displayed in the figure, for four groups of knots in Kepler's SNR. Window (a) contains the brightest complex of knots, located on the N-W side; in window (b) there is a compact group of knots, that appeared only about 20 yr ago: region (c) is projected near the remnant centre, while region (d) is located on the West side. The white rule in the figure corresponds to 10 arcsec on the sky.

The most striking characteristics of these images is that they show that virtually all the filamentary structures visible in previous images are actually arrays of compact knots. This is very clear for the "filaments" in regions (c) and (d). The situation is similar also for region (a), even though the pattern of knots is very complex there: various structures seem to be just the intersection of different filamentary structures, as if we observe the projection of a 3-dimensional network. Knots are arranged rather regularly along filaments, with a typical separation of about 2 arcsec: this scale length does not seem to vary along the remnant (just compare region (c) with region (d)). The sizes of most individual knots are near the resolution limit. For instance, most knots in region (c), when deconvolved with a stellar PSF, result to have typical sizes of 0.3–0.5 arcsec. This, at a distance of 4.5 kpc, translates into a typical knot size of $2-3\times10^{16}$ cm.

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A Large Disk-Like Structure Around the Young Stellar Object Z CMa

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We report here on the first observations of the luminous young stellar object Z Canis Majoris obtained with the adaptive optics COME-ON system.

Z CMa was originally thought to belong to the class of Herbig Ae/Be stars, the intermediate mass counterparts of T Tauri stars. Its optical spectrum displays strong emission lines with P Cygni profiles indicating outflow velocities of about 1000 km/s, but shows no photospheric absorption lines. Hartmann et al. (1989: *Ap.J.* **338**, 1001) recognized Z CMa to be an FU Orionis star, i.e., a young, presumably low-mass stellar object undergoing strong mass-accretion via an accretion disk. Models of the optical and near-infrared energy distribution of Z CMa show that these spectral regions are entirely dominated by emission from the disk and suggest a record mass-accretion rate of some 10^{-3} $M_{\odot}$/yr, which makes Z CMa the most luminous FU Orionis star known to date. Poetzel, Mundt, and Ray (1989; *Astron. Astrophys.*, **224**, L13) discovered a high-velocity gaseous bipolar outflow (traced by an optical jet including at least fifteen Herbig-Haro objects) that emanates from Z CMa and extends to about 2 pc (≈ 3′) on each side of the star at P.A. 60°. Since the connection between accretion disks and outflows in young stellar objects is well documented (if not yet understood), it is not too surprising that such spectacular outflow manifestations are associated with indirect evidence of an accretion disk in this FU Ori object.

As one of the brightest young stellar objects in the sky, and an interesting one too, Z CMa is an obvious candidate for high spatial resolution work. Recent speckle interferometry in the near-infrared reveals that Z CMa is in fact a binary with separation about 0.1″ (Christou et al., 1991; Proc. of ESO Conference on High Resolution Imaging by Interferometry). This finding is confirmed by Koresko et al. (1991; preprint), who show that the visible object (the inferred

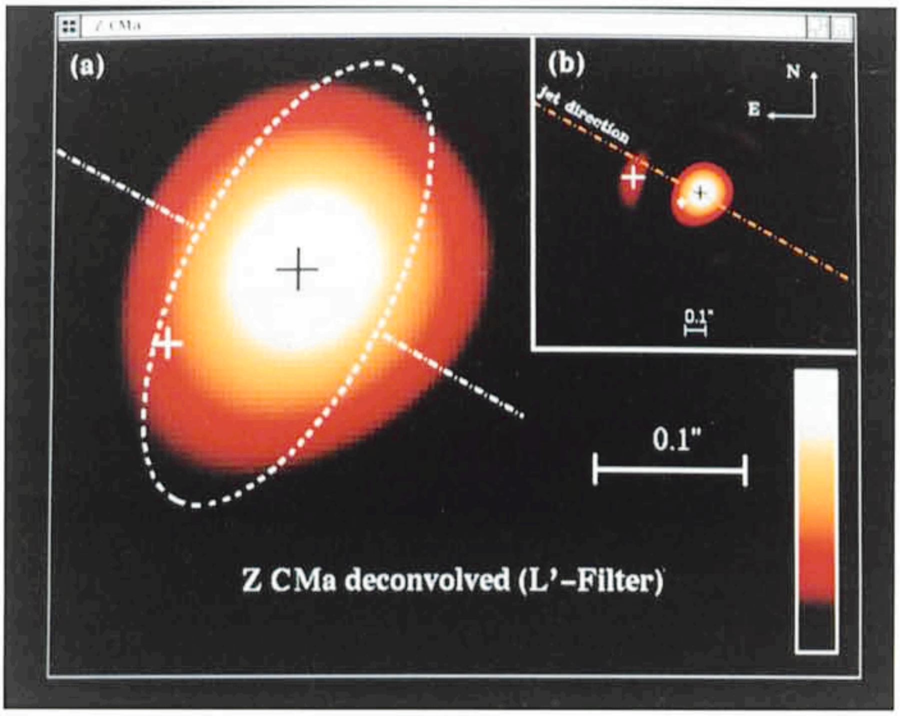

Figure 1: *Deconvolved images of Z CMa at L′ = 3.87μm, with superimposed components derived by best-fit model.*
(a) The binaries are located at (+): the visible component at SE, the infrared at NW. The ellipse shows the best-fit disk-like structure, centred at the L′ optical barycentre of the binaries, having a gaussian radial brightness profile in all directions: The dashed ellipse represents the 0.5 value of the gaussian. The intensity profile is linear on the colour scale. The direction of the Herbig-Haro objects and of the optical jet is indicated: see Figure (b).
(b) The same image as in Figure (a) on a larger scale. A third component may be present (+), but has to be confirmed. The dashed-dotted line gives the direction of the large-scale optical jet towards the Herbig-Haro objects and detected by the VLA.

FU Ori accretion disk) is located Southeast (P.A. 120°) of the infrared companion, which remains a somewhat mysterious, probably protostellar object having a higher bolometric luminosity. However, the binary system alone cannot account for the large far-infrared flux originating from the Z CMa region, a fact which leads Koresko et al. to speculate about the existence of a cool, extended structure surrounding the binary. The observations reported here reveal this condensation, and demonstrate that it is elongated in the direction perpendicular to the jet.

These observations use COME-ON at the Cassegrain focus of the ESO 3.6-m telescope, the adaptive optics VLT prototype described by Rigaut et al. (1991 a+b; *Astron. Astrophys.*, in press, and are part of its continued scientific use (Eta Carinae: *The Messenger* **63**; Ceres: *The Messenger* **65**). The imaging camera is a 32×32 InSb array with a 0.108″ pixel size on the sky. Standard image processing is applied and then followed by image reconstruction using a classical deconvolution algorithm from the complex visibilities. The deconvolved image at L′ = 3.87 μm is shown in Figure 1 together with the various components needed to get a resonable fit of the visibilities (using χ^2 minimization techniques). We find that the most probable model of this complex object is indeed a binary system surrounded by an extended, flattened structure. The positions of the optical and infrared binary components were assumed to be those found in speckle work, and the geometric properties of the extended structure were considered as free parameters in order to fit the observed complex visibilities. The centre of the disk-like structure is taken at the optical barycentre of the binary at L′. The inferred diameter of the disk-like strukture is 0.4 ± 0.06″. It is oriented at P.A. 153 ± 8°, whereas the outflow direction is at P.A. ≈ 60° (dashed-dotted line in the insert of Figure 1). We therefore suspect that the observed disk-like structure, which remains unresolved in the direction parallel to the jet, is in fact a large-scale disk, perpendicular to the outflow axis and surrounding both components of Z CMa. It is likely that this large-scale disk fuels the FU Orionis accretion disk that surrounds the visible component and provides a density gradient in the flow direction that helps to collimate the jet. In order to get the best possible fit to the visibilities, the presence of yet another component must be assumed, to account for the relative maximum of intensity seen on the diffraction ring at P.A. 70° (see insert of Figure 1). The brightness of this third component is much lower than that of either binary members; if confirmed by further work, this may represent either an emission knot in the jet or a stellar object.

This new result reveals the power of the adaptive optics technique to explore the close surroundings of young stellar objects. They appear more complex than anticipated, as demonstrated by this first direct image of a disk-like structure surrounding a binary (100 A.U.). Further instrumental developments are under way, including the use of coronographic techniques.

CNRS – Observatoire de Haute-Provence and European Southern Observatory

3rd ESO/OHP Summer School in Astrophysical Observations

Observatoire de Haute-Provence, France, July 15–25, 1992

With modern observatories being moved to ever more remote sites, fewer and fewer European students have ready access to up-to-date observing facilities. As one step towards balancing this obvious shortcoming in the training of young European astronomers, the ESO/OHP Summer School offers the opportunity to gain practical experience under realistic conditions.

In groups of three students, each guided by an experienced observer, the participants will prepare a small observing programme to be carried out with telescopes of 1.2–1.9 m aperture (direct imaging and spectroscopy) at OHP. The data reduction will be done with MIDAS, on-line also with IHAP. In a micro workshop at the end of the school each group will present their results, including additional pertinent information from the literature, to the other participants.

The preparation of the practical work will be supplemented by a series of 90-minute lectures which will be given by invited specialists. The subjects foreseen include (a) modern telescope layout, (b) charge-coupled devices, (c) design principles of high-throughput optical instruments, (d) crowded-field photometry, (e) high-resolution spectroscopy, (f) low-resolution and slitless spectroscopy, (g) astronomical infrared technology, and (h) data-reduction strategies. As a scientific highlight, a talk on a cosmological subject is foreseen. The working language at the summer school will be English. (Reports on the two previous ESO/OHP Summer Schools appeared in *The Messenger*: see No. **53**, p. 11 and No. **61**, p. 8.)

Applications are invited from graduate students working on an astronomical Ph.D. thesis at an institute in one of the ESO member countries. Application forms can be obtained from the organizers. The deadline by which applications must have been received is March 31, 1992. A letter of recommendation by a senior scientist who is familiar with the applicant's work will be required at the same time. Up to eighteen participants will be selected and have their travel and living expenses fully covered by ESO and OHP.

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RECTIFICATION

The VLT Adaptive Optics Programme (*The Messenger* No. **65**, p. 13)

The true value of the inclination of the projected rotation axis of Ceres with respect to the normal to the ecliptic plane is 4±6° and not 20 to 30 as erroneously given in Figure 1.

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