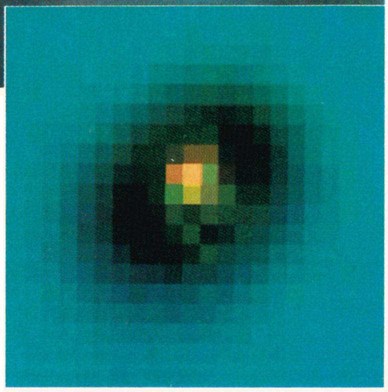

Three protoplanetary disks of gas and dust girdling young stars in the Orion nebula are imaged through narrowband filters by the Hubble's second-generation Wide Field–Planetary Camera with its corrective optics. The two disks farthest right are seen by the glow of their photoionized surface gas. The dark disk, farthest left, is seen only in silhouette against the glowing background gas. The inset shows it in higher resolution, imaged through a broadband filter that passes more of its central star's light.

cumstellar material forms disks rather than enveloping shells. To that end O'Dell and Wen employed a fourth, broadband filter with the high-resolution CCD array that serves the system's Planetary Camera mode. The inset to the figure above shows the high-resolution close-up of the dark proplyd, a superposition of Planetary Camera images taken through each of the four filters. The central star is much more prominent here than in the narrowband, wide-field image. In the high-resolution inset, a single CCD pixel subtends 0.046 arcseconds of sky. In the wide-field CCD arrays, which sacrifice resolution for a larger field of view, each pixel covers 0.1 arcseconds.

Mass estimates

Infrared and millimeter-wave observations have provided strong evidence of abundant protoplanetary disks around young stars in other, less flashy molecular clouds. (See the article by Anneila Sargent and Steven Beckwith in PHYSICS TODAY, April 1993, page 22.) But the glowing Orion nebula renders its proplyds visible at optical wavelengths. "And with the new, corrected WFPC2 camera we can see enough of them with sufficient resolution to do real quantitative science," says O'Dell. The radiation from the ionized gas at the surface of a bright proplyd, for example, provides a lower limit for the mass of gas in the circumstellar disk. And for the one dark proplyd found in the Orion nebula, the degree of incomplete obscuration of the background glow yields an important lower-limit estimate of the mass of dust and larger particulate material. For both kinds of measurements, O'Dell and Wen report lower limits of several Earth masses. And the spatial extent of these proplyds is typically an order of magnitude larger than the orbit of Pluto, just about what one would expect for an embryonic planetary system.

Much closer to home, for 10 years now we've had a spectacular optical image of a circumstellar disk around the star β Pictoris, just 51 light-years away. (See the article by Thomas Ahrens on page 38 of this issue.) β Pic is about 10^8 years old, hundreds of times older than the nurslings in the Orion nebula. In a disk that old, most of the particulate matter will long since have fallen into the star or, perhaps, coalesced into full-grown planets. And indeed, indirect evidence for planets circling β Pic continues to accumulate.[3]

—BERTRAM SCHWARZSCHILD

References

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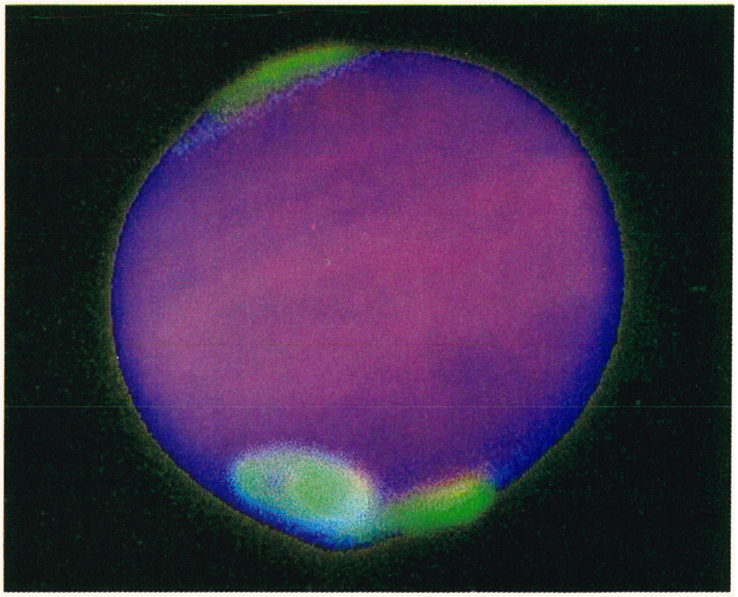
2. C. R. O'Dell, Z. Wen, Astrophys. J., to be published, 20 November 1994.
3. P. O. Lagage, E. Pantin, Nature **369**, 628 (1994).

A Comet Makes a Splash



This infrared image of a 33 000-kilometer-wide ring of hot gas expanding at 4 km / sec shows the aftereffect of the impact of fragment G of comet Shoemaker–Levy 9 with Jupiter on 18 July. The ring is apparent at 3.42 microns (shown green) as are Jupiter's two polar hoods. This composite, from Peter McGregor and Mark Allen (Australian National University), also contains infrared images at 3.09 mm (blue) and 3.99 mm (red). ■