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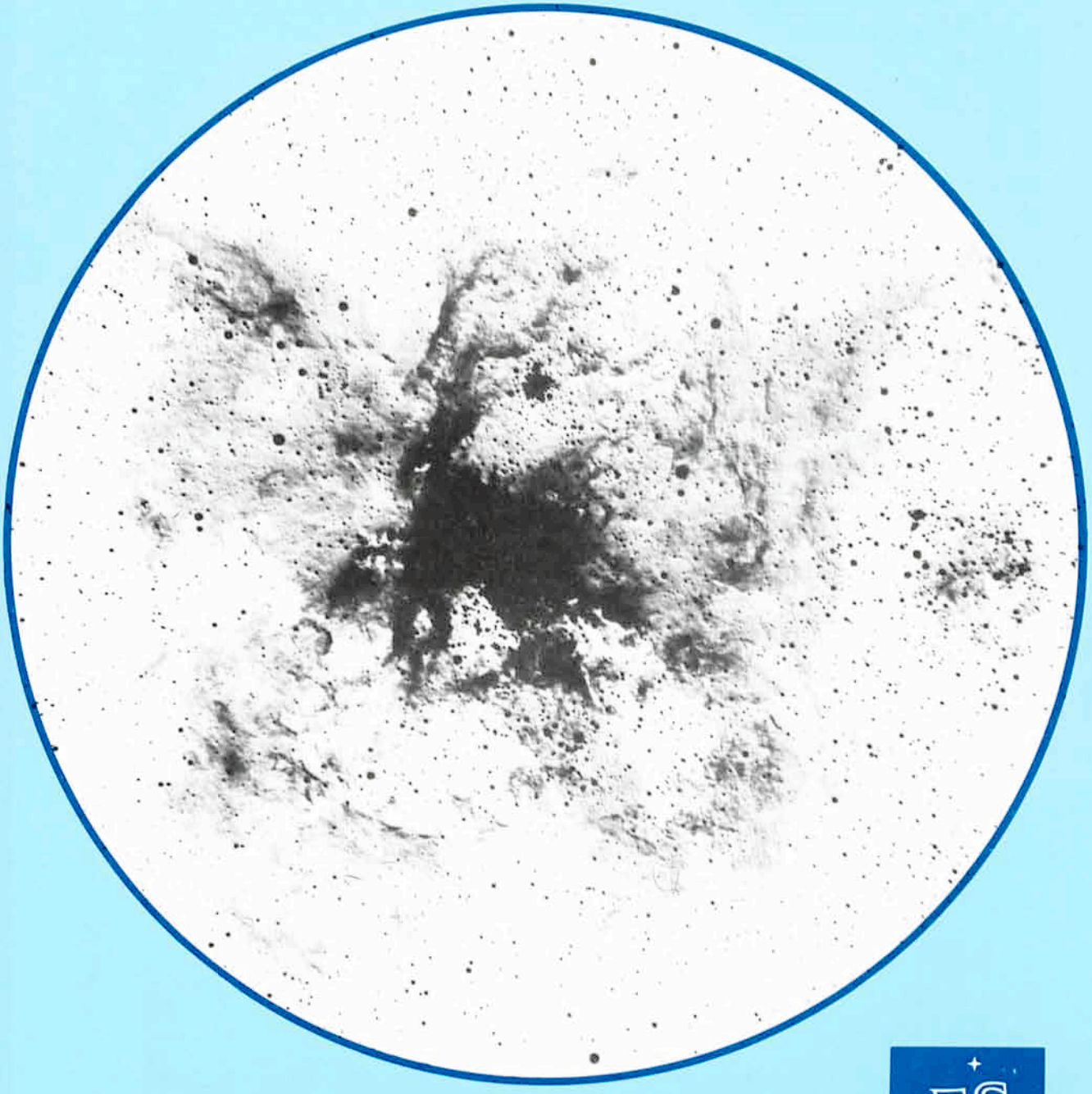

EUROPEAN SOUTHERN OBSERVATORY

Cover Photograph

30 Doradus (NGC 2070) is a large region of ionized hydrogen in the Large Magellanic Cloud. It is here photographed in the prime focus of the ESO 3.6 m telescope; exposure time : 10 min on IIIa-J emulsion behind a GG 385 filter; observer : S. Laustsen.

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Organisation Européenne
pour des Recherches Astronomiques dans l'Hémisphère Austral

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INTRODUCTION

During the year, the 3.6 m telescope became fully operational. With the newly arrived Image Dissector Scanner attached to the low-dispersion spectrograph, an efficient spectroscopic facility is now available. Much of the time the telescope was used with this and other ESO equipment, but quite a few visitors also brought their own equipment along. This included three groups with mm and IR equipment, two with Speckle interferometers, and three with other equipment. While this development is to be welcomed from a scientific point of view, the effort required at La Silla to adapt special equipment is considerable.

A wide variety of research programmes was done by visiting astronomers and staff. It would be difficult to select the highlights in programmes that covered all areas of contemporary astronomy and astrophysics ranging over extragalactic studies, studies of radio and X-ray sources, studies of stars and the structure of our own galaxy and interstellar matter. Several programmes taxed the 3.6 m telescope to its limits, like one in which a 20th magnitude object was observed at the rather high spectroscopic dispersion of 30 Å/mm. In many programmes a close connection was maintained with a variety of satellite-based programmes, in particular the ESA-NASA International Ultraviolet Explorer.

Much work was done on instrumentation, in particular for the 3.6 m telescope. Good progress was made with the Coudé Auxiliary Telescope, the Coudé Echelle Scanner, the near infrared module for the low-dispersion spectrograph and the infrared photometers. Design work on the Cross-Dispersed Cassegrain Echelle Spectrograph was nearing completion, work on some other instruments was initiated, and some studies were started on a possible Very Large Telescope (16 m) for the future.

In Geneva the facilities for plate measuring and image processing were improved and expanded, so as to be able to deal with the increased flow of data from instruments like the IDS for both staff and visitors. It is now becoming clear that much expanded facilities will be needed when two-dimensional detectors will be in regular use at La Silla.

RESEARCH

Galaxies

A major collaborative effort was undertaken by Crane, Materne, Tarenghi (ESO) and Chincarini (Oklahoma) to study the large-scale clustering of galaxies in the Horologium region. Observing time for this programme was obtained both at Tololo and at La Silla. About 200 spectra have been obtained to date in the 175 square degree region, and the sample is now complete to visual magnitude 15.5. An extension of the survey to a larger area and fainter magnitudes is planned. The cluster Sersic 40/6 was studied by Chincarini, Materne and Tarenghi on the basis of radial velocity measurements and counts of galaxies on Schmidt plates. An isothermal gas sphere does not yield an appropriate model for the cluster. Materne continued his studies of methods for the classification of groups of galaxies. Quantitative membership probabilities were evaluated. Application to the Local Group and its environment yields a mass-to-light ratio of 20 in solar units. Studies of the intergalactic light in clusters were made by Schnur (ESO) and Mattila (Helsinki).

Crane (ESO) obtained prime-focus plates for surface photometry of the lenticular galaxies NGC 2217 and 1543, both of which show interesting internal structure. Danks (ESO) and van Woerden (Groningen) are continuing their programme of UBV photometry of southern galaxies with the 1 m telescope to determine brightness and colour distributions. Integrated magnitudes and colours have been obtained for 60 galaxies. Alcaíno (Santiago) and Danks (ESO) also obtained integrated UBV photometry of galaxies as well as spectra (partly with the IDS at the 3.6 m telescope) of galaxies in the Fornax group and the group 0019–489. Some UBVR plates were obtained at the prime focus of the 3.6 m telescope for a study by Geyer (Bonn) and Schuster (ESO) of NGC 3256. Some accompanying dwarf galaxies may have been found. Plates were obtained by Laustsen (ESO/Aarhus) on NGC 5291 and 4650A. For the latter, West (ESO) obtained spectra. West also studied the galaxy NGC 1809.

Boulesteix, Comte, Courtès, Georgelin and Monnet (Marseille) used the 3.6 m telescope on several occasions with a special focal reducer (to f/2) and two-stage image tube at the Cassegrain focus. They studied the distribution and kinematics of ionized hydrogen in a number of southern galaxies of large angular diameter. In NGC 1313 (barred galaxy ideally suited for studying motions along the bar), NGC 5236 and NGC 1566 extensive radial velocity data (one measurement each 3–4 arc seconds!) were obtained and several hundreds of HII regions per galaxy were identified. More limited data were obtained in NGC 300, 1365, 2997, 4038/39 and 5128. With the 1.5 m telescope and a Fabry-Pérot system, Comte and Georgelin studied the kinematics of additional HII regions in galaxies, in the LMC, and in our own galaxy. Two 109α recombination line sources at distances $>$ 10 kpc were detected optically.

Alloin (ESO) with Collin, Joly, Vigroux (Meudon) studied the nitrogen and oxygen abundance in a large sample of extragalactic HII regions on the basis of published data. They conclude that there is no evidence for overabundance of these elements in the central parts of spiral galaxies or for systematic abundance gradients in the disks of spirals. The physical conditions in "hot spots" in the nuclei of galaxies were studied by Alloin and Kunth (ESO).

Danziger (ESO), in collaboration with six other investigators, has completed the optical and radio (VLA) identification of several supernova remnants in M33.

In the continuation of the ESO/Uppsala programme of spectroscopic observations of interesting galaxies found on the sky survey, spectra of about 150 galaxies were obtained with the 3.6 m and 1.5 m telescopes (Bergvall, Ekman, Lauberts, Westerlund (Uppsala), Breysacher, Muller, Schuster, West (ESO)). In addition, UBV photometry was obtained for numerous objects. About 50 per cent of the galaxies showed emission lines, usually in combination with blue colours.

A spectroscopic survey of certain classes of compact galaxies was undertaken by Kunth (ESO) and Sargent (Pasadena) with the aim of extending the sample of galaxies with intense bursts of star formation. In observing runs at La Silla and at Las Campanas spectra of more than a hundred objects were obtained. Kunth also discussed the properties of some Seyfert 1 galaxies—including I Zw 92 and III Zw 77—with strong permitted FeII lines from spectra obtained with the 200 inch telescope at Palomar.

Infrared photometry and spectroscopic and morphological studies of a large selected sample of SO galaxies and also of southern Markarian galaxies are being done by Arnold, Kreysa, Schultz, Sherwood (MPI Bonn) and Schnur (ESO).

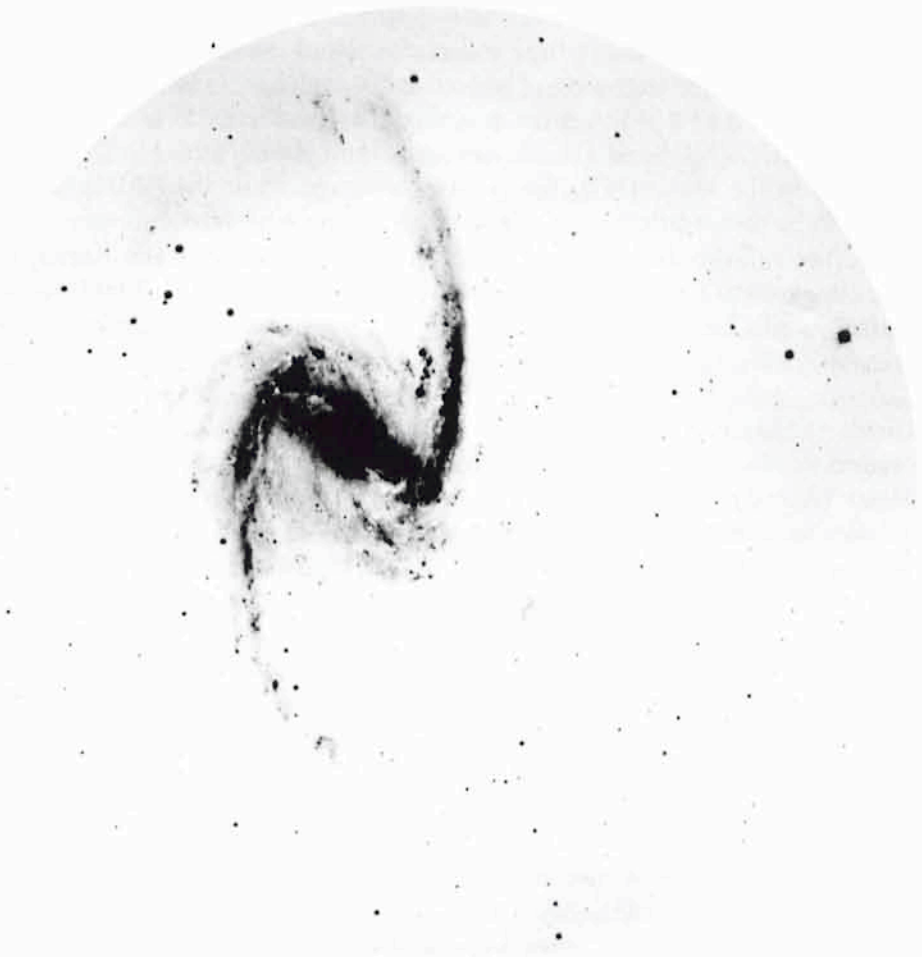
High-dispersion profiles of emission lines in the Seyfert galaxy NGC 1068 were studied by Alloin and Pelat (ESO/Meudon), who find that a broad component underlies many narrower components in particular in the [OIII] lines.

P. Véron (ESO) has studied the luminosity function of Seyfert 1 nuclei and BL Lac objects and has shown that the contribution of the very faint Seyfert nuclei to the X-ray background could be important. He also took photographs at the prime focus of the 3.6 m telescope of a number of galaxies with active nuclei to see if a star-like nucleus could be found. NGC 3347 appeared to have a resolved nucleus with a superimposed star 3 arc seconds away. NGC 2110, an X-ray source, also was found to have a bright but resolved nucleus.

Boksenberg (UC London), Bergeron and Dennefeld (ESO) took spectra with the 3.6 m telescope and the ICPS to study the effect of the activity in the nucleus on the general interstellar gas in Seyfert galaxies, in particular NGC 1068. With Tarenghi (ESO) they studied the relation of some Seyferts and quasars to groups and clusters of galaxies. Boksenberg (UC London) and Wamsteker (ESO) obtained data on the emission distribution and velocity field of NGC 5253 and Aguerro 6.

Huchtmeier (Hamburg) and Materne (ESO) continued their search for intergalactic hydrogen clouds with the Dwingeloo 25 m and the Effelsberg 100 m radio telescopes. They also mapped Scd and dwarf galaxies in the 21-cm line to determine the mass and size of the hydrogen distribution. Deep Schmidt plates are being taken to determine the corresponding distribution of optical light.

Lindblad (Stockholm/ESO) observed the nuclear spiral of the barred galaxy NGC 1512 with the 3.6 m telescope at 80 Å/mm to study its dynamics. Also the barred spiral NGC 1365 with a hot spot nucleus was observed. For A. Elvius (Stockholm) he obtained 64 spectra of the Seyferts NGC 1068, 1566 and 7469 with a slit of 2 arc minutes length. Most spectra covered the region around Hα, but some were in the uv region. Feitzinger, Kühn, Reinhardt and Schmidt-Kaler (Bochum) obtained spectra and photographs of the peculiar Seyferts NGC 1566, 3227, 6052, IC 4329 and Mkn 471, with the 1.5 m and 3.6 m telescopes. Particular attention was paid to the size of the active region and to eventual morphological features.



The southern barred galaxy NGC 1365 as photographed with the 3.6 m telescope on a IIIa-J plate through a GG 385 filter. The exposure time was 1 hour. This galaxy, which is an X-ray source and has a rapidly spinning nucleus with what seems to be a Seyfert-like core, is extensively investigated with the 3.6 m telescope. Observer : S. Laustsen.

M. Véron (Meudon/ESO) is studying the 4 C catalogue between 20° and 40° in order to correct the original fluxes for confusion and resolution and to identify most of the sources. In the course of this work, the fluxes of 416 sources were measured at 318 MHz with the Arecibo radio telescope.

Crane (ESO) continued studies of optical emission in the radio lobes of radio galaxies. Particularly successful were some observing runs with the 4 m telescope at Kitt Peak using at 400 × 400 pixel CCD.

The peculiar morphology of the radio galaxy NGC 6240 has been studied by Fosbury (ESO) and Wall (Cambridge, UK) on plates taken with the 3.6 m telescope. On the basis also of radio and spectral data obtained elsewhere, they conclude that the system represents a highly luminous phase in the collision of two gas rich galaxies. The jet of M82 was observed in the ultraviolet with the IUE satellite by Tarenghi (ESO).

The galaxy NGC 5128 (Cen A) was studied by several persons. Appenzeller (Heidelberg) obtained five spectra with the 3.6 m telescope across the dust belt to study different stellar populations and mass motions. Möllenhoff (Heidelberg) used the 1 m telescope, an image tube and narrow-band interference filters to obtain monochromatic photographs. The central wavelengths of the seven filters between 3750 and 6945 Å were placed on or between the emission lines of [OII], [OIII], [NII] and Hα. 29 new emission nebulae were identified. Strong emission in the Hα + [NII] feature was observed while the [OIII] lines were found to be comparatively weak. Some emission nebulae surround very luminous blue objects. Dennefeld (ESO) studied some luminous matter at a large distance from the galaxy. Arnold, Kreysa, Schultz and Sherwood (MPI Bonn) confirmed variability of Cen A and 3 C 273 at 1 mm in their observations with the 3.6 m telescope.

Ulrich (ESO) participated in the organization of large international collaboration to observe NGC 4151 and 3 C 273 mainly with the IUE satellite. With Meier (Austin) she observed compact central sources in the nuclei of radio galaxies as a first step towards a determination of their luminosity function. With several collaborators she completed a study of the evolution of the radio galaxy population in the recent past. De Ruiter (Leiden/ESO) continued his work on faint extragalactic radio sources observed with the Westerbork radio telescope. Statistical analysis of radio and optical data indicates that the space density of radio galaxies increases strongly between redshifts of 0.2 and 0.6; the numbers of quasars found are, however, much smaller than expected from currently fashionable evolution models.

Boksenberg (UC London), Danziger, Fosbury (ESO) and Goss (Groningen) obtained spectra at 30 Å/mm with the "Image Photon Counting System" developed by Boksenberg, of the 17.5-mag quasar PKS 2020–37 which is near a spiral and slightly more distant from an elliptical galaxy. Narrow interstellar CaII H and K lines have been detected in the quasar spectrum with a redshift similar to that of the two galaxies. This indicates the presence of extended gaseous halos surrounding one or both of these galaxies. The 20-mag quasar HS 2111–41 was also observed at 30 Å/mm. Many narrow absorption lines were detected

mostly shortward of redshifted Lyman α. J. Surdej (ESO) and J. P. Swings (Liège) observed high-redshift quasars with the 3.6 m telescope. In the case of PHL 5200, they found that the profile of the CIV 1550 Å line fits well to that calculated on the basis of a decelerated envelope in the gravitational field of the quasar.

Danziger, Fosbury (ESO), Goss and Ekers (Groningen) discovered an optical jet associated with the BL Lac object PKS 0521–36 on plates taken with the 3.6 m telescope. High-resolution radio observations with the VLA show asymmetric structure on the same spatial scale, but in a different position angle. On the basis of also some spectrophotometric data, they conclude that there is at least 10^5 solar masses of gas in this object.

With the 3.6 m telescope, Lelièvre (Meudon) measured spectra of 14 radio sources, including six quasars and five elliptical galaxies. Prime-focus plates in UBV allowed the morphological classification of some radio sources. A faint nebulosity was found around the quasar 0736 + 01 (z = 0.191) which may also belong to a cluster. With the 1 m telescope, Lelièvre did UBV photometry on 6 quasars and determined sequences in the field of others. Adam (Lyon) continued his photometric study of quasars and quasar candidates, obtaining data for 78 objects, a number of them being radio quiet. More than 150 new UBV measurements have been obtained now on La Silla, and a new study of the Hubble diagram of the various classes of quasars is in progress. Additionally, several objects showed indications of intra-day variability.

Steffe (Basel) and M. and P. Véron (ESO/Meudon) studied the surface density of quasars. Setti (Bologna) and Woltjer (ESO) found that the log N-log S curve for BL Lac objects is much less steep than that for quasars, indicating possibly a less strong evolution. They found that quasars are likely to make an important contribution to the X-ray background and that the faintness of this background sets important constraints on the number counts at faint magnitudes.

Magellanic Clouds

With the spectracon at the 3.6 m telescope, Ardeberg (Lund) obtained data on the luminosity functions in the halo of the LMC and the SMC. A survey for Wolf-Rayet stars in the LMC with the GPO with interference filter and down to B = 16.5 was made by Azzopardi (Toulouse) and Breysacher (ESO). A list of probable WR stars was made, and 13 were already confirmed and accurately classified by slit spectroscopy. Some WR stars in the SMC were studied with the 3.6 m telescope. From an absolute-magnitude calibration based on Hγ equivalent width for early-type stars, Azzopardi concluded that the SMC has an appreciable extent along the line of sight, and Breysacher is studying echelec spectra to further investigate this matter.

Foy (Meudon) took high-dispersion spectra of stars in the SMC with the Echelec and a holographic grating with 3,000 grooves/mm to determine precise abundances. VRI photometry of M-stars in the LMC was done by Lundgren and Westerlund (Uppsala). Lundgren also obtained spectra of M supergiants with the 1.5 m telescope. Richer, Olander and Westerlund (Uppsala) continued their studies of carbon stars in the LMC. UBV photometry for 403 LMC stars was

done by Isserstedt (Würzburg) to study the history of star formation. VR photometry of a hundred red supergiants in the LMC was done by Mianes (Toulouse).

Danks (ESO) obtained spectra of a large number of reddened stars in the 30 Doradus region in the LMC to study the diffuse interstellar feature at 4430 Å. Many stars with B-V colour excesses > 0.5 magnitude show this feature. It is intended to study the relation between reddening and equivalent width of this feature in detail for comparison with the same relation in our galaxy. A similar study was made by Houziaux (Liège) and Nandy (Edinburgh) with the IDS at the 3.6 m telescope, in conjunction with ultraviolet observations with the IUE satellite. The 4430 Å feature was found in several stars. However, in two heavily reddened stars both this feature and the one at 2200 Å are absent.

Supernova remnants in the Clouds were further studied by Dennefeld (ESO). Several ring-like objects with [SII]/Hα ratios intermediate between those typical for galactic SNR and HII regions were found, the nature of which is still not entirely clear. Dennefeld and Tammann (Basel/ESO) studied the mass function and stellar birth rate in the Clouds on the basis of presently available data.

Infrared

Several research programmes were done in the infrared with the 3.6 m and other telescopes by visitors with their own equipment. With a newly constructed 10–30 micron photometer, Epchtein and Turon (Meudon) mapped RCW 38:IRS 1 and resolved it into several sources assignable to a newly formed star cluster.

Schultz, Arnold, Kreysa and Sherwood (MPI Bonn) obtained observations at an effective wavelength of 1 mm at the prime focus of the 3.6 m telescope with a special photometer containing a liquid-helium-cooled bolometer, operated in a cryostat at a temperature of 1.2 K, and a focal plane chopper rotating on an air bearing. In this programme, 43 HII regions have been observed, the brighter ones of which were mapped. The brightness of these sources was significantly greater than at longer wavelengths supporting the assumption that the dominant radiation process is thermal emission by dust grains. Other observations at 1.3 mm were made with a heterodyne receiver by de Graauw (ESA) and his associates.

Andriesse and de Vries (Groningen) observed at the 1.5 m telescope with a new Fabry-Pérot spectrometer the [NeII] line at 12.8 microns. Preliminary spectra were obtained in G 333.6–0.2 and IC 418.

With the 1 m telescope, Bensammar and Journet (Meudon) observed HII regions between 1 and 20 microns. Danks (ESO), Shaver (Groningen/ESO) and Wamsteker (ESO) detected a large number of new IR sources associated with HII and CII regions and OH and H_2O sources. The source G 305.4+0.2 with a kinematical distance of > 8 kpc is a powerful emitter. IR scans and IV–N photography by Schuster (ESO) revealed an embedded cluster close to G 305.3+1. Some 50 IR sources (stars) have been measured in this region and from its HR diagram, its age and distance will be estimated. Near infrared photometry of several sources in a dozen of regions was done by Epchtein and

Turon (Meudon) who found an extended 2-micron source associated with a group of OH sources in W 28. A survey of OH/Mira sources was made by these investigators as well as by Guibert, Nguyen-Q-Rieu (Meudon) and Bouchet, Wamsteker (ESO). Tanzi (CNR Milano) and Salinari, Tarenghi (ESO) started a programme of IR photometry of early-type supergiants. Of particular interest were data on V 861 Sco = OAO 1653–40.

The stars HR 5999 and AG Car were observed in uvby and in the near infrared by Bakker, Thé (Amsterdam) and Wamsteker (ESO). Thé also obtained red and blue spectra at 12 Å/mm. The infrared excess for HR 5999 was confirmed. Wamsteker (ESO) interpreted the IR data on Nova Cygni in terms of a free-free radiation model. In collaboration with Bouchet (ESO) and Borquez (Santiago) he developed a system of standard stars for the In Sb detector, and through observations of solar-type stars attempted to obtain an absolute flux calibration. Wamsteker (ESO) also studied the IR properties of Ap stars with Weiss (Vienna) and of some asteroids with Schober (Graz).

Interstellar Matter

Studies of interstellar polarization continued. Bastiaansen (Leiden) measured the wavelength dependence of linear polarization for stars in which he previously had detected circular polarization. Two ultraviolet bands were measured at La Silla as a supplement to data obtained at the Leiden Southern Observatory. Accurate UBV polarization measurements were obtained by Knoechel (Hamburg) for 30 stars in the cluster complex near Eta Carinae. Intrinsic polarization was found in four stars. The WR star HD 93162 appears to be surrounded by a massive dust cloud as indicated by the high polarization which reaches 6.6 per cent in V. Knoechel also made observations for linear polarization in uvby for 28 stars in the cluster Trumpler 27; 28 OB supergiants in the Magellanic Clouds and an additional set of galactic ones were also observed.

About 60 direct plates were taken by Kohoutek (Hamburg), in some cases in collaboration with Laustsen (ESO/Aarhus), at the prime focus of the 3.6 m telescope, and photoelectric UBV and narrow-band measurements were collected for the morphological and photometric study of the peculiar planetary nebulae NGC 2346, 2818, 3132, 5189, 6302, A 33, He 2–36, M 2–9 and Sh 2–71. Large structural changes in M 2–9 were investigated and discussed using a new morphological model. In the field of NGC 3132, a new eclipsing binary was found having $P = 3^{d}.9258$. With Wehmeyer he studied the variation of the radial velocity of the nucleus of NGC 1360 for which a period of about 8 days found by other investigators has not been confirmed. A nearly constant heliocentric RV of 52.3 ± 4.3 km/s has been found as a mean value from observations on seven consecutive nights in November 1977.

Observations of northern SNR in the near infrared were made by Dennefeld (ESO) and Andrillat (OHP). Carbon lines were detected in the Cygnus Loop and the Crab Nebula on the basis of which abundance determinations are being made. Danziger (ESO) continued his detailed analysis of some southern SNR including Pup A. Tenorio-Tagle (MPI München/ESO) pursued gas dynamical studies of HII regions, a subject also studied by Manfroid (ESO/Liège).

Alcaíno (Santiago) continued his photometry of globular clusters, obtaining sequences in NGC 6144 and 6626 to calibrate B and V plates. With the 3.6 m telescope he obtained plates of NGC 288, 362, 1261, 2298, 3201, as well as of some galaxies. Wamsteker (ESO) obtained short-exposure three-colour photographs of NGC 7099. Analysis of the data seems to confirm a low helium abundance. Bouchet (ESO) studied IR sources in 47 Tuc and identified at least one SC star. Crane (ESO) searched for gaseous matter in some clusters with a special variable wavelength filter. West (ESO) studied the distant globular cluster GCl 0422–213.

Andersen and Nordström (Copenhagen) obtained radial velocity data for 65 stars in a list of bright southern population II stars found photometrically by Olsen and Strömgren. Two stars turned out to be double-lined spectroscopic binaries. uvbyβ photometry of nearby field stars was made by Heck (ESA) to be used in luminosity calibrations from statistical parallaxes. Terzan (Lyon) obtained UBV photometry of 153 stars in the direction of the galactic centre. Study of some Schmidt plates of the Bright Cloud B in Sagittarius revealed large numbers of variable stars as well as quite a few objects with proper motions exceeding 0$''$ per year.

Lindblad, K. Lodén and Zentelis (Stockholm) pursued studies of the age distribution and kinematics of early-type stars in the solar neighbourhood, selected in such a way that information may be obtained about the possible existence of large-scale galactic shocks. Coudé plates for radial velocity determinations were obtained for 90 and uvbyβ photometry for 180 stars. Maitzen and Schmidt-Kaler (Bochum) observed with the B & C spectrograph at the 1.5 m telescope 26 OB stars out to 9 kpc distance to determine radial velocities. A distant highly reddened WR star was observed by Pettersson (Uppsala) with the 3.6 m telescope. Gahm and Malmort (Stockholm) studied stars in bright nebulosities in dust clouds using the 3.6 m telescope. Distances to 24 such regions were determined, and the distribution of southern R-associations was reviewed. A number of emission-line stars—probably in a pre-main-sequence phase of evolution—were discovered.

Ardeberg (Lund) and Maurice (Marseille) further studied the region of IC 2944 where several groups are superimposed along the line of sight. Data were obtained with the Schmidt and the GPO, as well as with the RV Cass and the photometer; these should be helpful in elucidating star formation and spiral structure in this area. Some spectra of stars in the highly reddened cluster in Ara were obtained by Westerlund (Uppsala) with the 3.6 m telescope. Bernard (Lyon) carried out UBV photometry in the region of the open cluster Trumpler 26. L. O. Lodén (Stockholm) continued his studies of inconspicuous star clusterings. More than 300 stars were observed mostly in UBV, but partly also in uvbyβ. Gieseking (Bonn) continued his investigations of radial velocities with the GPO. A cluster membership study was made for NGC 3532. In ten open cluster fields about 12,000 radial velocities for 600 stars with magnitudes between 8 and 10.5 have now been determined with for two thirds of the stars an accuracy of 2.5 km/sec or better. Many new spectroscopic binaries were also identified, and a statistical investigation of the frequency of such systems was made.

In collaboration with Cassé (Saclay) and Scalo (Austin), Kunth (ESO) analysed the role of density waves in star formation in the galactic disk. Making use of the observed distribution of atomic and molecular hydrogen, they concluded this role to be minimal.

X-ray Sources

Ilovaisky, Motch and Chevalier (Meudon) detected optical pulses from the proposed candidate for the 7.7s X-ray pulsar 4U 1626–67. High-sensitivity, time-resolved, broad-band photometric observations of this faint blue star (B = 18.7) were made with the 3.6 m telescope using special equipment developed at Meudon. Analysis of one hour of data showed clear evidence of optical pulsations with a period of $7^{s}.6809 \pm 0^{s}.0035$, virtually identical with the extrapolated X-ray pulse period. The optical lightcurve is broad and has a full amplitude of 4 per cent of the mean net flux. These results may be consistent with reprocessing of X-ray pulses in a highly compact binary system. They also obtained photoelectric photometry of the optical counterpart of the pulsating binary 4U 1538–52. When folded with the 3.7^{d} binary period, the data show a lightcurve of $0^{m}.12$ full amplitude in B, with two maxima and two minima per period, typical of massive X-ray binaries. The value for the binary period is refined to be $3^{d}.7318 \pm 0^{d}.0002$.

De Loore and his associates (Brussels) continued their photometry and spectroscopy of X-ray sources, partly in collaboration with other observatories, IUE and X-ray satellites. Objects studied included Cen X–3, 4U 0900–40, 4U 1145–61, 4U 1223–62, 4U 1700–37 and others. Henrichs (Amsterdam) obtained high-dispersion spectra of SMC X–1, LMC X–4 and various candidate objects with the IDS at the 3.6 m telescope. With Zuiderwijk (Amsterdam/ESO) he searched for optical covariability with X-ray periodicities in 4U 1700–37 and 4U 1145–61. With the 3.6 m telescope, van Paradijs (Amsterdam) established or confirmed identifications for several X-ray sources including LMC X–3, 2 S 1538–52, 2 S 0921–630. The X-ray source 2 S 0549–07 was found to be associated with an elliptical galaxy NGC 2110 which has a rich emission-line spectrum with line widths of 400 km/sec. The probable optical counterpart of Ser X–1 appears to have a continuous spectrum. Van Paradijs also obtained 21 spectra of Cen X–3 to study its radial velocity curve. Photometric and spectroscopic observations of several galactic X-ray sources have been carried out by Pakull (ESO). The transient X-ray source MX 0656–07 and the source LMC X–2 were identified with a variable Be star and a faint Hα, HeII λ 4686 emission-line star, respectively.

In collaboration with Kruszewski (Warsaw), Semeniuk (Warsaw/ESO) and J. Surdej (ESO) reported that optical observations of 4U 1700–37 showed apparent oscillations with a period around 97 minutes, consistent with suggested periodicities in the X-ray data. Zuiderwijk (Amsterdam/ESO) continued his analysis of the spectrum of HD 77581, optical counterpart of 4U 0900–40. First results show interesting variations in Hβ and HeII (4686).

Binaries

Gahm and Lindroos (Stockholm) continued the study of young visual binaries; uvbyβ photometry was obtained for more than 50 systems. Studies of age and position in the HR diagram are being made. Van Dessel (Uccle) continued his

programme of radial velocities of visual binaries for which an astrometric orbit exists. Several spectra for this programme were obtained by Bareau (ESO). Duerbeck (Bonn) and A. and J. Surdej (ESO) determined a spectroscopic orbit for the ellipsoidal binary system TU Hor. Speckle observations of binaries and multiple systems were made with the 3.6 m telescope by Labeyrie and his associates (Meudon) and by Ebersberger and Weigelt (Erlangen).

Eclipsing binaries were studied by several persons. Ahlin (Stockholm) continued his studies of HD 161387, a zeta-Aurigae-type object (K5 Ib + B7:V:) with a period of 936 days. Some 20 spectra have now been obtained by Ahlin and other observers at La Silla. Andersen (Copenhagen) observed several detached double-lined systems with the coudé of the 1.5 m telescope. The orbits of zeta-Phe and QX Car were completed; the latter shows apsidal motion. The B-type contact system V 701 Sco was found to have identical components and a large rate of mass exchange. Accurate lightcurves of the systems observed spectroscopically were obtained by Nordström and Reipurth (Copenhagen) with the Danish 50 cm telescope. UBV observations of the short-period Algol systems X Gru and V 505 Sgr were continued by Walter (Tübingen) to look for long-time variations in the lightcurves; for the latter the asymmetry between the first and second part of the lightcurve outside eclipse appears to have changed sign compared to the situation in 1976. The W UMa variables AE Phe, RV Gru and ST Ind were also observed. Wolfschmidt (Bamberg) obtained lightcurves of the W UMa systems TY Men and UZ Oct and of the β-Lyrae system PX Car. Primary minimum of μ Sgr (180 days) was also observed.

Stars

Appenzeller (Heidelberg) obtained spectra (58 Å/mm) of 38 T Tauri stars and other young objects in the Chamaeleon T-association and in the Orion aggregate. Several new YY Orionis stars were found. Bertout and Wolf (Heidelberg) obtained 24 spectra with the coudé of the 1.5 m telescope of the YY Orionis stars S CrA and Co D –35° 10525. Strong spectral variations were found even within consecutive nights.

Haefner and Schoembs (München) completed the analysis of spectra and photometry of the βCep-star nu Eri. Haug (Hamburg) showed on the basis of UBV photometry that HD 80383 is a βCep variable, with a large maximum B amplitude of 0.165 mag. A primary period of 0.18465 day and a beat period of 10.075 days fits the amplitude changes, but not all the times of maximum.

A total of 71 Zeeman spectra to look for magnetic fields in pulsating variables were obtained by Tscharnuter (MPI München) and Weiss (Vienna). It is expected that fields as small as 100 Gauss may be detectable.

Speckle interferometry of several stars was done by Foy (Meudon) with the 3.6 m telescope. The diameter of Mira was confirmed to be strongly wavelength dependent. In particular at 4000 Å Mira is quite small. Betelgeuse appears to be smaller in the blue than in the red. Both Zeta 1 and Zeta 2 Reticuli appear to be double with separations of 0.″02 and 0.″05 respectively. The former is a subdwarf, and several peculiarities in the spectrum are explained by the discovery of the companion.

Spectra of the variable Carbon stars V Aql, RX Sgr, TX Psc, TW Hor, R Lep, AB Ant and W Sex were taken regularly by Bouchet (ESO) at 12 Å/mm in the blue and at 19 Å/mm in the red to obtain information on radial velocity variations and variations in the polyatomic molecules. VRI photometry was also done. To set up an appropriate system for this, Bouchet observed 100 standards in the Cousins system.

Observations of field RR Lyrae stars were made by Lub (ESO). The reductions appeared to show that the ESO 1 m uvbyβ system does not sufficiently match the standard system.

Simultaneous observations of Be stars were made with the 1.5 m (high dispersion) and with the 50 cm telescope (Chalonge spectrograph) by Briot, Divan and Zorec (Paris) to search for correlations between the emission-line intensities and the parameters of the continuous spectrum in the BCD system. A total of 53 spectra for 20 stars was obtained with the 1.5 m telescope and 240 spectra for 26 stars with the Chalonge spectrograph. Several high-dispersion spectra of Of stars were taken by Hunger and Kudritzki (Kiel). A detailed non LTE analysis yields a mass of 120 solar masses for HD 93250. A total of 18 blue spectra at 29 Å/mm was obtained of faint sd O stars with the IDS at the 3.6 m telescope. One extreme helium star—SB 21—was discovered.

Henrichs (Amsterdam) carried out uvby photometry of the variable emission A star and its companions HR 5999/6000 in conjunction with observations with the IUE satellite. Simultaneous spectroscopy and UBV photometry of peculiar variable emission-line stars were carried out by Klutz (Liège), A. and J. Surdej (ESO) and J. P. Swings (Liège). Correlations between the magnitude of the object and the intensity of some envelope absorption lines were found in the case of GG Carinae.

Observations of emission-line supergiants were made by Muratorio (Marseille). In S 22 various iron multiplets were identified. In collaboration with Friedjung (Meudon), it was concluded that the excitation of the ionized iron is not nebular, but evolution towards a nebular regime is confirmed. The star is losing mass at a rate of one solar mass per 1,000 years. Spectra of the F and G supergiants HR 4110, 4352, 3445, 4337, 4441, 6392, 5171 and R Pup have been taken by Reimers (Kiel) at 12 Å/mm. A first estimate of mass-loss rates corresponds to 4×10^{-7} solar masses per year of ionized gas inferred from Hα emission in R Pup and HR 4441. For a given spectral type the mass-loss rate appears to be correlated with luminosity.

Dravins (Lund) investigated to how early a spectral type chromospheric activity extends. A search for CaII K emission was made in the sharpest A- and F-type main sequence stars in the very young cluster IC 2391 and in the Hyades. Although the Echelec spectra permitted a high-resolution low-noise recording of the K-line profiles, no trace of emission was seen earlier than F5. A high-dispersion spectrum of δ CMa was obtained for Hultqvist (Stockholm).

In the helium weak stars, M. Jaschek (Strasbourg) found that apparently two subgroups exist: one with the iron peak elements enhanced and the other with

no metals but with hydrogen line profiles corresponding to earlier-type stars. She also found spectral variations on a short time scale in the early-type supergiants HD 152236, 148868 and 135591.

Manfroid and Renson (Liège) continued their observations and studies of variable Ap stars. The following periods were found: nuFor: 1.89 day, 20 Eri: 1.93 d, 46 Eri: 3.82 d, α Dor: 2.95 d, HD 36916: 1.564 d, HR 1957: 1.099 d. HR 1800 appeared to be constant. Simultaneous narrow-band photometry and coudé spectra were obtained by Seggewiss (Bonn) and Maitzen (Vienna) for the study of the broad depression at 5200 Å in the continuum of Ap stars. The photometric stability of Ap stars was studied by Weiss (Vienna). For Przybylski's star, HD 101065, variations in the β index with an amplitude of 0.007 mag were found and a period of 12.15 minutes inferred.

Holweger (Kiel) obtained high-dispersion spectra (3 Å/mm) of the late-type dwarfs tau Ceti and 82 Eri, and also of integrated sunlight to look for compositional differences among unevolved stars. M. and F. Spite (Meudon) observed metal-poor stars with the Echelec, paying particular attention to the CN band, Aluminium resonance lines and the strongest Europium line. These features are important in considerations on nucleogenesis. Some stars were also observed photometrically in VRI.

Spectroscopic investigations of DA white dwarfs have been carried out by Weidemann (Kiel) with the 3.6 m telescope. For 6 out of 7 photometric candidates the preliminary DA classification has been confirmed by hydrogen-line spectra. The spectra will be analysed with the Kiel model-atmosphere programme.

UBV observations of the old novae HR Del and V 841 Oph and of the dwarf nova WX Hyi were made by Bruch (Münster). Light variations at minimum were found in all three objects, but no conclusive periodicities could be established. Temperatures for the stars were estimated from their position in the two-colour diagram. In a programme of Danziger (ESO), Brunt and Whelan (Cambridge, UK), Whelan monitored three dwarf novae at four Chilean observatories including La Silla. The purpose was to detect events—possibly due to mass exchange, prior to the outburst of a dwarf nova and also to monitor changes in the lightcurve as a function of the time elapsed since the last outburst. The data will be combined with those of other southern hemisphere observers. Haefner, Schoembs and Metz (München) analysed their photometric and polarimetric data on the old nova RR Pic (as well as data on some helium-weak stars and a T Tauri star) for variability. No significant periodicities in the range 6–500 seconds were found. For RR Pic a periodicity of 30 sec had been claimed by others. Haefner, Schoembs (München) and Vogt (ESO) completed their study of VW Hyi on the basis of data obtained during normal light and during short and long eruptions with four different telescopes during several years. A search for polarization in VW Hyi and WX Hyi was made by Schoembs and Vogt. On 20 June 1978, the slow nova RR Tel was observed by Heck (ESA) and J. Surdej (ESO) in uvbyβ and spectroscopically at 29 Å/mm. Simultaneous data were also obtained with IUE.

Vogt (ESO) obtained spectra with high time resolution with the 3.6 m telescope. Radial velocity variations in the Balmer absorption lines during supermaximum in Z Cha were interpreted with a magnetic accretion model. Vogt also identified more than 50 dwarf novae in southern and equatorial fields. Spectra taken with the 3.6 m telescope by Schoembs (München) during the decline phase of VW Hyi show broad Hα absorption turning to broad double emission and then to a nearly featureless continuum. The radial velocity curve shows a period of 0.0749 day. The SU UMa variable V 436 was observed by Semeniuk (Warsaw/ESO) during an outburst. A periodicity of 0.06383 day was found.

Crane (ESO) took a very deep photograph (at 6500 Å) of the binary pulsar PSR 1913+16 with the Kitt Peak 4 meter telescope. A new object was found 0.3 ± 0.7 arc second away. If this object is indeed associated with the pulsar, important conclusions follow about the nature of the objects in the system and the related issue of the gravitational radiation emitted.

Solar System

Two unusual minor planets were detected by Schuster (ESO) 1978 CA and 1978 DA. The first one is an Apollo, while the second one belongs to the also rare Amor class. Detected well before closest approach, they could be widely observed also at other observatories. UBV observations of these asteroids by A. and J. Surdej (ESO) showed that 1978 CA is the third fastest rotator known in the solar system ($3^h\ 45^m$). Photoelectric lightcurves of 45 Eugenia, 308 Polyxo and 47 Aglaja were obtained by Debehogne (Uccle) who also determined positions and orbits of several asteroids and comets. Schober (Graz) obtained UBV observations for 9 Metis, 36 Atalante, 48 Doris, 68 Leto and several other asteroids. For 55 Pandora and 173 Ino, rotation periods of $4\overset{h}{.}8043$ and $5\overset{h}{.}93$ respectively were found. Comet Bradfield 1978c was observed spectroscopically (GPO) and photometrically by Bouchet and J. Surdej (ESO). A. and J. Surdej simulated the behaviour of asteroid lightcurves on the basis of a tri-axial ellipsoidal model.

Schmidt Telescope; Sky Survey and Atlas Laboratory

During 1978, a total of 522 plates was taken with the Schmidt telescope. The total included 43 plates for the completion of the ESO(B)—the quick blue—survey, 90 plates for the Red survey (partly still somewhat experimental), 59 plates for special surveys (LMC, SMC, galactic near IR), 137 plates for visiting astronomers, 75 for ESO staff and 118 plates for comets and minor planets—the latter mainly taken during bad weather.

The quick blue sky survey was fully completed. A total of 1,043 plates of 60 minutes exposure was taken by Schuster and his associates to yield 606 high-quality originals for the atlas project. The percentage of 58 per cent accepted is exactly equal to that achieved in the Palomar sky survey project. The rejected plates usually suffered from poor seeing or plate defects.

A new plate-holder device was installed, and with several other improvements executed under Muller's direction, the Schmidt telescope now can take plates of several hours exposure with perfectly round images. A new achromatic corrector was ordered for the telescope, which should lead to much improved image quality in the ultraviolet.

Concerning the atlas project, about 470 fields of the on-glass atlas have been distributed, while the on-film atlas had been sent out completely. Approximately 70 fields of insufficient quality—mostly early ones—were retaken or recopied and distributed free of charge to subscribers.

About 200 fields of the SRC(J) half of the joint ESO/SRC Atlas of the Southern Sky were each reproduced and distributed in 150 copies. The first ESO(R) plates were received from La Silla and some were of sufficient quality for reproduction. However, serious problems are still being encountered as a consequence of non uniformity resulting from hypersensitization. The exposure time of the R plates is now 120 minutes on IIIa-F plates behind an RG 630 filter, and consequently the amount of telescope time needed is large.

The Sky Atlas Laboratory continued to provide many services to ESO staff and others.

Many improvements were made to the measuring machines and the image processing system. Especially the Optronics S-3000 machine still needed much improvement. Both this machine and the Grant machine were also used by many visiting astronomers who came to measure plates and spectra taken at La Silla. With the installation of the IDS at the 3.6 m telescope at La Silla, the staff and visitor use of the image processing system much increased. In order to be able to absorb the steadily increasing flow of users, a PDS measuring machine has been ordered, while it is anticipated that in Garching ESO will have a both qualitatively and quantitatively much expanded data and image processing system. This will require a substantial investment, both financially- and personnelwise.

Joint Research with Chilean Institutes

The Danjon Astrolabe Project, a joint research programme between the University of Chile and ESO, continued during 1978, under the direction of F. Noël (Santiago).

Regular observations for time and latitude as well as for the improvement of the fundamental reference system have been carried out normally during the year. The planet Uranus was observed on 58 occasions, including double transits.

The collaboration with the Bureau International de l'Heure (BIH) at Paris and with the International Polar Motion Service (IPMS) of Japan has been continued regularly during the year. Time and latitude results are sent weekly to BIH and monthly to IPMS.

Conferences and Workshops

The following workshops and conferences were held during the year:

Modern Techniques in Astronomical Photography (jointly with IAU), Geneva, 16–18 May.
Infrared Astronomy, Utö (Sweden), 20–22 June.
Application of CAMAC to Astronomy (jointly with SRC of UK), Geneva, 27–29 September.

Statistics on Observing Time

From time to time it may be of interest to assemble some statistics about the use of the telescopes. Of course, considerable fluctuations occur from year to year, and as a consequence longer-term averages are needed. In the following table we give the distribution of the number of nights allocated with the 1 m and 1.5 m telescopes for the four-year period 1975–1978.

Distribution of Observing Time at the 1 m and 1.5 m Telescopes (1975—1978)

Percentage of total time	%	Percentage of six country time	%
six ESO countries	62	Belgium	10
other countries	2	Denmark	4
technical time	3	France	31
ESO staff	32	Germany	31
		Netherlands	11
		Sweden	14

The number of nights that certain kinds of instrumentation have been scheduled at these telescopes has developed as in the following table.

Use of Instrumentation with the 1 m and 1.5 m Telescopes

		1975	1976	1977	1978
1.5 m	Coudé spectrograph	175	134	150	160
	Echelec	24	68	87	74
	RV Cass + Zeiss camera	42	19	30	5
1.5 m + 1 m	B & C spectrograph	134	173	90	68
1 m	Photometer	228	193	214	203
	Polarimeter	10	5	11	28
	IR	66*	66	80	120*

* Including 15 nights at 1.5 m telescope.

From the table the predominance of the use of the coudé (including Echelec) and of the photometer is apparent. The marked decline of the use of the B & C spectrograph is undoubtedly partly related to the poor condition of the image tubes, which should improve in the future, and partly to the competition from the 3.6 m telescope. The infrared use of the 1 m telescope is steadily increasing.

Concerning the nature of the programmes, the percentage distribution has shown the evolution depicted in the following table, where we have added for comparison the 3.6 m telescope for 1978.

Types of Programmes Executed with the 1 m and 1.5 m Telescopes and with the 3.6 m Telescope in 1978

	1975	1976	1977	1978	1978 (3.6 m)
Extragalactic*	21	31	28	30	54
Galactic Structure	32	13	11	7	6
Interstellar Matter	13	17	20	15	14
X-ray Sources	7	12	13	10	9
Stars	26	27	26	36	16
Solar System	1	0	2	2	1

* Including Magellanic Clouds.

Worth noting are the much greater emphasis—as was expected—on extragalactic work with the 3.6 m telescope and the gradual decline of studies in galactic structure. Of the total extragalactic time, the Magellanic Clouds accounted for about 30 per cent on the 1 m and 1.5 m telescopes, and for 8 per cent on the 3.6 m telescope. Of course, the division in subjects is always somewhat arbitrary. For example, part of the X-ray sources are in the Magellanic Clouds and could have been included there. Similarly, it is not always easy to ascertain whether a study in a star cluster pertains to galactic structure or to stellar research.

A final statistic that may be of interest concerns the duration of an average observing period and the total number of such periods allotted to visiting astronomers.

Observing Periods of Visiting Astronomers with the 1 m and 1.5 m Telescopes

Year	Number of periods	Average number of nights per observer
1975	45	9.2
1976	55	8.6
1977	68	6.8
1978	75	5.8

For the 3.6 m telescope the number of periods was 29 and the average duration 4.4 nights. However, in the beginning of the year, the functioning of the telescope was still far from perfect, and consequently a certain amount of down time was included. Also at the 3.6 m telescope, several observing periods covered programmes for more than one visiting astronomer.

The numbers in the table for the 1 m and 1.5 m telescopes are a cause for some concern. Even when it is taken into account that some observers may have had during a visit to La Silla one period at the 1.5 m and one at the 1 m telescope or at some smaller telescope, it remains doubtful that such short observing periods could be optimal from either the scientific or the financial point of view. To some extent, it may also be true that modernization of equipment allows an observer to obtain his data more quickly. Nevertheless, the evolution of the figures in the table would seem to indicate that some more selectivity in the award of observing time could be beneficial.

FACILITIES

Telescopes

The 3.6 m Telescope

Various improvements were made to the alignment of the telescope optics, and the primary mirror was realuminized. Long series of precision measurements—using displacement transducers with about 2 μ resolution—have been performed on the prime mirror, in order to establish mirror movements as a function of telescope position. These measurements show that no prime mirror movements took place following readjustments to the lateral support system.

The data link connecting the telescope control computer and the data-acquisition system is under test in the telescope. This testing proceeds rather slowly, since the data-acquisition system, which is used during observations as well as during day time for data reduction, is only available for very limited amounts of time.

The control room and the control console have been rebuilt, which resulted in much more working space for the visiting astronomer. The new console allows a much better and rational control of both telescope and instruments. All the cables required for the large variety of equipment used in both Cassegrain and Prime Focus have been ordered. Patch panels are under construction, and mounting of connectors, etc. has started. In August, this new cable network will be implemented, which requires a 12-day stop of the telescope. This new network will eliminate the installation of cables on the Serrurier structure and on the dome floor, as is at present frequently required for the equipment which is brought to La Silla by visiting astronomers, and thus facilitate very much the installation of non-ESO equipment.

Vacuum equipment has been delivered to La Silla, and supports for pumps, pipes, etc. are under construction. The vacuum systems, one large and one small pump, will gradually be installed on the telescope without interrupting telescope operations.

Software to improve the pointing accuracy is being written. The first telescope model, which describes the required corrections as a function of α and δ, is being implemented in the telescope control software. The read-out of the telescope position has been improved; now a resolution of 1 arc sec in δ and 0.1 sec in α is available.

The Coudé Auxiliary Telescope

At the end of the year, the 1.5 m CAT was being assembled in Geneva. The mirrors were being figured at Grubb Parsons, according to rigorous specifications. The telescope drive is being built without gears but with direct drive

motors and inductosyn read-out on each of the two axes of the alt-alt mount. Much software effort is still needed for the drive. The CAT should arrive at La Silla by the end of the year, and installation should be fully completed by mid-1980.

Other Telescopes

The new optics for the Danish 1.5 m telescope was installed, and first results from tests and observation show the optical quality to be excellent. It is expected that the commissionary phase of the telescope by the Danish astronomers will come to an end by 1 October, and that following this, 50 per cent of the observing time will become available to ESO visiting astronomers and staff.

The image quality of the ESO 1.5 m telescope was improved following some mechanical readjustments. A complete data-acquisition system, identical with that for the 3.6 m telescope, is presently being installed. This became necessary as a consequence of the planned installation of reticon and IDS with the B & C spectrograph. Moreover, this new system will increase the capacity for the reduction of IDS data at La Silla, which at present has become a problem.

Some important modifications were made to the mirror cell of the 1 m telescope, and the image quality was much improved as a result. Stronger drive motors are being ordered to correct some problems that become more noticeable as the telescope grows older.

Modifications were made to the building, where the 1 m telescope was located long ago, which is now to house the Dutch 0.9 m telescope. Installation of the telescope should be completed early in 1979, and by 1 October 50 per cent of the telescope time should become available to ESO users. It is planned to devote that time exclusively to photometry.

VLT

Some very preliminary studies of a possible Very Large Telescope were initiated. Advantages and disadvantages of one large telescope versus an array of smaller ones were considered.

Instrumentation

Various items of instrumentation for the 3.6 m telescope were installed.

The image dissector scanner (IDS) has been extensively used since mid-year, in combination with the B & C low-dispersion spectrograph. A considerable software has been invested in making the system in a user-oriented way.

The spectracon has become available as a detector at the prime focus, and the first pictures obtained appear to be satisfactory.

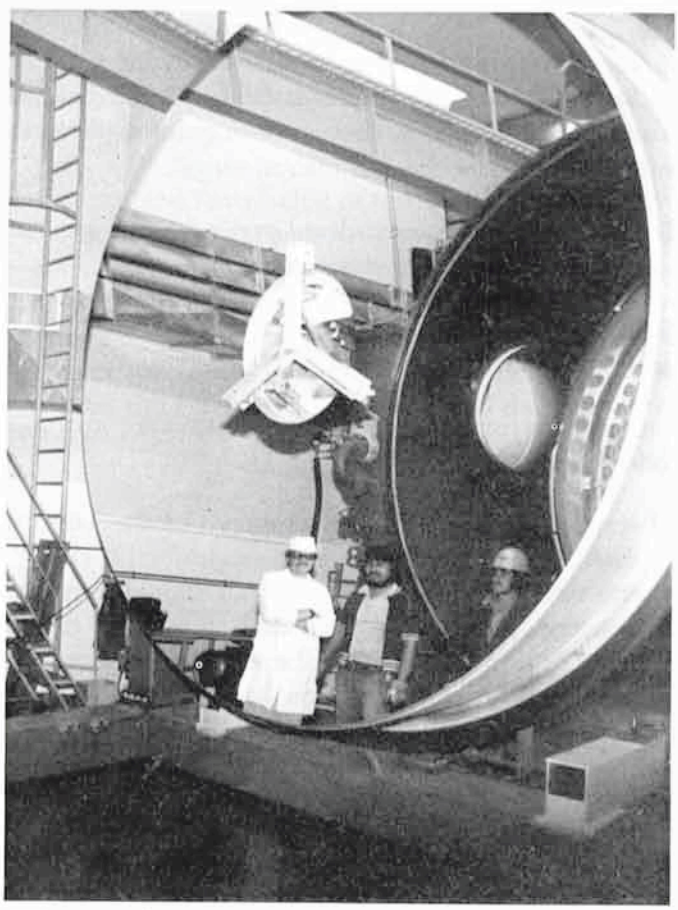
A Racine-type wedge was installed at the prime focus to facilitate photometric calibrations. Some tests are now being conducted and some modifications still will be needed for easy use.

Concerning future instrumentation, the situation is as follows:

The coudé echelle spectrometer (CES) intended for spectral resolutions of the order of 10^5 is being assembled in Geneva. If no further problems occur with the delivery of the digicons, installation at La Silla should take place during the first half of 1980. Much of the time it should be used with the CAT.

The Cassegrain (cross-dispersed) echelle spectrograph (CASPEC) was nearing the end of the design phase. Intended for spectral resolutions of the order of 30,000, it should be possible to observe stars of the 14th magnitude or may be fainter when the spectrograph is equipped with a suitable detector. Initially, an SEC vidicon is foreseen, but later this might be replaced by a photon-counting system. Of course, use with image tubes would also be possible. It is hoped that the instrument can be completed in Geneva before ESO leaves for Garching in mid-1980. If so, installation at La Silla could be completed early in 1981.

The triplet adapter is being assembled and tested in Geneva. Following some minor modifications, it is scheduled for installation at the telescope later in 1979. With the triplets it should be possible to take wide-field photographs (1 degree). In addition, a McMullan electronographic camera with 40 mm field (and later with 80 mm field) is foreseen.



The mirror of the 3.6 m telescope leaving the aluminizing tank. (Photograph by J. R. van der Ven.)

A new camera for the B & C spectrograph optimized for 800 nm has been delivered to work with the reticon. This should allow effective spectroscopy to be done to 1.0 micron or beyond. Assembly of the instrument is nearing completion, and tests at the telescope are foreseen for June 1979.

The design of the infrared photometers for the 3.6 m telescope has been completed, and construction is in progress. An In Sb detector will cover the 2–5 micron range and a bolometer the 10–30 micron range. Operation will be possible with standard filters or with a variable wavelength filter which should allow spectroscopy with a resolution of about 100 in the 2–5 micron range. Design work on the infrared top-end for the 3.6 m telescope is also progressing.

A simple straight-through single-channel photometer with chopper is being constructed at La Silla and should become available before the end of 1979.

A Hoag-type grism for use with the single-element corrector is being manufactured. A "red" and a "blue" grism will be available with a dispersion of 1500 Å/mm. A lower-dispersion red grism is also foreseen. The two first grisms should be available later in 1979. Design work is also being started on a grism for the triplet.

Other instruments for the 3.6 m telescope which are currently being designed or studied include a Focal Reducer to change the F/8 Cassegrain beam to F/2, which could be used in combination with interference filters, low-dispersion transmission gratings or a Fabry-Pérot interferometer; a CCD detector with about 500 × 325 pixel for which a tender is being prepared; a long-slit intermediate-dispersion spectrograph; a cooled grating infrared spectrometer for spectral resolutions of 1,000 in the 2–5 micron range.

A new B & C spectrograph is being ordered partly for use with the 3.6 m telescope and partly with the Danish 1.5 m telescope.

A second IDS is planned for use with the 1.5 m telescope. This should become available late in 1979 or early in 1980.

Of the work undertaken for the improvement of existing instrumentation, we mention the following:

A new control system for the B & C spectrograph of the 3.6 m telescope has been constructed. All preparations have been made for providing the B & C spectrographs with new EMI image tubes which should have been delivered long ago. Unfortunately, problems at the manufacturer have caused substantial delays, and the first proper tubes cannot be expected before mid-1979. As a consequence, a very unsatisfactory situation has arisen in particular with the B & C spectrograph of the 1.5 m telescope.

A blue flat field corrector has been acquired for the Echelec. With this corrector, the spectracon can be adapted to the Echelec, and tests of its suitability are under way. Serious problems were encountered with the magnesium electrodes used for the focussing of the Lallemand camera. New electrodes of soft copper are being constructed and tested.

New baking ovens for photographic plates have recently been delivered to La Silla which are suited for the use of both forming gas and nitrogen. A second nitrogen liquefier has been installed which produces 6 liters/hour.

A new high-precision clock system based on a caesium standard has been undergoing extensive tests in Geneva. Installation at La Silla is foreseen for the second half of 1979. All telescopes will be connected to this system.

Buildings and Grounds

In Europe construction of the new Headquarters building in Garching made good progress. Completion of the building is foreseen for mid-1980. The various instrumental developments in Geneva caused a very acute space shortage there, which was partly resolved by the acquisition of some temporary barracks.

At La Silla much effort was put in a wide variety of site improvements. These included the completion of the office of the maintenance department, the guard house, the building for the Dutch telescope, the asphalting of some critical sections of the access road, the construction of some additional water wells, improvements to the telephone and telex system, and many other items relating to various technical installations. Much attention was paid to safety, and a training programme for the fire brigade was developed. Some provisional studies concerning the use of solar and wind energy were concluded, and more specific plans in this area are now being developed.

The proper uninterrupted functioning of the utility system at La Silla is a matter of vital importance to all other activities, which requires a considerable effort. During the year, the consumption of pure water averaged 65 m^3/day, corresponding to 90 m^3/day at the wells before treatment in the water softening plant. A total of 1,800,000 kWh of electricity was generated during the year by the three generators in the power house. Of the total oil consumption of about 1,500 m^3, one third was used for heating and the remainder for the generation of electricity.

FINANCIAL AND ORGANIZATIONAL MATTERS

During 1978 the work on the Headquarters Agreement with the Federal Republic of Germany and also on most of the items to be included in the lease agreements with the Max-Planck Society on the ESO site in Garching has been terminated, and Council, at its December 1978 meeting, approved the texts of these agreements.

For the common ESO/EMBL Working Group on remuneration systems, which had been set up by the Councils of these Organizations in December 1977 to study alternatives to the presently applied CERN-type remuneration system, time has been too short to come to final conclusions already by the end of 1978. It is, however, expected that its recommendations will be available in the first half of 1979.

In July, an agreement on various salary issues was signed by the Director General and representatives of the Local Staff Association.

The Finance Committee which had last met in Chile in 1971, travelled to Chile again in November 1978 in order to obtain a direct impression of the progress made at La Silla during the last years. A visit to the Cerro Tololo Inter-American Observatory was also included.

Concerning Finance, the Council approved the 1979 budget, again with Member States' contributions in the amount of DM 32.5 million, confirming on this occasion once more that all possible economies should be used to maintain contributions during the coming years on the same level.

Budget Statement 1978

(in DM 1,000)

Expenditure

Budget Heading	Approved Budget	Expenditure (incl. commitments and uncommitted credits carried over to 1979)
1 Personnel	19,817	15,582
2 Operations	11,427	9,751
3 Capital outlays	6,472	6,313
4 Sky Survey Project	1,247	1,002
TOTAL EXPENDITURE	38,963	32,648
Reserve for cost variation	2,000	—
GRAND TOTAL EXPENDITURE	40,963	32,648

Income

Budget Sub-heading		Estimate	Actual (incl. receivables)
80	Contributions from member states	32,500	32,500
81	Unused appropriations from previous years	4,263	4,263
82	Sale of Sky Atlas	600	517
84	Internal tax	2,313	1,942
85–89	Miscellaneous	1,287	1,760
	TOTAL	40,963	40,982

Budget for 1979

(in DM 1,000)

Expenditure

Budget Heading	Directorate Garching	Establish-ment in Chile	Instrument Development/ Engineering Group Geneva	Scientific Group Geneva	Total
1 Personnel	3,067	8,339	4,268	3,452	19,126
2 Operations	1,613	6,457	1,617	1,381	11,068
3 Capital outlays	22	1,744	4,697	156	6,619
4 Sky Survey Project	—	—	—	1,360	1,360
	4,702	16,540	10,582	6,349	38,173
RESERVES					
Reserve for cost variation (4%)					1,500 (blocked)
TOTAL EXPENDITURE					39,673

Income

Budget Sub-heading		Estimate
80	Contributions from member states	32,500
81	Unused appropriations from previous years	2,882
82	Sale of Sky Atlas	720
84	Internal tax	2,244
85–89	Miscellaneous	1,327
TOTAL INCOME		39,673

APPENDIXES

Use of the 3.6 m Telescope During 1978

Period	Observer	Institute	Programme	Instrument
Jan. 1–3	T			
Jan. 3–6	Westerlund/Olander/Richer	Uppsala	Carbon stars LMC	BC+CIT
Jan. 6–8	Berezne/Lecacheux/Vapillon	Paris	Iapetus eclipse	"Pleyel" photometer*
Jan. 8–12	Westerlund	Uppsala	Interacting galaxies	BC+CIT
Jan. 12–17	West	ESO	Peculiar galaxies	BC+CIT
Jan. 17–30	T			
Jan. 30–Feb. 1	Appenzeller	Heidelberg	Various objects	BC+CIT
Feb. 1–3	Lelièvre	Meudon	N galaxies	BC+CIT, PF
Feb. 3–5	Georgelin/Comte	Marseille	H II regions in galaxies	Interferometer*
Feb. 5–6	Lelièvre	Meudon	N galaxies	PF
Feb. 6–8	Appenzeller	Heidelberg	Various objects	BC+CIT
Feb. 8–9	Lelièvre	Meudon	N galaxies	4-channel photometer
Feb. 9–11	T			
Feb. 11–14	Georgelin/Comte	Marseille	H II regions in galaxies	Interferometer*
Feb. 14–26	T			
Feb. 26–28	Gahm	Stockholm	Star formation in Coalsack	BC+CIT, PF
Feb. 28–March 1	T			
March 1–3	Gahm	Stockholm	Star formation in Coalsack	BC+CIT
March 3–5	Laustsen/Véron	ESO	Peculiar galaxies/Seyfert 1 nuclei	PF
March 5–9	van Paradijs (2½ nights)	Amsterdam	Identification of X-ray sources	BC+CIT
	Gahm (1½ nights)	Stockholm	Star formation in Coalsack	BC+CIT
March 9–12	Laustsen/Véron	ESO	Peculiar galaxies/Seyfert 1 nuclei	PF
March 12–13	van Paradijs	Amsterdam	Identification of X-ray soucres	BC+CIT
March 13–15	Laustsen/Véron	ESO	Peculiar galaxies/Seyfert 1 nuclei	PF
March 15–16	T			
March 16–22+	Kreysa/Sherwood/Arnold	MPI Bonn	Submillimeter and IR photometry of radio sources	Special photometer*
March 22–30	T			
March 30–31	Kohoutek	Hamburg	Peculiar planetary nebulae	PF
March 31–April 1	Kühn	Bochum	Peculiar Seyfert galaxies	PF
April 1–2	Kohoutek	Hamburg	Peculiar planetary nebulae	PF
April 2–3	T			

Period	Observer	Institute	Programme	Instrument
April 3–6	Courtès/Boulesteix	Marseille	Ionized gas in Sc galaxies	Interferometer*
April 6–7	Danks	ESO	Clusters of galaxies	PF
April 7–8	Kohoutek	Hamburg	Peculiar planetary nebulae	PF
April 8–10	Kühn	Bochum	Peculiar Seyfert galaxies	PF
April 10–13	Fosbury	ESO	Active elliptical galaxies	PF
April 13–29	T			
April 29–May 5	Ilovaisky	Meudon	X-ray source candidates	BC+CIT
May 5–9	Zuiderwijk	Amsterdam	X-ray source candidates	PF; BC+CIT
May 9–12	King/Schweizer	ESO/CTIO	Rotation of galaxies in pairs	BC+CIT
May 12–14	Surdej (for Geyer)	Bonn	UBV photometry of galaxies	PF
May 14–15	T			
May 15–17	Zuiderwijk	Amsterdam	X-ray source candidates	PF
May 17–30	T			
May 30–June 6	Westerlund	Uppsala	Cluster in Ara	BC+CIT
June 6–10	Surdej	ESO	Shells around peculiar stars	BC+CIT
June 10–11	Swings	Liège	Variable quasars	BC+CIT
June 11–13	Vogt	ESO	Ultra-short period dwarf novae	BC+CIT
June 13–28	T			
June 28–July 2	Knoechel	Hamburg	Polarization of TR 27	4-channel photometer
July 2–5	T			
July 5–8	Vogt	ESO	Ultra-short period dwarf novae	BC+CIT
July 8–11	Swings	Liège	Quasars	BC+CIT
July 11–22	T			
July 22–31+	de Graauw et al.	ESA/Utrecht	Submillimetre spectroscopy molecular clouds	Heterodyne receiver*
July 31–Aug. 2	Bareau (for Laustsen/Tammann)	Aarhus/ESO	Variables in IC 5152	PF
Aug. 2–5	Sherwood	MPI Bonn	Markarian galaxies	PF
Aug. 5–12	Wamsteker	ESO	Dust in galaxies	4-channel photometer, BC+CIT
Aug. 12–17	T			
Aug. 17–24+	Arnold/Sherwood	MPI Bonn	Submillimetre photometry of radio sources	Special photometer*
Aug. 24–Sept. 11	Boksenberg Goss Bergeron/Danziger/Dennefeld/ Fosbury/Materne/Ulrich/ Wamsteker	London/ Groningen/ ESO	Quasars, Seyferts, radio galaxies, ring galaxies	BC+Image Photon Counting System*
Sept. 11–13	T			
Sept. 13–19+	Epchtein et al.	Meudon	10, 20, 30-μm mapping of H II regions	Special IR photometer*
Sept. 19–22	T			

Use of the 3.6 m Telescope During 1978 (Continued)

Period	Observer	Institute	Programme	Instrument
Sept. 22–26	Schuster	ESO	Active galaxies	BC+IDS
Sept. 26–Oct. 2	Labeyrie/Bonneau	Paris	Stars and quasars	Speckle interferometer*
Oct. 2–4	Schuster	ESO	Quasars	BC+IDS
Oct. 4–8	Tammann (2 nights)	ESO	Variables in IC 5152	PF
	Schuster (2 nights)	ESO	Photometry of stars in Sculptor Dwarf Galaxy (SDIG)	PF
Oct. 8–26	T			
Oct. 26–30	Henrichs (2 nights)	Amsterdam	X-ray source candidates	BC+IDS
	Schnur (2 nights)	ESO	Nuclei of SO-galaxies	BC+IDS
Oct. 30–Nov. 4	Lindblad/Elvius	Stockholm	Barred and Seyfert galaxies	BC+CIT
Nov. 4–7	Henrichs (1½ nights)	Amsterdam	X-ray source candidates	BC+IDS
	Schoembs (1½ nights)	München	Dwarf novae	BC+IDS
Nov. 7–10	Foy/Blazit	Meudon	Mira variables and globular clusters	Speckle interferometer*
Nov. 10–18	T			
Nov. 18–21	Knoechel	Hamburg	Polarization of OB-supergiants	4-channel photometer
Nov. 21–23	T			
Nov. 23–25	Tarenghi/Materne	ESO	Clustering of galaxies	BC+IDS
Nov. 25–27	Danks/Alcaíno	ESO/Santiago	Clusters of galaxies	BC+IDS
Nov. 27–28	Wamsteker	ESO	Dust in galaxies	BC+IDS
Nov. 28–29	T			
Nov. 29–Dec. 3	Georgelin/Monnet	Marseille/Lyon	Kinematics in galaxies	Interferometer*
Dec. 3–5	Ardeberg	Lund	Luminosity function in Magellanic Clouds	Spectracon
Dec. 5–7	Tarenghi/Materne	ESO	Lenticulars and Clustering of galaxies	PF; BC+IDS
Dec. 7–11	Hunger/Weidemann	Kiel	Faint sd O-stars and DA white dwarfs	BC+IDS
Dec. 11–16	T			
Dec. 16–19	Weigelt	Erlangen	Speckle interferometry	Speckle interferometer*
Dec. 19–23	Perrier (for Geyer/ Danziger/Dennefeld)	Bonn/ ESO	Miscellaneous	PF
Dec. 23–25	Alcaíno	Santiago	Photometry of globular clusters	PF
Dec. 25–28	Nandy/Morgan	Edinburgh	Dust composition in the Magellanic Clouds	BC+IDS
Dec. 28–30	Swings	ESO/Liège	Variable quasars	PF; BC+IDS
Dec. 30–Jan. 1	Vogt	ESO	Dwarf novae	4-channel photometer; BC+IDS

\+ Programme with also day-time use of telescope
T Tests or other technical time
BC Boller and Chivens Spectrograph
CIT Carnegie Image Tube
IDS Image Dissector Scanner
PF Prime Focus photography
* Special equipment of the observer

Use of the 1.52 m Telescope During 1978

Period	Observer	Institute	Programme	Instrument
Jan. 1–2	Pakull	ESO	X-ray sources in the LMC	BC
Jan. 2–3	Muller	ESO	Peculiar galaxies	BC
Jan. 3–6	Olander	Uppsala	M stars in the LMC	BC
Jan. 6–8	Muller	ESO	Peculiar galaxies	BC
Jan. 8–13	Schnur	ESO	Nuclei of SO-Galaxies	BC
Jan. 13–19	Kunth	ESO	Compact galaxies	BC
Jan. 19–26	Seggewiss	Hoher List	Ap stars	Coudé
Jan. 26–28	T			
Jan. 28–30	Breysacher	ESO	Wolf-Rayet stars in the Magellanic Clouds	Echelec
Jan. 30–Feb. 2	Dravins	Lund	Chromospheres in early-type stars	Echelec
Feb. 2–5	Lyngå	Lund	Luminosity function LMC	Spectracon
Feb. 5–12	Georgelin/Comte	Marseille	H II regions in the Galaxy and LMC	Interferometer*
Feb. 12–15	Surdej	ESO	Peculiar galaxies	BC
Feb. 15–22	Reimers	Kiel	Mass loss from red giants	Coudé
Feb. 22–26	Gahm	Stockholm	Stars in early phases	Coudé
Feb. 26–March 10	Danks (4 nights)	ESO	Diffuse interstellar lines	Echelec
	de Loore (6 nights)	Brussels	X-ray binary systems	Echelec
	Wamsteker (2 nights)	ESO	Globular clusters and their cores	Echelec
March 10–12	Breysacher	ESO	Wolf-Rayet stars in the Magellanic Clouds	Echelec
March 12–20	Andersen[1]	Brorfelde	Eclipsing binaries	Coudé
March 20–27	Kudritzki	Kiel	O-stars	Coudé
March 27–28	Surdej	ESO	Interstellar lines near η Car	Coudé
March 28–April 1	Klutz	Liège	Peculiar Be stars	Coudé
April 1–7	Kühn	Bochum	Radial velocities of galactic objects; Seyferts	BC
April 7–10	Fosbury	ESO	Active elliptical galaxies	BC
April 10–15	Kühn	Bochum	Peculiar Seyfert galaxies	BC
April 15–27	Rahe (6 nights)	Bamberg	Close binary systems	Coudé
	Wolf (6 nights)	Heidelberg	YY Ori and T Tau stars	Coudé
April 27–May 4	de Loore[1]	Brussels	X-ray binary systems	Coudé and Echelec
May 4–7	King	ESO	Velocity dispersions in globular clusters	Echelec
May 7–10	Danks	ESO	Galaxies	BC
May 10–15	Ilovaisky/Motch	Meudon	X-ray sources	Special photometer*
May 15–20	Briot	Paris	Be stars	Coudé
May 20–June 2	Zuiderwijk[1] /Thé	Amsterdam	X-ray sources, peculiar variable stars	Coudé
June 2–5	Pakull (2½ nights)	ESO	X-ray sources	BC
	for Houziaux (½ night)	Mons	V 348 Sgr	BC
June 5–10	Maurice	Marseille	Stars in Carina arm	RV Cass
June 10–17	Zentelis	Stockholm	Local system of early-type stars	Coudé

Use of the 1.52 m Telescope During 1978 (Continued)

Period	Observer	Institute	Programme	Instrument
June 17–19	Surdej	ESO	Be stars	Coudé
June 19–22	T			
June 22–27	Danks[1]	ESO	Hot emission stars	Coudé
June 27–29	T			
June 29–July 4	Schnur	ESO	Intergalactic light in clusters	BC
July 4–7	Danks	ESO	Galaxies	BC
July 7–9	Bouchet	ESO	Carbon stars	Coudé
July 9–16	de Loore	Brussels	X-ray binary systems	Echelec+Coudé
July 16–20	Swings	Liège	Peculiar stars with IR excess	Coudé
July 20–27	Tscharnuter/Weiss	Munich/Vienna	Magnetic fields in pulsating variables	Zeeman analyser
July 27–Aug. 1	Jaschek, M.[1]	Strasbourg	Hot stars	Coudé
Aug. 1–7	Spite	Meudon	Abundances in globular cluster stars	Echelec
Aug. 7–11	Jaschek, C.	Strasbourg	Be stars	Coudé
Aug. 11–14	Breysacher	ESO	Wolf-Rayet stars in the SMC	Echelec
Aug. 14–15	T			
Aug. 15–24	Andriesse	Roden	IR spectroscopy galactic sources	Fabry-Pérot*
Aug. 24–28	Bouchet	ESO	Carbon stars	Coudé
Aug. 28–31	Schuster	ESO	Peculiar galaxies	BC
Aug. 31–Sept. 3	Lauberts	Uppsala	Peculiar galaxies	BC
Sept. 3–5	Schuster	ESO	Peculiar galaxies	BC
Sept. 5–6	T			
Sept. 6–10	Bouchet	ESO	Carbon stars	Coudé
Sept. 10–13	T			
Sept. 13–14	Bareau	ESO	Stellar magnetic fields	Zeeman analyser
Sept. 14–24	Bouchet[1]	ESO	Carbon stars	Coudé
Sept. 24–26	Wamsteker	ESO	Globular clusters and cores	Echelec
Sept. 26–Oct. 4	Breysacher/(Azzopardi)	ESO/Toulouse	Structure of the SMC	Echelec
Oct. 4–6	Bouchet	ESO	Carbon stars	Coudé
Oct. 6–13	Andersen[1]	Brorfelde	New Population II stars	Coudé
Oct. 13–16	Bareau (for van Dessel)	Brussels	Visual binaries	Coudé
Oct. 16–18	Bareau	ESO	Stellar magnetic fields	Zeeman analyser
Oct. 18–23	T			
Oct. 23–29	Spite	Meudon	Abundances in metal-poor stars	Echelec
Oct. 29–Nov. 5	Foy	Meudon	Abundances in the SMC	Echelec
Nov. 5–11	Muratorio	Marseille	Emission stars in Magellanic Clouds	Echelec
Nov. 11–16	Holweger	Kiel	Late-type dwarfs	Coudé

Period	Observer	Institute	Programme	Instrument
Nov. 16–18	Bareau	ESO	Stellar magnetic fields	Zeeman analyser
Nov. 18–24	de Vries	Roden	Planets and planetary nebulae	Fabry-Pérot*
Nov. 24–28	Dachs	Bochum	Peculiar galaxies	BC
Nov. 28–30	Danks	ESO	Clusters of galaxies	BC
Nov. 30–Dec. 3	Ekman	Uppsala	Compact and interacting galaxies	BC
Dec. 3–8	Monnet/Rosado	Lyon/Mexico	Surface photometry of galaxies	Focal reducer*
Dec. 8–10	Alcaíno	Santiago	Cores of globular clusters	Coudé
Dec. 10–15	Weigelt	Erlangen	Speckle interferometry and holography	Speckle interferometer*
Dec. 15–22	Breysacher	ESO	Wolf-Rayet stars in SMC	Echelec
Dec. 22–24	Swings	ESO/Liège	Peculiar stars with IR excess	Coudé
Dec. 24–30	Querci, M.	Meudon	Carbon stars	Coudé
Dec. 30–Jan. 1	Schnur	ESO	SO-galaxies	BC

[1] Including $^2/_3$ night for Ahlin (Stockholm) on HD 161387.

Period	Observer	Institute	Programme	Instrument
Jan. 1–3	Schulz	Tübingen	X-ray binary WRA 977	P
Jan. 3–6	Westerlund	Uppsala	M stars in the LMC	P
Jan. 6–16	Wlérick	Meudon	Colours of quasars	P
Jan. 16–19	Schnur	ESO	Clusters of galaxies	P
Jan. 19–23	Pakull	ESO	X-ray sources in LMC	P
Jan. 23–25+	Bouchet	ESO	Carbon stars	IRP
Jan. 25–30	Lub	ESO	RR Lyrae in globular clusters	P
Jan. 30–Feb. 5	Schröder	Hamburg	Circular polarization of white dwarfs	Polarimeter
Feb. 5–8	Schnur	ESO	Clusters of galaxies	P
Feb. 8–15	Lelièvre	Meudon	Radio sources	P
Feb. 15–18	Vogt	ESO	Dwarf novae with supermaxima	P
Feb. 18–21	T			
Feb. 21–28	Knoechel	Hamburg	Polarimetry of TR 14/TR 16	Polarimeter
Feb. 28–March 2	Surdej	ESO	Be stars	P
March 2–9	Möllenhoff	Heidelberg	Monochromatic imaging NGC 5128	Spectracon
March 9–17	Adam	Lyon	UBV photometry of quasars	P
March 17–19	Wamsteker/Danks/Bouchet	ESO	Observations with CCD	
March 19–25+	Wamsteker	ESO	Asteroids/H II regions	IRP
March 25–April 1+	Sherwood/Schultz	MPI Bonn	IR photometry of radio sources	IRP
April 1–8	Adam	Lyon	UBV photometry of quasars	P
April 8–14	Kohoutek	Hamburg	Peculiar planetary nebulae	P
April 14–27+	Shaver/Danks (6 nights)	Groningen/ESO	Region of star formation	IRP
	Bensammar (5 nights)	Meudon	Regions of star formation	IRP
	Wamsteker (2 nights)	ESO	H II regions	IRP
April 27–May 9	Burger (6½ nights)	Brussels	X-ray binary systems	P
	Ilovaisky (5 nights)	Meudon	X-ray sources	Special photometer*
	Ilovaisky (for Ulrich ½ night)	ESO	3C 273	Special photometer*
May 9–15	Henrichs	Amsterdam	X-ray source candidates	P
May 15–18	Alcaíno	Santiago	Sequences for globular clusters	P
May 18–23+	Thé/Wamsteker	Amsterdam/ESO	Peculiar variable stars	IRP
May 23–26	Zeuge	Hamburg	Young open clusters	P
May 26–31	Ardeberg	Lund	Stars in Carina arm	P
May 31–June 6	Crane	ESO	Black holes in globular clusters	P
June 6–10	Westerlund	Uppsala	Radio sources	P
June 10–14	Pakull	ESO	X-ray sources	P
June 14–17	Lindroos	Stockholm	Stars in early phases	P

Period	Observer	Institute	Programme	Instrument
June 17–21	Smith	ESO	Binary PKS 1925–524	P
June 21–24	T			
June 24–27	Lindroos	Stockholm	Stars in early phases	P
June 27–July 3	Bernard	Lyon	Bright cloud Sag B	P
July 3–9	Knoechel	Hamburg	Polarization of TR 27	Polarimeter
July 9–16	Burger	Brussels	X-ray binary systems	P
July 16–19	T			
July 19–23+	Danks/Bouchet	ESO	OH/H_2O regions	IRP
July 23–25+	Wamsteker/Schober	ESO/Graz	Asteroids	IRP
July 25–31+	Salinari/Tanzi	ESO/Milano	OH sources/H II regions	IRP
July 31–Aug. 3	Vogt	ESO	Dwarf novae with supermaxima	P
Aug. 3–10	Bruch	Münster	Old novae	P
Aug. 10–17+	Schultz/Sherwood	MPI Bonn	Radio sources	IRP
Aug. 17–21+	Bouchet/Querci	ESO/Meudon	Carbon stars	IRP
Aug. 21–25+	Wamsteker	ESO	Asteroids	IRP
Aug. 25–29+	Bouchet/Querci	ESO/Meudon	Carbon stars	IRP
Aug. 29–31	Vogt	ESO	Dwarf novae with supermaxima	P
Aug. 31–Sept. 4	Schnur	ESO	Intergalactic light in clusters	P
Sept. 4–8	Fosbury	ESO	Parkes radio galaxies	P
Sept. 8–12	Lauberts	Uppsala	Peculiar galaxies	P
Sept. 12–15+	Wamsteker/Schober	ESO/Graz	Asteroids	IRP
Sept. 15–19+	Wamsteker/Bouchet	ESO	IR calibration	IRP
Sept. 19–24+	Turon/Epchtein	Meudon	10, 20, 30-μm mapping of H II regions	IRP
Sept. 24-26	T			
Sept. 26–Oct. 1	Danks	ESO	Galaxies	P
Oct. 1–4	Tammann/Danks	ESO	Stars in IC 5152/Galaxies	P
Oct. 4–7	Alcaíno	Santiago	Clusters of galaxies	P
Oct. 7–9+	Bouchet	ESO	Carbon stars	IRP
Oct. 9–16+	Bensammar	Meudon	Regions of star formation	IRP
Oct. 16–22+	Guibert/(Nguyen)/ Wamsteker/Bouchet	Meudon/ESO	OH-sources	IRP
Oct. 22–30	Lundgren	Uppsala	Carbon and M stars in the LMC	P
Oct. 30–Nov. 4	Schoembs	Munich	Dwarf novae	P, polarimeter
Nov. 4–10	Vogt	ESO	Dwarf novae	P
Nov. 10–13	T			
Nov. 13–16+	Wamsteker	ESO	Solar stars	IRP
Nov. 16–21+	Epchtein/Brockmann	Meudon	Late-type stars H II regions	IRP
Nov. 21–27	Knoechel	Hamburg	Polarization of OB-supergiants	Polarimeter

Use of the 1 m Telescope During 1978 (Continued)

Period	Observer	Institute	Programme	Instrument
Nov. 27–30	Ekman	Uppsala	Interacting galaxies	P
Nov. 30–Dec. 5	Schnur	ESO	Intergalactic light in clusters	P
Dec. 5–10	Ardeberg	Lund	Luminosity function of the Magellanic Clouds	P
Dec. 10–16+	Shaver/Wamsteker	ESO	Regions of star formation	IRP
Dec. 16–24	Danks/(van Woerden)	ESO/Groningen	Bright galaxies	P
Dec. 24–30	Querci, F.	Meudon	Carbon stars	P
Dec. 30–Jan. 1	Mianes	Toulouse	Photoelectric photometry of M supergiants and Miras in LMC	P

P Standard ESO Photometer
IRP Infrared Photometer

The ESO 50 cm telescope was used throughout the year. In addition, 133 nights on the Danish 50 cm telescope and 220 nights on the Bochum 61 cm telescope were scheduled for ESO users. The GPO was scheduled for 121 nights. Infrared work was scheduled at the 1 m telescope for 105 days.

Meteorological Report

Negligible amounts of snow fell this year on La Silla on: June 18, 27 and 28, July 27 and September 12.

APPENDIX II – Publications

Adam, G.: UBV Photometry of Southern Quasars and Quasars Candidates. *AA Suppl.*, **31,** 151–157.

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Dravins, D.: High Dispersion Astronomical Spectroscopy with Holographic and Ruled Diffraction Gratings. *Applied Optics*, **17,** 404.

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In addition to the publications listed, numerous miscellaneous communications were made to the "International Astronomical Circulars" and to the "Information Bulletin on Variable Stars". Various papers were also published in more popular magazines.

ESO Publications

Annual Report 1977.

The Messenger—El Mensajero Nos. 12–15.

Scientific Preprints Nos. 19–39.

Proc. ESO Conference on Optical Telescopes of the Future (ed. F. Pacini, W. Richter and R. N. Wilson).

Proc. Modern Techniques in Astronomical Photography (ed. R. M. West and J.-L. Heudier).

APPENDIX III – Members of Council, Committees and Working Groups on January 1, 1979

Council

Belgium:	P. Ledoux
	M. Deloz/L. Poulaert
Denmark:	K. Gyldenkerne
	P. A. Koch
France:	J.-F. Denisse (President)
	S. Filliol
Federal Republic of Germany:	I. Appenzeller
	C. Zelle
The Netherlands:	A. Blaauw
	B. Okkerse
Sweden:	B. E. Westerlund
	M. Lemne

Committee of Council

M. Deloz/L. Poulaert	B. Okkerse
J.-F. Denisse (President)	B. E. Westerlund
P. A. Koch	C. Zelle

Scientific and Technical Committee

A. Behr (1978–79)	G. Münch (1979–83)
H. van der Laan (1978–82)	P. E. Nissen (1978–80)
P. Léna (1978–82) (Chairman)	B. Strömgren (1978–79)
J. Lequeux (1978–80)	J. P. Swings (1979–83)
C. de Loore (1978–81)	

Finance Committee

Belgium:	L. Poulaert/M. Deloz (Chairman)
Denmark:	H. Grage
France:	M. Rey
Federal Republic of Germany:	W. Sandtner
The Netherlands:	R. A. van Welt
Sweden:	M. O. Ottosson

Observing Programmes Committee

Members	*Substitutes*
L. Houziaux (until 31. 12. 1980)	C. de Loore
K. Hunger (31. 12. 1981) (Chairman)	Th. Schmidt-Kaler
P. S. Thé (31. 12. 1982)	P. C. van der Kruit
Dr. S. Laustsen (31. 12. 1983)	P. E. Nissen
B. E. Westerlund (31. 12. 1982)	A. Elvius
G. Wlérick (31. 12. 1979)	G. Monnet

Users Committee

J. Andersen (1978–80)
A. Ardeberg (1978–80)
E. H. Geyer (1978–79)
S. Ilovaisky (1978–79)
J. van Paradijs (1978–79)
J.-P. Swings (1978–80) (Chairman)

Working Group for the Planning of the ESO Headquarters*

A. Blaauw
M. Deloz
J.-F. Denisse
K. Gyldenkerne
B. E. Westerlund
C. Zelle

Joint EMBL/ESO Working Group on Remuneration System

G. Armento
M. Deloz
J. Dörr
Y. Genet
H. Grage
J. E. A. Hay
R. Leclerc
P. Le Nail (Chairman)
J. W. Nijhof
H. Østergaard-Andersen
V. C. Ravensloot
G. af Sandeberg
W. Sandtner
J. Trachsel
B. de Vidts

Meetings in 1978

Council	15 June Munich	7 December Munich
Committee of Council	11 May Geneva	16 November Geneva
Finance Committee	13–14 June Munich	6–11 November Chile
Scientific Technical Committee	10 May Geneva	27 September Geneva
Observing Programmes Committee	23–25 May Aarhus	29 November– 1 December Paris
Users Committee	26 September Geneva	
Working Group on Remuneration Systems	6 February Heidelberg	6–7 April Munich
	19–20 June Heidelberg	27–28 September Munich

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