ure 2b. Figure 3b contains only 30 knots, because the INVENTORY routine failed to detect [O III] emission from the others.

From both figures it is seen that the regions containing younger knots (filled circles) are separated from those containing older knots (open circles). In Figure 3a the correlation between [S II] and Hα+[N II] intensities is rather good, but older knots are typically brighter in [S II]. However, in Figure 3b this correlation is poor. Most of the brighter knots in [O III] are young, while this is not so for [S II].

These results qualitively agree with a scenario in which the knots are initially at a higher ionization level, which then decreases with time. However, quantitative conclusions are beyond the scope of this discussion which is still based on incomplete data.

7. What's Next?

We have shown that a spectroscopic survey of optical knots, if combined with the present knowledge on their evolution, can provide a wealth of information on the temporal behaviour of the interaction of a blast wave with dense and compact clumps. Therefore, it might represent a useful benchmark for theoretical models of this interaction. The next step in this programme is to obtain a complete set of spectra for all catalogued knots. Intensity information on many lines would allow one to see how physical quantities, like densities and temperatures, evolve with time. A further goal is to discriminate those spectral features that mostly depend on evolutionary phase from those directly related to the intrinsic properties of a knot, like original density, size, etc. . . .

A detailed mapping of the radial velocities of knots is also planned. With Kepler's SNR we are at present in the paradoxical situation that proper motions are known in more detail than radial velocities. These two components, once combined, will give a 3-dimensional picture of the kinematics of this object. Such a study could provide valuable information on the structure and possibly also on the nature of this remnant.

The present advanced stage of our investigation is mostly due to observations taken at La Silla. The equipment present at La Silla is particularly suitable for a completion of the survey with a reasonably short observing time. Multi-Object-Spectroscopy facilities are the most suitable for optimizing observing time when spectra are needed for a large number of nearby objects. A private instrument (but well integrated in La Silla environment) like CIGALE Fabry-Perot scanning interferometer from Marseille Observatory (Boulesteix et al., 1984), however, is ideal for radial velocity mapping.

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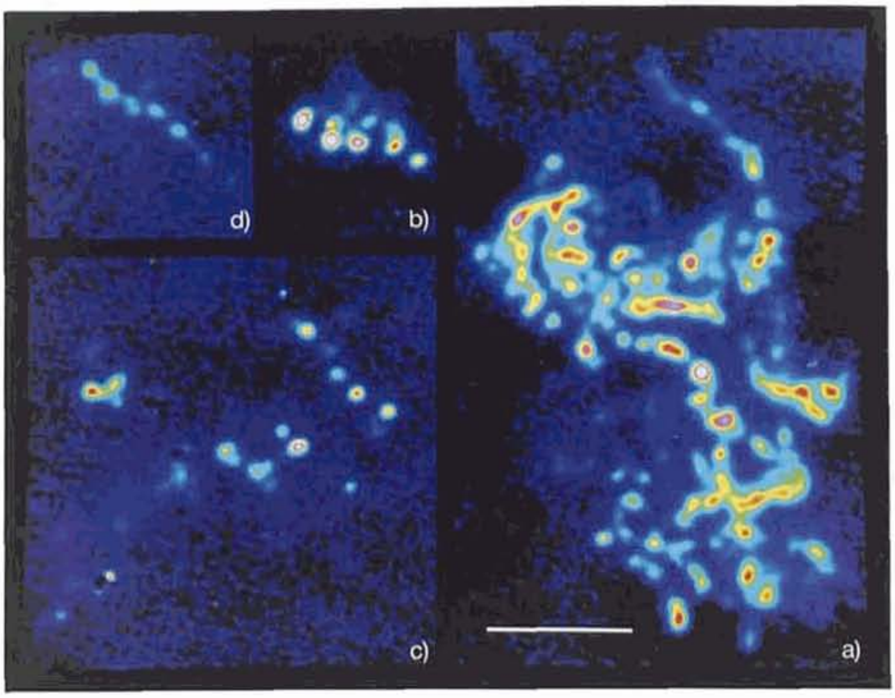
Subarcsecond Structures in Kepler's SNR

Narrow-band frames of Kepler's SNR have been obtained on May 15, 1991, using SUSI at the New Technology Telescope, during an official run devoted to imaging and spectroscopy of this object. Here we present images of the most conspicuous clusters of optical knots. These images are based on a 10-min exposure frame, taken with a narrow-band filter centred on Hα + [N II] lines; the seeing was 0.7 arcsec.

After standard reduction, the stellar continuum has been subtracted using another 10-min exposure with an off-line narrow-band filter, obtained in similar seeing conditions. Before stellar subtraction the two point-spread functions have been carefully equalized, taking care of degrading the resolution as little as possible. In the resulting image the residuals are about 7% (peak-to-peak) of the original stellar images, while the seeing has been degraded to 0.8 arcsec.

In order to extract details on the fine structure of the optical knots, we digitally simulated an unsharp-masking procedure. We convolved the image with a gaussian function of 1.8 arcsec FWHM, and added a constant value of 1.5 times the sky background. We finally divided the original image by this "mask". The effect of such a procedure is that of depressing the diffuse emission, as well as that of compressing the dynamical range. The dynamical compression allows us to see at the same time knots that originally were differing in intensity even by a factor 100. The results are



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 $2-3 \times 10^{16}$ 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

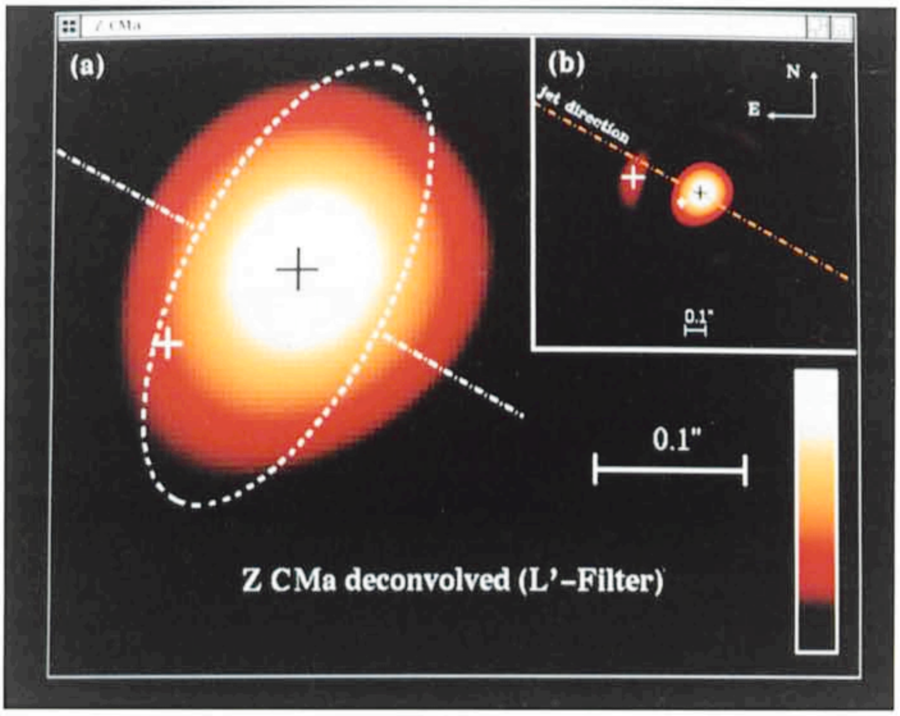

Figure 1: *Deconvolved images of Z CMa at L′ = 3.87μm, with superimposed components derived by best-fit model.*
(a) The binaries are located at (+): the visible component at SE, the infrared at NW. The ellipse shows the best-fit disk-like structure, centred at the L′ optical barycentre of the binaries, 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.