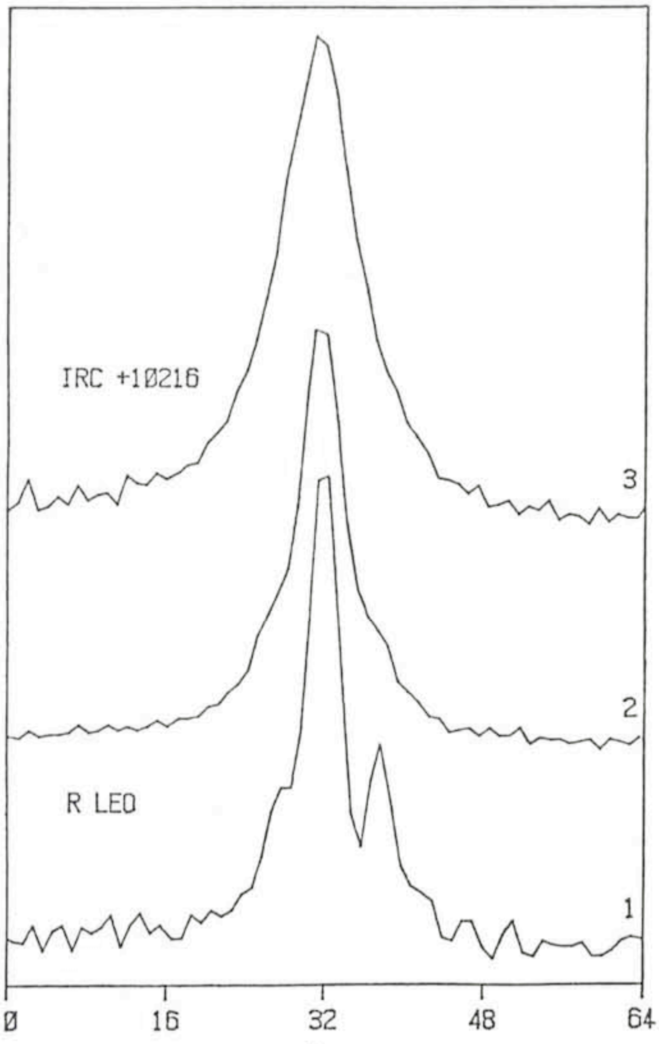

Fig. 3: *Scans obtained in band M with the ESO 3.6 m telescope in October 1980. Sampling period: 87 milliarcsec.*
1 – Point-like source, the 10 ms scan shows speckles.
2 – Same scan as 1 averaged with following ones during 180 ms, speckles are smoothed out.
3 – Extended object, the 10 ms scan exhibits no speckles at all.

the sky. So the maximum sampling frequency (5.7 $arcsec^{-1}$) was larger than the telescope cut-off frequency (3.72 $arcsec^{-1}$ at M) as is preferable for securing an oversampling.

Both objects are late-type stars with negative K and M magnitudes. So these graphs do not represent the usual appearance of individual scans of common and less bright objects. But one can deduce from them the limiting magnitudes M_{lim} in speckle mode and compare to the known photometric performance. With one arcsec seeing, one finds M_{lim} (3σ, 1s) = 4 in agreement with M_{lim} = 3.4 derived from M_{lim} (3σ, 15mn) = 10 given for the photometric mode with a 3 arcsec diaphragm. The slight discrepancy – favourable for speckle mode – comes from the background limitation in photometry, no longer present in the speckle mode where the instrument throughput is reduced. Similarly the same deduction leads to K_{lim} (3σ, 1s) = 8.

M_{lim} (1s) only gives the limitation in the guiding sense when the signal is used for centring; if offset guiding is achieved on field stars, a longer integration is possible, hence fainter objects may be analysed.

Object Spectrum

The final object spectrum contains information on the size of the object up to the cut-off frequency D/λ of the telescope. This makes the value of speckle interferometry obvious even when a single cross-section of the object spectrum is obtained. Such a spectrum is shown in Fig. 4: IRC + 10216 is a carbon star with double shell structure. Because of the non-unicity of the solution describing complex structures in the image, the radial intensity distribution cannot be retrieved in a straightforward way, except on bright objects, where the high signal-to-noise ratio should allow the use of phase-restoration techniques, still in their infancy when applied to astrophysical data.

But one can assert the departure of the object from circular symmetry by exploring different directions of scanning. This explains that we often rotated the Cassegrain adaptor for observing some interesting objects expected to present some assymmetry. This feature offered by the 3.6 m Cassegrain focus is indeed an important advantage of the system configuration.

A Useful New Catalog

A revised Shapley-Ames catalog of bright galaxies by Allan Sandage and Gustav Tammann has just been published by the Carnegie Institution of Washington.

In 1932, Shapley and Ames published their Harvard survey of 1,246 bright galaxies. Their work became the basic listing of bright galaxies; after half a century, it still has a major role in studies of galaxies in the local region.

In the early 1950's, Sandage set out a plan to compile type, magnitude, and redshift data for all galaxies in the original Shapley-Ames catalog. The project, later joined by Tammann, was an outgrowth of the photographic survey of bright galaxies begun at Mount Wilson in 1909 and continued at Palomar after completion of the 5 meter Hale telescope in 1949.

The result of that long-range program is the present catalog, containing data on types and magnitudes for all the Shapley-Ames galaxies and redshift for all but one (NGC 3285). The usefulness of this catalog lies mainly in the list of uniformly determined Hubble type for a large and complete sample of galaxies. Too often, in the literature, the type of galaxies has been estimated on poor photographs producing unexpected results. But another aspect of this work makes it a necessary tool for all astronomers interested in bright galaxies: the listed redshifts are extracted from 430 sources. For 68 % of all galaxies, at least two independent redshift determinations are available, but the velocity of 394 galaxies rests on only one determination and could be in some cases in error. However, it is estimated that the median error is 40 km s^{-1}.

The book also contains 90 illustrations of galaxies exemplifying luminosity classes.

This catalog is a necessary tool as it provides a uniform set of basic data for a large and complete sample of nearby galaxies. It can be ordered from:

Publications office
Carnegie Institution of Washington
1530 P Street, N.W.
Washington, D.C. 20005

Its price is 29 US $.

P. V.

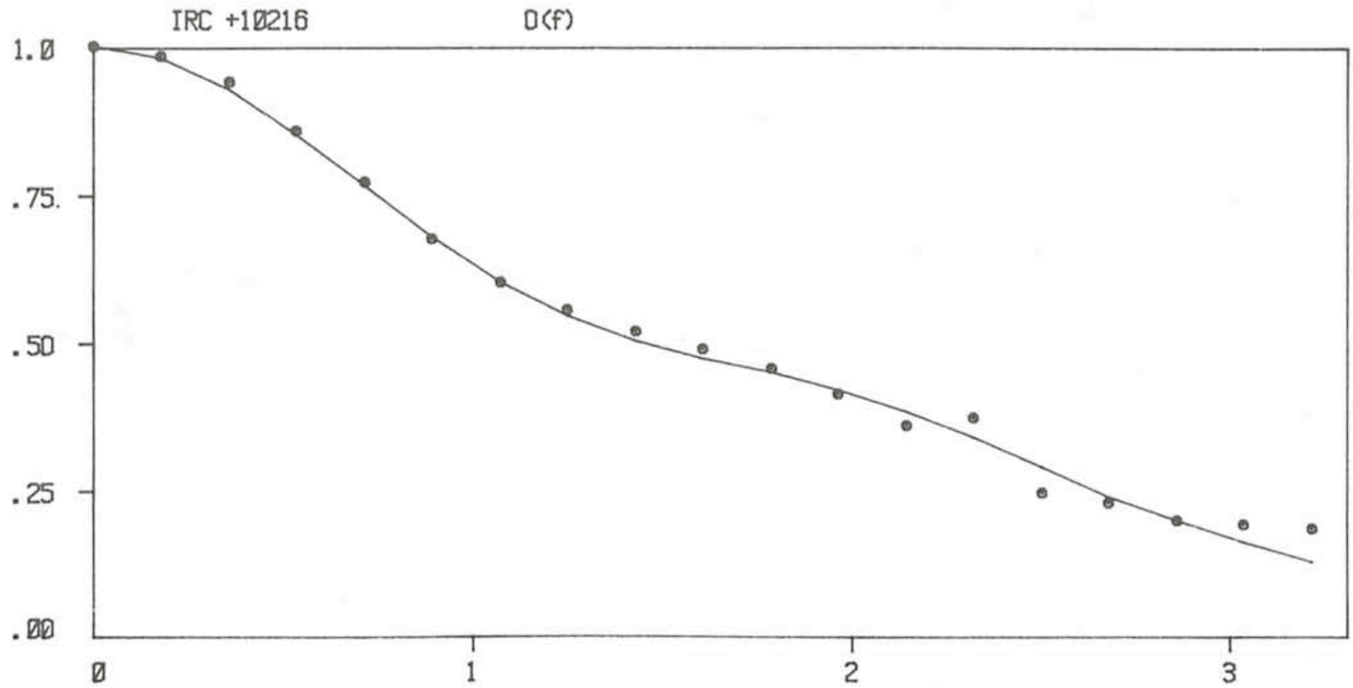

Fig. 4: *Spectrum modulus of IRC + 10216 (normalized at origin, versus spatial frequency in arcsec^{-1} at L(3.5 μ). Scanning direction is east-west. The full line represents a model composed of two disks of 0.36 and 1.2 arcsec respective diameters.*

Seeing Variations

The critical step in the "image modulus" restoration process is to determine the atmospherical coherence length, parameter correlated to the seeing and theoretically retrievable from the data themselves. This parameter appears to be of prime importance when one corrects the reduced data from the point-spread function as measured on a point-like source, hence with other seeing conditions than with the object. But this task is increasingly difficult as the source becomes fainter because it makes the computation less and less reliable. The only way to avoid this artificial limitation to a correct restoration is to measure the seeing independently through a "seeing monitor" centred on a field star.

As evidence has been given that such an instrument should be included in a more general seeing study (R. Wilson, 1980, ESO internal report on dome seeing), we have good hope to add a prototype soon into the speckle system.

I wish to thank A. Moorwood and P. Salinari for the introduction to the new IR photometer and the ESO electronic staff of La Silla for the repetitive support they gave to transform an unorthodox project into reality.

Photometric Classification of Pulsating Variables with Periods between One and Three Days

R. Diethelm, Astronomisches Institut der Universität Basel

The MESSENGER contains many articles referring to exciting celestial objects of more or less "exotic" nature. In this note the description of the photometric behaviour of only a small group of stars is presented, which nevertheless have proven to be important in the quest for measuring distances, and which may hold keys for the theory of stellar evolution. These stars show periodic variations of their apparent brightness due to a radial pulsation instability of their outer atmospheres. Commonly they have been divided into two major subgroups, the RR Lyrae stars whose periods lie between a few hours and roughly one day, and the Cepheid variables with periods of more than one day. While the first – also called cluster-type variables – are considered to be members of the oldest stellar population of our Galaxy, the latter are thought to belong primarily to the younger stellar population.

It has been shown during the first decennia of this century, that the RR Lyrae stars all have roughly the same intrinsic brightness, while the Cepheid variables satisfy a proportionality between their absolute magnitude and the logarithm of their period. These facts render them powerful distance indicators within our own galaxy, at least on our side of the galactic nucleus and in some cases even to our nearest neighbour galaxies.

The division of the two major subgroups at a fixed period is quite arbitrary and not supported by any physical considerations. In fact, some overlap in the period interval between one