centre. At a distance of 188 kpc the galaxy has a radius of 3.3 kpc. In the central field 22 carbon stars are within 330 pc from cluster No. 4, 6 are within 110 pc. All observations so far show that cluster No. 4 is the least metal poor, having [Fe/H] = –1.4. The most metal-poor clusters observed in this galaxy have [Fe/H] = –2.1. It has been suggested, on the basis of the distribution of the Magellanic Clouds, that a certain metal-poorness favours the formation of carbon stars of this type. Obviously, this poorness should not go too far, otherwise the Sculptor galaxy with [Fe/H] ≤ -1.8 should have been far richer in carbon stars than indicated by this survey.

We turn, finally, to the irregular galaxy NGC 6822. Its apparent distance modulus is m–M $\sim$ 25. With a reddening of about E(B-V) = 0.4 its distance is about 616 kpc. From previous investigations it is known to contain many blue and red supergiants. 16 H II regions have been identified, and many similarities to the LMC have been noted. There may be a slight deficiency in N and O.

If the carbon stars have $M_I \sim -4$ we are not likely to reach them in this galaxy. Our survey has given 23 M stars. A number of them are certainly members of the galaxy; some may be foreground objects. This has to be checked, preferably with velocity determination.

For all five galaxies holds that spectroscopy of the identified faint M stars, too, should be rewarding. They have to be either members of these galaxies, or dwarf members of our galaxy. In either case, the knowledge of their characteristics would contribute essentially to the solutions of fundamental problems concerning the evolution of galaxies.

Photometric and Polarimetric Observations in NGC 6334, NGC 6357 and NGC 6302

Th. Neckel

Polarization is observed in the light of many stars and is normally attributed to interstellar dust particles aligned in an interstellar magnetic field. It is, however, quite possible that—at least in some cases—the polarization arises in dusty envelopes, surrounding stars during the earliest phases of their life. Dr. Thorsten Neckel from the Max-Planck-Institut für Astronomie in Heidelberg, FRG, has recently obtained observations of such objects from La Silla. Combining photometric and polarimetric measurements, it has become possible to provide new, important evidence for the intrinsic, bipolar model.

Several investigations carried out at the Max-Planck-Institut für Astronomie in Heidelberg within the last years are concerned with problems of star formation. Star formation is restricted to regions of high dust densities. Observations of embedded sources are often possible only at infrared wavelengths, because of the higher extinction for the visible light. One of our powerful instruments for observing recently-formed stars is an image-tube camera which is used at wavelengths up to 1 micron. Hitherto invisible young stars in the giant H II regions M 17, W 3 and others have been detected.

In these H II regions very high degrees of polarization have been found. Whereas the "normal" interstellar dust produces polarization values up to about 5 %, polarization degrees higher than 20 % were observed in M 17 and W 3 (Schulz et al., 1978). An appreciable part of the high extinction of these stars occurs in the H II regions themselves, where the densities of gas and dust are very high. Under these conditions the "Davis-Greenstein mechanism" for aligning the dust particles becomes very ineffective. So it proved to be difficult to explain these high polarization values by anisotropic extinction due to dust particles aligned in an interstellar magnetic field. Therefore, the observed high degrees of polarization are possibly due to a different mechanism (Elsässer and Staude, 1978).

Dust Envelopes

One possibility is the assumption of non-spherical dust envelopes around stars in which scattering by dust grains or electrons produces the polarization. Bipolar nebulae like "Minkowski's foot print" or S 106 are examples for such a configuration. These objects exhibit around a central star a disk of dust being nearly parallel to the line of sight and, therefore, obscuring the central star. (The central star in S 106 becomes visible in the near infrared, as shown by photographs with our image-tube camera (Eiroa et al. (1979).) Extended lobes of gas and dust, vertical to the dust disk, are visible. In these directions the disk is not optically thick. Therefore the light of the central star can illuminate the lobes. In the lobes we see predominantly scattered light which is highly polarized. The two lobes of "Minkowski's foot print", for example, are polarized to 15 % and 25 % respectively (Cohen and Kuhi, 1977).

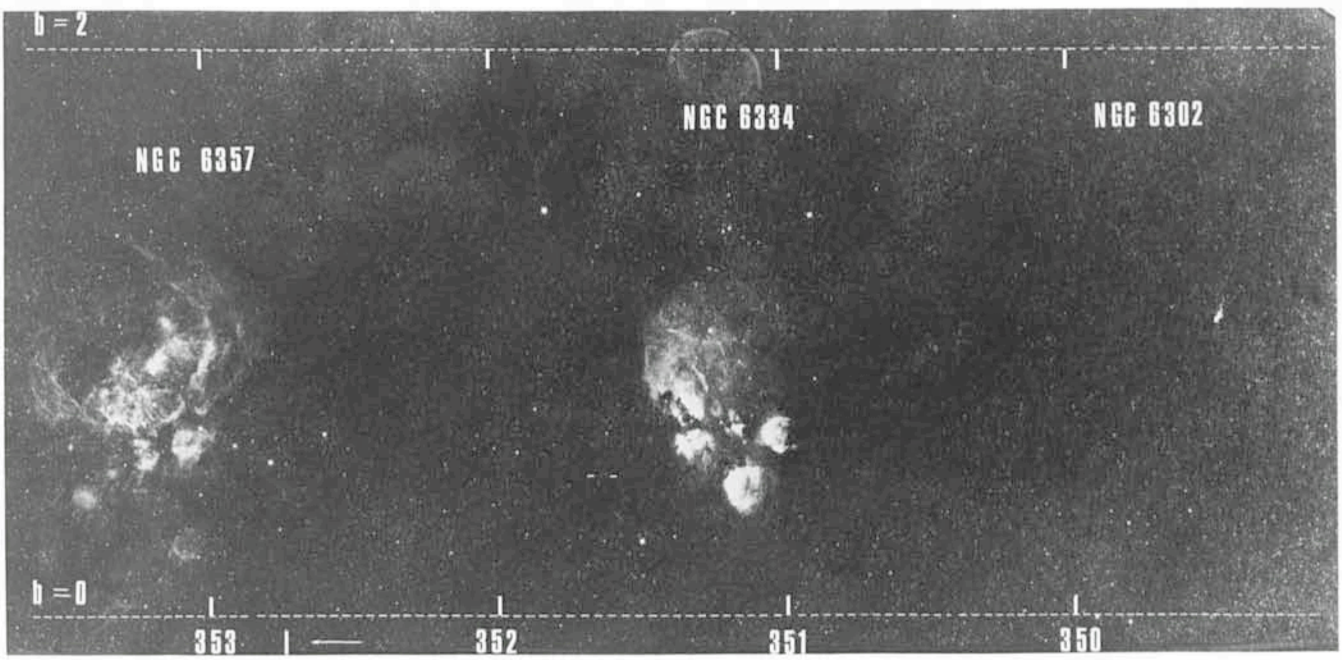
Whereas "Minkowski's foot print" and S 106 are not obviously related to regions of star formation, the peculiar bipolar nebula NGC 6302 is only 1°5 distant from NGC 6334, one of the largest H II regions in the Southern Milky Way. In NGC 6334 star formation is still going on, as indicated by the presence of OH masers and other very young objects (see Alloin and Tenorio-Tagle, 1979). Furthermore, the more evolved H II region NGC 6357 is located 1°5 away. The part of the Southern Milky Way containing NGC 6302, 6357 and 6334 is shown in figure 1a. The photograph is from the red print of the Palomar Sky Survey. The H II regions NGC 6334 and 6357 are members of the Sagittarius spiral arm; for NGC 6302 no distance estimation has yet been possible.

The Observations

NGC 6334 and NGC 6357 contain many early-type stars. For the brighter ones, UBV observations were already made in 1976 at the Gamsberg in South West Africa using our 50 cm telescope, from which resulted the distance 1.72 kpc for both H II regions. Additional fainter stars were observed with the ESO 1 m telescope in June 1979. Their (B-V)/(U-B) two-colour diagram is shown in figure 2. 18 stars of spectral type O to B 2 were found in NGC 6357 and 13 in NGC 6357. In NGC 6357 nearly all of them are located within the two compact radio sources G 353.2+0.9 and G 353.1+0.7. These radio sources are delineated in figure 1b by two isophotes of the 1.95 cm continuum radiation observed by Schraml and Mezger (1969). Figure 2 shows that all these stars have similar colour excesses, corresponding to extinction values in the range $A_v = 5^m$ to 6^m. Some foreground stars exhibit extinction values up to $2^m.4$, so that the internal extinction in the H II region itself amounts to about 3^m.

For all early-type stars in NGC 6357, except the faintest ones, polarization measurements were made, also at the ESO 1 m telescope during 3 nights in June 1979. The polarization vectors (after subtracting the foreground polarization) are shown in figure 1b. Whereas inside the two compact radio sources all polarization vectors are nearly parallel, their mean directions, 146° and 79° respectively, are very different. In G 353.2+0.9 the polarization is surprisingly small. This may indicate that within this region the magnetic field is nearly parallel to the line of sight or that the mechanism of aligning the dust grains is not efficient.

The extinction values in NGC 6334 are generally smaller, ranging from 3^m to $4^m.6$, only two stars with appreciably higher A_v values, about $6^m.50$, have been found. Star no. 34,



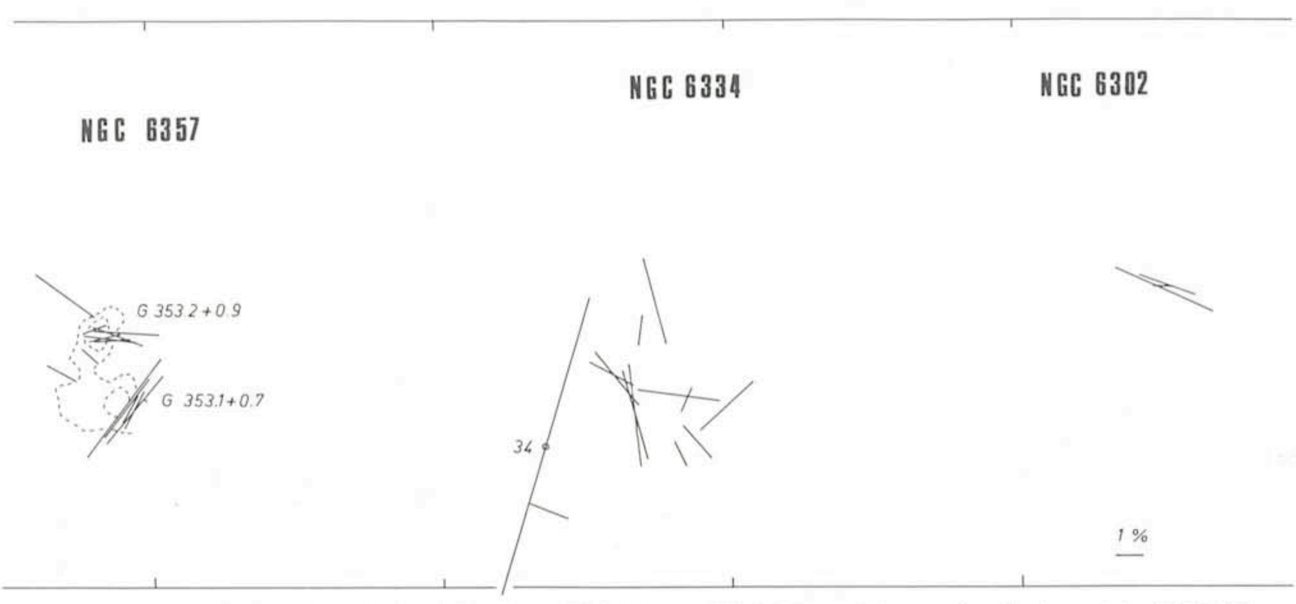


Fig. 1a: *The Milky Way in Scorpius with the H II regions NGC 6334 and NGC 6357 and the peculiar bipolar nebula NGC 6302.*
Fig. 1b: *The polarization vectors for the observed stars in the H II regions NGC 6334 and NGC 6357 and in the lobes and the centre of NGC 6302. In NGC 6357 two isophotes of the 1.95 cm radiation are shown.*

marked in figure 1, is situated in a dark cloud which seems to be associated with NGC 6334. It has the highest observed polarization, (p_v = 10.70 % ± 0.60 % and 11.5 % after subtracting the foreground polarization) which exceeds those of the other stars observed in NGC 6334 by a factor 3 to 4. However, its extinction is only about 2^m higher. This indicates that in the dark cloud the conditions for polarizing the star light are very different from those in the H II region. A similar behaviour was found in M 17, where all extremely high polarization values are observed in the dark cloud associated with M 17 (Lenzen and Schulz, 1979). A hint about an unusual mechanism for this high polarization may be expected from its wavelength dependence. Because star 34 was observed for the first time during the last of my 3 polarimetric nights, only 1 measurement in U, B, and V respectively could be made. Usually the polarization has its maximum at about 5500 Å. For star 34, however, the highest value was found in the ultraviolet, p_u = 13.0 % ± 3.6 %. Because of the faintness of star 34, U = $15^m.5$, the wavelength dependence of p for this star still needs further observations.

NGC 6302

NGC 6302 is very peculiar in many respects. Although listed in the catalogue of planetary nebulae by Perek and Kohoutek, it is clearly not a typical planetary nebula, as pointed out already by Minkowski and Johnson (1967). Short-exposure photographs of this bipolar nebula show a dark lane between the two lobes (see Minkowski and Johnson, 1967). An excellent photograph of NGC 6302 is published in the ESO *Messenger* 15, p. 11. NGC 6302 is one of the most highly excited gaseous nebulae known. From the relative halfwidths of the [N II] and H α profiles, Elliott and Meaburn (1977) found in the centre of NGC 6302 the extremely high electron temperature T_e = 26,700 K. T_e values > 20,000 K are unlikely even when radiatively excited by a star with a surface temperature of 10^5 K. Therefore, the high T_e value in NGC 6302 indicates collisional excitation. As the possible source of energy a star has been suggested, which emits an energetic stellar wind. However, no central object has been found up to now. During my 3 polarimetric nights in June 1979 I have measured the polarization at 3 points in NGC 6302: in its centre as well as in the brightest parts of the lobes using a 16" diaphragm. In the centre the polarization is found to be below 1 %. In the lobes however, much higher values have been found, up to 5 %, and the directions of p are nearly vertical to the directions to the centre. Therefore the light of NGC 6302 must be partly scattered light from the central source, surrounded by dust, which is optically thick in the line of sight but not in the directions to the lobes. The simplest model is a dust disk seen edge-on similar to those in "Minkowski's foot print" or S106.

NGC 6302 is surrounded by many extremely red stars. The dust, which is responsible for their high reddening, appears to be quite distant, because also many unreddened stars in the same region are present. If NGC 6302 is physically related to this dust cloud, it also cannot be nearby. So it seems probable that the nearness of NGC 6302 to the H II regions NGC 6334 and NGC 6357 is not a projection effect, but they are in reality "neighbour" objects in the Sagittarius spiral arm.

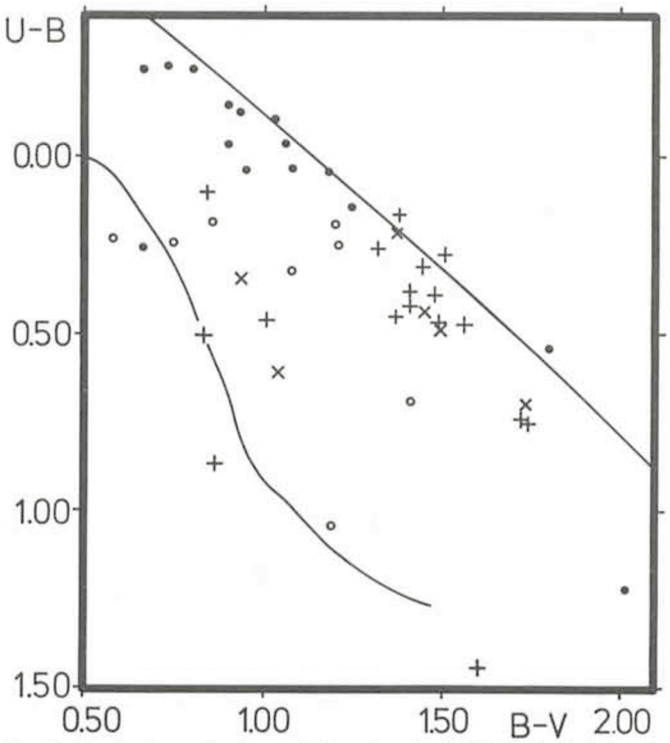


Fig. 2: *Two-colour diagram of the stars in NGC 6334 (dots) and NGC 6357 (upright crosses for stars in G353.2+0.9, diagonal crosses for stars in G353.1+0.7 and open circles for stars outside the compact radio sources). The two lines are the reddening line for an O5 star and the unreddened main sequence.*

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Tentative Time-table of Council Sessions and Committee Meetings in 1980

The following dates and locations have been reserved for meetings of the ESO Council and Committees:

January 21–22	Finance Committee, Geneva
(February 6	Council, Geneva)
(April 17–18	Finance Committee, Geneva)
May 20	Users Committee
May 21	Scientific/Technical Committee, Geneva
May 22	Committee of Council, Geneva
June 2–4	Observing Programmes Committee, Geneva
June 18–19	Finance Committee, Brussels
June 20	Council, Brussels
November 4	Scientific/Technical Committee, Munich
November 5–6	Finance Committee, Munich
November 7	Committee of Council, Munich
November 27–28	Council, Munich
December 2–4	Observing Programmes Committee, Munich