universe, said Dr. Sarah Johnson, a planetary scientist at Georgetown University. In a memoir called *Sirens of Mars*, Johnson writes about how the search for life on the planet inspired her to become a planetologist. Mars, she writes, has long been humanity's "mirror, our foil, a telltale reflection of what has been deepest in our hearts. Mars has been a blank canvas. And tenderly, our human seeking has rushed to fill it."

What is so interesting about Mars?

The fourth planet from the sun is more like Earth than any of the others. It's about half our planet's size, has variable seasons, polar ice caps, and plains and gullies possibly shaped by water flow. "All of that," said David Weintraub, a professor of astronomy at Vanderbilt University, "made it easy for us to tell ourselves that life was likely to have emerged there." At the same time, its relative proximity — in October, it will swing to within 38.6 million miles of Earth — has made it seem within reach of a space mission. The interest in Mars was ignited in 1877, when the Italian astronomer Giovanni Schiaparelli noted a series of mysterious lines seemingly etched into the Martian surface. He described them as canali, which literally means "channels" but was mistranslated into "canals," carrying the hint they had been constructed by intelligent life. The idea was seized upon some 20 years later by the influential American astronomer Percival Lowell, who theorized that the canals were created by an ancient, dying civilization to channel water as the Martian surface dried into the red desert it is today. The canals "run for thousands of miles in an unswerving direction, as far relatively as from London to Bombay," Lowell wrote. Later, the lines were proved to be nothing more than an optical illusion.

Which nation got there first?

In July 1965, NASA achieved the first successful fly-by with a craft called Mariner 4. During ensuing decades, the U.S. and the Soviet Union periodically dispatched orbiters and landers to the planet. During the late 1990s, NASA's Mars Global Surveyor discovered dry riverbeds and evidence of glacial activity — suggesting that water once existed in abundance on Mars. Since water is associated with life, the finding reignited interest in Mars; in subsequent years, the U.S., Russia, China, and other nations sent nearly 20 missions there. NASA's Curiosity rover has been exploring the planet since 2012.

Have we found life?

No, although the question isn't without controversy. The 1976 NASA mission discovered four samples that registered as positive for microbial respiration, but a subsequent test found no signs of organic matter. Most scientists attribute the positives to a quirk of soil chemistry. Still, Curiosity has found evidence of organic compounds hinting at the past or current presence of microbial life. There is hope that Perseverance may finally settle the question. It carries equipment to search for the biological signatures of life, and the rover will drill into the Martian soil and eventually send samples back to Earth. "The goal," said NASA Administrator Jim Bridenstine, "is to discover life on another world."

When will humans go?

NASA's timeline calls for a crewed mission to the moon by 2024, a lunar base by 2028, and flights from the moon base to Mars sometime in the 2030s. SpaceX is planning uncrewed missions to Mars about two years from now; if all goes well, says SpaceX CEO Elon Musk, he may launch a manned mission in 2024. But manned missions still face huge obstacles. On a one-way, five- to 10-month journey to Mars through space, astronauts would be bombarded with so much radiation, it could cause cancer, affect their vision, and even disrupt their central nervous systems. "As it stands today, we can't go to Mars, due to radiation," said physicist Marco Durante. "It would be impossible to meet acceptable dose limits." Scientists also worry about the impact on humans of a prolonged period of reduced gravity and isolation. Musk says the first travelers to Mars must be "prepared to die" on the Red Planet. Still, he said, "it would be an incredible adventure."

The challenge of landing safely

Landing a manned spaceship on Mars will be extremely difficult. The planet's atmosphere is about 100 times thinner than Earth's, making it considerably harder to slow a craft while it hurtles toward the surface at an estimated speed of 13,000 miles per hour. Unmanned landers have overcome this hurdle by using parachutes and inflatables that enable the craft to bounce rather than crash, but current technology doesn't allow for larger, heavier manned craft to land safely this way. Since landing on Mars with the weight of sufficient fuel for a return journey is impractical, NASA has plans for a craft it calls the Mars Ascent Vehicle (MAV). This vehicle will be sent to Mars ahead of time without any fuel, so that it is light enough to land. The MAV would then create its own fuel by squeezing oxygen from the carbon dioxide-heavy Martian atmosphere. Once astronauts land on the planet, NASA's plan calls for them to get aboard the fully self-fueled MAV, launch from the surface, dock with an orbiting craft, and then journey back to Earth.

Response option(s):

- In the first paragraph, Planetologist Dr. Sarah Johnson writes that "Mars... has been a telltale reflection of what is deepest in our hearts." What do you think she means? Is there anything interesting to you about Mars?
- What are some of the biggest obstacles facing human travel to Mars? Why would someone risk being the first astronaut to Mars, given that SpaceX CEO Elon Musk says such a person must be "prepared to die?" Does such a crazy-sounding mission make any sense to you? Explain.
- Summarize any point made in the article and respond.