means of studying the geometry of the envelopes themselves. At least this will be valid in the case where the electron density as well as the density gradient may be determined independently by simultaneous spectroscopic observations.

Simultaneous Observations at La Silla

In 1977 we started at La Silla a programme of simultaneous spectroscopic and polarimetric measurements for which ESO is able to offer excellent facilities. Discussing our observational routine, we had to decide whether to select a sample of only a few stars, each of them being observed over a long period, or to observe a larger number of stars, but spending only a relatively short observation time on each. Considering the great variety among Be stars, we decided upon the latter.

However, the long integration time, which is necessary for high-dispersion spectra, and also a narrow-band filter polarimetry, then restricts the observations to objects brighter than 6th magnitude. About 160 stars remain. Due to the concentration of young stars to the galactic plane, most of them can be observed at La Silla.

In our first run in 1977 we could observe 15 Be stars simultaneously. In 1979 we observed a further 15 stars and in addition 6 of the stars we had already observed two years earlier.

The repetition of observations turned out to be very illuminating because all six stars exhibited pronounced variations. For example, in 1977 λ Pav showed a normal B-type spectrum whereas in 1979 a marked double emission appeared. ε Tuc varied its spectrum quite contrary and the other stars changed their line profiles remarkably (see fig. 1).

Very surprising was the fact that five of twenty-one programme stars, known as emission-line stars, did *not* show any emission in Hα!

The Shell of π Aqr

Everyone who is concerned with calculations of extended envelopes knows by experience that it would be too optimistic to believe that the Be star problems can be solved quite simply by simultaneous spectroscopic and polarimetric observations. We soon had to learn this lesson from the shell star π Aqr. As was pointed out, the Hα line profile shows that the ratio of polar radius to equatorial radius lies within 1/2 and 1. On the other hand, we have the results of the polarization measurements (see fig. 3):

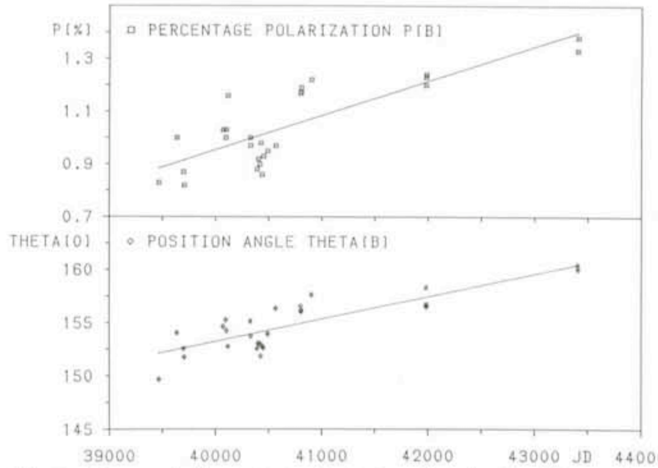


Fig. 3: *The variable polarization of π Aqr in the blue colour observed over a period of 12 years by different authors.*

Assuming simple electron scattering, the extremely high polarization of π Aqr requires this ratio to be between 1/3 and 1/5. What is wrong here? Perhaps the models used for both the line-profile calculations and also the continuum polarization are too simplified. Perhaps the polarization is caused not only by electron scattering but also by aligned grains. A confirmation may be the strong variability as well as the increase of polarization during the period of observation. However, which particles should be aligned and what is the physical mechanism responsible for an alignment of particles?

We have no answers to these questions at the moment. Therefore we are now trying to start calculations which take into account the known fact that the photosphere of a rapidly rotating star, like π Aqr, cannot be a sphere but must be flattened. This asymmetry of the geometry of the photosphere will cause a radiation flux which is also asymmetric in its geometry. Therefore, an additional polarization will result by electron scattering even within a spherical shell.

Acknowledgements

We wish to express our appreciation to all staff members at La Silla for their assistance during the simultaneous observations on two telescopes.

NEWS AND NOTES

Identification of Minor Planets

All over the world, every night, photographical plates are exposed with astronomical telescopes. And astronomical photography has become a great hit among amateurs who, for comparatively little money, can buy rather large, high-quality instruments.

As is well known to the readers of the *Messenger*, such photos may frequently show trails of minor planets. The fainter the limiting magnitude, the more trails are likely to be seen. Many professional astronomers are full-time "minor planet hunters" and with larger telescopes and better photographic emulsions more and more objects are being picked up. Many amateurs are now capable of reaching magnitude 15 or even 16 and have the fun of discovering new minor planets.

One of the major problems that confronts the astronomer who works in this field is to determine whether a trail belongs to a planet that is already known or whether it is new. The necessity of being able to answer this important question quickly and efficiently in connection with the research that is carried out at the Schmidt telescope on La Silla has led ESO astronomers H.-E. Schuster and R. M. West to develop a method that may be of interest to others.

ESO has several computer systems in Chile and in Geneva. Some of these control the telescopes on La Silla and others control the measuring machines in Geneva. There are, of course, also some systems that are used for "regular" computations. Some years ago, ESO decided to standardize its computer equipment, and after a careful study the Hewlett-Packard 21MX was chosen. This has the great advantage that programmes can be immediately transferred from one ESO computer to another, without time-consuming software rewriting.

A set of programmes has been written that takes care of almost all problems in connection with minor planet work, from identification to measurement of accurate positions, but not (yet) computation of orbits from observed positions.

The basic feature is a computer file with the orbital elements of all numbered minor planets which is regularly brought up to date. As of August 1979, there are 2,167 entries. The file originates from a card catalogue that was generously made available to ESO by Dr. Lutz Schmadel of the Astronomical Computing Centre in Heidelberg. A second file contains the elements of all minor planets that were discovered at ESO. Since the elements vary with time because of planetary perturbations, a programme is available that carries the epoch of the elements forward or backward in time. This programme is based on a subroutine that was also delivered by Dr. Schmadel and which has proven to be very accurate.

To identify a minor planet trail is now rather easy. All the astronomer has to do is to use a "search" programme. He first tells the computer the central coordinates of the plate on which the trail is seen, the epoch of the plate (i.e. the exact time it was exposed), the size of the plate (in millimetres) and the plate scale ("/mm). The programme then, in about one minute, runs through the element files and prints out which planets can be seen in the plate field, the rectangular (X, Y) coordinates of the corresponding trail and the magnitude. By placing a transparent millimetre grid on the plate, it is very easy to verify whether the trail in question corresponds to one of the known planets. In practice, very few planets that are brighter than 16^m are unknown, but most of those fainter than 17^m are new discoveries.

Accurate measurements of the trail positions can be done for instance on the ESO S-3000 measuring machine in Geneva that is capable of taking plates of 14 × 14 inch size. Positional measurements have now become a matter of routine and ease, because a high degree of automation has been achieved. Astrometrical standard stars in the field shown by a plate are acquired automatically from the Perth 70 catalogue which is stored on the computer disc. Similarly, the earlier-mentioned programme may be used to find the minor planets on a plate without having to search for them through a microscope. Thus, when trails of supposedly new planets are measured, it takes very little effort to add measurements of all known planets on the plate.

The measured (X, Y) coordinates are transformed into celestial (α, δ) coordinates by means of another programme. All in all, it now takes about 15 minutes to measure a few minor planet trails on a Schmidt plate and obtain accurate positions ($\pm$ 0."3). Most of the time is spent on the measurement of the standard stars that serve as reference.

The positions are sent to the Minor Planet Bureau of the IAU that, under the leadership of Dr. B. Marsden, has achieved a high degree of perfection in orbital calculation and identification of "new" planets with "unidentified" observations from earlier epochs. This enormous task is facilitated by a computer catalogue of about 200,000 minor planet observations which can be searched once the approximate orbit of the "new" planet is known. It is not rare that the efforts of Dr. Marsden and his associate Dr. Conrad Bardwell lead to several identifications, sometimes dating back to early in this century. The requirement that a planet must have been observed in at least three oppositions before it can be numbered can therefore sometimes be met immediately.

R. M. West

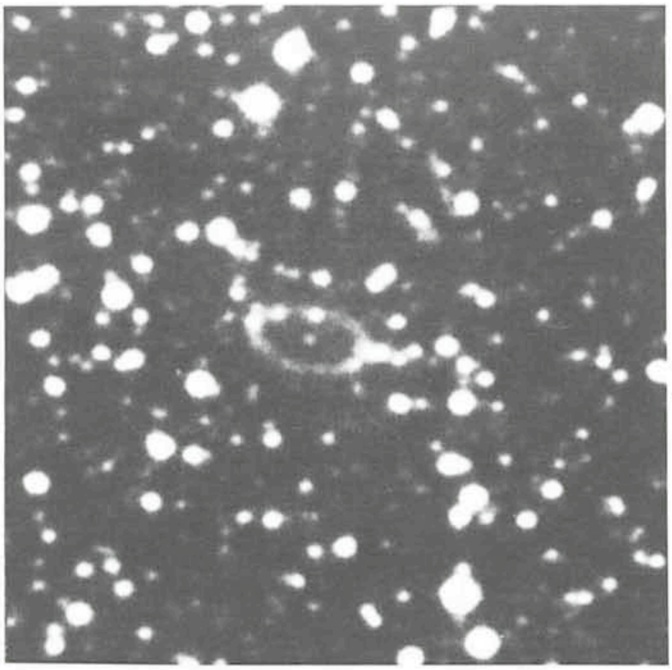
Galaxy or Nebula?

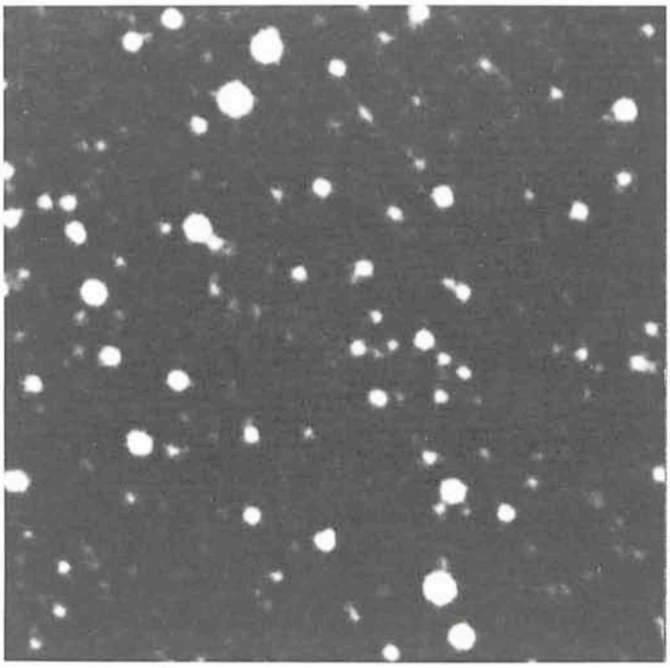
The ESO (R) half of the joint ESO/SRC Atlas of the Southern Sky is now going well ahead (2-hour exposures on IIIa-F + RG630 plates with the ESO Schmidt telescope).

It is obviously of great interest to compare these red plates (wavelength interval: 6300–7000 Å) with corresponding blue plates, for instance the ESO (B) plates (3900–4900 Å) in order to discover objects that are either very blue or very red. During the quality control of a red plate, ESO astronomer H.-E. Schuster recently noticed a very peculiar object near one of the edges. The object, which is shown enlarged here, has the form of an oval ring; the longest diameter is about 28 arcseconds. The object is not at all visible on the ESO (B) plate (also shown here).

One would suspect that it is a planetary nebula or perhaps a ring galaxy. The central star of a planetary nebula is normally blue, but a comparison of the two photos does not show a particularly blue object in the centre. Nor is it usual to encounter an extragalactic object at this low galactic latitude (+ 3°.7).

It is faintly visible on the Whiteoak extension to the Palomar Atlas but is not included in the lists of planetary nebulae that have so far been published. Spectroscopic observations are now eagerly awaited; for those who want to try themselves, here are the accurate coordinates (1950.0) of the central "star" : R. A. = $16^h 40^m 57^s.44$; Delt. = –39° 57' 48."4.





A mysterious object, reproduced from a rejected ESO (R) plate (upper, 120 min IIIa-F + RG630, bad seeing) and an ESO (B) plate (lower, 60 min IIa-O + GG385), both obtained with the ESO Schmidt telescope. North is up and east to the left.