

**Stellar Shadow in Serpens Nebula**

# Giant ‘Bat Shadow’ Takes Flight in Serpens Nebula

For centuries, astronomers and philosophers alike wondered how our solar system and its planets came to be. In the late 1700s, the philosopher Immanuel Kant proposed that planets are born from disks of dust and gas that swirl around their home stars.

But it wasn't until the 1990s that the Hubble Space Telescope provided strong evidence for such disks. Hubble observations of newly formed stars in the nearby Orion Nebula revealed many of these disks in visible light for the first time.

A similar disk is buried within the Serpens Nebula, a portion of which is featured on the front of this lithograph. The disk itself is hidden from view, but the tell-tale signs of its presence can be seen in the form of a giant shadow that spans about 200 times the length of our solar system. Nicknamed the “Bat Shadow,” the wing-like feature is visible on the right side of the image.

The near-infrared vision of the Hubble Space Telescope captured the shadow being cast by the disk, which surrounds a young star called HBC 672. A similar-looking shadow is being cast by another young star, at the upper left of the image.

Shadows such as these can yield important clues about a disk's nature, even when the disk itself cannot be seen. The thickness of the shadow and the sharpness of its edges tell astronomers about the width of the disk and its density. Based on this image, the disk is likely to be puffy and full of gas. The wavelengths of light that can pass through parts of the disk also carry information about the size and composition of the dust grains within it.

Studying young stellar disks is important because our own solar system was born from a similar disk of material whirling around the Sun. However, our solar system only allows us to see the end result of planet formation — not the process. Distant disks can serve as analogs of the early solar system, and help astronomers better understand the formation and evolution of our own cosmic home.

*Image credit: NASA, ESA, and STScI*

## VOCABULARY

**Near-infrared:** The region of the infrared spectrum that is closest to visible light. Near-infrared light has slightly longer wavelengths and slightly lower frequencies and energies than visible light.

**Stellar disk:** A rotating disk of dense gas and dust surrounding a young, newly formed star. Around the youngest stars, they are the reservoirs of material out of which planets may form.

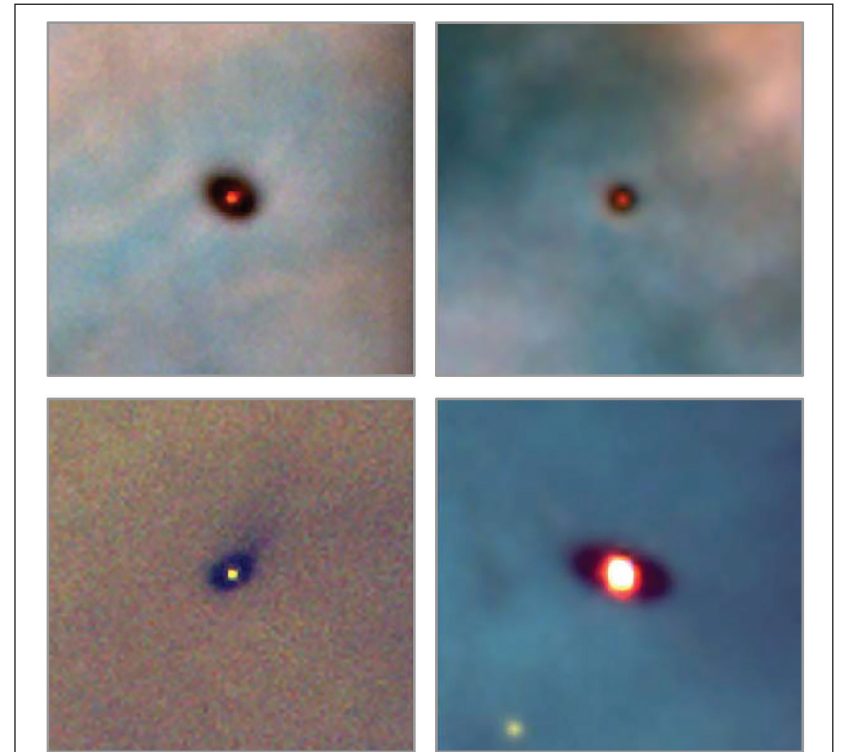
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These dark disks around newborn stars are seen in Hubble's visible-light observations of the Orion Nebula. The disks are easily seen because they block most of the light of the host star and have the bright nebula behind them to create a silhouette. In a similar manner, the Bat Shadow is apparent because the nebula behind and around HBC 672 appears bright when seen in near-infrared light. Although the disks in Orion appear small, they are actually about three to eight times larger than the length of our solar system.

*Credit for Hubble images: Mark McCaughrean (Max-Planck-Institute for Astronomy), C. Robert O'Dell (Rice University), and NASA*

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