1959. Photographic observations at Observatoire de Haute-Provence (OHP) with the 80 cm (f/6, Newton focus) and 193 cm (f/5, Newton focus) telescopes have enabled us to discover 11 stellar clusters of which 8 are globular as well as a very large number of variable stars for which a photometric study is now being carried out.

A long series of B and R observations of the same fields were obtained in 1968 by means of the 48-inch Schmidt telescope on Mount Palomar. Many of these photographic plates have not yet been studied, because until recently the Lyon Observatory did not have a blink comparator that could accommodate plates larger than 25 x 25 cm. However, a new blink comparator has now been built which permits measurements on plates up to 30 x 30 cm and detection of magnitude variations of less than $0^m.2$. The (X, Y) position of a star is measured in an orthogonal system with arbitrary origo (X_0, Y_0).

In 1972 we started another series of photographic observations with an image-tube camera (ITT 4708, S20 extended red photocathode) at the f/15 Cassegrain focus of the ESO 1.52 m telescope. The aim was to find and to study the RR Lyr-type variables in a number of globular clusters which had already been observed at OHP.

Now, with the improved blink comparator and a fully digitized Iris photometer (Askania, automatic iris) available, a group of astronomers consisting of scientists from the Institut d'Astrophysique in Paris and the Lyon Observatory is proposing to perform a detailed photometric study of the bright cloud B in Sagittarius, within the area:

$$17^h \leqq \text{R.A.} \leqq 18^h \text{ and } -24^\circ \geqq \text{Decl.} \geqq -33^\circ,$$

centred approximately on the star 45 Oph (R.A. = $17^h\ 26^m$; Decl. = $-29^\circ\ 59'$). The principal aims are:

(1) the study of known variables in that region,

(2) the detection of new variable stars by
- the new blink comparator and
- photoelectric photometry, in particular to find the δ Scuti variables,

(3) the measurement of particularly red stars, either intrinsically red or reddened by interstellar absorption,

(4) the estimate of the interstellar absorption in the direction of the galactic centre,

(5) the search for a possible correlation between the type and the spectral distribution of the identified variable stars,

(6) the determination of the distances to the numerous globular clusters which are either situated or projected into this direction.

The photographic observations commenced in June 1976 with the ESO Schmidt telescope. H.-E. Schuster and his collaborators have already obtained 21 plates in B and R of excellent photometric quality, mostly under good seeing conditions. They cover a field of about 10° square, centred on 45 Oph. Each field has been photographed at least twice with the following exposures: B (IIa-O + GG 385) 20 and 40 minutes; R (103a-E + RG 630) 30 and 60 minutes.

A preliminary study of some of these plates was carried out in January 1977 with the blink comparator at the Sky Atlas Laboratory in Geneva and some variable stars were found around the globular cluster Terzan 2. We are now continuing the measurements of the entire set of plates and of the 1968 Palomar plates. The results will be included in a forthcoming publication.

In parallel to this work we expect to:
- complement the photographic plates with exposures in U and V, in collaboration with H.-E. Schuster, and
- establish photometric sequences in UBVRI with stars in the sky area under study. These sequences should cover a magnitude interval from V = 8.0 to V = 17.0 or, if possible, preferably fainter. We expect to use the ESO 50 cm, 1 m and 3.6 m telescopes for this purpose.

Although a large number of observational data have been gathered during the past 18 years at OHP and ESO (a total of more than 2,000 plates), they only cover relatively small fields (60 x 60 arcminutes at OHP and 3 arcminutes circular at ESO). It is therefore obvious that general conclusions concerning the structure of the Milky Way in the direction of the centre can only be made after an extended study of the observations which have been proposed in the present programme.

The Exciting Star of Planetary Nebula NGC 3132

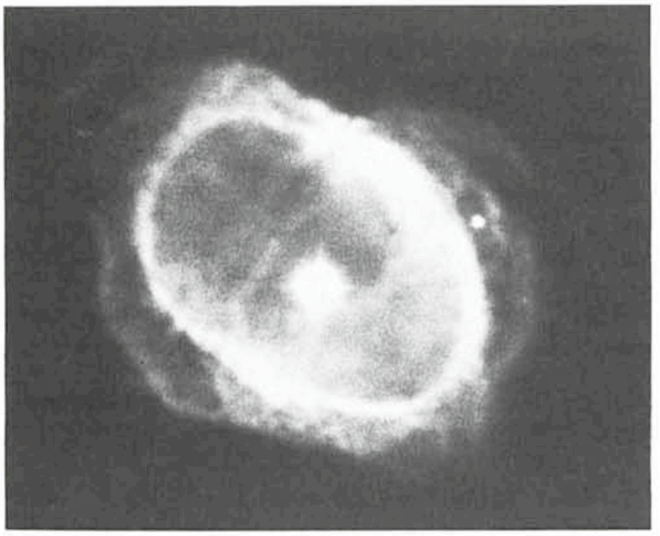

Fig. 1. — *Ultraviolet photo of NGC 3132, obtained on Feb. 14, 1977 at the 3.6 m telescope (plate no. 393). Exposure 8 minutes, IIIa-J + UG 1. The diameter of the nebula is about one arcminute.*

The term "Planetary Nebula" was coined when 18th-century astronomers discovered celestial objects that looked similar to the solar-system planets in their small-aperture telescopes. We now know that these nebulae have their origin in stellar outbursts (explosions) during which a star throws away consecutive shells of matter which afterwards expand around the central star. Spectroscopic analyses of the nebulae indicate that these stars are intense sources of ultraviolet radiation that excite the atoms in the nebulae. This is almost always confirmed when direct spectroscopic observations are made of the stars situated at the centres of the planetary nebulae: they are exceedingly hot, often the surface temperature is of the order of 100,000 °K.

A dilemma has existed for some time in the planetary nebula NGC 3132 in the constellation Pictor (Painter's easel) at R.A. = $6^h\ 05^m$; Decl. = -60°. Whereas the nebula indicates a temperature of about 100,000 degrees of the central star, HD 87892, this is not observed. As a matter of fact, HD 87892 is an A-type star which certainly is not hotter than 10,000 to 12,000 °K.

Recent observations by Dr. L. Kohoutek of the Hamburg Observatory, in collaboration with Dr. S. Laustsen of ESO, appear to solve this problem. A series of short exposures with the ESO 3.6 m telescope have revealed that the central star of NGC 3132 is in fact a double star and that the faint companion in all likelihood has the necessary characteristics to excite the nebula. It has a visual, apparent magnitude of about 16.5 and a luminosity 110 times that of the Sun. The star is extremely blue. It is therefore a subluminous, blue star, a stellar type that is typical for the central star of an evolved planetary nebula.

Drs. Kohoutek and Laustsen have submitted their detailed results to the journal *Astronomy and Astrophysics*.

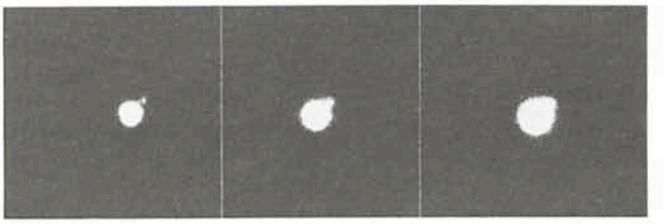

Fig. 2. — *Short-exposure images of visual binary HD 87892. 5, 10 and 20 seconds on IIIa-J + UG 1. The distance between the centres of the two components is 1.65 arcsecond.*

3.6 m Telescope: Excellent Optical Quality

The preliminary tests of the optical quality of the 3.6 m prime and Cassegrain foci optics have now been analyzed. They show that the large ESO telescope is optically nearly perfect and that the design specifications have been met, probably even significantly surpassed. The tests were carried out by the ESO Optics Section (in particular Daniel Enard, Francis Franza, Maurice Le Luyer, Patrick Monnerat and Raymond Wilson) and the present report was compiled by the leader, Dr. R. N. Wilson:

Prime Focus

In *The Messenger* No. 7 a brief summary was given of the alignment and test of the prime focus optics of the 3.6 m telescope (prime mirror with Gascoigne plate correctors). The preliminary analysis of the test results (mainly computer analysis of Hartmann test plates) was based on measurements with the modified Blink Microscope whose measuring precision is insufficient for establishing the formal energy concentration, although adequate for providing information on the important, low spatial frequency error residuals such as third-order spherical aberration, coma and astigmatism. In spite of these limitations, there was clear evidence that the specification (75 % of the geometrical energy to be within a circle of 0.4 arcsec diameter) had been met, perhaps by a clear margin.

Since this report, about 50 Hartmann plates for the prime focus have been measured on the "Galaxy" measuring machine at Herstmonceux in England. "Galaxy" has the necessary measuring precision of the order of 1 μ. We consider that errors due to the photographic processing conditions (the dark-rooms were not finished at that time) and non-random (dome) turbulence giving asymmetries in some spots are probably more serious sources of error than residual measuring errors on "Galaxy".

The computer analysis of the "Galaxy" measurements is now almost complete and it is hoped to produce a final report on the prime focus (with Gascoigne plates) within the next few weeks. However, it is already fully confirmed that the specification has been met with 80 % of the geometrical energy within 0.42 arcsec for the zenith position and only minor variations for the inclined telescope (between 0.46 arcsec southwards to 0.35 arcsec eastwards). These figures correspond, of course, to the state of the telescope after the removal of the very small decentring coma error present after the alignment. We believe that even this excellent result is too pessimistic; for the residual astigmatism is probably largely due to dome turbulence. Furthermore, the small residual in spherical aberration can be removed by a further axial adjustment of the corrector and any genuine residual astigmatic effects present in the primary can be removed by a small adjustment of the axial support system.

Our calculations show that removal of third-order astigmatism alone would give a geometrical energy concentration of 80 % within 0.35 arcsec diameter, while further removal of the residual spherical aberration and triangular astigmatism would give 80 % within 0.27 arcsec diameter. It should be remembered further that energy concentration values, although an apparently simple means of specification, are the most difficult values to prove formally with the Hartmann method and tend to be pessimistic because of the high spatial frequency residual statistical and systematic errors entering as background noise with a relatively large effect on the concentration values.

Our work on the prime focus had convinced us that the dome seeing was probably the major limiting factor—we wondered what the Cassegrain focus would reveal in this respect!

Cassegrain Focus

The Cassegrain focus (CF) alignment and test was a relatively simple process compared with the prime focus—it took only 3 weeks for three staff members from Geneva, compared with 11 weeks for the prime focus (PF). The main reason for this was that the PF operation represented the first use of the telescope. All the basic alignment had to be done from scratch and many general "teething problems" overcome. The initial part of the CF alignment was simply a repetition of the PF procedure—establishing a sighting line perpendicular to the δ-axis and passing through the centre of the prime mirror. (This requirement stems from the need for accessibility to the south pole and means that the δ-axis is the starting point of the optical alignment.) This sighting line was lined up with a cross-hair defining the centre of the top unit of the telescope, this cross-hair having been lined up with the centre of the prime mirror during the previous PF adjustment. On our telescope there is no possibility of translating laterally the secondary mirror within its top unit—it can only be tilted. With this single degree of freedom, only one condition can be fulfilled, and this must be imagery free from decentring coma. This is possible even if the optical axes of the primary and secondary are not exactly coincident, for a residual translation error can be compensated by a tilt. But this will incline the pointing direction (effective optical axis) so that the tolerance on perpendicularity with the δ-axis may not be met.