Pinwheels in the Quintuplet Cluster

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The five enigmatic cocoon stars after which the Quintuplet cluster was christened have puzzled astronomers since their discovery (I). Hundreds of stars have now been identified within the cluster (2, 3), placing it among the most massive in our Galaxy, yet the nature of the five extremely red stars at the heart of the Quintuplet has remained elusive. Their extraordinary cool, featureless thermal spectra (~780 to 1315 K [3]) have been attributed to various stellar types from young late-type carbon-rich (WC-spectrum) stars to white dwarfs. Despite the growing evidence of the stars acting as illuminating engines and the additional find that the cluster contains an as yet undetected massive black hole (5), the nature of these stars remains a mystery.

A False-color images of Q 2 at 3.08 μm July 1999 (A) and Q 3 at 2.21 μm from August 1998 (B) and at 3.08 μm from July 1999 (C). Overplotted on the Q 3 images is a rotating archimedean spiral model fitted to the dominant tail of the outflow plume at the two separate epochs (dashed line). Identification of Quintuplet objects, including Q 2 and Q 3, is discussed further in (6) and fig. S1.

Given the extreme visible extinction (A_v = 29 ± 5 [2]), small separation of the central binary stars (likely ~0.6 milliarcsec or 5 astronomical units), and presence of high-luminosity circumstellar dust shells, it would be extremely difficult to detect or study these systems with other techniques. The most luminous stars in our Galaxy are often surrounded by dusty shells, and the implication that most, if not all, of these stars harbor massive binaries (not single stars) has important implications for the high-mass tail of the stellar initial mass function. Binarity is also a key element to studies of type Ib and type Ib supernovae. There are recent indications that explosion light curves can be modified by the imprint of circumstellar matter, carrying an encoding of the mass-loss history of the supernova precursor star system (10, 11).

References and Notes
6. Materials and methods are available on Science Online.
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Materials and Methods
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References
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