Astronomers studying the atmospheres of planet-munching white dwarf stars have found that some stellar meals included the same ingredients as Earth.

Remains of rocky bodies that once circled the white dwarfs pepper the gas envelopes around the dead stars. The ratios of elements in these remains — called “pollution,” since it mars the star’s normally pristine hydrogen or helium atmosphere — tell astronomers what the bodies were made of and where they might have come from. Although about as common as normal stars in the Milky Way, white dwarfs aren’t the most obvious choice for astronomers looking for traces of extrasolar planets — but, it turns out, the dense, collapsed stars may be incredibly useful.

Each of two polluted white dwarf stars snarfed at least 10 sextillion grams of rocky dust, roughly equal to the mass of the dwarf planet Ceres (a sextillion equals 1 with 21 zeros after it). And, one of the stars ate something very similar in composition to the Earth, astronomers report online August 7 at arXiv.org and in an upcoming issue of the Astrophysical Journal.

“This means that planetlike rocky material is forming at Earthlike distances or temperatures from these stars,” says astronomer and study coauthor Ben Zuckerman of UCLA. Zuckerman notes that it’s still unclear whether the material is from a planet, planetlike bodies or an asteroid, but it is clear that there’s a lot of it.

For years, astronomers thought the dwarfs were simply catching dust during their interstellar travels. Now, scientists think the atmospheric debris signals the presence of ancient orbiting planetary systems. Zuckerman says that between 25 and 30 percent of white dwarfs have orbital systems that contain both large planets and smaller rocky bodies. After the dwarf forms, larger, Jupiter-mass planets can perturb the orbits of smaller bodies and bounce them toward the star.
“This is the first hint that despite all the oddball planetary systems we see, some of them must be more like our own,” says astronomer John Debes of NASA’s Goddard Space Flight Center in Greenbelt, Md., who was not involved in the study. “We think that most of these systems that show pollution must in some way approximate ours.”

Zuckerman, UCLA astronomer Beth Klein and colleagues used the Keck I telescope in Hawaii to peer closely at two helium-dominated white dwarfs and determine the ratios of the polluting elements. Star PG1225-079 has a mix of elements — including magnesium, iron and nickel — in ratios resembling those found in bulk Earth and some elements that are two or three times more abundant (calcium, for example).

The other star, HS2253+8023, munched material that contains more than 85 percent oxygen, magnesium, silicon and iron — very much like Earth. That’s indicative of a rocky parent body forming in an area with conditions similar to those where the Earth first formed.

“I’ve never seen so much detail in spectra,” says astronomer Jay Holberg of the University of Arizona in Tucson, who was not involved in the study. “People have seen iron and calcium and other things in these stars, but [this group has] gone off and found a whole slew of other elements.”

Incredibly dense, white dwarfs are about the size of Earth but as massive as the sun, and mark the final stage of stellar evolution for more than 90 percent of the stars in the Milky Way. But before reaching that stage, stars puff up into red giants, a process that can rearrange an orbiting system and gobble up any bodies too close-by. Then the stars collapse — and some survivors of that initial expansion and contraction might be chucked inward by larger bully planets.

**SUGGESTED READING:**


**CITATIONS & REFERENCES:**
B. Klein et al. Rocky extrasolar planetary compositions derived from externally-polluted white dwarfs.