ANNUAL REPORT 1976

EUROPEAN SOUTHERN OBSERVATORY

Cover Photograph

The "Horsehead nebula" is a dark cloud of obscuring dust in front of a luminous nebula of excited gas in our galaxy. This photograph was taken by Dr. S. Laustsen at the prime focus of the 3.6 m telescope.

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presented to the Council
by the Director-General, Prof. Dr. L. Woltjer

Organisation Européenne pour des
Recherches Astronomiques dans l'Hémisphère Austral

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INTRODUCTION

On 9 November 1976 the first fully successful photographs were taken with the newly installed 3.6 metre telescope at La Silla. Thus the telescope project was approaching a most satisfactory conclusion. By the end of the year, numerous photographs had already been taken with the one-element prime focus corrector. Further work on the telescope continued, and during the following year the Cassegrain and coudé foci should become operational. While during 1977 most of the time will still have to be devoted to telescope adjustments, serious research programmes should receive an increasing share.

A new instrumentation plan for the 3.6 m telescope covering the period 1977–80 was approved by the ESO Council. Among the items foreseen for the next few years are a cross-dispersed échelle Cassegrain spectrograph, a coudé scanner and a variety of developments in detectors and infrared equipment. At the end of the year, the TP Division was reorganized to better be able to deal with the instrumentation. The existing group structure was replaced by two groups: an engineering group and an instrumentation development group. The scientific group in Geneva was also expanding, and research in a variety of subjects was started.

The restructuring in Chile was completed. All technical and most scientific and administrative activities are now concentrated at La Silla, with only a small office remaining in Santiago. The new structure led to substantial improvement in the functioning of the La Silla observatory. The last buildings of the auxiliary construction programme were nearing completion by the end of the year.

In the middle of the year, the Administration moved from Hamburg to Garching near Munich. Much effort was devoted to the planning for the new Headquarters building in Garching, where all European activities of ESO should be located by the end of 1979.

RESEARCH BY STAFF AND VISITING ASTRONOMERS

Galaxies

Extragalactic research at ESO has been expanding rapidly. Two long-range programmes of spectroscopic and photometric observations of interesting galaxies discovered by Lauberts (ESO/Uppsala) on the Quick Blue Survey were conducted by Breysacher, Muller, Schuster, West (ESO) and by Westerlund and his associates (Uppsala) who observed altogether about 150 objects. Further observations were obtained by West at Las Campanas Observatory. Some 70 new emission-line galaxies were found. These studies will provide a valuable list of objects for more detailed studies with the 3.6 m telescope. Several faint dwarf galaxies were found on the Quick Blue Survey by Schuster and West (ESO). A particularly interesting case is represented by the Sculptor dwarf. Photographs taken with the 3.6 m telescope by Laustsen (ESO) show an abundance of bright blue stars.

Observations in clusters of galaxies have been obtained by Havlen and Quintana (ESO), by Schnur (ESO) and by Materne (ESO), partly in collaboration with Chincarini (Bologna) and Tarenghi (Milano). Radial velocities of individual galaxies were measured and the luminosity functions of several clusters studied. Materne also studied mathematical models for the description of clusters in order to arrive at better membership criteria.

Disney (Groningen) obtained multi-aperture UBV observations of 50 Parkes radio galaxies and BL Lac-type objects. Of particular interest were observations of NGC 1510 which has the typical light distribution of an elliptical, but very blue colours. Three BL Lac-type objects (AP Lib, 0521–36 and 0548–322) were found to be steady over hours of continuous measurements (contrary to other claims). Their colours as a function of aperture confirm that they are probably elliptical galaxies with miniature quasars in the core. Garnier (Lyon), Wlérick (Meudon) and Westerlund (Uppsala) extensively studied 3C 120 and AP Librae and analyzed the results in terms of a superposition of a galaxy and a miniquasar. In the former case, the colours of the underlying galaxy do not correspond to those of a giant elliptical. UBV observations of quasars were obtained by Adam (Lyon), and by Westerlund (Uppsala) and Wlérick (Meudon). P. and M. Véron (ESO and Meudon) determined accurate optical positions of radio galaxies and quasars; they also studied the classification of quasars and galaxies with active nuclei. Crane (ESO) searched for faint optical emissions between galaxies in groups and (at Kitt Peak in collaboration with Tyson (Bell Laboratories) and Saslaw (Charlottesville)) in the extended radio-emitting lobes of galaxies.

Bergeron (ESO) with Alloin (Nice) and Pelat (Paris) discussed the physical conditions and heavy-element abundances in Markarian and Seyfert-type galaxies. Bergeron studied the nebulosities around some quasars and concluded that these may be gaseous disks (30–60 kpc) ionized by hard radiation from the nuclei. With Gunn (Caltech) she

studied the nature of extended neutral hydrogen disks around nearby spiral galaxies.

Kreysa, Schultz and Sherwood (Bonn) observed forty SO galaxies in the IR (1–5 μ) and found infrared excesses in quite a few of them. NGC 1316 was found to have a constant flux density between 1 and 5 μ, but to increase by a factor of twenty at 11 μ.

Tammann (ESO/Basel) with Sandage (Hale Observatories) further studied the Hubble constant. In collaboration with Yahil (Tel Aviv) they determined the solar motion with respect to the Local Group of galaxies. On kinematic grounds they conclude that IC 10, IC 5152, the Pegasus dwarf, WLM, DDO 210 and Leo A are probably members, whereas NGC 404, NGC 6946, IC 342 and Maffei 1 and 2 are not.

Tammann (ESO/Basel) further studied the statistics of supernovae. He derived a rate of one per 15 years in our galaxy, in good agreement with the expectation from extragalactic evidence. The average rate for Shapley-Ames galaxies, however, is only one per 185 years. With Crane and Woltjer (ESO), the distribution of supernovae in the Coma cluster was analyzed. The rate per unit luminosity was found to be at least 6–10 times lower in the outlying halos than in the main bodies of the galaxies.

All the needed material was obtained with the ESO Schmidt for the programme of Schuster (ESO) and Westerlund (Uppsala) to provide classifications of the missing objects in the Revised NGC.

Magellanic Clouds

Borgman and Danks (Groningen) obtained uvby and 3300 Å photometric data in the LMC to supplement information obtained with the Dutch ultraviolet satellite. Observations of some other objects in this programme, including planetary nebulae, are being analyzed by Pottasch (Groningen).

Breysacher (ESO) and Westerlund (Uppsala) continued their observations of Wolf-Rayet stars in the Clouds with the Echelec spectrograph (124 Å/mm) in order to determine the frequency of binaries, while de Groot (ESO) continued his observations of P Cygni-type stars in the Clouds. Spectra of supergiants in the SMC were observed by Divan and her associates (Meudon) and by Dubois (Strasbourg). Observations at relatively high dispersion for abundance analysis were obtained by Foy (Meudon) with the Echelec in the échelle mode. Azzopardi (Toulouse) observed the SMC with an Hγ interference filter and obtained equivalent widths in Hγ for 300 stars. Olander and Westerlund (Uppsala) obtained VRI photometry and spectra of M-type supergiants in the LMC. Mianes (Lyon), Prévot (Marseille), Burnichon (Paris) and Rousseau (Lyon) completed the uvby photometry for 53 of the hottest stars in the LMC. The absolute magnitudes of the presumed O stars are quite consistent with those in our galaxy. The mean visual absorption is found to be $0^{m}.37$. Together with Martin, Rebeirot (Marseille) and Westerlund (Uppsala) they obtained R, I photometry of 121 stars in the LMC. Johansson (Uppsala) established a UBV sequence of 40 stars with $7 < V < 12$. Ardeberg (Lund) observed the Clouds with a spectracon. The halo regions appear to be well populated with faint red stars. Maurice (Marseille) and also Pakull (Hamburg) obtained spectra of optical candidates for X-ray sources in the LMC. Dennefeld (ESO), partly in collaboration with Danziger and Crane (ESO), continued his studies of supernova remnants in the Clouds. The analysis of N 63A and N 132D in the LMC and of N 19 in the SMC has been essentially completed. A study of candidates for SNR was started.

Interstellar Matter

Danks (Groningen), Houziaux (Mons) and Manfroid (ESO) continued their spectrographic studies of southern H II regions. Danziger, Dennefeld and Schuster (ESO) observed some nebulosity near 47 Tuc. Breysacher (ESO) further studied complex structure in the interstellar Ca II lines in OB stars in the nebulae near η Carinae. Gammelgaard (Aarhus) obtained observations to study the relation between the 6180 Å indices and interstellar polarization. Polarization observations were also made by Krautter (Heidelberg).

Turon (ESO) continued his work on dense clouds of interstellar gas and participated in infrared observational programmes of compact H II regions in collaboration with groups at Lyon and Meudon. Wamsteker (ESO) made infrared source searches in southern H II regions and in the error boxes of CRL sources. He and Schultz, Kreysa and Sherwood (Bonn) made infrared observations of OH sources as well as of regions near the galactic centre which show 10 GHz peaks. Simultaneous monitoring at 1612 MHz with the Effelsberg radio telescope shows correlated flux changes. Danks (Groningen) observed G 333.6–0.2 in the infrared.

Kohoutek and Martin (Hamburg) obtained photoelectric measurements in 13 narrow bands of 24 planetary nebulae and their nuclei. Some further observations for this programme were obtained by Lauterborn (Hamburg). West (ESO) obtained spectra of three new southern planetaries found on the Quick Blue Survey plates. Danks and Pottasch (Groningen) obtained uvby R data on many planetaries for correlation with uv data obtained with the ANS satellite.

Manfroid (ESO) started extensive computations on the structure and dynamics of H II regions, solving simultaneously the equations for the dynamics and for the radiative transfer. The complete evolution of an H II region around a 30-solar-mass star has been calculated.

Clusters and Galactic Structure

Alcaíno (Santiago) continued his photometry in the globular clusters NGC 1261, 2298 and 7099.

The 1–3.5 μ infrared radiation of the central regions of some ten globular clusters was measured by Wamsteker (ESO). The results are complemented by spectroscopic and direct photographic studies of the same clusters.

Havlen (ESO) and Moffat (Bochum) concluded their analysis of a galactic cluster in Scorpius with $5^{m}.8$ visual absorption. The coexistence of two Of stars and two Wolf-Rayet stars in this cluster is of particular interest. It supports the view that massive Of binaries with mass exchange and mass loss are the progenitors of WR stars. Havlen and Breysacher (ESO) obtained spectra with the Echelec to further study this matter.

Dubois (Strasbourg) observed late-type giants in seven galactic clusters in a search for spectral peculiarities. Breysacher (ESO) and Spite (Meudon) studied the rotation of stars in IC 2391. The hot stars were found to rotate relatively slowly and the F stars relatively too fast.

Photometric uvby and Hβ observations of stars were obtained by Heck (Liège) of stars brighter than $6^{m}.5$, and by Lindblad, Lodén and Schober (Stockholm) in a programme

aimed at the age distribution and kinematics of early stars in the solar neighbourhood between longitudes of 315° and 350°. Wramdemark (Lund) continued his photometric observations of early-type stars in Carina. Johansson (Uppsala) observed 400 stars in UBV and some of them also in uvby and Hβ. Loibl (Hamburg) continued the study of absorption measurements in Vela and started a programme on the density of red giants. UBV observations of 120 B-type stars in Vela were made by Haug (Hamburg), in particular to study the distribution of interstellar absorption. Lodén (Stockholm) continued the studies of groupings of stars in the Carina-Crux-Centaurus region. Several open clusters and some smaller aggregates were identified on the basis of uvby, Hβ photometry.

Olsen and Strömgren (Copenhagen) obtained many observations of uvby standards in order to better establish the relation with the uvby system in the north. Knude (Copenhagen) obtained the last uvbyβ observations of A and F stars brighter than $9^{m}.5$ in 62 Selected Areas along the Southern Milky Way.

Andersen and Nordström (Copenhagen) obtained 520 plates at the coudé for the determination of the radial velocities for the B, A and F stars in the Bright Star Catalogue and for a programme of Grosbøl (Copenhagen) on the effect of spiral structure on stellar kinematics.

Blaauw (Leiden) and West (ESO) obtained GPO plates of McCormick fields in a search for high-velocity stars. Gieseking (Bonn) obtained 104 GPO plates of several galactic clusters and selected star fields for kinematic studies, cluster membership determination and studies of spectroscopic binaries.

Staller and Thé (Amsterdam) further studied the space distribution and luminosity of M dwarfs near the South Galactic Pole on the basis of VRI photometry.

X-ray Sources

Spectra of X-ray sources and optical candidates for these were obtained by Lauterborn (Hamburg) and by de Loore (Brussels). Extensive optical observations of Sco X-1 were obtained by Chevalier and Ilovaisky (Meudon). Simultaneous observations with the Copernicus satellite of some flares show that the X-ray flares precede their optical counterparts by 15–60 seconds. They also obtained numerous spectrographic (Echelec) and photometric observations of the transient X-ray source A 0620–00. Radial-velocity measurements of spectral features do not show any evidence for the expansion which is typical of ordinary novae. Further photometry of this source was obtained by Mauder (Tübingen).

In a search for infrared counterparts of X-ray burst sources, Wamsteker (ESO) found a strong IR source associated with the rapid burster MXB 1730–335. The results appear to be consistent with the identification of this object as a highly reddened globular cluster.

Binaries

Andersen (Copenhagen) obtained coudé spectra of eclipsing binaries for mass determinations. Data for V 539 Ara and V 760 Sco were complete, while the study of the very eccentric apsidal-motion system V 1647 Sgr is being continued. Imbert (Marseille) obtained coudé spectra of several eclipsing binaries ; preliminary orbits were

obtained for EQ TrA, VV Mon and AI Phe. Ahlin (Stockholm) observed the 936-day-period Auriga-type variable HD 161387 at the coudé. Spectral classes for the components are K 5 Ib and B 7 : V. A spectroscopic ephemeris will be determined before the favourable total eclipse in May 1980. Schöffel (Bamberg) obtained 103 coudé spectra of W UMa variables.

UBV photometry of eclipsing binaries and W UMa systems was obtained by several observers. Seggewiss (Bonn) observed RY, DV and DX Aqτ and UZ Oct. Duerbeck (Bonn) and Walter (Tübingen) studied the W UMa star ST Ind, RV Gru and AX Phe as well as the eclipsing binaries ER Ori, TX Cet and TU Hor. Spectra of AE Phe were also obtained.

Ahlin, Gahm and Lindroos (Stockholm) obtained spectra of components of very young visual binaries. The secondary components frequently show anomalous spectra, possibly indicative of a pre-main-sequence nature. Chareton and Oblak (Besançon) obtained uvby Hβ photometry on numerous visual binaries. Studies of absolute magnitude and metallicities are being made.

Stars

Appenzeller (Heidelberg) searched for YY Orionis stars by observing young stellar objects associated with dark clouds. Three certain cases were found, including S CrA which is by far the brightest member of the class and which was further studied with Wolf and Bertout (Heidelberg). A comparison of the spectral properties with protostellar model calculations has been made and indicates that S CrA is a low-mass protostar in its final hydrodynamical collapse phase.

Havlen (ESO) and Rakos (Vienna) obtained improved area scanner measures of Sirius B which lead to a temperature of 32,000°. Apparently the star compares normally with other DA white dwarfs.

Hardorp (Paris) searched for solar-type stars and found that the Sun itself is not a G2 V star. The observations have a bearing on the metal abundance in the Hyades.

Spite (Meudon) completed his analysis of two metal-deficient giants and refined his previous analysis of HD 128279.

Klutz and J. P. Swings (Liège) studied spectra of the Be star HD 51585 detecting heterogeneities in the extended atmosphere, and of GG Car. Swings and his students further analyzed the emission-line stars RX Pup, CD −52° 9243 and some compact emission-line nebulae. The spectrum of the A0 ep star HD 190073 with very complex and variable structure in the H and K absorption lines was studied by Swings and J. Surdej (ESO/Liège). The light variations of γ^2Vel were studied by Stenholm (Lund) on the basis of data obtained for him by several visiting astronomers. Preliminary analysis reveals variation in the emission lines with respect to the continuum around the phase zero. Doazan (Meudon) studied the Be stars, λ Par, ε PsA and α Col spectroscopically for rapid variations and found rapid inversions of the emission peaks in some cases. Feinstein (Cordoba) obtained simultaneous photometry. Baade and Seitter (Münster) obtained spectroscopic and photometric data for sixteen Be stars. Wolf (Heidelberg) obtained high-dispersion spectra of several early F-type supergiants in order to look for faint emission features in the Ca II resonance lines caused by eventual chromosphe-

ric activity. The observations were made with a holographic grating with a very low scattered light level. Mass-loss rates were evaluated by Reimers (Kiel) for late-type giants and supergiants on the basis of spectroscopic observations.

Hunger (Kiel) obtained coudé spectra of He variables. A detailed analysis was made of σ Ori E. Pedersen and Thomsen (Aarhus) found seven new periodic He variables and studied the variability of the strength of He I λ 4026.

Heck and Renson (Liège) studied Ap variables in uvby. Long-period variations have been found in HD 50169. Faúndez (Santiago), Maitzen (Bochum) and Vogt (ESO) completed their uvby g_1 g_2 photometry of 400 Ap and 1,000 normal stars. There appears to be a smooth transition from normal to peculiar stars with all degrees of marginal peculiarity. Maitzen, Tüg (Bochum) and Seggewiss (Bonn) carried out intermediate-band photometry of Ap stars and blue stragglers in galactic clusters.

Querci (Meudon) observed long-period carbon variables. Lauterborn (Hamburg) carried out four-colour photometry of cepheids. Geyer (Bonn) and Vogt (ESO) obtained UBV observations of the δ Scuti star V 743 Cen. Elvius (Stockholm) further studied a strongly variable hydrogen-deficient star. Large variations (300 km/sec) in radial velocity were observed.

Breysacher and Vogt (ESO) simultaneously obtained spectra and UBV photometry of the dwarf novae BV Cen and EX Hya. Vogt continued his spectroscopic survey of dwarf novae. The analysis of many years of photoelectric observations (with several other observers) of EX Hya is nearly completed. A significant period change was found.

Solar System

Deubner (Freiburg) studied the short-period time variability of the Sun, by measuring Uranus and Neptune with the double-beam photometer. For periods between twenty minutes and three hours an upper limit of 6×10^{-5} was placed on the amplitudes of eventual variations.

Light curves of several asteroids were obtained: by Debehogne (Uccle), partly in collaboration with J. and A. Surdej (ESO/Liège), for 59 Elpis, 599 Luisa and 349 Dembowska, by A. and J. Surdej for 471 Papagena, and by Schober (Graz) for 14 Irene and 7 Iris.

Positions of comets and asteroids were determined by Schuster and by West (ESO) and by Debehogne (Uccle). Schuster discovered a comet with the largest known perihelion distance (nearly 7 AU). J.P. Swings (Liège) obtained spectra of Comet West and studied the fragmentation of its nucleus.

Further Theoretical Studies

Lucy (ESO) studied the fission hypothesis of binary star formation by hydrodynamical calculations. Preliminary results were obtained, showing the development of a pear-shaped figure with the subsequent formation of a binary. These calculations appear to confirm the sequence of events envisaged by Poincaré. Sanders (ESO) studied

spiral patterns induced by a rotating bar in the central parts of a galaxy. Contopoulos (ESO) studied self-consistent problems near the inner Lindblad resonance, in particular in the case of barred spirals. Constantinescu (ESO) in collaboration with Radicati (CERN) studied self-gravitating rotating fluids from the point of view of the theory of phase transitions. Various powerful techniques developed in other areas of theoretical physics may provide useful models for the study of rapidly rotating stars.

Pacini (ESO) with Vitello (Cornell) extended self-consistent models of expanding radio sources—in which the hydrodynamics is taken into account—to the fully relativistic case. With Salvati (Frascati) a possible model for X-ray bursts was considered. The model assumes imperfect corotation between a neutron star and the surrounding matter with consequent building up of magnetic fields followed by flares. Quintana (ESO) in collaboration with Carter (Meudon) continued the study of the relativistic structure of solid neutron stars and their elastic behaviour.

Sky Survey and Atlas Laboratory

Throughout 1976, plates continued to be taken for the ESO (B) Atlas. By the end of the year, good plates had been obtained for about 90 per cent of the 606 fields. The remaining plates, mainly in the $-20°$ zone, will be taken during 1977. The ESO/Uppsala cooperation continued. By the end of the year, 300 fields had been searched, yielding close to 9,000 objects.

Copies of the ESO (B) plates were made at the Sky Atlas Laboratory in Geneva. By the end of the year, 300 on-glass copies had been distributed to each of 20 customers and 400 on-film copies to each of 42 customers. About 150 plates taken with the SRC Schmidt telescope in Australia were received. Some fields have already been published as the first instalment of the ESO/SRC Atlas of the Southern Sky.

Much attention was given to technical details in connection with the ESO (R) Atlas which constitutes the red half of the joint ESO/SRC Atlas of the Southern Sky. It was originally the intention to use the 098–94 emulsion, but with the availability of the new fine-grain 127–04 emulsion it was felt that there would be many advantages in switching to the 127-04. In particular, this emulsion has the same characteristics in terms of graininess and resolution as the IIIa-J emulsion that is being used for the SRC Survey. Comparative tests were carried out in June 1976 and clearly showed the superiority of the 127–04 over 098–04.

A large sensitization plant was installed in the Schmidt dome during April 1976. This plant may be used either for long-term nitrogen flushing or nitrogen baking. Tests were undertaken to determine by which method the 127–04 atlas plates should be sensitized.

In Geneva a new control system was built for the S-3000 measuring machine. A blink comparator was acquired, and preparations for the installation of the Grant measuring machine (formerly located in Santiago) werde made.

Joint Research with Chilean Institutes

The Danjon Astrolabe Project During 1976

The Danjon Astrolabe Project, a joint research programme between ESO and the Universidad de Chile, progressed during 1976. The observations of the fundamental groups, which define the instrumental system of the astrolabe, were continued. Up to 30 November 1976, 434 groups were observed, which corresponds more or less to 12,000 transits of stars. In December 1976, a new series of observations of two systems of catalogue groups will commence. The new catalogue groups are similar to those observed for the First Astrolabe Catalogue of Santiago; nevertheless, some modifications were introduced according to the recommendations approved by the astrolabe working group during the XVIth General Assembly of the IAU at Grenoble. It is expected to complete the observations of the catalogue groups in three or four years. These observations will provide the material for a second astrolabe catalogue. The observations of planets with the astrolabe have been continued. During 1976, the planet Uranus was observed on 74 occasions, including 30 double transits.

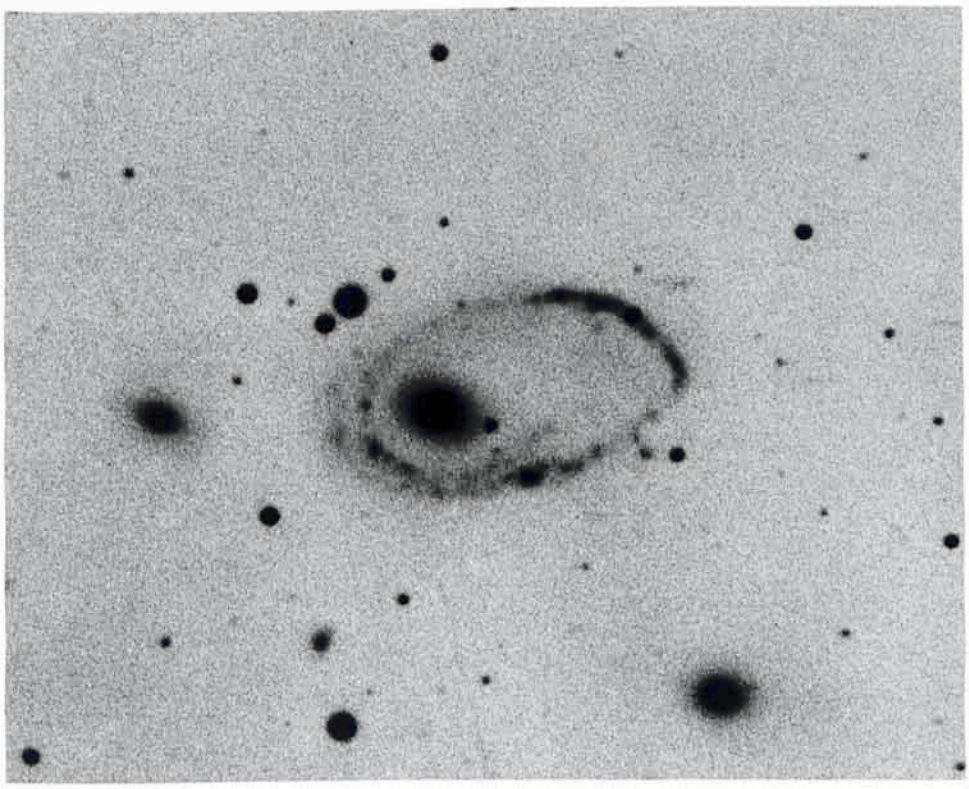
Five students, Mrs. S. Rojas de Neupert, A. Sulic, D. Comte, Messrs. M. Faúndez and H. Neupert from the Universidad de Chile in Santiago participated in scientific work at ESO.

FACILITIES

Telescopes

The 3.6 m Telescope

The 3.6 m telescope was shipped to Coquimbo early in the year. Assembly started in April and was completed in September. An unfortunate accident in the early phases of the assembly took the life of Mr. Beal from the firm of Creusot-Loire, who had come to La Silla for the telescope installation. Following the completion of the mechanical assembly and the installation of the controls system, the primary mirror was mounted and adjusted in the telescope with the assistance of Mr. Bayle (REOSC). After a phase of mechanical and optical alignment for the prime focus station, extensive optical and tracking tests were performed in which Professor Fehrenbach (OHP) participated. While the evaluation of the extensive Hartmann plate material is not yet completed, it is already clear that the telescope optics is excellent. Soon after the completion of these tests, the 3.6 m mirror was very successfully aluminized in the new aluminizing tank which had just been installed. Everything then was ready for the first photographs to



Ring galaxy. A photograph of this object taken with the ESO 1 m Schmidt telescope was shown on the cover of the 1974 Annual Report. The present photograph taken with the 3.6 m telescope shows a wealth of detail that cannot be seen on the Schmidt picture.

be taken at the prime focus. One of the first photographs taken by Laustsen concerned a faint object discovered earlier by West on the ESO Sky Survey. The resulting publication (*Astronomy and Astrophysics* **54**, 639, 1977) by Laustsen, Richter, van der Lans, West and Wilson not only established that this object was one of the faintest galaxies known, but also that the 3.6 m telescope project had been a success and that the telescope could be relied on to provide new data of high scientific significance. The complex combination of mechanical, electronic and optical components had survived its first test.

An extensive period of tests and adjustments now began which was expected to last until the end of September 1977. By that time, also the Cassegrain and the coudé foci will be provided with light. At the beginning of October 1977 the first visiting astronomers should be able to work with the telescope.

While all appeared to be well with the telescope, unfortunately the same was not the case with the dome. Shortly after its completion, a storm severely damaged the inner insulating shell. This showed that the dome had not been properly constructed and did not meet the ESO specifications. While the very costly repair work is covered by the manufacturers warranty, it will cause serious delays in the work on the telescope. The repairs are expected to take much of the first half of 1977, and during that period the telescope may be used only a small number of days each month, while also the sky coverage will be quite limited.

Initial work with the telescope is restricted to the prime focus. The prime-focus adapter for the Gascoigne single-element correctors performed well. This adapter contains the guiding and focusing arrangements which are needed. A photometric calibration system still is to be provided. Also, during the tests it appeared that an independent focusing arrangement for the television camera used for guiding would be advantageous.

The Gascoigne correctors—which have the advantage of simplicity and few reflections—yield a corrected field of 16 arc minutes. It is foreseen to install in the future also triplet correctors for a larger field (60 arc minutes). The optics for these correctors are essentially ready, while the design for the adapter and camera is also nearly complete. Fabrication of the adapter should take most of the current year and the triplets should be installed at La Silla in the spring of 1978.

The Cassegrain adapter was completed, and an extensive test programme was carried out in Geneva. It should be installed at the telescope in April 1977. This adapter contains provisions for guiding and field or slit viewing and will serve as the general interface between the telescope and the instrumentation (photometers, spectrographs) at the Cassegrain focus.

Some design work has been done on the planned infrared top end with wobbling secondary.

The Coudé Auxiliary Telescope

Design work on the three-mirror CAT was nearing completion. The telescope has an aperture of 1.5 metre and an f/120 optical system. It should be completed and installed at La Silla during 1979.

Danish 1.5 m Telescope

This telescope represents a joint project, with ESO providing the building and Copenhagen University the telescope and the dome. Observing time will be shared equally between ESO and the Danish institutions. The building has been completed, and the dome, the mechanical parts of the telescope and the control system have been installed. It is expected that the optics which are currently being finished at Grubb Parsons (Newcastle, UK) will arrive at La Silla late in 1977.

Other Telescopes

All ESO telescope mirrors—except that of the Schmidt—and also the Bochum 61 cm mirror were newly aluminized. An instrument was constructed at La Silla which allows the rapid realignment of the secondary mirrors.

Two digital encoders were added to the 1.5 m telescope to improve the setting accuracy. The coordinates derived from these encoders are displayed on a computer-driven digital display. The setting accuracy of the telescope is now better than 0.5 arc minute for the coudé configuration.

New finder telescopes were added to the 1 m and 1.5 m telescopes. The GPO was completely realigned and readjusted.

Instrumentation

Both in Geneva and at La Silla much effort was spent to provide the 3.6 m telescope and the other telescopes with adequate instrumentation. A coherent plan for the 3.6 m telescope instrumentation was prepared and approved by the Council. During the preparation of this plan, a survey was made of the wishes of scientists in the member countries. The response showed a high level of interest which augurs well for the later use of the telescope.

The status of the instrumentation projects for the 3.6 m telescope by the end of 1976 was as follows:

1. A Boller and Chivens spectrograph for comparatively low dispersion work had arrived in Geneva. Installation of various remote control features was in progress. The spectrograph has 10-cm plane gratings and has been optimized for a dispersion of 120 Å/mm, although higher dispersion gratings will also be provided. The usable slit length should be 25 mm corresponding to 3 arc minutes at the Cassegrain focus. Wavelength and photometric calibrations are provided. The spectrograph has been designed for work with image tubes, and both red and blue tubes will be provided when the instrument comes to La Silla in mid-1977.

2. An image-dissector scanner (IDS) of the Wampler-Robinson type is being built in Geneva for use with the B&C spectrograph. The IDS will allow observation of spectra in 1024 channels with sky subtraction. With two different sets of tubes the wavelength range 3000–8000 Å may be covered. Arrival at La Silla in late 1977 is anticipated.

3. Two further options are to be added to the B&C spectrograph. A near infrared detector (reticon) should extend the observable spectral range to 12000Å, while re-

placement of the plane grating by an échelle with addition of a cross-dispersing prism should yield somewhat higher dispersion spectra of faint objects. It is expected that these options will be available rather early in 1978.

4. The 4-channel photometer for uvby and UBV photometry has undergone some provisional tests at the Observatoire de Haute-Provence with quite satisfactory results. The instrument will be sent to La Silla in the spring of 1977.

5. A coudé spectrometer is under development. It is based on an échelle grating of 200 x 400 mm. The desired order may be isolated by interference filters or by a predisperser. The instrument may be used as a scanner with two photomultipliers in single or double-pass mode as well as with a digicon. Resolution of 100,000–200,000 should be obtained. Current planning foresees installation at La Silla later in 1978.

6. A cross-dispersed échelle Cassegrain spectrograph has high priority in the instrumentation plan. A preliminary design has been made and work on a definitive design was about to begin. Spectral resolutions of 20,000–30,000 are aimed for, and a vidicon as well as an imaging photon-counting system are envisaged as detectors. Probably the instrument will not be available before some time in 1979.

The instrumentation plan foresees a substantial effort in the acquisition of up-to-date detectors. In addition to the reticons, digicons and vidicons mentioned in connection with specific instruments, further developments in photon-counting detectors are planned. In the electronographic area, the Lallemand caméra électronique and the spectracon have already been used successfully at La Silla, and arrangements are being made for the acquisition of some other types of tube. In this area as well as in general with instrumentation, the selection criteria by which equipment is chosen involve not only the intrinsic qualities of the instruments, but also their simplicity and reliability of operation in the La Silla environment.

Infrared instrumentation also plays an important role in the future planning. Studies are being undertaken to define more precisely the prospective complement of instruments.

A programme of improvements of existing instrumentation at La Silla was executed during the year:

The Boller and Chivens spectrograph of the 1.5 and 1 m telescopes underwent numerous improvements. The collimator support was modified to eliminate the mechanical instabilities which in the past gave rise to line shifts. An image tube was added to the slit viewer. A new Carnegie image-tube system arrived and is presently being tested.

At the coudé of the 1.5 m telescope a new holographic grating was installed, and a Hartmann focus test was added. A new échelle grating was obtained for the Echelec.

A new single-channel photometer was constructed for the 1 m telescope. The double-channel photometer built by Dr. Geyer (Bonn) was put into operation, and a data-acquisition programme was written. New data-acquisition programmes were also prepared for the infrared photometer.

New exposure meters are being constructed which should be installed on all spectrographs. An adapter with television guiding was constructed which will replace the present Zeiss camera.

A standard Camac-based data-acquisition system is under development for eventual use with all ESO instrumentation, which will be first installed at the 1 m telescope.

Buildings and Grounds

While in Europe the planning for the new Headquarters building in Garching was started, at La Silla the auxiliary construction programme was nearing its completion. By the end of the year, the warehouse, the maintenance workshop, the four new Pelícano dormitories and the Club house, the office and library building had all been fully completed, and most of these were also occupied. The astro-workshop was nearing completion. The new system of trenches with new piping, cold and hot water and heating, the new electrical network, the new water-treatment plant and the new heating plant were all essentially finished, while substantial improvements to the telephone system and to the road system were still being made.

The reliability of the present water wells at Pelícano was a source of some concern, and some studies of the situation were initiated. Fortunately, with the termination of part of the construction works, the consumption diminished. Also the sufficiency of the present electrical power plant seems uncertain, and studies have been started of possible ways to increase the supply and to reduce the consumption.

FINANCIAL AND ORGANIZATIONAL MATTERS

The restructuring of the organization, begun in 1975, was completed by the end of 1976.

In Chile, most activities are now concentrated at La Silla. As a consequence, a large part of the ESO building in Vitacura was no longer needed. Towards the end of the year, an agreement was concluded with the United Nations for the rental of this space.

In Europe, the scientific group began to take shape, while with the partial change-over from telescope development to instrumentation development the structure of the TP Division was also changed. The present organigram of ESO is exhibited on page 22.

The Administration moved from Hamburg to Garching near Munich, where provisional offices were set up in rented appartments, pending the completion in 1979 of the Headquarters building where all European activities of ESO should find their final home. Only about two-thirds of the Hamburg staff followed ESO to Garching. As a consequence, several staff changes occurred, but by the end of the year, the office in Garching was functioning smoothly again.

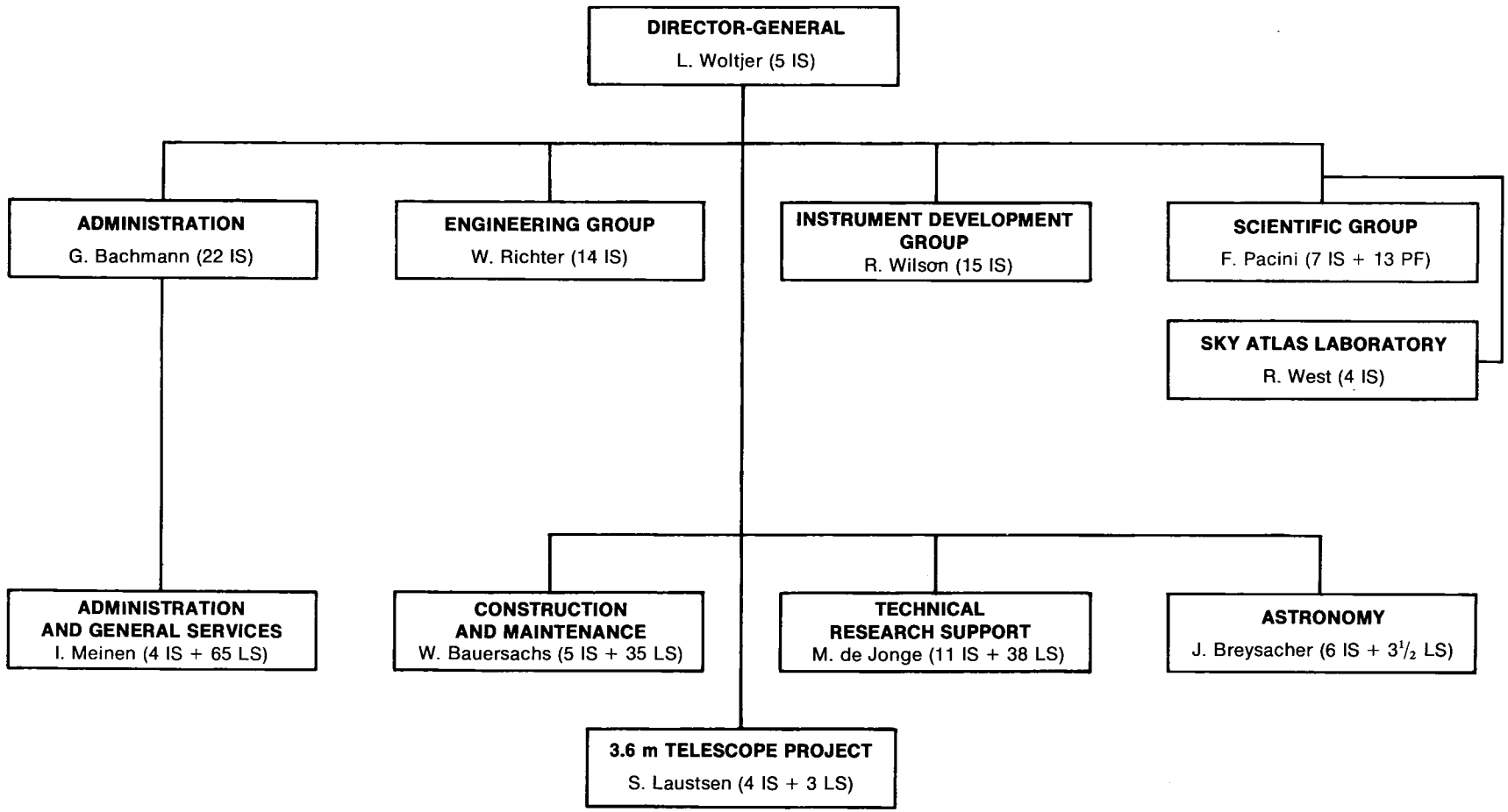
Planning for the new Headquarters building made good progress. A general design was prepared by the architectural firm of Fehling and Gogel in Berlin, and subsequently approved by the special Working Group established by the Council for the planning of the Headquarters. Considerable progress was also made in negotiations with the Federal Republic of Germany aimed towards concluding a formal Headquarters agreement. Parallel discussions took place with the Max-Planck Gesellschaft.

Concerning finance, the ESO Council approved the 1977 budget on the basis of the previously envisaged contribution ceiling of DM 32.5 million. Now that the 3.6 m telescope and the auxiliary construction programme are approaching completion, growing emphasis is given to the instrumentation programme.

The relocation of the Office of the Director-General from Hamburg to Garching was not financed through the normal budget, but by a special relocation budget amounting to a total of DM 602,000, two-thirds or DM 400,000 of which are financed through a special contribution by the Federal Republic of Germany.

The Organigram of ESO on 1 January 1977

Staff numbers are indicated in each grouping in the following way: IS = international staff; LS = local staff; PF = paid associates and fellows.



Representation of nationalities among the international staff and award of telescope time by countries. A total of 225 nights on the 1 m and 1.5 m telescopes was used by ESO staff for maintenance, tests and research.

Member state	Number of employees on 31. 12. 1976	Number in %	Financial share in % (1976)	Observing time at 1 m and 1.5 m telescopes	
				nights	percentage
Belgium	5	5.2	8.3	47	10
Denmark	7	7.3	4.7	30	6
France	21	21.9	33.3	150	30
Fed. Rep. of Germany	34	35.4	33.3	147	30
Netherlands	13	13.5	11.0	49	10
Sweden	4	4.2	9.4	70	14
Total	96			493	100
Other	12			14	

The totals of purchase orders placed in the period of 1 October 1975 to 30 September 1976:

	TOTAL	Chile	Hamburg Garching	Geneva
Value below DM 10,000	3,123	2,381	370	372
Value DM 10,000 to 100,000	98	35	20	43
Value exceeding DM 100,000	10	1	1	8

Budget Statement 1976

(provisional figures)
(in DM 1,000)

Expenditure

Budget Heading	Approved Budget	Transfers[1]	Revised Budget	Expenditure (incl. commitments and unused credits carried over to 1977)
1 Personnel	17,767	⁄. 158	17,609	14,430
2 Operations	7,336	⁄. 44	7,292	7,009
3 Capital outlays	13,327	—	13,327	13,187
4 Sky Survey Project	871	—	871	774
TOTAL EXPENDITURE	39,301	⁄. 202	39,099	35,400
Reserve for cost variation	2,353	—	2,353	800
GRAND TOTAL EXPENDITURE	41,654	⁄. 202	41,452	36,200

Income

Budget Sub-heading	Estimate	Transfer[1]	Revised estimate	Actual (incl. receivables)
80 Contributions from member states	32,500	⁄. 202	32,298	32,298
81 Unused appropriations from previous years	4,117	—	4,117	4,117
82 Sale of Sky Atlas	591	—	591	429
84/89 Miscellaneous	4,446	—	4,446	3,342
TOTAL	41,654	⁄. 202	41,452	40,186

[1] Amounts transferred to the Relocation Budget (see page 21).

Budget for 1977

(in DM 1,000)

Expenditure

Budget Heading	Directorate Garching	Establish-ment in Chile	3.6 m TP Division Geneva	Scientific Group	Total
1 Personnel	2,788	7,995	3,706	3,877	18,366
2 Operations	1,656	5,363	1,518	758	9,295
3 Capital outlays	10	3,431	6,057	150	9,648
4 Sky Survey Project	—	—	—	989	989
	4,454	16,789	11,281	5,774	38,298
RESERVES					
Reserve for cost variation (6 %)					2,298
TOTAL EXPENDITURE					40,596

Income

Budget Sub-heading		Estimate
80	Contributions from member states	32,500
81	Unused appropriations from previous years	3,424
82	Sale of Sky Atlas	591
84	Internal tax	2,867
85–89	Miscellaneous	1,214
TOTAL INCOME		40,596

APPENDIXES

APPENDIX I – Use of Telescopes

Use of 152 cm telescope during 1976

Period	Observer	Programme	Institute	Equipment
Jan. 1–11	Maurice	Optical counterparts of X-ray sources in LMC	Marseille	Echelec
Jan. 11–16	Vega/Ramírez	Spectroscopic binaries (for de Groot)	ESO	Coudé
Jan. 16–26	Imbert	Spectroscopic binaries—eclipsing binaries	Marseille	Coudé
Jan. 26–Feb. 5	Dennefeld	Spectroscopy of supernova remnants	ESO	BIT
Feb. 5–10	Breysacher	Wolf-Rayet stars in LMC	ESO	Echelec
Feb. 10–20	Hunger	He stars and Wolf-Rayet stars (for Seggewiss)	Berlin	Coudé
Feb. 20–March 1	Grewing	Interstellar absorption lines	Bonn	Coudé
March 1–10	Ilovaiski	Spectroscopy of southern X-ray sources	Meudon	Echelec
March 10–18	Swings	Spectroscopy of peculiar Be stars	Liège	Coudé
March 18–24	Breysacher/Spite	Stellar rotation in IC 2391	ESO/Meudon	Echelec/Coudé
March 24–April 1	Mauder	X-ray binaries	Tübingen	Coudé
April 1–5	Breysacher	Eruptive variables	ESO	Echelec
April 5–8	de Groot	Spectroscopic binaries/HD 161387 for Ahlin	ESO	Coudé
April 8–20	Andersen	RV programmes for Grosbøl *et al.*; eclipsing binaries	Copenhagen	Coudé
April 20–28	Dubois	Late-type giants in open clusters	Strasbourg	RV Cass.
April 28–May 2	Elvius	Variable hydrogen-deficient star	Stockholm	BIT
May 2–9	Appenzeller	Spectroscopy of pre-main-sequence objects	Heidelberg	BIT
May 9–18	de Loore	X-ray binaries	Brussels	Coudé
May 18–20	de Groot	Spectroscopic binaries	ESO	Coudé
May 20–28	Terzan	Photographic photometry of globular clusters	Lyon	Z. Camera
May 28–30	Havlen	X-ray clusters of galaxies	ESO	BIT
May 30–June 5	Vogt	Eruptive variables	ESO	BIT
June 5–7	Wamsteker	Infrared stars; galaxies	ESO	BIT
June 7–16	Breysacher/Chu Kit	OB stars near η Car.	ESO/Marseille	Echelec
June 16–18	Maintenance	Aluminizing of primary mirror		
June 18–22	Westerlund	Galaxies	Uppsala	BIT
June 22–24	Havlen	Velocity dispersion in clusters of galaxies	ESO	BIT
June 24–30	Westerlund	Galaxies	Uppsala	BIT

Period	Observer	Programme	Institute	Equipment
June 30–July 13	Surdej	Planetary nebulae for OHP-Liège programme	OHP/Liège	BIT
July 13–17	Breysacher/Chu Kit	OB stars near η Car (joint with Chu Kit)	ESO/Marseille	Echelec
July 17–25	Dennefeld	Spectroscopy of supernova remnants	ESO	BIT
July 25–27	Havlen	X-ray clusters of galaxies	ESO	BIT
July 27–31	Breysacher	Peculiar galaxies (with Schuster/Muller/West)	ESO	BIT
July 31–Aug. 3	Dennefeld	Photography of ring galaxies	ESO	ZIT
Aug. 3–12	Wolf	Faint emission features in F and A stars	Heidelberg	Coudé
Aug. 12–20	Lauterborn	Optical study of X-ray binary stars	Hamburg	BIT
Aug. 20–22	Ahlin	Stars in early phases of evolution	Stockholm	BIT
Aug. 22–26	Schuster	Peculiar galaxies (with Breysacher/Muller/West)	ESO	BIT
Aug. 26–Sept. 4	Ahlin	Stars in early phases of evolution	Stockholm	Coudé
Sept. 4–15	Doazan	Rapid variations of Be stars	Paris	Coudé
Sept. 15–24	Schoeffel	RV of peculiar W UMa binaries	Bamberg	Coudé
Sept. 24–Oct. 1	Materne	Spectroscopy of elliptical galaxies	ESO	BIT
Oct. 1–4	Breysacher	Peculiar galaxies (with Schuster/Muller/West)	ESO	BIT
Oct. 4–8	Surdej	Peculiar emission-line stars	ESO/Liège	Coudé
Oct. 8–11	Duerbeck	W UMa system AE Phoenicis	Hoher List	Coudé
Oct. 11–18	Foy	Abundances in SMC stars	Meudon	Echelec
Oct. 18–19	Maintenance	Adjustment of optical alignment		
Oct. 19–26	Divan	Spectrophotometry of supergiants in SMC	Paris	Chalonge spectrograph
Oct. 26–27	Divan	Opt. candidates for X-ray sources in LMC (for Maurice)	Marseille	Chalonge spectrograph
Oct. 27–Nov. 3	Breysacher	Wolf-Rayet stars in the Magellanic Clouds	ESO	Echelec
Nov. 3–5	Wamsteker	Globular clusters	ESO	Echelec
Nov. 5–7	Surdej	Peculiar emission-line stars	ESO/Liège	Coudé
Nov. 7–14	Baade	Spectroscopy of Be stars (for Seitter)	Münster	Coudé
Nov. 14–22	Zuiderwijk	Spectroscopy of X-ray sources	Amsterdam	Echelec
Nov. 22–29	Dennefeld	Spectroscopy of supernova remnants	ESO	BIT
Nov. 29–Dec. 1	Breysacher	Peculiar galaxies (with Schuster/Muller/West)	ESO	BIT
Dec. 1–3	Pakull	Optical candidates for X-ray sources	Hamburg	BIT
Dec. 3–7	Westerlund/Olander	M stars in the LMC	Uppsala	BIT
Dec. 7–15	Ardeberg	Luminosity function of the MC (with Lyngå/Cullum)	Lund/ESO	Spectracon
Dec. 15–20	Havlen/Quintana	Clusters of galaxies	ESO/Santiago	BIT
Dec. 20–26	Materne/Chincarini	X-ray clusters of galaxies	ESO/Bologna	BIT
Dec. 26.–Jan. 1, 1977	Materne	Spectroscopy of galaxies in the Dorado cloud	ESO	BIT

Use of 100 cm telescope during 1976

Period	Observer	Programme	Institute	Equipment
Jan. 1–7	Martin	Planetary nebulae and their nuclei	Hamburg	SP
Jan. 7–18	Loibl	Interstellar absorption in Vela	Hamburg	SP
Jan. 18–22	Schnur	Tests of BIT	ESO	BIT
Jan. 22–Feb. 7	Garnier	UBV photometry of radio sources	Lyon	SP
Feb. 7–11	Wamsteker/Kreysa	IR: OH sources and galaxies	ESO/Bonn	IRP
Feb. 11–20	Pedersen/Nissen	Variability of He stars	Aarhus	Aarhus phot.
Feb. 20–March 1	Disney	Photometry of radio galaxies	Groningen	SP
March 1–10	Chevalier	Photometry of southern X-ray sources	Meudon	SP
March 10–14	Wamsteker	IR photometry	ESO	IRP
March 14–23	Gammelgaard	Supergiant stars	Aarhus	Aarhus phot.
March 23–April 1	Swings	Peculiar emission-line stars with IR excess	Liège	BIT
April 1–5	Vogt	Eruptive variables	ESO	BIT
April 5–14	Wramdemark	UBV Hβ photometry of early-type stars in Car.	Lund	SP
April 14–20	Wamsteker	IR photometry	ESO	IRP
April 20–28	Zuiderwijk	Stars near X-ray sources	Amsterdam	BIT
April 28–May 2	Elvius	Variable hydrogen-deficient stars	Stockholm	SP
May 2–7	Pakull	Galactic X-ray sources	Hamburg	SP
May 7–10	Wamsteker	IR Photometry	ESO	IRP
May 10–16	Schober	uvby and Hβ photometry of early-type stars	Stockholm	SP
May 16–17	de Groot	Eclipsing binaries	ESO	SP
May 17–18	Smith	Tests of BIT	ESO	BIT
May 18–19	de Groot	Eclipsing binaries	ESO	SP
May 19–26	Martin/Kohoutek	Planetary nebulae	Hamburg	SP
May 26–30	Havlen	UBV in clusters of galaxies	ESO	SP
May 30–June 6	Danks	IR photometry of galaxies and M 17	Roden	IRP
June 6–10	Wamsteker	Globular clusters and M 17	ESO	IRP
June 10–15	Danks	IR photometry of galaxies and M 17	Roden	IRP
June 15–18	Havlen	Test of modified SP	ESO	
June 18–24	Loibl	Density of red giants and variables	Hamburg	SP
June 24–30	Havlen	Test of modified SP	ESO	
June 30–July 7	Westerlund	Variable radio sources	Uppsala	SP
July 7–9	Wamsteker	IR photometry	ESO	IRP
July 9–27	Schultz	IR photometry of radio sources	MPI, Bonn	Special IR
July 27–Aug. 14	Querci	Carbon variable stars	Meudon	SP
Aug. 14–15	Maintenance	Tests of telescope		
Aug. 15–26	Staller	M dwarfs in Southern Galactic Pole region	Amsterdam	SP

Period	Observer	Programme	Institute	Equipment
Aug. 26–Sept. 5	Manfroid	Study of southern gaseous nebulae	Liège	BIT
Sept. 5–12	Lyngå/Cullum	Test observations with spectracon	Lund/ESO	
Sept. 12–21	Materne	Polarimetry at high latitudes; photom. of E galaxies	ESO	Polarimeter/SP
Sept. 21–Oct. 1	Adam	UBV of quasars	Lyon	SP
Oct. 1–4	Materne	Elliptical galaxies	ESO	SP
Oct. 4–6	Vogt	Photoelectric sequences in dwarf nova fields	ESO	SP
Oct. 6–9	Maintenance	Aluminization of mirrors		
Oct. 9–14	Schnur	RV of galaxies in clusters	ESO	BIT
Oct. 14–19	Havlen	Cluster of galaxies 0340–538	ESO	BIT
Oct. 19–23	Mianes	uvby photometry of LMC O-type stars	Lyon	SP
Oct. 23–27	West	Peculiar galaxies (with Breysacher/Schuster/Muller)	ESO	SP
Oct. 27–Nov. 2	Mianes	uvby photometry of LMC O-type stars	Lyon	SP
Nov. 2–15	Sherwood, Kreysa/Wamsteker	IR photometry of radio sources	Bonn/ESO	IRP
Nov. 15–16	Maintenance			
Nov. 16–18	Dennefeld	Spectroscopy of supernova remnants	ESO	BIT
Nov. 18–22	Alcaíno	Photoelectric sequences of southern globular clusters	Santiago	SP
Nov. 22–29	Crane	Emission lines in galaxies, SNR and H II regions	ESO	Special
Nov. 29–Dec. 1	Pakull	Search for optical candidates for X-ray sources	Hamburg	SP
Dec. 1–3	Havlen	Tests of modified SP	ESO	
Dec. 3–7	Westerlund/Olander	Red stars in the LMC	Uppsala	SP
Dec. 7–10	Pakull	Optical candidates for X-ray sources	Hamburg	SP/BIT
Dec. 10–13	Schnur	RV of galaxies in clusters	ESO	BIT
Dec. 13–16	Materne/Chincarini	X-ray clusters and galaxies	ESO	SP
Dec. 16–20	Ardeberg/Lyngå/Cullum	Luminosity function of the MC	Lund/ESO	SP
Dec. 20–27	Tüg	Ap stars among blue stragglers	Bochum	SP
Dec. 27–30	Alcaíno	Photoelectric sequences of southern globular clusters	Santiago	SP
Dec. 30–Jan. 1,1977	Denoyelle	Photoelectric photometry of OB stars	Brussels	SP

The ESO 50 cm telescope was used throughout the year. In addition, 122 nights on the Danish 50 cm telescope and 104 nights on the Bochum 61 cm telescope were scheduled for ESO users. The GPO was scheduled for 122 nights. For infrared observations 113 daytime hours were used on the 1 metre telescope.

Meteorological Report

The weather during 1976 was extraordinarily poor. There were only 207 photometric nights (six or more hours of uninterrupted clear sky). The total number of clear night hours was 2,126, only 75 per cent of the number for 1975. Precipitation fell on February 11, 12, August 7, 16, 26, 27 and September 7.

APPENDIX II – Publications

Visiting Astronomers

Alcaíno, G.: The X-ray Globular Cluster NGC 1851. *AA*, **50**, 299–303.

Alcaíno, G.: The Globular Cluster NGC 3201. *AA Suppl.* **26**, 251–259.

Alcaíno, G.: UBV Five Aperture Photometry on Thirty-five Southern Galaxies. *AA Suppl.* **26**, 261–272.

Alcaíno, G.: The Globular Cluster NGC 1904. *AA Suppl.* **26**, 353–358.

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Andriesse, C. D., de Vries, J. S.: Infrared Observations of M 17S at Medium Spatial and Spectral Resolution. *AA*, **46**, 143–147.

Bernard, A.: Séquences standards photoélectriques UBV au voisinage des amas NGC 6256, 6304, 6638 et photométrie globale de NGC 4590, 6256, 6304, 6401, 6638. *AA Suppl.* **25**, 281–285.

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Grønbech, B.: Four-colour Light Curves of the Eclipsing Binary AE Phe. *AA Suppl.* **24**, 399–411.

Grønbech, B., Naqvi, S.I.H.: HR 1991. A New Variable B Star. *AA Suppl.* **26**, 147–154.

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Lohmann, W.: Der offene Sternhaufen NGC 5617, *Astrophys. Space Science*, **41**, 27.
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Paffhausen, W., Seggewiss, W.: Spectroscopic Orbits of the Eclipsing Binaries DV and DX Aqr. *AA Suppl.* **24**, 29–34.
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Wolf, B., Sterken, C.: HD 91619 (B5Ia) and HD 96919 (B9Ia), Two Peculiar Hα Variables. *AA*, **53**, 355–361.
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ESO Publications

Annual Report 1975
ESO Technical Report No. 7
ESO Information Booklet
The Messenger—El Mensajero Nos. 4–7.

APPENDIX III – Members of Council, Committees and Working Groups per 1 January 1977

Council

Belgium:	P. Ledoux M. Deloz/L. Poulaert
Denmark:	K. Gyldenkerne B. Strömgren (President) P. A. Koch
France:	J.-F. Denisse (Vice-President) S. Filliol
Federal Republic of Germany:	I. Appenzeller C. Zelle
The Netherlands:	H. G. van Bueren J. H. Bannier
Sweden:	P. O. Lindblad M. Fehrm

Committee of Council

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M. Deloz/L. Poulaert
J.-F. Denisse
P. A. Koch
P. O. Lindblad
B. Strömgren (President)
C. Zelle

Scientific Policy Committee

L. Biermann (Chairman)
J. Lequeux
P. G. Mezger
J.-C. Pecker
P. Swings

Finance Committee

Belgium:	L. Poulaert/M. Deloz (Chairman)
Denmark:	H. Grage
France:	R. Chamoux
Federal Republic of Germany:	C. Zelle
The Netherlands:	A. L. Goedhart
Sweden:	J. Gustafsson

Instrumentation Committee

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J. Borgman
R. Cayrel
G. Courtès (Chairman)
L. Delbouille
Ch. Fehrenbach
D. J. Malaise
P. E. Nissen
E. H. Schroeter
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Observing Programmes Committee

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L. Houziaux	C. de Loore
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M. Rudkjøbing	P. E. Nissen
B. E. Westerlund	A. Elvius
G. Wlérick (Chairman)	J. Lequeux

Working Group for Financial Rules and Regulations

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M. Deloz (Chairman)	H. Grage
P. J. Fierst van Wijnandsbergen	W. Sandtner

Working Group for the Planning of ESO Headquarters

H. G. van Bueren	P. O. Lindblad
M. Deloz	B. Strömgren (Chairman)
J.-F. Denisse	C. Zelle

Working Group for the Review of the Functions of ESO Committees

I. Appenzeller	G. Gahm
L. Biermann	K. Gyldenkerne
A. Blaauw	P. Ledoux
G. Courtès	G. Wlérick
J.-F. Denisse (Chairman)	L. Woltjer

Meetings in 1976

Council	3 June 1976 Hamburg	2 December 1976 Munich	
Committee of Council	14 May 1976 Hamburg	29 October 1976 Garching	
Finance Committee	13 May 1976 Hamburg	30 November 1976 Munich	
Scientific Policy Committee	29 November 1976 Garching		
Instrumentation Committee	12 May 1976 Hamburg	23 November 1976 Geneva	
Observing Programmes Committee	3 June 1976 Hamburg	25/26 November 1976 Amsterdam	
Working Group Committees	2 June 1976 Hamburg	1 December 1976 Munich	
Working Group Planning Hq.	2 June 1976 Hamburg	29 October 1976 Garching	1 December 1976 Munich

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