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## The Power of Perseverance: Mars's Newest Resident Has Arrived

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## Perseverance Rover's Goals:

1. Determine whether life on Mars ever existed by searching for indicators of ancient microbial life.
2. Characterize Mars's current and past climate, and discover what caused its climate to change over time.
3. Characterize Mars's geology, including collecting and documenting samples to be returned to Earth in a future mission.
4. Gather knowledge about the viability of human expeditions to Mars, primarily through experimenting with the instruments on Perseverance.



# The Power of Perseverance

## *Mars's Newest Resident Has Arrived*

Written by Megan McLaughlin  
Illustrated by Averly Sheltraw

**F**ebruary 18, 2021 was a big day. At 3:55 p.m. EST, NASA mission control confirmed that the Perseverance rover had safely touched down on Mars, becoming the planet's newest resident. Perseverance is a part of NASA's Mars Exploration Program, a long-term mission to explore its climate, geology, signs of ancient microbial life, as well as to test the technology in preparation for human exploration.

Perseverance was built at the NASA Jet Propulsion Laboratory in California, the United States (U.S.). It is the largest Mars rover NASA has ever built, weighing 2,260 pounds (1,025 kilograms). The path to constructing and launching Perseverance was a long one. The Perseverance mission was first announced in December 2012, just a few months after the Curiosity rover's successful landing on Mars. After the announcement, NASA scientists thoroughly considered variables such as mission priorities, landing sites, and which instruments would be critical to the achievement of the mission objectives. These decisions were part of the pre-launch phase, as well as were assembling the rover in a contaminant-free environment, transporting the rover from California to Florida, and performing tests before the launch.

After the pre-launch phase came the launch, cruise, arrival, and surface operations. Perseverance launched at 7:50 a.m. EDT on July 30 from the Cape Canaveral Air Force Station in Florida and traveled 309 million miles (497 million kilometers) over the course of 213 days to reach its final destination, the Jezero Crater on Mars.

Perseverance's primary objective is to find signs of microbial life. Scientists believe that 3.5 million years ago, Jezero Crater was a lake that spanned 28 miles (45 kilometers). The crater is home to one of the best-preserved delta deposits on Mars. These deposits have clear inflow and outflow channels, which indicate that the crater undoubtedly held water a long time ago. Therefore, NASA Scientists anticipated that the Jezero Crater — especially the river delta area — had a high potential for containing ancient microbial life.

While Perseverance's landing in the Jezero Crater facilitates scientists' search for ancient microbial life, the scientific aspirations do not stop there. Perseverance is equipped with seven instruments, twenty-three cameras, and two microphones that all serve different purposes in helping the rover pursue her goals. Some of these instruments include Mars Environmental Dynamics Analyzer (MEDA), which monitors the weather and dust level on the surface of Mars, and Radar Imager for Mars's Subsurface Experiment (RIMFAX), which uses radar to see geologic features

under the surface of Mars. Further, it contains Planetary Instrument for X-ray Lithochemistry (PIXL), which has a tiny X-ray tool that can identify the chemical makeup of rocks, and Mars Oxygen In-Situ Resource Utilization Experiment (MOXIE), which produces oxygen from Mars's carbon dioxide-rich atmosphere.

MOXIE is a particularly trailblazing instrument that has significant implications for the future of Mars missions. MOXIE converts carbon dioxide, a resource that makes up about 96 percent of Mars's atmosphere, into oxygen, which is required to launch rockets. MOXIE will demonstrate whether or not rockets can be launched from Mars in the future. If successful, MOXIE would return caches of rocks and deposits that Perseverance will harvest to Earth for future study. Future reworking of MOXIE could also be used to launch astronauts back to Earth from Mars and help with breathing technology. Right now, MOXIE can produce only 0.022 pounds (10 grams) of oxygen per hour — nowhere near close to the tens of metric tons it would take to launch rockets off of Mars. Future MOXIE revisions would need to be built at least 100 times bigger.

Also aboard Perseverance is Ingenuity, a four-pound (1.8 kilograms) helicopter that will make history as the first attempt at powered flight on another planet. Unlike the many instruments that make up Perseverance, Ingenuity is an autonomous aircraft that is not designed to aid Perseverance with its goals for the Mars 2020 missions. Instead, Ingenuity is a project focused on technological innovation; how Ingenuity performs on Mars will determine if robotic scouts are a promising option for future Mars missions. Ingenuity is merely a technological demonstration to see if a powered flight on another planet is viable, but if Ingenuity is successful, future helicopters might offer scientists a new perspective that rovers and orbiters are unable to provide.

Perseverance's anticipated mission duration is at least one Earth year. In that time, Perseverance will collect samples of rocks, specially selected by the rover's instruments, to store in caches in the hopes that they may be returned to Earth in a later mission. Perseverance makes history by being the first rover to collect samples that are intended to be brought back to Earth.

Perseverance builds on the legacy of her predecessors. Spacecrafts have increasingly become more technologically advanced and increasingly more capable of making discoveries—especially ones that point to possibilities of microbial life on Mars. For now, Perseverance's primary objective is to find out whether or not there truly is life on Mars. As @NASAPersevere posted on Twitter on February 18, "Perseverance will get you anywhere." ●●●