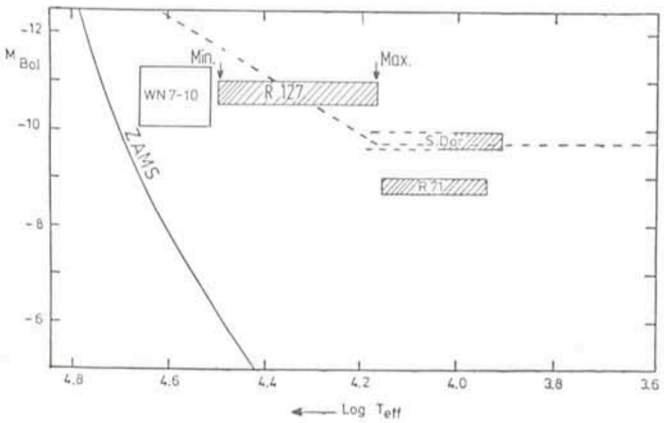

Fig. 8: *Location of the newly discovered S Dor variable R127 in the Hertzsprung-Russell diagram in comparison with the other two established S Dor variables of the LMC. Also included in the figure is the upper envelope of known stellar absolute bolometric magnitudes as derived by Humphreys and Davidson (1979). The approximate position of the late WN-type stars is also given.*

Dor variable detected and intensively studied so far. It is also one of the most luminous stars of its class with $M_{bol} \approx -11$ both during minimum and maximum (in contrast to the variations in the visual by 1.3 mag). Like for the other S Dor variables we explain this particular finding by the very high mass loss ($\dot{M} = 6 \cdot 10^{-5} M_{\odot} yr^{-1}$) during outburst. The variations in the visual are caused by bolometric flux redistribution in the envelope whilst the bolometric luminosity remains practically constant.

The location of R127 in the Hertzsprung-Russell diagram together with the other two known S Dor variables of the LMC are shown in fig. 8.

We note that Walborn classified R127 as an Of or alternatively as a late WN-type star. This indicates that the star is a late Of star evolving right now towards a WN star. Since we have detected an S Dor-type outburst of this star we conclude that this transition is not a smooth one but is instead accompanied by the occasional ejection of dense envelopes.

References

Conti, P. S.: 1976, *Mem. Soc. Roy. Sci. Liège* **9,** 193.
Duncan, J. C.: 1922, *Publ. Astron. Soc. Pacific* **34,** 290.
Hubble, E., Sandage, A.: 1953, *Astrophys. J.* **118,** 353.
Humphreys, R. M., Davidson, K.: 1979, *Astrophys. J.* **232,** 409.
Lamers, H. J. G. L. M.: 1981, in "Effects of Mass Loss on Stellar Evolution", IAU Coll. No. 59, Eds. Chiosi and Stalio.
Mendoza, E.: 1970, *Bol. Obs. Tonantzintla Tacubaya* **5,** 269.
Pickering, Z. C.: 1897, Harvard Circ. No. 19.
Walborn, N. R.: 1977, *Astrophys. J.* **215,** 53.
Wolf, B., Stahl, O.: 1982, *Astron. Astrophys.* **112,** 111.
Wolf, M.: 1923, *Astron. Nachr.* **217,** 475.

Observations of Comet IRAS-Araki-Alcock (1983d) at La Silla

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As mentioned already in the last issue of the *Messenger,* a very exciting comet crossed the Earth's neighbourhood a few months ago. First discovered by the infrared satellite IRAS, then by two amateurs, Araki (Japan) and Alcock (UK), this comet approached the Earth with a minimum distance of 0.03 AU on May 12, 1983. The previous record of such a minimum distance was in 1770 with Comet Lexell.

This event provided a unique opportunity for studying a comet at very high spatial resolution. This is of major interest

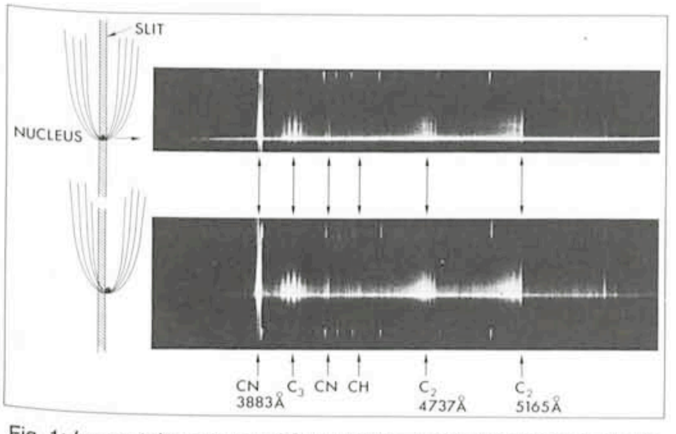

Fig. 1: *Image-tube spectra of Comet IRAS-Araki-Alcock obtained with the 1.5 m ESO telescope on May 13, 1983 at UT 00:20. The upper spectrum includes the nucleus (exposure time 2 minutes), while the lower spectrum has been obtained with the slit of the spectrograph out of the nucleus.*

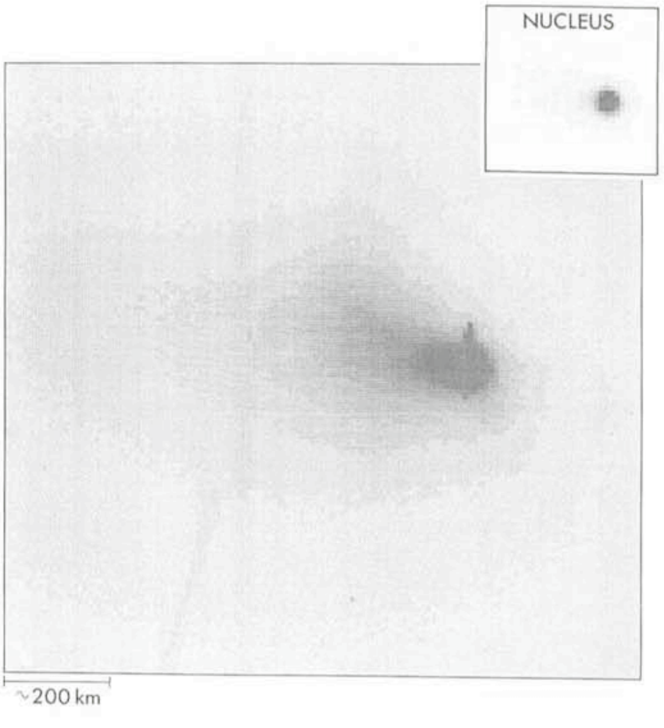

Fig. 2: *CCD images of the comet obtained in the Z filter (10000 Å) at the 1.5 m Danish telescope. In the 5 min. exposure image the nucleus is saturated. The insert image of the nucleus has been obtained with an exposure time of 1 min.*

since most of the information about the nature and the origin of comets lies in the central region – the nucleus and its immediate environment – which are usually too small to be observed from the ground. In the case of Comet IRAS, a spatial resolution of about 10–20 km could be reached at the time of closest approach.

Comet IRAS was observed with three instruments at La Silla: IDS spectra were obtained at the 3.6 m telescope, and image-tube spectra (fig. 1) with the 1.52 m telescope; CCD pictures were recorded at the 1.54 m Danish telescope. These data are now under reduction.

Since the spectra were recorded at several points of the comet, in the inner coma and outside, we hope to derive information upon the abundances of radicals as a function of their distance to the nucleus, which is important for the understanding of the dissociation processes which lead from the parent molecules (ejected from the nucleus) to the daughter molecules and the radicals observed in a larger scale. This would be especially interesting for Comet IRAS where the parent molecules H_2O and NH_3 have been detected at radio wavelengths. The CCD pictures (fig. 2), with a scale of about 0.5 arcsec per pixel, might be able to confirm the visual observations reported by S. Larson (IAU Circular No. 3811) which suggest the existence of a 12 km cocoon surrounding the nucleus, and the radar observations of Campbell et al. (IAU Circular No. 3811) also suggesting the presence of a "skirt" around the nucleus.

Recent Results of IR Speckle Interferometry at ESO

C. Perrier, ESO

Our speckle system was implemented in late 1979 on the 3.6 m telescope. Although at that time every component was in a preliminary state, we could record results useful enough to prove the feasibility of such a high spatial resolution instrument. The astrophysically usable results came later in 1981 together with sensitivity gain of the IR photometer (Perrier, 1981, *The Messenger* No. 25, p. 26). Since then we have entered a period of studies of specific astrophysical targets, some of which will be reported in this article.

In the meantime, the pioneering work done by Sibille, Chelli and Léna (1979, *Astronomy and Astrophysics* **79,** 315) triggered the development of similar instruments at the Anglo-Australian, K.P.N.O., IR Facility and Canada-France-Hawaii telescopes. This recent interest in IR speckle instruments is related to the lack of high angular resolution of objects suffering a high extinction. Especially concerned are those discovered in the systematic search for compact IR objects which is currently being carried out in molecular clouds (like the Orion complex), but also some exotic objects whose mass loss (e.g. η Car, IRC+10216) or activity (NGC 1068) is better studied in the near infrared where the inner regions become visible. These instruments are also well suited for the search of IR companions as shown by the spectacular discovery of the one of T Tau (Dyck et al., 1982, *Astrophysical Journal* **255,** L103).

The trend to expand the access to such facilities cannot go without developing more reliable observational procedures and more powerful reduction techniques. Part of them have already been exposed by Mariotti et al. (1983, *Astronomy and Astrophysics* **120,** 237) and a thorough review has been done by Bates (1982, *Physics Reports,* **90,** 203). We shall give here some indications of these advances besides the presentation of the results.

Some Instrument Related Remarks

Let us in short see what the speckle observing procedure looks like. A description of the system was published in the *Messenger* No. 25 but it has evolved now to a more sophisticated one and will do so until an optimized version, physically separated from the photometric facilities, comes into use one year from now. Thus no updated documentation exists.

The standard speckle procedure gives on-line access to the visibility or 1-D Fourier Transform (FT) modulus of the intensity distribution (see e.g. Léna, 1981 in "ESO Conference on Scientific Importance of High Angular Resolution"). The observation must be repeated several times to ascertain sufficiently low statistical errors. When the reference source is only a few degrees away from the object it is now possible to alternate very frequently allowing a sequence "Ref.-Source" to last less than 5 minutes. A series of sequences is computer-controlled, so no time is lost by manual pointing. In this way the seeing variations are minimized.

Some objects allow a non-standard procedure: if they are close enough (a few arcsec) they permit a "source switching" very similar to the photometric beam switching. The 3.6 m telescope can perform this accurately enough every 10 seconds for any scanning direction and offset vector. This procedure is most useful for objects otherwise too faint for an accurate guiding. The reference star serves for this and of course for the mean transfer function measurement. This fast switching mode also provides adequate conditions for the image reconstruction of extended sources.

As stated before, our technique is well suited for the study of a wealth of objects, even with its present limiting magnitudes – e.g. L≃5 at 3σ with a one-hour sequence and a 2-arcsec seeing – still 2 to 2.5 magnitudes below their optimum values. We have focused our work on objects showing an intense IR excess and the 10 μm silicate feature, indicator of circumstellar dust grains. They have large dust envelopes usually due to high mass loss rates. Often these are so large that the shell

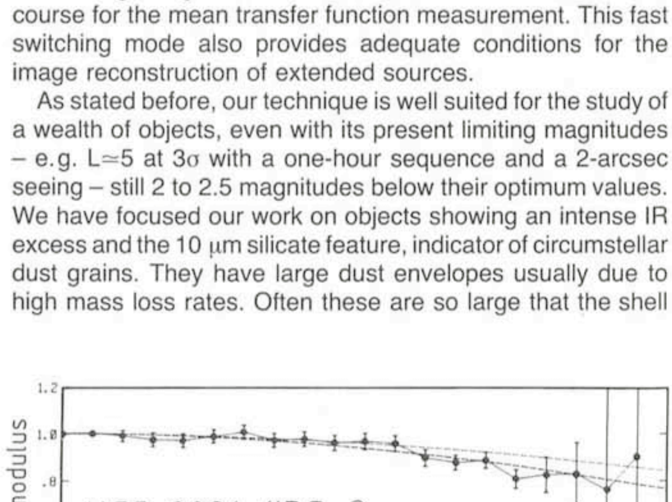

Fig. 1: *Visibility of NGC 2024 #2 fitted with theoretical filled-disk spectra of diameters 0.12 and 0.15 arcsecond λ = 4.64 μm. Position angle = 90°. The error bar is the standard deviation from the mean for several independent observations.*