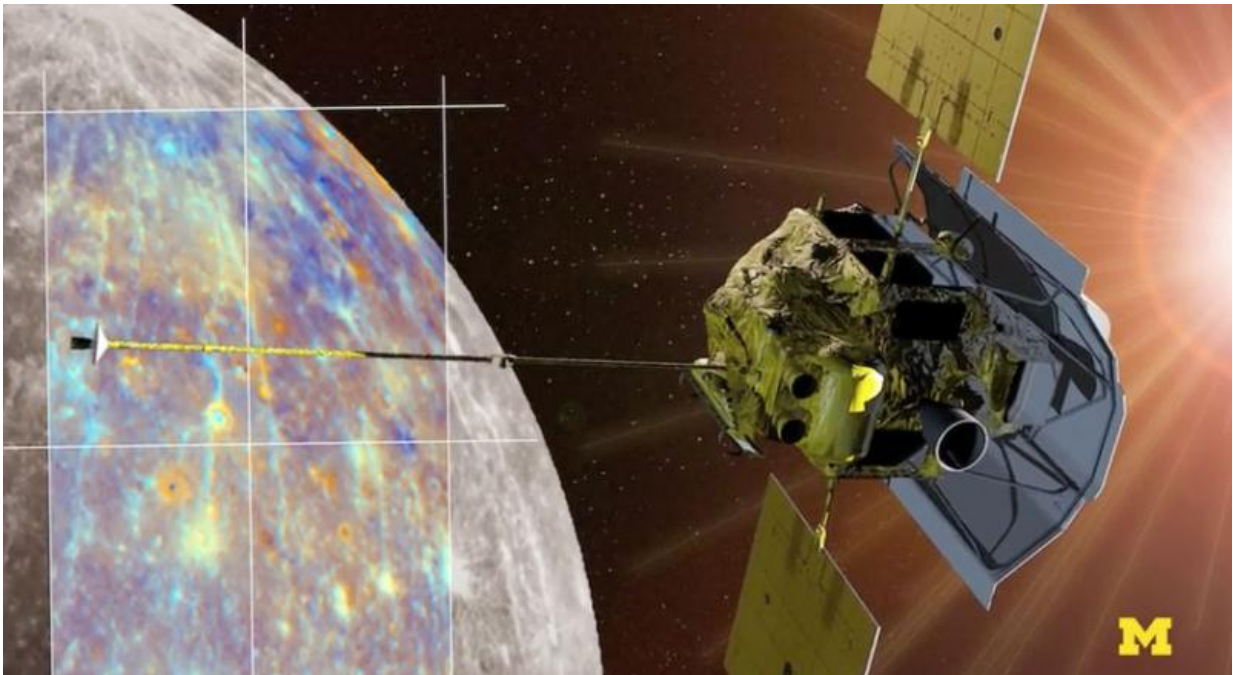


Mercury MESSENGER nears epic mission end

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Credit: NASA

A spacecraft that carries a sensor built at the University of Michigan is about to crash into the planet closest to the sun—just as NASA intended.

MESSENGER launched from Earth in 2004, traveled 4.9 billion miles, and has been orbiting Mercury for the past three years, giving scientists an unprecedented look into both the history of the [solar system](#) and a

planet they knew relatively little about. It will run out of fuel around April 30 and end its mission with a bang.

Without a thick atmosphere to slow the craft down and partially incinerate it, MESSENGER will keep accelerating as it barrels toward Mercury. It'll be traveling around 8,750 mph when it hits.

"To be honest, it's going to be sad," said Jim Raines, an assistant research scientist in the U-M Department of Atmospheric, Oceanic and Space Sciences.

Raines is one of the roughly 75 people—faculty members, engineers and students—who have been involved over the years in either making the spacecraft's Fast Imaging Plasma Spectrometer, also known as FIPS, or analyzing data it sent back. FIPS is a soda-can-sized sensor that identified what electrically charged particles made up Mercury's ultra thin atmosphere and magnetosphere.

As an engineer at U-M's Space Physics Research Lab, Raines helped design FIPS. As a doctoral student in planetary science, he used its data in his thesis. And since graduating, he has worked as a research scientist on the mission.

"I've been in charge of watching over it to make sure it's okay on a day-to-day basis since 2006, so for almost 10 years," Raines said. "It's going to be strange when I don't have to do that anymore."

FIPS was a new design when the engineers devised it. It's rare for NASA to use such relatively untested technology on an interplanetary spacecraft, but nothing existed that could adequately measure the plasma in Mercury's space environment.

Plasma is electrically charged gas. The gases that make up Mercury's

outer atmosphere are mostly charged because of how the sun influences the planet and its environment, including through its [solar wind](#). The solar wind is a stream of charged particles.

FIPS helped scientists understand what makes up Mercury's atmosphere, and where that atmosphere comes from. Turns out it's mostly sodium and oxygen atoms that the solar wind "sandblasted" from the planet's poles. The sun's ultraviolet light then ionizes the atoms—strips off electrons so they end up electrically charged rather than neutral. These findings also told researchers that Mercury's magnetosphere, which can somewhat shield the planet from the solar wind, is relatively weak.

Mercury is a difficult planet to study because it's so close to the sun—as little as a third of the distance that Earth is. This makes it both hard to see from Earth, and hard to get to with a spacecraft due to the sun's strong pull. Before MESSENGER, only the Mariner 10, had been there. It swung by on its way to Venus in the mid-1970s and could only map less than half of Mercury's surface. Also, Mariner 10 did not measure any of its ionized atmosphere.

"Now, we've explored the planet," said Thomas Zurbuchen, a professor of atmospheric, oceanic and space sciences who led the U-M work on the mission. "We're at the end of a really successful mission and we can't do anything anymore to stop it from doing what it naturally wants to do. The sun is pulling on it. The planet is pulling on it. It's just physics. It has to crash."

On Mercury, where the sun rises three times as big and almost 10 times as bright, but only once every 176 Earth days, MESSENGER will leave a crater.

On Earth, it leaves a legacy of knowledge about what Zurbuchen called a fossil planet. Without an [atmosphere](#) to protect its surface from asteroids

and without shifting continents and geological processes that rejuvenate its surface every few million years, Mercury gives us a new perspective on the solar system.

"We study Mercury because it's part of our history," Zurbuchen said. "It's part of who we are and where we come from."

Provided by University of Michigan

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