At the Core of the Milky Way, The Brightest Star Ever Seen

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Try to imagine a star so big that it would fill all of the solar system within the orbit of Earth, which is 93 million miles from the Sun. A star so turbulent that its eruptions would spread a cloud of gases spanning four light-years, the distance from the Sun to the nearest star. A star so powerful that it glows with the energy of 10 million suns, making it the brightest ever observed in our galaxy, the Milky Way.

Actually, a star so big and bright should be unimaginable, according to some theories of star formation. But there it is, near the center of the Milky Way, long hidden from the human eye by vast dust clouds and its magnitude only now revealed by the Hubble Space Telescope, using a camera sensitive to the infrared light that penetrates the clouds.

The detection of the luminous star, about 25,000 light-years from Earth in the direction of the constellation Sagittarius, was announced yesterday by the Space Telescope Science Institute in Baltimore and the University of California at Los Angeles. The infrared photograph was taken and analyzed by a team of astronomers led by Dr. Donald F. Figer and Dr. Mark R. Morris of the university.

"This star may have been more massive than any other star, and now it is without question still among the most massive," Dr. Figer said. "Its formation and life stages will provide important tests for new theories about star birth and evolution."

Dr. Bruce H. Margon, an astronomer at the University of Washington in Seattle, said the discovery demonstrated the ability of the Hubble telescope's near infrared camera and multi-object spectrometer, an instrument installed last year by visiting astronauts, to probe the central regions of the Milky Way. Dust clouds there had left astronomers working in a virtual fog. The dust absorbs the visible light of stars, even those as bright as the one that was just identified.

As a result, "we know less about the center of our own galaxy than we do about the center of other much more distant galaxies," Dr. Margon said.

The presence of a presumably mammoth star in that dusty region was first noted early in this decade by ground-based infrared telescopes. In research for his doctorate in astronomy, Dr. Figer found reasons to suspect that the star was especially powerful and that its "past eruptive stages" might have created the glowing nebula of dust and gas around it.

The Hubble findings not only revealed the full magnitude of the star but also confirmed that its eruptions had produced the extensive nebula. Astronomers said the shape of the nebula reminded them of a pistol, and named its source the Pistol Star.

From the star's brightness and prodigious output of gases, astronomers have drawn conclusions about its short and brilliant career. It probably formed one million to three million years ago, a brief time in cosmic history. It may have weighed up to 200 times the mass of the Sun before consuming and shedding so much of its mass in violent eruptions.

Dr. Figer and Dr. Morris said the Pistol Star was so massive when it was born that it brought into question current thinking about how stars were formed. Stars take shape within huge dust clouds when interstellar gases contract under their own gravity, eventually condensing into hot clumps that ignite the hydrogen fusion process.

Some theorists had doubted that material for a star on the massive scale of the Pistol Star could coalesce without blowing itself apart. It is also assumed that a nascent star would radiate enough energy at some point to halt the inward fall of material, thus limiting a star's maximum mass. But what is that limit?

Dr. Margon said that he had not studied the data, but that the Hubble telescope had proved to be highly reliable in investigating what lies beyond the dust barrier at the galactic core. Theorists, he said, will now have to refine or recast their ideas of star formation

Dr. Morris said, "Evidence leads us to believe that the star formation process near the center of the galaxy may favor stars much more massive than our modest Sun."

Astronomers analyzing the data estimated the present mass of the star at 100 solar masses. Twice in the last 6,000 years, eruptions in the star's atmosphere ejected expanding shells of gas equal to the mass of several suns, the largest being the cloud stretching four light-years. At such a rate of mass loss, the star probably has only another one million to three million years to live. Its likely fate is a spectacularly explosive death in a supernova.

By contrast, the Sun is a star of modest size, a diameter of about 860,000 miles, but much greater longevity. It is about five billion years old, astronomers estimate, with another five billion to go.

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