Hubble views stellar EGGs

They look like undersea coral or stalagmites rising from the floor of a cavern. But these images reveal a far more exotic world—huge pillars of gas that constitute the birthplace of stars in the Eagle nebula, a star-forming region 7,000 light-years from Earth.

In these newly released pictures from the Hubble Space Telescope, ultraviolet light from hot, fully grown stars eats away the oval tips of the pillars, known as EGGs (evaporating gaseous globules). In some cases, so much gas has boiled off that the newborn stars swaddled in the EGGs become visible.

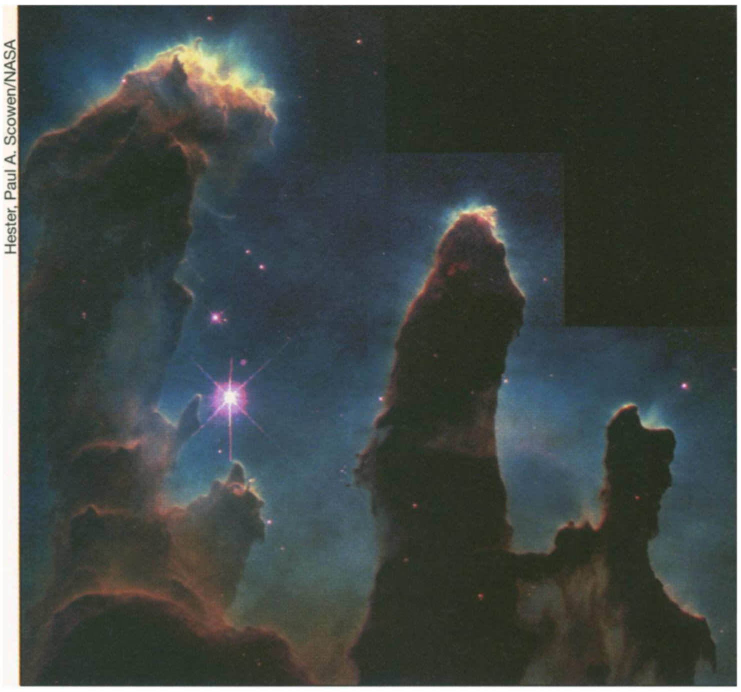
In stripping away gas, the ultraviolet radiation not only uncovers newborns, it deprives them of the material they need to grow more massive.

"For a long time, astronomers have speculated about what processes control the sizes of stars," says Hubble investigator John J. Hester of Arizona State University in Tempe.

"Now, in [the Eagle nebula], we seem to be watching at least one such process at work right in front of our eyes. . . . In some ways it seems more like archaeology than astronomy. The ultraviolet light from nearby stars does the digging for us, and we study what is unearthed," he continues.

"This is the first time that we have actually seen the process of forming stars being uncovered by photoevaporation."

A star forms when gas in an interstellar cloud collapses under its own weight, forming a ball dense enough to ignite nuclear fuel at its core. Left to its own devices, a fledgling star uses gravity to grab additional material from its gaseous cocoon until wind from the star pushes the infalling gas aside.



Hester, Paul A. Scowen/NASA

Pillars of gas, part of the Eagle nebula, show erosion due to ultraviolet light from hot stars. Red depicts emission from singly ionized sulfur atoms; green denotes hydrogen emission; blue depicts light from doubly ionized oxygen.

Released earlier this week at a NASA press conference in Washington, D.C., the Hubble images suggest that in the crowded stellar nursery of the Eagle nebula, some infant stars never get the chance to grow bigger. It appears that "matter is still falling onto [the newborns] right up until the time that the gas gets blown away by photoevaporation," says Hester.

"These stars never get to determine when they've had enough mass; when their surroundings get zapped, it freezes the mass . . . at a random place in evolution."

Captured in various stages of erosion, most of the 50 or so EGGs imaged by Hubble retain their smooth, oval shape. This suggests that the stars buried inside hadn't generated winds yet or matured to the point where they had accumulated material around them into disks.

The formation of circumstellar disks ranks as the first step in making planets; without them, the stars "aren't going to be forming solar systems," says Hester. Indeed, he notes, the Eagle nebula may qualify as a prime hunting ground for brown dwarfs—objects that never accumulated enough mass to become full-fledged stars.

Hester emphasizes that in many other regions of space, where stars form in isolation, photoevaporation does not determine their mass. The process plays a key role only in places that already contain lots of hot, massive stars able to bombard their surroundings with ultraviolet light. — *R. Cowen*

Multicellular fossils may be world's oldest

Sunlight filters through shallow water, dappling tiny blades of brown algae that cling to the soft seafloor. Small spores drift from pores and settle to the bottom. This tranquil scene could take place today—except that these particular algae no longer exist.

Their fossils do, however, and like an ocean current, scientific uncertainty swirls around them.

In the Oct. 27 SCIENCE, two researchers at the Chinese Academy of Geological Sciences in Tianjin announced the discovery of 300 of the earliest fossils of multicellular organisms. Each less than an inch long, the 1.7 billion-year-old fossils lie in sedimentary rock that constitutes the Tuanshanzi Formation. Earth's movements pushed the rock to the surface near Jixian, east of Beijing.

Authors Zhu Shixing and Chen Huineng suggest that the organisms are brown algae. They point to similarities in modern brown algae such as *Laminaria,* a much larger, multicellular seaweed that lives in shallow coastal waters. Like *Laminaria,* some of the Tuanshanzi fossils have an apparent holdfast for clinging to rocks, an algal stem, and one or more wide blades.

Shixing/SCIENCE

Leaflike fossil from Jixian, China.

Scanning electron microscope photos reveal another similarity: The fossils have porelike openings ringed with what appear to be cells.

But nonmulticellular organisms—rafts of blue-green algae, for example—can yield similar images, says the University of Montreal's Hans J. Hofmann, a paleontologist familiar with the Tuanshanzi layers. "Interpreting photos is always difficult," he adds, "even though the dating of the fossils may be fine."

Uranium-lead isotope dating places surrounding rock at around 1.7 billion years old, somewhat less than half the age of Earth. But that "makes the fossils a good 800 million years older than the next organisms that look clearly like true multicellular algae," says Harvard University algologist Andrew H. Knoll.

Researchers have long hunted for early examples of multicellular plants or animals. Later fossils of clearly multicellular algae abound: They appeared late in Precambrian time, some 800 million years ago. Much earlier fossils of single-celled organisms, twice as old as the Tuanshanzi samples, also exist.

But finding fossils from the intervening period, when the jump to multicellularity probably occurred, poses "a problem," Knoll says. Volcanic heat and land shifts may have destroyed many remnants of early multicellular organisms. Even so, scientists are concerned that so few fossils have been found.

"I think they're true fossils," says Hofmann, "but I'm not convinced that they are truly multicellular." — *M. Centofanti*