Astronomers may have for the first time witnessed a sun-like star devouring a planet, shedding light on the fate that will befall Earth in about four billion years when our dying sun swells to engulf our world, a new study finds.

By analyzing countless stars during various stages of their evolution, astronomers have discovered that as our sun and stars like it near the ends of their lives, they begin to exhaust their primary source of fuel, the hydrogen near their cores. This leads their cores to contract and their outer shells to expand and cool. During this "red giant" phase, these stars may billow out anywhere from 100 to 1,000 times their original diameter, swallowing closely orbiting planets.

"We know that this must happen to all planets that are orbiting at distances smaller than that of the Earth, but it was considered extremely challenging to provide experimental evidence for this," study lead author Kishalay De, an astrophysicist at the Massachusetts Institute of Technology, told Space.com.

For decades, scientists have detected evidence of stars just before and shortly after the act of consuming planets. However, researchers had never caught a star in the act until now, De explained.

"Honestly, one of the biggest surprises for me was that we found it in the first place," De said in an email. "Planetary engulfment has been a fundamental prediction in our understanding of stars and planets, but their frequency have been very uncertain. So finding a potentially rare event for the first time is always exciting."

In the new study, De and his colleagues made their breakthrough after examining a burst of radiation dubbed ZTF SLRN-2020, which took place in 2020 in the Milky Way's disk about 12,000 light-years away, near the constellation Aquila. During the event, a star brightened by a factor of 100 over the course of a week.

"The work started back in 2020 when I was not looking for this type of event, actually," De said. "I was looking for a much more common type of outburst called novae." Novas are stellar explosions that can happen when a red giant pours fuel onto a companion white dwarf star.

The initial discovery was made by analyzing data collected by the Zwicky Transient Facility, run at the California Institute of Technology's Palomar Observatory. The Zwicky Transient Facility scans the sky for stars that rapidly change in brightness, which could be events such as novas.

To learn more about ZTF SLRN-2020, De analyzed the spectrum of light from the bright outburst. "That's when I was surprised to see that unlike a nova, which has hot gas around it, this source was primarily surrounded by cool gas," he said.

Cool gas from such bursts often results from merging stars, De explained. When he followed up by looking at data from the same star collected by the Keck Observatory in Hawaii, he also found molecules that can only exist at very cold temperatures.