February 2020

It's time to say goodbye to NASA's Spitzer Space Telescope. Here's why.

Specifically, Spitzer's struggle comes from trying to balance charging its battery, communicating with Earth and keeping its instruments cool. When it launched in 2003, those tasks didn't interfere much with each other, but the longer the mission continued, the bigger a challenge it became. And so, on Jan. 30, more than 16 years after its launch, NASA will send the spacecraft its final commands.

"There is a natural end to the mission and we are reaching it," Luisa Rebull, an astronomer at the NASA Infrared Science Archive at the California Institute of Technology, which hosts Spitzer's data, told Space.com. Spitzer was designed to focus on infrared light, which lets scientists see through dust that obscures the view of other types of telescopes. During its tenure, the spacecraft, which has cost a total of $1.36 billion over two decades, has used that talent to tackle astronomical puzzles like how stars and planets form.

"We see star-forming regions, we see galaxies forming and merging and just a whole cornucopia of objects in space that are not visible to our eyes in the optical, but are visible in the infrared," Suzanne Dodd, former mission manager for Spitzer.
That's because of something special about Spitzer.

"One of the unique things about Spitzer that makes this all possible is its orbit," Dodd said. Spitzer orbits the sun, tagging along behind Earth and slipping a bit farther away from us each year. "It's drifting from the Earth and the moon, so it's not getting the infrared radiation that the Earth and moon system create." Without that interference, Spitzer can gather better data.

Eventually, that orbit will be on the opposite side of the sun from Earth for a long period of time — a clear no-go for space communications. Right now, Spitzer is about a third of an orbit behind Earth, so the sun isn't yet blocking communications.

But even now, the logistics of the mission are becoming challenging. The farther Spitzer lags behind Earth, the more dramatically the spacecraft has to twist itself in order to communicate back to its scientists. That stresses the spacecraft's solar-charged batteries, Rebull said, and when they finally get to recharge, the batteries warm up. "That's not good when you're trying to detect little bits of heat," she said — that would be the infrared light Spitzer targets, which is essentially radiated heat.

There's a second hot problem with the maneuver: The more the spacecraft twists, the more sunlight reaches part of the spacecraft that are supposed to stay cool. The longer the mission continues, the more time Spitzer scientists lose to this process. "You have to wait for the batteries to recharge and then everything to cool down again before you can keep observing," Rebull said.

Eventually, the spacecraft won't be able to make that maneuver at all, she added — it would run out of power while sending data back to Earth. That's why NASA made the decision to shut the telescope down. Spitzer will gather its last observations on Jan. 29 and turn off the next day.

Then, scientists will be left with hopes that another space telescope dedicated to the infrared will someday take its place — and, of course, with the data Spitzer has gathered over 16 years. It's a melancholy time for mission scientists, but not an unexpected one.

"I know it's just a space robot," Rebull said. "But he's our space robot."