Outbursts and Jet Activity in CH Cygni (abstract)

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Abstract of a paper presented at a memorial symposium in honor of Dr. Janet A. Mattei, Brandeis University, Waltham, MA, October 29, 2004; received June 2, 2005; accepted June 2, 2005

Abstract We present results from our long-term multiwavelength study of the symbiotic system CH Cygni.

Symbiotic systems are interacting binaries showing a composite spectrum with signatures of a late-type giant and a high-temperature component, often a compact object. They are some of the most fascinating interacting binary systems because they are among the likely candidates for progenitors of bipolar planetary nebulae. They have also been invoked as potential progenitors of at least a fraction of type Ia Supernovae, a key cosmological distance indicator.

CH Cyg is a nearby (D=250 pc) symbiotic system composed of an evolved M6–7 III star and an accreting white dwarf. In addition, there is possibly an enigmatic third stellar body in the system. The components of this system have not been resolved.

We detected dramatic changes in the spatial and spectral distribution of the emission in this system using a combination of multiwavelength high-resolution imaging and photometry. Extended structures observed in the UV, optical, radio, and more recently, at X-ray wavelengths show that they are associated with repeated outbursts and jet activity in this system.

Our analyses of the AAVSO light curve showed that CH Cyg has undergone at least three outbursts in the past two decades (Karovska and Mattei 1992; Karovska, Carilli, and Mattei 1998). Each outburst was preceded by extended intervals of quiescence. We show that this activity is correlated with the changes in the physical environment of this interacting binary system, and with the jet activity observed at UV, radio, and X-ray wavelengths (e.g. Corradi *et al.* 2001; Karovska 2004; Karovska *et al.* 2005a).

The results of our long-term study of this system, showing temporal variability on time scales of many years, underlines the importance of long-term monitoring by AAVSO. In order to determine the causes of the outbursts and of the jet activity, it is also crucial to resolve the components especially at optical, UV, and X-ray wavelengths. However, even the nearest symbiotic binaries cannot be easily resolved

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with existing telescopes and interferometers. So far, the individual components have been resolved clearly in only one symbiotic system—Mira AB (e.g. Karovska *et al.* 2005b).

Imaging with a sub-milliarcsecond resolution will resolve the components of the CH Cyg system and many other interacting binaries, and will allow studies of the causes and consequences of the jet activity. This can be achieved using the Stellar Imager, a future UV/Optical Interferometer in space (Carpenter *et al.* 2005; Karovska *et al.* 2004), which will provide an advance in resolution power at least two orders of magnitude finer than that of the HST.

Note: This work is the result of a project that Janet Mattei and I have collaborated on for over a decade.

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