National Aeronautics and Space Administration

# Parker Solar Probe

*A Mission to Touch the Sun*

NASAfacts

### *Launch*

- Launch Window: July 31 – August 19, 2018
- Launch Site: NASA's Kennedy Space Center, Florida
- Launch Vehicle: Delta IV-Heavy with Upper Stage

## Humanity's First Visit to a Star

NASA's historic Parker Solar Probe mission will revolutionize our understanding of the sun. The mission is named for Dr. Eugene Parker, whose discovery of the solar wind and other profound contributions have transformed our knowledge of the sun. Parker Solar Probe will plunge through the sun's atmosphere, closer to the surface than any spacecraft before it, facing brutal heat and radiation conditions—and ultimately providing humanity with the first-ever close-up view of a star.

## Journey to the Sun

To unlock the mysteries of the sun's atmosphere, Parker Solar Probe will use seven Venus flybys over nearly seven years to gradually reduce its orbit around the sun. The spacecraft will come as close as 3.9 million miles (6.2 million kilometers) to our star, well within the orbit of Mercury and more than seven times closer than any spacecraft has come before.

Flying into the outermost part of the sun's atmosphere, known as the corona, for the first time, Parker Solar Probe will employ a combination of in situ measurements and imaging to revolutionize our understanding of the corona and expand our knowledge of the origin and evolution of the solar wind. It will also make critical contributions to our ability to forecast changes in Earth's space environment that impact life and technology on Earth.

## Extreme Exploration

Parker Solar Probe will perform its scientific investigations in a hazardous region of intense heat and solar radiation. The spacecraft will fly close enough to the sun to watch the solar wind speed up from subsonic to supersonic, and it will fly though the birthplace of the highest-energy solar particles.

To perform these unprecedented investigations, the spacecraft and instruments will be protected from the sun's heat by a 4.5-inch-thick (11.43-centimeter-thick) carbon-composite shield, which will need to withstand temperatures outside the spacecraft that reach nearly 2,500 degrees Fahrenheit (1,377 degrees Celsius).

## The Science of the Sun

The primary science goals for the mission are to trace how energy and heat move through the solar corona and to explore what accelerates the solar wind as well as solar energetic particles. Scientists have sought these answers for more than 60 years, but the investigation requires sending a probe right through the extreme heat (almost 10,000 degrees Fahrenheit or 5,530 degrees Celsius) of the outer corona. Such a probe is finally possible today through cutting-edge thermal engineering advances that can protect the spacecraft on its dangerous journey. Parker Solar Probe will carry four instrument suites designed to study magnetic fields, plasma, and energetic particles, as well as image the solar wind.

## Teaming for Success

Parker Solar Probe is part of NASA's Living With a Star program to explore aspects of the sun–Earth system that directly affect life and society. The Living With a Star flight program is managed by the agency's Goddard Space Flight Center in Greenbelt, Maryland, for NASA's Science Mission Directorate in Washington, D.C. The Johns Hopkins University Applied Physics Laboratory is designing, building, and will operate the spacecraft, and manages the mission for NASA.

## Eugene Newman Parker

In the mid-1950s, a young physicist named Eugene Parker proposed a number of concepts about how stars—including our sun—give off energy. He called this cascade of energy the solar wind, and he described an entire complex system of plasmas, magnetic fields, and energetic particles that make up this phenomenon. Parker also theorized an explanation for the superheated solar corona, which is (against physical laws) hotter than the surface of the sun itself: nanoflares, which in enough abundance could cause this heating.

More than half a century later, the Parker Solar Probe mission will finally be able to find proof for Parker's groundbreaking theories and ideas, which have informed scientists about solar physics and magnetic fields around stellar bodies. Much of his pioneering work, which has been proven by subsequent spacecraft, defined a great deal of what we know about the how the sun–Earth system interacts.

Born on June 10, 1927, in Michigan, Parker received a B.S. in physics from Michigan State University and a Ph.D. from Caltech in 1951. He then taught at the University of Utah, and since 1955, Parker has held faculty positions at the University of Chicago and at its Fermi Institute.

He has received numerous awards for his research, including the George Ellery Hale Prize, the National Medal of Science, the Bruce Medal, the Gold Medal of the Royal Astronomical Society, the Kyoto Prize, and the James Clerk Maxwell Prize.

At closest approach, Parker Solar Probe will hurtle around the sun at approximately 430,000 miles per hour (700,000 kilometers per hour). That's fast enough to get from Philadelphia to Washington, D.C., in one second.

At closest approach to the sun, the front of Parker Solar Probe's solar shield will face temperatures approaching 2,500 degrees Fahrenheit (1,377 degrees Celsius). The spacecraft's payload will be near room temperature.

On the final three orbits, Parker Solar Probe will fly to within 3.9 million miles (6.2 million kilometers) of the sun's surface—more than seven times closer than the current record-holder for a close solar pass, the Helios 2 spacecraft, which came within 27 million miles (43 million kilometers) in 1976.

For more information about Parker Solar Probe, visit:

**nasa.gov/solarprobe**
**solarprobe.jhuapl.edu**



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