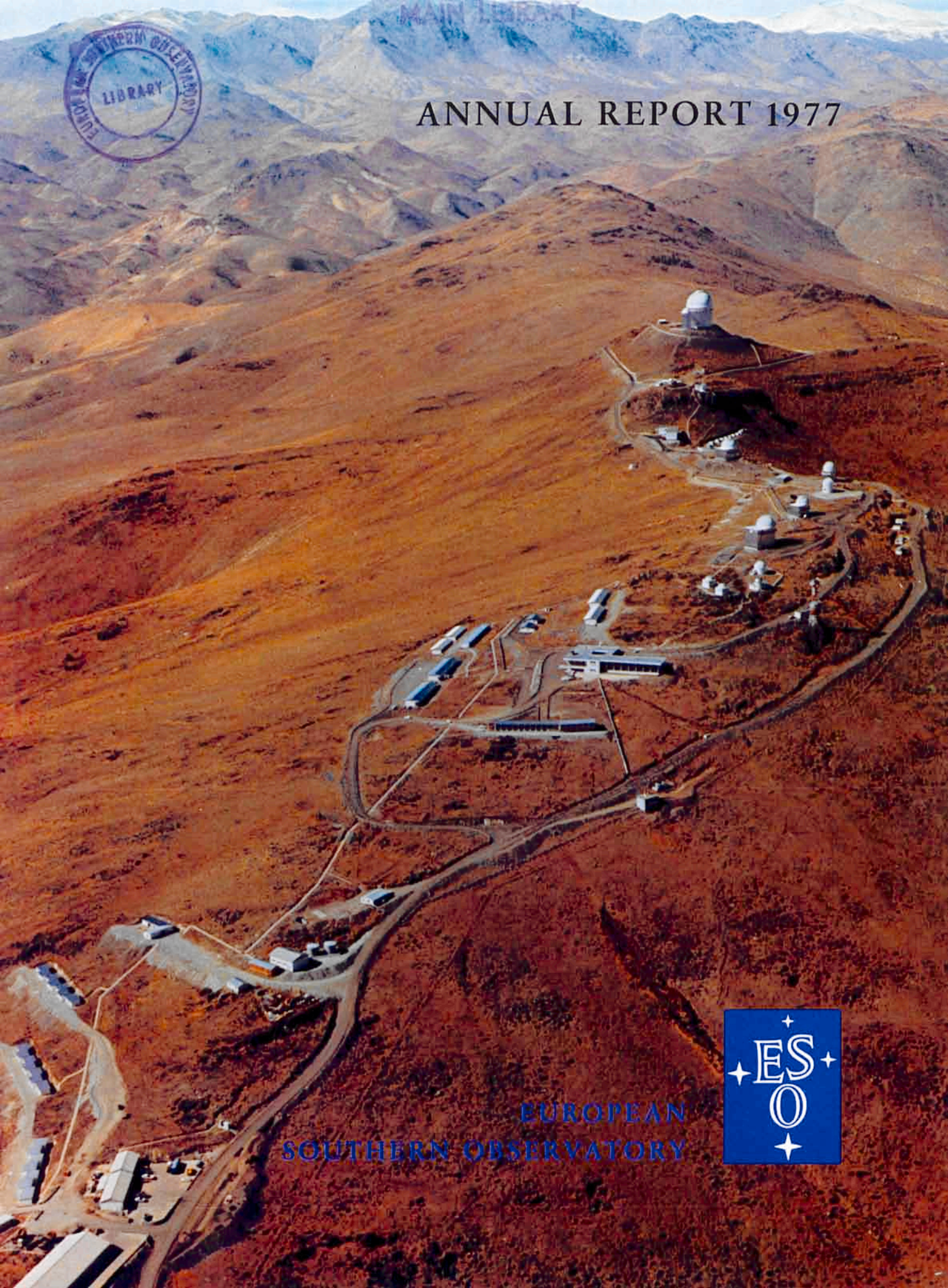
ANNUAL REPORT 1977



EUROPEAN
SOUTHERN OBSERVATORY

ESO

Cover Photograph

Aerial view of the European Southern Observatory on La Silla. At upper right the 3.6 m telescope with CAT tower. Below it the Swiss 40 cm telescope and still further down the Astroworkshop and Electronic Laboratory Building. To its right the 1 m Schmidt telescope and (starting at top) the Danish 1.5 m telescope, the GPO astrograph, the photometric 1 m and spectrographic 1.5 m telescopes. Immediately below are (clockwise from top) Chilimap, Bochum 61 cm, Danish 50 cm and ESO 50 cm telescopes. The two large buildings towards the centre are the Hotel and the Offices and Library Building. To their left and above are some of the dormitories. The buildings at bottom left are the Warehouse and (above) the Workshop. To their left are some more dormitories and above these (from left to right) the Clubhouse, Heating Plant and Maintenance Department. *Photo taken by B. Pillet*

ANNUAL REPORT 1977

presented to the Council
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Organisation Européenne pour des
Recherches Astronomiques dans l'Hémisphère Austral

EUROPEAN SOUTHERN OBSERVATORY

TABLE OF CONTENTS

INTRODUCTION

On 1 October 1977 the first Visiting Astronomers arrived at La Silla to obtain photographic and spectroscopic observations with the 3.6 m telescope. Thus, for the first time the dream of European astronomers of having a large optical telescope of their own was realized. In the subsequent months, others followed, and while much work remained to be done on the telescope, successful observations were achieved, with 40 per cent of the time on the telescope scheduled for research programmes. By the end of the year a total of more than a thousand plates had been taken at the prime focus as well as about a hundred spectra.

Research programmes of a wide variety were conducted at the 3.6 m telescope and the other telescopes. Among the highlights may be mentioned the discovery of the nearest bright quasar (ESO 113-IG 45)—which affords an unusual opportunity for detailed study of this still mysterious class of objects—the identification with some faint galaxy of the very strong southern radio source 13S 6A which hitherto had remained hidden behind very dense interstellar absorption and the discovery of the binary nature of the X-ray source in the Large Magellanic Cloud LMC X-4.

Instrumentation development for the 3.6 m telescope constituted an important part of the ESO effort. A low-dispersion spectrograph and a 4-channel photometer were installed at La Silla, while in Geneva work progressed on an Image Dissector Scanner, a Coudé Echelle Spectrometer and a number of other instruments and detectors.

In Chile the Auxiliary Construction Programme was essentially completed. As a result, La Silla has now been provided with a complete infrastructure of air strip, roads, utilities and buildings. In Europe the planning of the Headquarters building in Garching made good progress. Construction should begin in 1978, and all ESO activities in Europe should be moved there in the summer of 1980.

RESEARCH

Galaxies

The start of regular observations with the 3.6 m telescope has had already its impact on research programmes at ESO, in particular in the extragalactic area.

Two long-range programmes of spectroscopic and photometric observations of interesting galaxies found on the Quick Blue Survey were continued by Bergvall, Ekman, Lauberts, Westerlund (Uppsala) and by Breysacher, Muller, Schuster, Surdej, West (ESO). Additional spectroscopic observations were obtained by West with the 1 m Swope telescope at Las Campanas. About 450 galaxies have been observed in these programmes, of which 40 per cent have emission lines. Many particularly interesting galaxies have been photographed by Laustsen (ESO) with the 3.6 m telescope. Several dwarf galaxies found by Schuster and West (ESO) were further studied.

Spectra of galaxies in clusters were obtained by Tarenghi (ESO), partly in collaboration with Materne (ESO) and Chincarini (Bologna). Clusters Klemola 44, Sersic 4016, 0427–53, 0625–46, 0056–67, 0053–73 and 0316–44 were selected because of associated radio or X-ray emission. In the observations with the 3.6 m telescope, Tarenghi obtained in three nights 60 spectra of galaxies in the magnitude range 14–17 at a dispersion of 170 Å/mm. Other clusters were studied in attempts to measure intergalactic light by Schnur (ESO) and by Havlen and Quintana (ESO) who completed their work on CA 0340–58 which is possibly connected with the X-ray source 3U 0328–52. This cluster appears to be very similar to the Coma cluster. The cluster Klemola 44 was photographed by Danks (ESO) with the 3.6 m telescope. Crane (ESO) continued the analysis of the luminosity function in some clusters. Semeniuk (ESO/Warsaw) studied the density distribution in several clusters.

Wlérick (Meudon), Westerlund (Uppsala) and Garnier (Lyon) continued their work on the radio source 3C 120. Analysis of the photometry obtained to date shows the presence of two components in the optical continuous spectrum of the nucleus, one of which increases with frequency and may be joined to the X-ray observations. Photometry of AP Librae was obtained by Westerlund (Uppsala), and a similar analysis will be made. Adam (Lyon) measured 56 possible quasars photometrically at the 1 m telescope, to obtain candidates for further study at the 3.6 m telescope. With Wlérick (Meudon) some photoelectric sequences in quasar fields were also obtained.

The object ESO 113-IG 45 turned out to be a most interesting transition stage between a quasar and a galaxy. Spectroscopy by West (ESO) at Las Campanas, photography by Danks (ESO) at the 3.6 m telescope and photometry by Alcaíno (Santiago) at the 1 m telescope shows a galaxy with a nucleus responsible for most of the light, and with an absolute visual magnitude of −24 well within the quasar range.

The results were published as a Letter to *A&A* early in 1978. Further observations in the infrared by Salinari and Tarenghi (ESO) indicate a strong continuum at long wavelengths. Searches for light variations in the nucleus have been made by Duerbeck (Bonn) and Vogt (ESO). A variety of properties of quasars (pairing and spectroscopic aspects) were analyzed by Setti (Bologna) and Woltjer (ESO).

The Seyfert galaxy NGC 1566 was studied by Schlosser and Schmidt-Kaler (Bochum), and by Alloin, Collin-Souffrin and Doazan (Meudon) who obtained spectra for studying time variations during the year. Several other galaxies with emission lines were studied by the latter group. P. Véron (ESO) analyzed the available information on NGC 1275 and found many similarities to the BL Lac objects. Emission models for the nucleus of NGC 4151 were investigated by Bergeron and Pacini (ESO).

The very strong southern radio source 13S6A which had remained unidentified for more than 25 years because of strong interstellar obscuration in the field, was identified by Laustsen, Schuster and West (ESO) on near infrared (IV-N) plates taken with the 3.6 m telescope. Crane (ESO) in collaboration with Tyson (Bell Laboratories) and Saslaw (Charlottesville) discovered for the first time optical emission from the radio lobes of an extragalactic radio source on the basis of plates obtained at Kitt Peak.

Ulrich (ESO) studied the velocity of head-tail radio galaxies with respect to the intracluster medium. The velocities of these objects appear to be essentially the same as those of cluster galaxies without strong radio emission. Danziger (ESO) in collaboration with Goss (Groningen) and others is continuing optical studies of giant radio galaxies and other steep spectrum radio sources associated with active nuclei. Ulrich (ESO) in collaboration with a group at Bologna has produced and studied a new complete sample of radio galaxies taking into account both optical and radio observations.

M. and P. Véron (Meudon/ESO) continued the determination of optical positions of radio sources. M. Véron identified a number of southern radio sources with very steep spectra with clusters of galaxies. P. Véron analyzed confusion effects in the 3C catalogue and published a new catalogue in which these effects are corrected for.

Ten lenticular galaxies were studied by Alloin (Meudon). Echelec spectra are being used to make stellar population models, while the dust content is being evaluated from 3.6 m plates taken by Laustsen (ESO) for some objects. The aim of the study is to look for correlations between gas/dust content and population type. The barred spirals NGC 1365 and NGC 1512 were observed photographically and spectroscopically (116 Å/mm) by Lindblad (Stockholm) to elucidate the dynamics of the spiral structure. Line-width measurements in giant ellipticals were started by Materne (ESO). Danks (ESO) and van Woerden (Groningen) started a programme of UBV photometry of bright southern galaxies to determine brightness and colour distributions. It is intended to study the dependence of various galaxy parameters on morphological type. A study of the dynamics of NGC 3256 was started by Bergeron (ESO) and Disney (Cardiff) partly on the basis of plates taken by Laustsen (ESO) with the 3.6 m telescope.

Van Agt (Nijmegen) obtained plates with the 3.6 m telescope of the Sculptor dwarf galaxy to study more than 150 variable stars. Star No. 92, formerly classified an anomalous BL Her star, turns out to be an unresolved optical double, one component of which is a normal RR Lyrae star. Melnick (ESO) in collaboration with D'Odorico (Asiago) has identified 57 star clusters in M 33 on plate material taken at the Hale Observatories. These clusters will be used to study composition gradients.

Materne (ESO) has completed the discussion of a new method for a three-dimensional analysis of groups of galaxies. With Huchtmeier (Hamburg) he has undertaken a search for neutral hydrogen clouds in galaxy groups making use of the Dwingeloo 25 m radio telescope. Tammann (Basel/ESO) with Kraan (Basel) investigated the properties of a distance-limited nearby sample of galaxies. The luminosity functions of spirals and ellipticals were obtained. The mean luminosity density within 30 Mpc from the Virgo cluster was found to be 1.5×10^8 $L_\odot/Mpc^3$. With Sandage (Hale) he essentially completed a revision of the Shapley-Ames Catalogue of bright galaxies.

Magellanic Clouds

UBV photoelectric and photographic photometry in the SMC was done by Azzopardi and Vigneau (Toulouse). Azzopardi (Toulouse) and Breysacher (ESO) found some new WR stars in the SMC with the GPO with an interference filter centered at 4650 Å. High-dispersion spectra in the SMC were taken by Foy (Meudon) with the Echelec and a holographic grating with 3,000 lines/mm. Integrated UBV measurements of 52 clusters in the SMC were made by Alcaíno (Santiago). Borgman, Hartsuiker (Groningen) and Danks (ESO) completed their work on surface photometry near 30 Doradus, which had been previously observed in the ultraviolet with the ANS satellite. Further studies of the stellar content of the LMC were made by Martin (Marseille) making use of the GPO. Earlier studies led to the completion of a catalogue of 1822 LMC members with V magnitudes and spectral types. Mianes (Toulouse) measured 111 blue stars in the LMC down to $V = 14$ in the uvby system. Studies of supernova remnants in the Magellanic Clouds were continued by Dennefeld (ESO). IR observations of 30 Doradus were obtained out to 10 microns by Schultz and Sherwood (Bonn) and by Epchtein, Roucher and Turon (Meudon).

Infrared

Shaver and Danks (Groningen) detected more than 20 new infrared sources associated with H II regions, C II regions and OH and H_2O maser sources. The most interesting region is G 12.2-0.1, observed at Westerbork, where the strongest IR source appears to be a hot dust cocoon surrounding an early O star which ionizes most of the associated radio source: H_2O maser emission originates in this circumstellar shell. Several compact H II regions have been observed by Epchtein, Roucher and Turon (Meudon) at 2 microns, to find the heating sources, and at 10 microns, to find the distribution of dust densities and temperatures in the surrounding H II regions. Several late-type stars have also been observed between 2 and 30 microns, and a correlation between the period and L-N index in late-type variables was found.

Schultz, Sherwood and Kreysa (Bonn) obtained observations of nuclei of galaxies (mainly SO) and of OH sources. The latter were monitored simultaneously at

1612 MHz with the Effelsberg radio telescope. The IR variations appear to be in phase with the OH variations, but optical depth effects in the dense dust clouds surrounding the sources seem to reduce the amplitudes. The data extend from 1.25 to 30 microns. According to Schultz *et al.*, the sensitivity improved to 0.013 and 0.062 f.u. at 2.2 and 3.7 microns respectively for S/N = 3 and in 10 seconds. This is equivalent to limiting magnitudes at K and L of $11^{m}.5$ and $10^{m}.0$.

Salinari and Tarenghi (ESO) searched for IR sources associated with type-I OH masers and with H II regions. For 25 objects found brighter than magnitude 8 at 2.2 microns, five-colour photometry was obtained in the 1–5 micron region. Wamsteker (ESO) also observed southern H II regions and made a preliminary calibration for the IR photometric system. Observations of Nova Cygni (1975) had been obtained earlier which show a strong wavelength dependence of the time of maximum; this has been interpreted in terms of a simple free-free radiation model.

Interstellar Matter

Various studies of interstellar polarization were made. Martel (Lyon) studied the linear polarization of the exciting stars of 14 H II regions in UBV and in some cases with special filters. The polarization of the H II regions themselves was also measured whenever possible. Knoechel (Hamburg) measured the linear polarization of 111 stars in NGC 4755, Pismis 11 and Trümpler 27 in UBV. The polarization of some stars in TR 27 is most unusual, exceeding 10 per cent and showing a peculiar colour dependence. VRI and H_{α}, H_{β} photometry has been obtained for some of the stars. Krautter (Heidelberg) also obtained polarization measurements. Tinbergen and Bastiaansen (Leiden) did a survey for interstellar circular polarization both at La Silla and at Las Campanas. Circular polarization was discovered in 12 stars, which now will be studied in detail.

Interstellar absorption lines at 3 Å/mm were studied by Grewing (Tübingen) with the camera III of the coudé spectrograph. Early B stars nearer than 200 pc were selected. Despite the low reddening of the stars, it was possible to detect Na I or CA II interstellar lines in half of the cases, corresponding to column densities in the range 10^{11}–10^{12}/cm^2.

More than 50 spectra of H II regions—many with IR emission—were obtained by Danks (Groningen). Melnick (ESO) studied the kinematics of the gas in the H II region associated with NGC 3603, where turbulent velocities in excess of 25 km/sec are found. The gas in the central part of the region is expanding at a large velocity. Manfroid (ESO) continued his studies of H II regions, both observationally and theoretically. Models were constructed in which the ionization equations and the dynamical equations are taken into account.

Kohoutek (Hamburg) obtained coudé spectra to study the radial velocities, expansion kinematics and relative spectrophotometry of several planetary nebulae. Photometry was done in 15 narrow-band interference filters between 3240 Å and 8340 Å to determine the energy distribution of the central stars and the physical parameters in the nebulae. A faint blue companion to the central star of NGC 3132 was found on plates taken with the 3.6 m telescope in collaboration with Laustsen (ESO).

Danziger (ESO) made extensive investigations of the Kepler and Vela supernova remnants in which spectroscopic data are fitted to very detailed theoretical models.

Clusters and Galactic Structure

Alcaíno (Santiago) continued his photometry of globular clusters. Photoelectric sequences were obtained for NGC 1261, 2298, 6144 and 6541 in the range V = 11 to V = 16.5. The cluster NGC 1851 was studied by Wamsteker (ESO) and collaborators on short-exposure plates obtained at CTIO. Short-exposure UBV plates of NGC 7099 were obtained with the 3.6 m telescope and are being studied by Alcaíno (Santiago). Wamsteker (ESO) also obtained echelec spectra of 8 globular clusters to look for composition gradients.

Further spectra of the highly-reddened Ara cluster were obtained by Westerlund (Uppsala). Spectra of stars in NGC 3603 were obtained by Melnick (ESO) with the echelec. Havlen (ESO) and Herbst (Carnegie DTM) completed their work on the young stellar complex in Ara OB1. The central cluster NGC 6193 contains many stars still contracting towards the main sequence. The cluster NGC 3114 was studied by Amieux (Nice) with the GPO, to obtain spectral classifications. Possible clusters or fragments of clusters were studied by Lodén (Uppsala) on the basis of UBV photometry for 200 stars and uvbyβ photometry for 123 stars.

Havlen (ESO) analyzed his UBVβ data on OB stars near the long-period cepheid VZ Puppis in order to compare the distribution of gas and stars in and below the galactic plane. Medium-dispersion spectra were also obtained. Petterson (Uppsala) observed 301 stars in Norma and Scorpio in UBV to calibrate photographic material for a more extended spectral survey. The investigation of the "Norma dark cloud" by Haug and Bredow (Hamburg) was completed. H_β observations were obtained for a similar study of interstellar absorption in Vela. Wramdemark (Lund) obtained photometry for about 150 stars in the Carina arm. UBVβ observations were also obtained for a study with Ardeberg (Lund) of interstellar extinction in a field in Scorpius. Loibl (Hamburg) observed 220 F-type stars in uvbyβ for a study of stellar populations and absorption in the vicinity of the sun in the galactic center direction. Unger (Bochum) obtained H_β photometry for distant OB stars with large z-distances. Ott (Münster) obtained photometry with newly-defined RGU filters, to test their suitability for stellar statistics.

Thé and Staller (Amsterdam) continued their work on M dwarfs in the direction of the south galactic pole. VRI magnitudes were determined for part of a sample of about 400 M stars. The space density of M dwarfs appears to be much lower than had been inferred from data near the north galactic pole. In the meantime, systematic errors have been found to affect the latter which may resolve the discrepancy.

Gieseking (Bonn) further investigated radial velocities with the GPO. Spectroscopic binaries and radial velocities in and around clusters and associations were observed. Radial velocities of fairly bright B and A stars (V = 7–10) are measured with a standard deviation of about ±6 km/sec.

About 600 more spectra were taken by Nordström and Andersen (Copenhagen) for their programme of radial velocities of 450 stars in the Bright Star Catalogue with

spectral types B-F5. The observations are now complete. Radial-velocity measurements for the calibration of GPO plates were made by Denoyelle (Ukkel) who also used the GPO to obtain MK classifications for faint OB stars.

X-ray Sources

Chevalier and Ilovaisky (Meudon) conducted simultaneous photometric and spectroscopic observations of the star suggested by Sanduleak and Philip as a candidate for LMC X-4. This resulted in their discovery of the binary nature of the system. Assuming a primary star of mass 20–25 $M_\odot$, the upper limit for the compact object's mass is around 2 $M_\odot$. Recent observations with the Ariel 5 and SAS-3 satellites have resulted in the discovery of X-ray eclipses in LMC X-4 with the optical period (1.408 days) and phase. They also continued their programme of simultaneous X-ray and optical observations of Sco X-1 with high time resolution. The X-ray observations were made with the SAS-3 satellite. The data are currently being analyzed.

Observations of X-ray sources in the LMC were also made by Maurice (Marseille) who obtained echelec spectra of LMC X-1, 2, 4 and 5. The data on LMC X-4 further contributed to the identification mentioned before. Photometric and spectroscopic observations by Mauder (Tübingen) confirmed the identification of WRA 977 with 3U 1223–62, where the X-ray pulse period was found to have a counterpart in fast uv data. Radial-velocity observations allowed the mass function to be determined. Pakull and Lauterborn (Hamburg) searched for optical counterparts of X-ray sources. They obtained an orbital period of 22.60 ± 0.02 days for WRA 977. Cen X-3 and HD 77581 showed much photometric activity correlated with an increased uv brightness. High-dispersion spectra of HD 153919 (4U 1700–37) and WRA 977 (4U 1223–62) were obtained by van den Heuvel (Amsterdam) in a combined programme with van Dessel (Ukkel) and De Loore (Brussels). Simultaneous multicolour photometric measurements were obtained by Burger (Brussels) and Henrichs (Amsterdam). Additional photometry of optical candidates of 4U 1626–67 and GX 301–4 was carried out. Pedersen (Aarhus) studied HD 77581 and HD 153919 with the Danish Echelle Line Intensity Spectrometer and found variations in the He I 4026 Å line. Zeuge (Hamburg) studied radial velocity variations on 100 GPO plates in the fields of X-ray sources to obtain identifications.

Binaries

Frisk, Gahm and Lindroos (Stockholm) continued their programme of studies of very young visual binaries. Spectra of 143 secondary components and uvby photometry of 165 multiple stars have been obtained, and several secondaries with pre-main-sequence characteristics have been found. Oblak (Besançon) obtained uvbyβ observations for most of 68 binaries to study absolute magnitudes. Van Dessel (Ukkel) obtained radial velocities for visual binaries with astrometric orbits.

Eclipsing binaries were studied extensively. Andersen (Copenhagen) obtained spectra of the high-eccentricity system V 1647 Sgr. Ahlin (Stockholm) further studied the 936-day-period object HD 161387. The eclipse, which was expected to begin early October 1977, was actually observed though the zenith angles were quite large. The next eclipse in May 1980 will be more favourable. Duerbeck (Bonn) obtained UBV light curves for BV Eri, BW Eri, RX Gru, Y Hyi, AE Phe, X Pic and RT Scl and spectra for ER Ori. Definitive orbits for the double-lined systems VV Mon, AI Phe and BW Agr were obtained by Imbert (Marseille). Rahe (Bamberg)

obtained simultaneous photometry and spectroscopy of eclipsing binaries to study mass transfer.

Stars

With the Danish Echelle Line Intensity Spectrometer Pedersen (Aarhus) searched for variability in CNO peculiar stars. Variability of the He I 4026 Å line was found in several cases and also in the Ap star HD 124224. Observations in uvby of several Ap stars were made in Renson's (Liège) programme by Manfroid (ESO). New periods were found in several objects. Simultaneous spectroscopy and uvby photometry was carried out by van den Heuvel and Henrichs (Amsterdam) for several Ap stars. A sample of Ap stars was studied for short-term variability (few hours) by Weiss (Vienna). While no such variations were found, some new short-period variables (Probably δ Scuti type) were discovered among the comparison stars.

The bright young variable shell star HR 5999 was studied by Thé and van der Linden (Amsterdam). Spectral and photometric variations of Be stars were simultaneously observed by Doazan (Meudon) and Feinstein (La Plata). Spectra and photometry were obtained for the peculiar emission-line star with IR excess GG Carinae, and data on RX Puppis and HD 45677 were analyzed by Klutz, J. P. Swings, O. Simonetto (Liège) and A. and J. Surdej (Liège/ESO). Metz and Pöllitsch (München) obtained simultaneous polarimetric and spectrographic observations of Be stars to test the flattened disk model.

Narrow-band photometry of faint and newly-discovered Wolf-Rayet stars was made by Lundström and Stenholm (Lund). Häfner, Schoembs and Metz (München) could not confirm the existence of fast periodic or quasi periodic variations in the emission lines or in the continuum of the WR binary γ^2 Velorum. They also studied SX Phe. Moffat (Bochum, now Montreal) studied several WR stars and concluded provisionally that some truly single WR stars do exist.

Beta Cephei stars were studied by Sterken (Brussels) in collaboration with Jerzykiewicz (Warsaw); 13 new variables were found. Haug (Hamburg) discovered HD 80383 to be a Beta Cephei variable. Lub (ESO) continued his investigations of RR Lyrae stars and of various aspects of the Walraven VBLUW system for the photometry of variables. The star Al Velorum was observed by Surdej (ESO) and Elst (Ukkel). Appenzeller, Mundt and Wolf (Heidelberg) made simultaneous spectroscopic and photometric observations of T Tauri and YY Orionis stars. A new bright YY Orionis star CoD $-35°$ 10525 was discovered. Solf (Heidelberg) continued his spectroscopic observations of Mira variables in post-maximum phases. Velocity differences between absorption lines of different excitation potentials were measured. Doazan and Heidmann (Meudon) studied the spectral changes in R CrA. Extensive studies of dwarf novae were made by Vogt (ESO), partly in collaboration with Häfner and Schoembs (München) and with Duerbeck (Bonn).

Spectra and photometry of variable carbon stars were obtained by Bouchet (ESO), who also observed 100 standard stars to set up an RI photometric system.

Mass loss in three supergiants was studied by Wolf (Heidelberg) and Sterken (Brussels). On the basis of P Cygni-type profiles in H_α the mass loss was quanti-

tatively evaluated. Spectra for the study of emission lines and rotational velocities in B stars were obtained by Lacoarret (Nice).

The analysis of the halo giants HD 84903 and HD 184711 by F. and M. Spite (Meudon) was completed. These stars are among the most metal-deficient stars known.

Solar System

Photometric observations of minor planets were made by A. and J. Surdej (Liège/ESO), by Wamsteker (ESO) and by Schober (Graz).

Ratier (Pic-du-Midi) started an astrometric programme on the satellites of Uranus and Neptune. Schuster and West (ESO) discovered or observed various comets and asteroids. Observations were frequently made at the request of the institutions (Smithsonian in Cambridge and Recheninstitut Heidelberg) where orbits for such bodies are calculated. In a joint study of Schuster (ESO) and Sekanina (Cambridge, USA), the data for comet d'Arrest were analyzed to obtain the physical conditions in the tail and an estimate of the amount of matter ejected.

Schmidt Telescope

In addition to the plates taken for the sky survey, numerous plates were taken for Visiting Astronomers and staff. During the period January 1972 to mid-November 1977, a total of 346 plates were taken for Visiting Astronomers and 142 for ESO staff. In addition, 230 plates were taken of asteroids and comets mostly at times when conditions were too poor for other projects.

Further Theoretical Studies

Contopoulos (ESO/Athens) studied various aspects of orbits in the potential field of the galaxy with spiral structure taken into account. Included were studies of the inner Lindblad resonance and of solutions of Poisson's equation in spiral galaxies (with Athanassoula, Besançon), dispersion relations in galaxies with a halo (with Terzides, Bonn), and of the effects of resonances. Lindblad (ESO/Stockholm) studied various aspects of spiral structure problems.

King (ESO/Berkeley) started a study of the encounters of binary stars with field stars for applications to the high density cores of globular clusters. Constantinescu (ESO, now München) in collaboration with Radicati (CERN) and Michel (Paris) completed an investigation of rotating bodies from the point of view of symmetry breaking.

Pacini (ESO) in collaboration with Salvati (Frascati) studied models for compact nonthermal sources, taking into account the continuous acceleration of the radiating particles. The transfer of line radiation in moving stellar envelopes was studied by J. Surdej (ESO).

Sky Survey and Atlas Laboratory

By the end of 1977, all but 6 fields had been taken for the ESO (B) Survey. A number of early plates of lower quality were replaced by new plates. The

ESO/Uppsala collaboration continued and 400 fields were searched, yielding approximately 12,000 objects. South of −45°, 75 per cent were new identifications.

Copies of the ESO (B) plates were made at the Sky Atlas Laboratory in Geneva. By the end of the year, 550 on-film copies had been distributed to each of 42 customers and more than 400 on-glass copies to each of 20 customers. About 200 plates were received from the SRC Schmidt telescope for the ESO/SRC Atlas of the Southern Sky. Early in the year, it was discovered that some of the film copies which were delivered in 1976 had certain blemishes, in particular that small areas appeared to be out of focus. The cause was traced to the copying procedures in Australia and in Geneva, and it was decided to recall the first 50 fields. It was possible to overcome these problems by adopting an improved vacuum system, which however resulted in a somewhat slower production rate. In order to catch up, a two-shift, 13-hour working day was introduced at the Sky Atlas Laboratory. Stringent quality checks will be performed of all copies in the future by SRC astronomers in Edinburgh and by the ESO personnel. By the end of 1977, approximately 130 SRC plates had been copied and 100 of these sent to each of more than 120 customers.

Approximately 50 red plates were taken with the ESO Schmidt for the ESO part of the ESO/SRC Atlas. In order to reach the sky limit, the exposure time was set to 90 minutes, but the experience showed that the combination of a high-resolution high-contrast emulsion and a long exposure lead to an inacceptable failure rate. Various sensitization procedures are being studied to reduce the exposure times. Infrared IV-N plates were successfully sensitized by Dr. Schuster, and many plates were obtained of Milky Way fields.

In Geneva much work was done on the measuring machines. Several fundamental defects in the S-3000 machine have been corrected, but several others still have to be dealt with. A beginning has been made with limited visitors use of the measuring machines. With the blink comparator and the Grant machine the experience has been generally favourable, but at present it is recommended to use the S-3000 mainly for astrometric purposes.

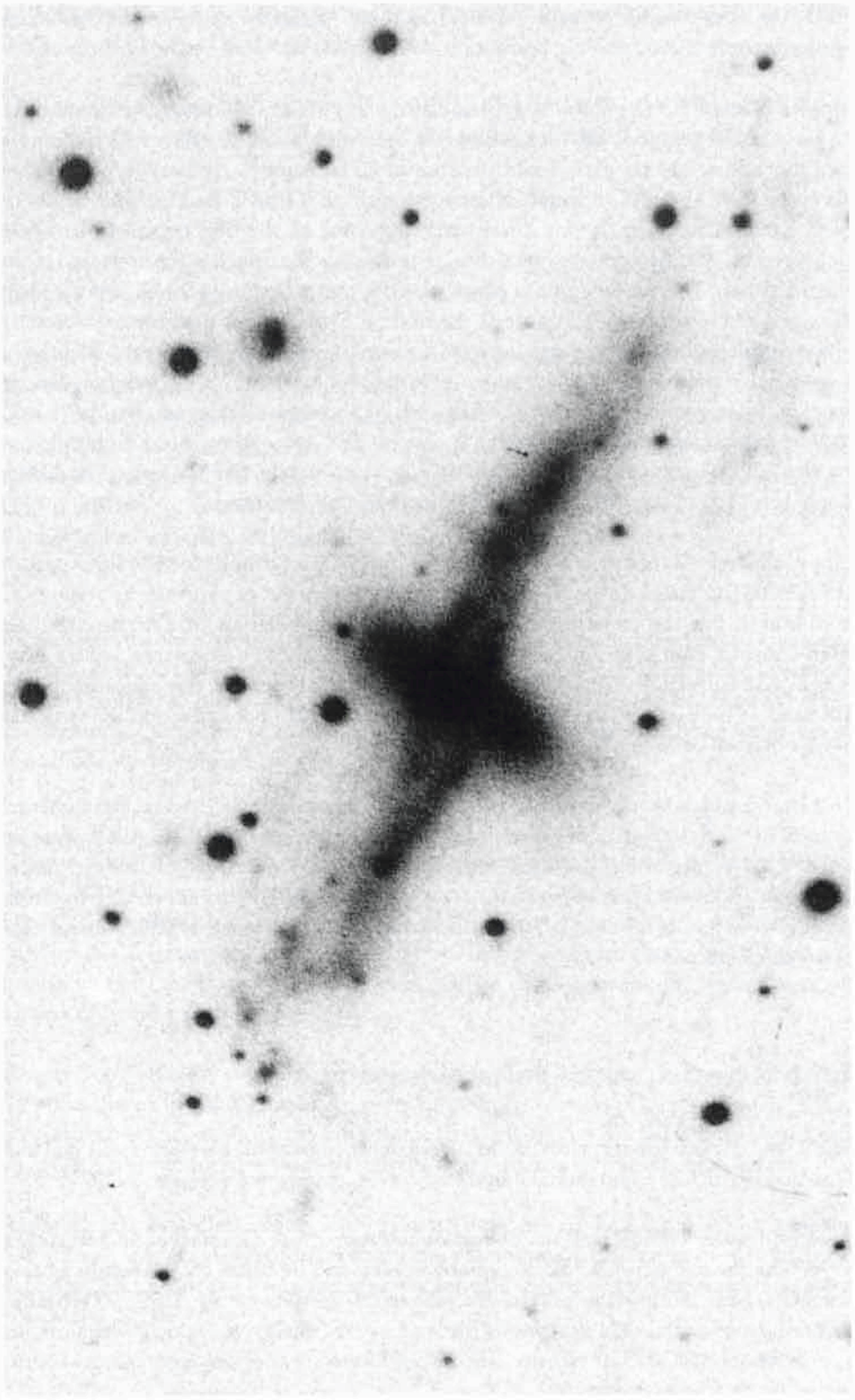
Joint Research with Chilean Institutes

The Danjon Astrolabe Project During 1977

The Danjon Astrolabe Project, a joint research programme between ESO and the Universidad de Chile and directed by Dr. F. Noël, made good progress in 1977.

A second series of observations of catalogue groups was commenced in December 1976. The second astrolabe catalogue of Santiago will be based on the results of this second series. During the period December 1976—November 1977, 231 fundamental groups and 121 catalogue groups were observed, which amounts to approximately 10,500 star transits. The planet Uranus was observed on 43 occasions, including 13 double transits.

The results in time and latitude given by the fundamental groups were sent regularly to the Bureau International de l'Heure at Paris and the International Polar Motion Service at Misuzawa, Japan.



The southern, peculiar galaxy NGC 4650 A photographed at prime focus of the 3.6 m telescope. Exposure time was 90 minutes, on a IIIa-J emulsion, through a GG 385 filter. Observer S. Laustsen. The scale on this print is 1 second of arc per mm. Its strange morphology and dynamical behaviour is under study at ESO.

FACILITIES

Telescopes

The 3.6 m Telescope

Following the installation of the telescope in the second half of 1976, a substantial amount of work remained to be accomplished: The Cassegrain adapter was installed and checked out during April and May, while later in the year mirrors III and V of the coudé system were put into position. In addition, a wide variety of improvements and adjustments were made to the telescope and its handling equipment.

Extensive repair work was made to the dome by the manufacturer. While this appears to have strengthened the inner shell sufficiently so that no further difficulties have been encountered, the repairs caused interruptions in the work on the telescope. In addition, much dust was produced with detrimental effects on a number of telescope components. In particular, it proved to be necessary to realuminize the primary mirror.

The Hartmann tests of the primary mirror were fully evaluated. The conclusion was that the optical specifications (including the Gascoigne correctors) had been met by a considerable margin. With perfect adjustments and the elimination of all dome-seeing effects, 80 per cent of the light should be concentrated within 0.3 arc second. A variety of effects, however, at present have made it impossible to maintain the perfect adjustment required. In order to improve the situation, a new unit has been constructed for the convenient centering of the correctors. In addition, work has been started on a new control system for the air pressure pads which provide the lateral support for the mirror. The Cassegrain optics were fully adjusted, and provisional results indicate that the optical quality of the telescope at this focus is excellent.

The design of the triplet adapter was completed. This adapter will allow the observation of a field of 1 degree. The task turned out to be more difficult than foreseen because heavy and space-consuming detectors had to be provided for, thus leaving an astronomer with insufficient space in the present cage. The final design therefore provides for remote control for the basic equipment. Construction and tests should be completed later in 1978. A photometric calibration system has been constructed at La Silla for use with the prime-focus correctors.

Observations were started to determine the pointing corrections for the telescope. Ultimately, it should become possible to point the telescope to within a small number of arc seconds. In combination with the Quantex integrating television system in the Cassegrain adapter, it then should become possible to set very fast on objects fainter than magnitude 20 without offsetting.

The Coudé Auxiliary Telescope

The mechanical design of the 1.5 m CAT has been completed and a contract for the construction awarded to MAN (Germany). The contract for the manufacture of the optical components has been awarded to Grubb Parsons (U.K.). The CAT should be assembled and tested in Geneva in 1979. Erection at La Silla should begin later that year, and the telescope should become operational in 1980.

Other Telescopes

The work on the optics of the Danish 1.5 m telescope was approaching completion at Grubb Parsons.

Standard CAMAC-based interfaces for data acquisition have been installed at the 1 m and 0.5 m telescopes.

A TV guiding system was brought into operation at the 1.5 m telescope.

Telescope Test Equipment

The "coma device" for on-line detection of decentering coma was completed in prototype form. Tests performed at the Pic-du-Midi gave very encouraging results, but were not completely conclusive because of very poor weather conditions.

Instrumentation

Much effort was spent on the development of the instrumentation for the 3.6 m telescope. Unfortunately, the amount of work on the telescope itself still took up much of the capacity of the TP Division, and as a result several projects proceeded more slowly than anticipated. The status of the 3.6 m telescope instrumentation projects at the end of 1977 was as follows:

1. A low-dispersion spectrograph was delivered following manufacture by Boller and Chivens. The spectrograph has been equipped for remote control. Following construction of the controls in Geneva and after extensive functional tests, the instrument was sent to La Silla where it has been functioning since the middle of the year. The initial experience has been quite satisfactory.

2. The 4-channel photometer for uvby and UBV photometry and polarimetry has been installed at La Silla in the middle of the year. Initial results show, as expected, that the uvby colour system is reproduced quite well, but that this is not entirely the case for the UBV system. The reason for this is that the separation of the colours by the dichroic mirrors cannot fully give the overlapping passbands of the UBV system. Some additional hardware will be constructed which will allow the use of the photometer in a single-channel mode without the dichroics and with arbitrary filters.

3. The construction of the hardware for the image dissector scanner (IDS) was completed. Most of the software also has been written, and extensive tests are taking place following which the instrument should be sent to La Silla in the first half of 1978.

4. A camera optimized for the near infrared has been ordered for use with the low-dispersion spectrograph. Development of the associated reticon detector was making good progress.

5. The coudé echelle spectrometer (CES) made good progress. The 200 × 400 mm echelle grating has been ordered as well as the turntable on which it is to be mounted for the scanner mode. The design and construction of many other components is progressing well. Considerable difficulties were encountered in the acquisition of the digicon which had been envisaged as a detector, but an order has now been placed. Assembly of the instrument should begin in Geneva in the second half of 1978.

6. A spectracon will become available for use as a detector at the prime focus. The rather substantial work required for its installation is nearing completion, and the instrument should be ready for use by October 1978.

7. Much optical and mechanical design work has been done on the cross-dispersed Cassegrain echelle spectrograph. Work on the associated vidicon detector is making good progress. A high-quality SEC tube has been ordered, and much of the electronic hardware development has been accomplished.

8. The design of some simple infrared photometer for the 2–20 micron range advanced well.

Much additional work was undertaken aimed at the improvement of existing instrumentation for other telescopes:

For some time now serious difficulties have been experienced in the acquisition of the image tubes manufactured in the USA which have been in use at La Silla until now, because of export regulations. As a consequence, it was decided to switch to image tubes of European manufacturers. This has necessitated a number of changes in the existing adaptations including the construction of new magnetic coils, which is underway at La Silla. It is expected that the new EMI tubes will be installed at La Silla by the middle of 1978, which should lead to a substantial improvement especially in the functioning of the B&C spectrograph for the 1.5 m telescope.

The spectracon has become available for use with the 1.0 m and 1.5 m telescopes. Though some initial difficulties were encountered, the instrument is now available to visiting astronomers.

A new grating support has been constructed for the Echelec spectrograph at the 1.5 m telescope. Four different gratings can be interchanged instantaneously. A blue field corrector has been ordered which should allow the use of the spectracon with the Echelec. A Hartmann focus test device was installed at the coudé spectrograph.

An exposure meter has been designed and built and is currently in use with the B&C spectrograph. The other spectrographs will be provided with the same exposure meter.

A software package has been prepared which allows for more efficient use of the infrared photometers at the 1.0 m telescope.

Buildings and Grounds

In Europe the planning for the new Headquarters building in Garching was nearing completion. Construction of the nearly 6,000 m^2 building should begin in 1978. All of ESO's European activities are expected to be moved to the Garching Headquarters in the summer of 1980.

At La Silla the auxiliary construction programme was essentially completed. As a result, La Silla has now a modern infrastructure of air strip, roads and utilities and adequate office, technical and hotel facilities for housing all of its activities. Of course, the maintenance of all of this requires a considerable effort, and a wide variety of improvements needs to be made on an ongoing basis. The studies of the water supply situation were completed, and some additional wells are being constructed. Studies of the possible use of solar energy for reducing the considerable cost of oil at La Silla were started.

FINANCIAL AND ORGANIZATIONAL MATTERS

After the reorganization in Chile, the building up of the Scientific Group and the relocation of the administration to Munich, 1977 is the first year during which the newly-shaped organization reached some consolidation, which is also reflected in essentially the same organigram as submitted with the 1976 Annual Report. In fact, only the 3.6 m Telescope Project ceased to exist at the end of 1977 as a separate organizational unit, its remaining tasks having been taken over by the technical services.

During the year, work continued on the Headquarters Agreement with the Federal Republic of Germany, the lease agreement with the Max-Planck Society and on the plans for the construction of the future ESO Headquarters building in Garching. Latest plans foresee the relocation of ESO's Geneva activities to Germany around the middle of 1980, and ESO's cooperation contract with CERN was correspondingly extended until 31 August 1980. In Chile, the move of many activities to La Silla reduced the space requirements in Santiago. Part of the Vitacura building was consequently leased to the United Nations.

Questions came up whether ESO's CERN-shaped Staff Rules and Regulations for International Staff will still be appropriate by the time ESO will be in Garching, and the Council decided at its December 1977 meeting to set up together with EMBL a Working Group; this Working Group is expected to make recommendations to the respective Finance Committees and Councils by the end of 1978.

The previously established Working Group for the review of the ESO Financial Rules and Regulations completed its tasks with the development of a new version of the Internal Financial Regulations which after approval by the Finance Committee at its November 1977 meeting were implemented on 1 January 1978.

The Council, at its December meeting and after some preliminary contacts with the Italian Research Council aiming at the membership of Italy in ESO, invited Professor G. Setti to participate in the Council meetings as an observer.

Concerning finance, the Council approved the 1978 budget on the basis of a contribution level of DM 32.5 million, the same level approved during the last few years.

Budget Statement 1977

(in DM 1,000)

Expenditure

Budget Heading	Approved Budget	Expenditure (incl. commitments and uncommitted credits carried over to 1978)
1 Personnel	18,366	14,213
2 Operations	9,295	7,566
3 Capital outlays	9,648	9,534
4 Sky Survey Project	989	861
TOTAL EXPENDITURE	38,298	32,174
Reserve for cost variation	2,298	—
GRAND TOTAL EXPENDITURE	40,596	32,174

Income

Budget Sub-heading		Estimate	Actual (incl. receivables)
80	Contributions from member states	32,500	32,500
81	Unused appropriations from previous years	3,424	3,424
82	Sale of Sky Atlas	591	396
84	Internal tax	2,867	1,842
85/89	Miscellaneous	1,214	1,934
	TOTAL	40,596	40,096

Budget for 1978

(in DM 1,000)

Expenditure

Budget Heading	Directorate Garching	Establish-ment in Chile	Instrument Development/ Engineering Group Geneva	Scientific Group Geneva	Total
1 Personnel	3,061	8,723	3,779	4,254	19,817
2 Operations	1,834	7,068	1,582	943	11,427
3 Capital outlays	26	1,555	4,741	150	6,472
4 Sky Survey Project	—	—	—	1,247	1,247
	4,921	17,346	10,102	6,594	38,963
RESERVES					
Reserve for cost variation (5%)					2,000
TOTAL EXPENDITURE					40,963

Income

Budget Sub-heading		Estimate
80	Contributions from member states	32,500
81	Unused appropriations from previous years	4,263
82	Sale of Sky Atlas	600
84	Internal tax	2,313
85–89	Miscellaneous	1,287
TOTAL INCOME		40,963

APPENDIX I – Use of Telescopes

Scheduled Use of 3.60 m Telescope During 1977

Period	Observer	Number of nights	Institute	Programme	Instrument
Oct. 4–20	van Agt	2	Nijmegen	Var. stars in the Sculptor dwarf spheroidal galaxy	PF*
	Lindblad	2	Stockholm	Two barred galaxies: NGC 1365 and NGC 1512	PF + Spectro
	Wamsteker/Dennefeld	1	ESO	Short exposure photography of globular clusters	PF
	Wamsteker/Surdej/Swings	2	ESO/Liège	Shell stars	PF
Nov. 3–19	Tarenghi	3	ESO	Spectroscopy in clusters of galaxies	Spectro
	Crane	2	ESO	Surface photometry of lenticular galaxies	PF
	Schnur	4	ESO	Surface brightness of distant clusters of galaxies	PF + Spectro
Dec. 2–18	Magellanic Clouds Group	4	Marseille	Faint O stars in LMC	Spectro
	Swings	4	Liège	Variable quasars	Spectro
	Dennefeld	2	ESO	Supernova remnants	Spectro
	Ulrich	3	ESO	Photography of radio galaxies	PF

* Prime Focus photography

Use of 1.52 m Telescope During 1977

Period	Observer	Institute	Programme	Instrument
Jan. 1–8	Denoyelle	Brussels	RVs for calibration of GPO-plates	RV Cass
Jan. 8–10			Tests	
Jan. 10–17	Lauberts	Uppsala	Peculiar galaxies	B&C
Jan. 17–21	Schuster	ESO	Peculiar galaxies	B&C
Jan. 21–29	Maurice	Marseille	X-ray sources in LMC	Echelec
Jan. 29–Feb. 3	Kohoutek	Hamburg	Spectrophotometry of planetaries	Coudé
Feb. 3–11	Klutz	Cointe-Ougrée	Spectrography of Be stars	Coudé
Feb. 11–18	Alloin	Nice	Emission in lenticular galaxies	B&C + Echelec
Feb. 18–21	Breysacher	ESO	Wolf-Rayet stars in the Magellanic Clouds	Echelec
Feb. 21–March 9	Kohoutek (1½ nights)	Hamburg	Spectrophotometry of planetaries	Coudé
	Solf (6½ nights)	Heidelberg	Spectra of long-period variables	Coudé
	Moffat (8 nights)	Bochum	Spectra of Wolf-Rayet stars	Coudé
March 9–19	Ilovaisky	Meudon	Spectroscopy of galactic X-ray sources	Echelec
March 19–22	Wamsteker	ESO	Globular clusters	Echelec
March 22–23			Tests	
March 23–26	Havlen	ESO	WR stars in Puppis OB-associations	Coudé
March 26–April 1	Haefner	München	Spectroscopy of β Cep stars	Coudé
April 1–8	Floquet	Paris	6 nights: Observations of ApHg and ApSi stars	Coudé
			1 night: Delta Canis Majoris (for Hultqvist)	Coudé
April 8–15	Oyen	Leuven	OB-stars in Circinus for calibration	RV Cass
April 15–18	Muller/Schuster	ESO	Peculiar galaxies	B&C
April 18–26	Schnur	ESO	Intergalactic light in clusters of galaxies	B&C
April 26–27			Tests	
April 27–May 8	Andersen/Olsen	Copenhagen	RVs of bright stars, eclipsing binaries	Coudé
May 8–17	van Dessel	Brussels	Radial velocities of visual binaries, X-ray sources	Coudé, RV Cass
May 17–20	Wamsteker	ESO	Core spectra of globular clusters	Echelec
May 20–27	Breysacher	ESO	Interstellar lines in OB stars near Eta Carinae	Echelec
May 27–30	Surdej	ESO	HD 190073, XX Oph	Coudé
May 30–June 1			Maintenance	
June 1–11	Gahm	Stockholm	7½ nights: Stars in early phases of evolution	B&C + Coudé
			2½: Spectrophotom.variability of CNO stars (for Pedersen)	Coudé
June 11–14	Pakull	Hamburg	Optical candidates for X-ray sources	B&C
June 14–17	Westerlund	Uppsala	Spectroscopy in reddened cluster in Ara	B&C
June 17–24	Ratier	Pic-du-Midi	5 nights: Astrometry of satellites of Uranus and Neptune	Zeiss camera
			2 nights: Photometry of globular clusters (for Terzan)	Zeiss camera
June 24–July 1	Schulz	Tübingen	X-ray binaries, T Tau stars	Coudé
July 1–6 [1]	Melnick	ESO	Clusters	Coudé, Echelec
July 6–13	van den Heuvel	Amsterdam	X-ray sources	Echelec
July 13–20	Materne	ESO	Giant elliptical galaxies	Echelec, B&C

Period	Observer	Institute	Programme	Instrument
July 20–30	Wolf	Heidelberg	T Tau and YY Ori stars	Coudé, B&C
			½ night: Spectroscopy of V 348 Sgr (for Houziaux)	B&C
July 30–Aug. 2	Rahe	Bamberg	Mass exchange in eclipsing binaries	Coudé
Aug. 2–10	Pakull (7 nights)	Hamburg	X-ray sources	Echelec, B&C
	Tests (1 night)			
Aug. 7–8			Tests	
Aug. 10–15	Muller/Breysacher	ESO	Peculiar galaxies	B&C
Aug. 15–19	Ekman	Uppsala	Spectroscopy of peculiar galaxies	B&C
Aug. 19–24[1]	Surdej	ESO	HD 190073, XX Oph	Coudé
Aug. 24–26	Bouchet	ESO	Carbon stars	Coudé
Aug. 26–Sept. 10	Doazan	Paris	Be stars, Seyfert galaxies, RCrA star	Coudé, Echelec
Sept. 10–15[1]	Bouchet	ESO	Carbon stars, globular clusters	Coudé, Echelec
Sept. 15–23[1]	Pöllitsch	München	Be stars	Coudé
Sept. 23–24	Bouchet	ESO	Carbon stars	Coudé
Sept. 24–Oct. 1	Spite	Meudon	Abundances of heavy metals in iron-poor stars	Echelec + Coudé
Oct. 1–9[1]	Breysacher	ESO	Structure of the SMC	Echelec
Oct. 9–16	Foy	Meudon	Chemical composition of dwarf galaxies	Echelec, Coudé
Oct. 16–19	Staller	Amsterdam	Hα profiles of SMC X-1	B&C
Oct. 19–25	Tarenghi	ESO	X-ray clusters of galaxies	B&C
Oct. 25–28	Schlosser	Bochum	Peculiar Seyfert galaxy	B&C
Oct. 28–29	Duerbeck	Hoher List	Spectroscopic orbit of ER Ori	Coudé
Oct. 29–30	Bouchet	ESO	Carbon stars	Coudé
Oct. 30–Nov. 6	Imbert	Marseille	Eclipsing binaries	Coudé
Nov. 6–8	Wamsteker	ESO	Core spectra of globular clusters	Echelec
Nov. 8–11	van Paradijs	Amsterdam	Hα profiles of SMC X-1	B&C
Nov. 11–15	Bergvall	Uppsala	Spectroscopy of peculiar galaxies	B&C
Nov. 15–27	Wehmeyer (4 nights)	Hamburg	Planetary nebula NGC 1360	Coudé
	Bouchet (5 nights)	ESO	Carbon stars	Coudé
	Surdej (3 nights)	ESO	Interstellar lines in OB stars near Eta Carinae	Coudé
Nov. 27–29	Sterken	Brussels	Variability of early B stars	Coudé
Nov. 29–Dec. 5	Lacoarret	Nice	B stars in open clusters	Echelec, Coudé
Dec. 5–11	Melnick	ESO	Brightest stars in H II regions in LMC	Echelec
Dec. 11–20	Dennefeld	ESO	Supernova remnants	B&C, Zeiss camera
Dec. 20–21			Tests	
Dec. 21–27	Mauder	Tübingen	X-ray binary WRA 977	Coudé
Dec. 27–30	Surdej	ESO	Interstellar lines in OB stars near Eta Carinae	Coudé
Dec. 30–Jan. 1, 78	Pakull	ESO	X-ray sources in the LMC	B&C

[1] Including 2/3 night during which spectra were taken for Ahlin at the coudé of the eclipsing binary HD 161387.

Use of 1 m Telescope During 1977

Period	Observer	Institute	Programme	Instrument
Jan. 1–6	Haug	Hamburg	Interstellar absorption in Vela	SP
Jan. 6–10*	Wamsteker/Turon	ESO	H II regions	IRP
Jan. 10–14	Danks/Hartsuiker	Roden	Reddening and population in 30 Doradus region	SP
Jan. 14–24	Adam	Lyon	UBV photometry of quasars	SP
Jan. 24–28	Surdej	ESO	Peculiar galaxies	SP
Jan. 28–Feb. 7	Tinbergen/Bastiaansen	Leiden	Interstellar circular polarization	Special
Feb. 7–10	Kohoutek	Hamburg	Planetary nebulae	SP
Feb. 10–14	Vogt	ESO	Ap stars in open clusters	SP
Feb. 14–21	Danks	Roden	Spectroscopy of gaseous nebulae	B&C
Feb. 21–27	Chevalier	Meudon	Galactic X-ray sources	SP
Feb. 27–March 4*	Wamsteker	ESO	H II regions	IRP
March 4–8			Camac installation, tests	
March 8–16	Chevalier	Meudon	Galactic X-ray sources	SP
March 16–19	Schnur	ESO	Tests	
March 19–28*	Schultz/Sherwood	MPI Bonn	IR photometry of radio sources	IRP
March 28–April 1	Vogt	ESO	Ap stars in open clusters	SP
April 1–9*	Turon/Epchtein	ESO/Meudon	H II regions	IRP
April 9–16*	Danks/Shaver	Roden	IR of regions of star formation	IRP
April 16–26	Martel	Lyon	Polarization of small H II regions	Special
April 26–29	Vogt	ESO	Ap stars in open clusters	SP
April 29–May 6	Knoechel	Hamburg	Polarimetry of the galactic cluster Kappa Crucis	Polarimeter
May 6–14	Querci	Meudon	Variable carbon stars	SP
May 14–18	Burger	Brussels	Galactic X-ray sources	SP
May 18–27	Schnur	ESO	Intergalactic light in clusters of galaxies	SP
May 27–30	Vogt	ESO	Ap stars in open clusters	SP
May 30–June 6	Pedersen	Aarhus	Spectrophotometric variability of CNO stars	Special
June 6–10	Pakull	Hamburg	X-ray sources	SP
June 10–17	Unger	Bochum	Distant OB stars at high z	SP
June 17–23	Westerlund	Uppsala	Radio sources	SP
June 23–28	Alcaíno	Santiago	Sequences for globular clusters	SP
June 28–July 1			Tests	
July 1–7	Schulz	Tübingen	T Tau stars	SP
July 7–14	Henrichs	Amsterdam	X-ray sources	SP
July 14–22	Surdej	ESO	Peculiar galaxies	SP
July 22–26	Melnick	ESO	Clusters	SP
July 26–31*	Wamsteker/Bouchet	ESO	30μ photometry of H II regions + standards	IRP
July 31–Aug. 7	Lundstroem	Lund	Wolf-Rayet stars and galactic structure	SP
Aug. 7–11	Ekman	Uppsala	Peculiar galaxies	SP
Aug. 11–18	Danks	ESO	Bright southern galaxies	SP

Period	Observer	Institute	Programme	Instrument
Aug. 18–Sept. 2*	Sherwood/Kreysa (13 nights) Tests (2 nights)	MPI Bonn	IR photometry of radio sources	IRP
Sept. 2–4*	Wamsteker/Bouchet	ESO	Asteroids	IRP
Sept. 4–15	Adam	Lyon	UBV photometry of quasars	SP
Sept. 15–23	Metz	München	Simultaneous spectroscopy and polarimetry of Be stars	Special
Sept. 23–26	Smith	ESO	Photometry of NGC 6401	SP
Sept. 26–27			Tests	
Sept. 28–Oct. 4*	Wamsteker/Bouchet	ESO	H II regions; asteroids	IRP
Oct. 4–14	Staller	Amsterdam	The luminosity function of M-dwarfs	SP
Oct. 14–21	Alcaíno	Santiago	Integrated UBV of 36 SMC clusters	SP
Oct. 21–23*	Wamsteker	ESO	Simultaneous lightcurves of asteroids	IRP
Oct. 23–Nov. 5*	Epchtein/Roucher (7 nights)	Meudon	10 and 20μ study of compact H II regions	IRP
	Salinari/Tarenghi (6 nights)	ESO	Type I OH sources	IRP
Nov. 5–13	Vigneau	Toulouse	UBV photometry of SMC	SP
Nov. 13–15	Vogt	ESO	Photometry of dwarf novae with supermaxima	SP
Nov. 15–19	Bergvall	Uppsala	Peculiar galaxies	SP
Nov. 19–27	Wamsteker/Bouchet (4 nights*)	ESO	H II regions	IRP
	Crane (4 nights)	ESO	Tests	
Nov. 27–Dec. 6	Crane/Dennefeld	ESO	Photoelectric photometry of emission lines in SNR	SP
Dec. 6–13	Magell. Clouds Group (Mianes)	Meudon/ Toulouse	uvby photometry of LMC O-B2 stars	SP
Dec. 13–21	Surdej	ESO	Peculiar galaxies	SP
Dec. 21–23	Wamsteker	ESO	Tests, H II regions	IRP
Dec. 23–28	Kviz	Geneva	Eclipsing variables	SP
Dec. 28–Jan. 78	Mauder	Tübingen	X-ray binary WRA 977	Polarimeter

* IR programme, telescope is used on a night and day-time basis.

The ESO 50 cm telescope was used throughout the year. In addition, 233 nights on the Danish 50 cm telescope and 93 nights on the Bochum 61 cm telescope were scheduled for ESO users. The GPO was scheduled for 111 nights. Infrared photometry was done at the 1 m telescope during about 800 day-time hours.

Meteorological Report

The weather during 1977 was only slightly better than during the very poor preceding year. There were only 210 photometric nights (six or more hours of uninterrupted clear sky). The total number of clear night hours was 2,266. Precipitation fell, with an unusually high frequency, on April 7, May 5, June 23, 29, July 12, 21, 22, August 5, 14 and December 16.

APPENDIX II – Publications

Visiting Astronomers

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Alcaíno, G.: Basic Data for Globular Clusters. *Pub. Astron. Society of the Pacific*, **89**, 491.

Andersen, J., Nordström, B.: Bright Southern Stars of Astrophysical Interest. *AA Suppl.*, **29**, 309–312.

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Appenzeller, I.: Image Tube Spectrograms of Southern Young Emission Line Objects. *AA*, **61**, 21–26.

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Clausen, J. V., Grønbech, B.: Four-colour Photometry of Eclipsing Binaries. VIII: CV Velorum, Light Curves, Photometric Elements and Absolute Dimensions. *AA*, **58**, 131–137.

Clausen, J. V., Grønbech, B.: Four-Colour Light Curves of the Eclipsing Binary RT Scl. *AA Suppl.*, **28**, 389–401.

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Debehogne, H.: Découverte d'une flare star sur un cliché du 18 Août 1976, pris au grand prisme objectif de l'observatoire ESO à La Silla, Chili. *AA*, **60**, 281–283.

Debehogne, H., de Freitas Mourao, R. R.: Positions de la Comète P/d'Arrest. *Acta Astronomica*, **27**, 297–300.

Denoyelle, J.: The Spatial Distribution of Young Stars in Vela ($\ell = 257°$ to $284°$). *AA Suppl.*, **27**, 343–365.

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ESO Publications

Annual Report 1976
Technical Report No. 8
The Messenger—El Mensajero Nos. 8–11
Scientific Preprints Nos. 1–18

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.

APPENDIX III – Members of Council, Committees and Working Groups on January 1, 1978

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:	H. G. van Bueren 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-Technical Committee

A. Behr (1978–79)	J. Lequeux (1978–80)
L. Biermann (1978)	P. O. Lindblad (Chairman) (1978–81)
G. Courtès (1978)	C. de Loore (1978–81)
H. van der Laan (1978–82)	P. E. Nissen (1978–80)

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:	J. Gustavsson

Observing Programmes Committee

Members	*Substitutes*
L. Houziaux (until 31.12.1980)	C. de Loore
K. Hunger (Chairman) (31.12.1981)	Th. Schmidt-Kaler
P. S. Thé (31.12.1982)	P. C. van der Kruit
M. Rudkjøbing (31.12.1978)	P. E. Nissen
B. E. Westerlund (31.12.1982)	A. Elvius
G. Wlérick (31.12.1979)	J. Lequeux

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)

Working Group for the Planning of ESO Headquarters*

H. G. van Bueren
M. Deloz
J.-F. Denisse
P. O. Lindblad
C. Zelle

Joint EMBL/ESO Working Group on Remuneration System

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

* Professor B. Strömgren was appointed Chairman of the Working Group for the Planning of ESO Headquarters until 31.12.1977. No successor has been yet designated.

Meetings in 1977

Council	12 May Munich	1 December Munich
Committee of Council	22 April Geneva	22 September Geneva
Finance Committee	2 March Garching	3 November Garching
Scientific Policy Committee	17 May Trieste	13 December Geneva
Instrumentation Committee	1 June Geneva	
Observing Programmes Committee	23 to 25 May Kiel	23 to 25 November Geneva
Working Group Committees	11 May Munich	
Working Group Planning Hq.	22 April Geneva	

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