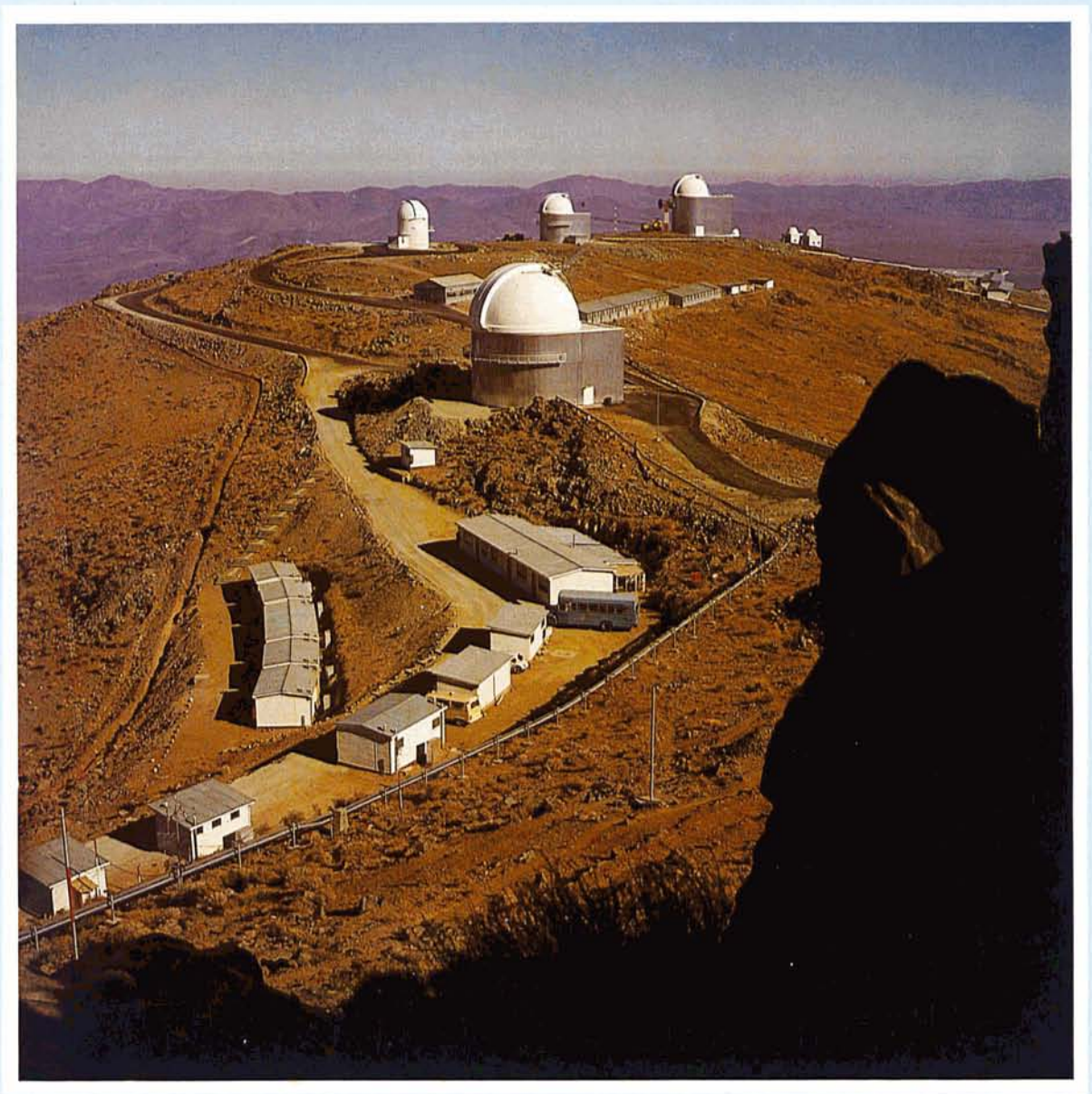
ANNUAL REPORT 1972



EUROPEAN SOUTHERN OBSERVATORY

ANNUAL REPORT 1972

presented to the Council
by the Director-General, Prof. Dr. A. Blaauw,
in accordance with article VI, 1 (a) of the ESO Convention

Organisation Européenne pour des
Recherches Astronomiques dans l'Hémisphère Austral

EUROPEAN SOUTHERN OBSERVATORY

Frontispiece:

The European Southern Observatory on La Silla mountain. In the foreground the "old camp" of small wooden cabins dating from the first period of settlement on La Silla and now gradually being replaced by more comfortable lodgings. The large dome in the centre contains the Schmidt Telescope. In the background, from left to right, the domes of the Double Astrograph, the Photometric (1 m) Telescope, the Spectroscopic (1.52 m) Telescope, and the 50 cm ESO and Copenhagen Telescopes. In the far rear at right a glimpse of the Hostel and of some of the dormitories. Between the Schmidt Telescope Building and the Double Astrograph the provisional mechanical workshop building. (Viewed from the south east, from a hill between the existing telescope park and the site for the 3.6 m Telescope.)

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INTRODUCTION

General Developments and Special Events

The present report generally follows the pattern of previous years, but its scope has been enlarged, some rearrangement effected and the presentation condensed.

In the chapter on research activities we incorporate, for the first time, statistics concerning requested and allocated numbers of observing nights for visiting astronomers over the past years, including a break-down according to the principal telescopes and the various Member States. The chapter "Administrative Matters", which replaces the previous chapters on "General Administrative Policy", "Personnel" and "Financial Matters", also includes a number of statistics.

Another new feature is the account of the Sky Atlas Project and the associated laboratory. The former appendix with the list of staff members in grades 9 and higher is incorporated in the chapter on "Administrative Matters". In the chapter "Council, Committees and Working Groups" the main items dealt with by some

of these bodies are briefly summarized, particularly if they are not referred to elsewhere in the text.

A very important event was Council's visit to Chile, where it held its regular second meeting of the year and took the opportunity to study various aspects of the Organization's operations at Santiago and La Silla. A visit paid by the President of Council, accompanied by some of the delegates and the ESO Directorate, to the President of the Republic of Chile enhanced the significance of the Council's visit.

Other highlights of the year were two conferences initiated by ESO and sponsored jointly with sister organizations: the conference on "The Role of Schmidt Telescopes in Astronomy", jointly arranged by ESO, the British Science Research Council and the Hamburg Observatory, was held in Hamburg in March and the "ESO/CERN Conference on Auxiliary Instrumentation for Large Telescopes" in Geneva in May. These provided an excellent basis for subsequent work in ESO on the Sky Atlas Project and the Large Telescope Project, respectively.

October 1972 marked the 10th anniversary of the signature of the ESO Convention by the original Member States of the Organization. This decade witnessed first of all the completion of the site-testing surveys that resulted in the choice of La Silla and subsequently the erection of buildings for the medium-sized telescopes, the hostel and other premises on La Silla, and the headquarters at Vitacura, Santiago. The 1.52 m and 1 m telescopes and the Grand Prisme Objectif had become operational by the time of Council's previous visit to Chile in 1969, and observational work of staff and visiting astronomers had started. Since that time, La Silla has ranked as one of the principal observatories in the southern hemisphere. The increasing scientific activity there is reflected in the ESO Annual Reports of recent years.

The continued intensity with which visiting astronomers and ESO staff utilized this telescope equipment in the year 1972 is apparent from the extensive account with which the present report begins. Excellent additional perspectives were opened by the near-completion of the mounting of the Schmidt telescope which, by the end of the year, was producing fine photographs of the southern sky, although room was left for further technical improvements on the telescope's performance. The work of the TP Division continued successfully, reaching at the end of the year the important milestone of the adjudications for the principal contracts for the construction of the 3.6 m telescope, its building, and its dome.

As the first stage of the work of this Division, the design of telescope and buildings, drew to an end and the construction phase began, emphasis of the Division's work also shifted to its next big task: the definition and realization of the programme for the initial auxiliary instrumentation. The TP Division, moreover, joined in a modest way in the solution of instrumental problems connected with the Schmidt telescope and the equipment operating in Chile.

Whereas the legal status of the ESO establishments in Chile had been defined since November, 1963, in the Agreement (Convenio) with the Government of Chile, the status of ESO establishments in Europe remained for a long time open. A Working Group of the Council was appointed to resolve this situation.

Although economic developments in Chile in several respects tended to complicate our operations, the Observatory continued its positive evolution, thanks to the unfailing cooperation of the Chilean Government and our staff's ability to cope with the new circumstances; in the latter respect, Council's measures to alleviate economic shortages were very helpful.

At the meeting of the Instrumentation Committee on March 28, Professor Borgman succeeded Professor Fehrenbach as Chairman of this committee. Professor Fehrenbach had held office since the creation of the Instrumentation Committee in the earliest stage of ESO's development, when it was still governed by its provisional Council. He closely collaborated with ESO's first Director, Professor Heckmann, and its Technical Director, Professor Ramberg, in the planning of telescopes and instrumentation, and directed the activity of the Instrumentation Committee with unflagging enthusiasm. We are pleased to report that Professor Fehrenbach continues as a regular member of the committee.

1972 was the first year without a technical directorship, after Professor J. Ramberg's resignation from this post per December 31, 1971, mentioned in the previous Report. Although it was a natural development that many of the tasks of the technical director were shifted to the TP Division and to the technical services in Chile after their creation, Prof. Ramberg's retirement was keenly felt in the ESO Directorate. He had been associated with the Directorate since the earliest days, first as assistant director and later as technical director; and his extensive knowledge of ESO, combined with a firm belief in the Organization as an instrument of European astronomical collaboration, was always a most valuable asset.

Mr. J. Bloemkolk retired as Manager in the Office of the Director General and Mr. H. Hyslop-Tuffield as Administrator I in the Office of the Director for Chile. Reference to their contributions to ESO may be found in the sub-section on Personnel.

Automated Grant comparator-microdensitometer in the Vitacura Headquarters, Santiago. The data acquisition and control system is based on a HP 2114 B computer.

RESEARCH ACTIVITIES

Visiting Astronomers

As in previous Annual Reports, we shall give an account of the research programmes for which telescope time was allocated to Visiting Astronomers, together with a table of the observing dates. We shall, however, begin by presenting, for the first time, statistics concerning requested and allocated observing nights over the past years. These are based on data collected since March 2, 1970, which was the beginning date of the first allocation period for which application forms were introduced requiring detailed specifications of the numbers of nights requested.

Statistics of Telescope Use

It is recalled that, since the main ESO telescopes came into regular use for Visiting Astronomers (the 1 m photometric telescope since about November 1968, the 1.52 m spectrographic telescope and the Grand Prisme Objectif since about September 1969), applications have been requested for specific periods. After an exploratory period, the ESO Directorate, in consultation with the Observing Programmes Committee, arrived at the current system of two half-yearly terms, from April 1 through September 30, and October 1 through March 31. The allocation periods are identified by reference numbers, used, e.g., in the Announcements to Visiting Astronomers, and for completeness sake listed in Table 1.

Table 1

Specification of the periods for which observing time was allocated to Visiting Astronomers

Reference number	Period from noon	Period to noon	Notes
1	Nov. 1, 1968	May 1, 1969	only 1 m telescope
2	May 1, 1969	Sept. 1, 1969	only 1 m telescope
3	Sept. 1, 1969	March 2, 1970	1.52 m tel. and GPO added
4	March 2, 1970	Sept. 1, 1970	
5	Sept. 1, 1970	March 2, 1971	
6	March 2, 1971	July 1, 1971	
7	July 1, 1971	Oct. 1, 1971	
8	Oct. 1, 1971	Apr. 1, 1972	50 cm tel. added
9	Apr. 1, 1972	Oct. 1, 1972	
10	Oct. 1, 1972	Apr. 1, 1973	
11	Apr. 1, 1973	Oct. 1, 1973	

The periods finally arrived at have appeared the most practical from various points of view: the October-to-April period includes the meteorologically most favourable months and also coincides with the Magellanic Clouds season, and their beginnings allow the fixing of suitable dates for meetings of the Observing Programmes Committee.

The total number of requested nights, from all ESO countries together, has gradually increased. For the 1.52 m and 1 m telescopes together, it amounted to:

1 668 for the 25-month period,
March 1970 through March 1972, and

1 767 for the 24-month period,
April 1972 through March 1974.

In addition, there were increasing numbers of requests for the smaller, 50 cm and 60 cm, telescopes.

These figures show that the strong demand for telescope time, apparent from the first days when La Silla became operational, has continued. Over the 3-year period March 2, 1970, to April 1, 1973, for all ESO Member States together, the demand exceeded the number of nights available to Visiting Astronomers by a factor of 1.9. For that period, as well as for the year April 1972 to April 1973, the break-down of these "pressure factors" for the various countries is given in Table 2. It should be noted that such factors tend to fluctuate from year to year, especially for the smaller countries. In the calculations the numbers of available nights per country have been based on proportional shares according to the financial contribution formula. For various reasons, these do not always correspond to the allocated numbers.

Table 2

"Pressure factors" (Requested number of nights divided by proportional share) for Visiting Astronomers for the past three years and for the past year, for the 1.52 m and the 1.00 m telescopes combined

	March 2, 1970, to April 1, 1973	April 1, 1972, to April 1, 1973
Belgium	1.1	0.9
Denmark	0.7	2.1
France	2.5	1.8
Federal Rep. of Germany	1.5	1.7
Netherlands	2.7	2.2
Sweden	2.2	4.2

For the approximately 3-year period March 1970 — April 1973 (allocation periods 4 through 10) we present in Table 3, for the various ESO countries, and separately for the 1.52 m, the 1 m telescope and the GPO, the accumulated numbers of observing nights requested and nights allocated. For the two first-mentioned telescopes together, in the fourth column, we add, below the allocated numbers, the corresponding percentages out of a total of 100 % for all Visiting Astronomers' nights. Statistics of this kind have been published earlier for the allocation periods 1 to 7 (see the article by Blaauw in "Mitteilungen der Astronomischen Gesellschaft", No. 30, p. 15—29, 1971). In comparison to the earlier statistics, those of Table 2 represent a further step in a gradually stabilizing system. Table 3 gives rise to the following remarks.

In the allocation of numbers of nights, the Directorate first of all follows the advice of the Observing Programmes Committee, which judges the proposals exclusively on their scientific merits. The Directorate also takes into account other circumstances, such as: accumulation of proposals for certain limited seasons of the year, or relative scarcity for other periods; instrumental feasibility of execution of the programme; and the aim to arrive, in the long run, at relative shares of the available nights approximately proportional to the financial contributions of the Member States. The latter consideration is becoming more and more a concern of the Directorate, as a tendency seemed to be developing towards certain discrepancies in this respect. Such discrepancies may arise from various factors, of which the quality of the proposals need not be the dominating one — such as the number of proposals put forward by a Member State and hence its "pressure" for getting time, the preferred time of the year (Magellanic Clouds season or "galactic" season), difficulty for observers to execute missions outside the academic terms, etc. For the year 1972 the "proportional shares" according to the financial contributions would have been, in terms of rounded-off percentages: Belgium 8, Denmark 5, France 33, Federal Republic of Germany 33, Netherlands 10, Sweden 10.

A break-down, similar to that of Table 3, but only for the period April 1972 to April 1973, is presented in Table 4. It adds figures for the small telescopes combined (ESO 50 cm, Copenhagen 50 cm part-time, Bochum 60 cm part-time). These are

Table 3

Numbers of nights allocated to Visiting Astronomers and comparison with requested numbers for the 1.52 m, 1 m and GPO telescopes.
Period: **March, 2, 1970, to April 1, 1973** (allocation periods 4 through 10)

	1.52 m telescope		1 m telescope		1.52 and 1 m telescopes combined		Grand Prisme Objectif	
	Req.	All.	Req.	All.	Req.	All. (%)	Req.	All.
Belgium	72	60	43	20	115	80 *(6)*	—	—
Denmark	24	11	26	11	50	22 *(2)*	—	—
France	688	381	404	136	1092	517 *(39)*	463	366
Fed. Rep. of Germany	257	133	377	228	634	361 *(28)*	23	20
Netherlands	45	36	305	173	350	209 *(16)*	—	—
Sweden	105	46	190	71	295	117 *(9)*	—	—
Total	1191	667	1345	639	2536	1306 *(100)*	486	386
ESO staff, maintenance, Vis. Astr. other countries		460		488		948		

used almost exclusively for photometric work and have turned out to be most useful in relieving the pressure on the 1 m photometric telescope. It happens regularly that requests for the latter may be satisfied, at least partly, with the smaller telescopes. For this reason, more nights are generally allocated than are requested for these telescopes.

The double astrograph for objective prism radial velocity work (Grand Prisme Objectif) has been used intensively by French astronomers since it became operational in 1969. The use by other countries, already very modest in these early years, has been further reduced. This development is undoubtedly largely due to the facts that a duplicate of the telescope is in use at the Haute-Provence Observatory, that measuring machines required for the evaluation of the plates are not generally

Table 4

Numbers of nights allocated to Visiting Astronomers; comparison with requested numbers for the 1.52 and 1 m telescopes; for period **April 1, 1972, to April 1, 1973** (allocation periods 9 and 10)

	1.52 m telescope		1 m telescope		1.52 and 1 m telescopes combined		0.5 and 0.6 m telescopes combined	Grand Prisme Objectif
	Req.	All.	Req.	All.	Req.	All. (%)	Allocated	Allocated
Belgium	21	24	13	6	34	30 *(7)*	35	—
Denmark	24	11	26	11	50	22 *(5)*	—	—
France	197	101	65	3	262	104 *(25)*	60	143
Fed. Rep. of Germany	72	31	168	90	240	121 *(30)*	55	—
Netherlands	10	8	85	56	95	64 *(16)*	28	—
Sweden	62	31	121	40	183	71 *(17)*	105	—
Total	386	206	478	206	864	412 *(100)*	283	143
ESO staff, maintenance, Vis. Astr. other countries		159		159		318	167	

available in other countries, and that the instrument has turned out to be particularly suited for the identification of members of the Magellanic Clouds, a programme which meanwhile has progressed considerably.

The Annual Reports over the past three calendar years, including the present report, show, in addition to the exact dates at which telescopes were used, the total numbers of useful hours as reported by observers. For the 1.52 m and the 1 m telescopes combined these totals were 3 118 for 1970, 3 129 for 1971, and 2 932 for 1972 — altogether 9 179 hours. As the total number of nights covered was about 1 300 (*for each of the two telescopes 60 % of the year*) this corresponds to an average useful period of just about seven hours per night. Certainly an illustration of the outstanding qualities of the La Silla site.

Research by Visiting Astronomers

Tables 5—9 summarize the programmes undertaken by visiting astronomers during 1972. The fourth column gives the actual number of useful observing hours.

Galactic Structure

The Galactic Plane

Deharveng observed a number of H II regions, using photographic interference techniques. He observed in H α light, with a linear mean dispersion of 25 Å/mm, the nebulae RCW 19, 40, 59, 91, 92, 94, 95, 99 and 102 in order to redetermine their radial velocities. They are important for the understanding of the spiral structure of the Southern Milky Way in particular, as their motions differ slightly from those of the other nebulae in the Norma-Centaurus Arm, situated behind the Sagittarius-Carina Arm. Deharveng has also observed the nebulae RCW 14, 22, 64, 65 and 71. Their radial velocities show that the region RCW 71 is near the Sun, at a distance of about 1400 pc, and belongs to the Sagittarius-Carina Arm. The regions RCW 64 and 65 have rather large negative velocities, of about —66 km/sec; this indicates that they are situated at about 5000 pc from the Sun in the Norma-Centaurus Arm.

The region RCW 58 has also been observed by Deharveng. It resembles morphologically NGC 6888 and is, like the latter, excited by a Wolf-Rayet star. It has an expansion velocity of 15 km/sec but does not show doubling of the lines as does NGC 6888. In the nebula RCW 104 Deharveng found a very strong internal turbulence with velocity gradients reaching 50 km/sec per minute of arc.

Around the nebula IC 4628 Deharveng has observed 3 H II regions connected with 109 α sources. These observations will complete the very detailed study of this nebula undertaken by Miss Laval.

Attempts have been made to detect optical regions at the positions of the 109 α sources 298,8 and 298,9. Deharveng has also begun a detailed study of the Carina nebula using monochromatic photographs with 10 Å passbands and high spatial resolution of 46 seconds of arc per minute as well as interferograms with a linear mean dispersion of 8 Å/mm. Over a large part of the nebula doubling of the lines is observed. These photographs, obtained in the wavelengths of various nebular lines, will permit a detailed study of the varying physical conditions in the nebula as well as a morphological study of peculiarities in the zones with double lines.

Karlsson reports observations of B-type stars in a number of regions in the Galactic Plane. His programme aims at a study of 10 areas situated at every 5 degrees of longitude between 225° (area 1) and 270° (area 10), each area covering about 10 square degrees.

Some of the areas have been observed at Mt. Stromlo and Siding Spring Observatories. During 1972, at La Silla, Karlsson obtained observations in the UBV system of about 700 stars. The results derived so far give the interstellar extinction in areas 1, 2 and 10.

In area 1, the reddening is rather even over the field, reaching a maximum of E (B — V) = 0.8 — 1.0 mag.

In area 2, low reddening of E (B — V) ~ 0.2 — 0.3 mag is found nearer than 1500 pc; the reddening increases at greater distances, reaching 0.7 mag at about 3 kpc.

In area 10, the colour excess reaches 0.5 mag at a distance of about 1 kpc and then increases slowly to about 0.9 mag at a distance of 2 kpc. In this area a number of stars have been found at a distance of 4 kpc.

Lub observed in a joint programme with Pik Sin The, aiming at a study of the space distribution of M stars in the direction of the Carina spiral feature and in the direction of an interarm region in Vela. He reports that 359 of the 540 programme stars were observed once each in R and I with the 1 m telescope. The standard error of a single measurement for I and R-I is ± 0.02 mag and ± 0.02 mag, respectively.

The programme will be completed by measurements of plates for the remaining M stars in the two regions which cover in Carina 2 × 2 degrees and in Vela 4 × 4 degrees.

Lyngå has used the ESO 50 cm and 1 m telescopes for UBV observations in two programmes. In the programme carried out with the smaller telescope, 700 observations in the UBV system were obtained of stars brighter than 12th mag in the Carina region of the Southern Milky Way. With the 1 m telescope Lyngå established sequences in Vela, Carina and Crux in a joint programme with Wramdemark. He observed also a number of faint, suspected WR stars as well as some planetary nebulae detected by Stenholm. For the study of the Carina region Lyngå also obtained a number of spectra of OB stars for radial velocity and spectral classification work, using the Cassegrain spectrograph of the 1.5 m telescope. Some of these plates were subsequently measured with the Grant machine in the ESO Headquarters in Santiago. Among the observed objects HD 105563 was found to be a VV Cephei star.

Oyen is studying the galactic structure in the region between galactic longitudes 316 and 328. For this purpose he has selected 249 OB stars from objective prism surveys. The limiting magnitude of his survey is about $m_{pg} = 14$. Using the ESO 50-cm telescope, he observed all the selected stars at least twice in the UBV system. The analysis of the material is being carried out.

Schröder began a programme aiming at the study of the distribution of radial velocities, spectral types and luminosity classes of normal stars as a function of galactic centre distance. The first step is to set up photoelectric sequences between 12th and 17th mag in three fields centered at $18^h\ 11^m$, $-29°\ 30'$; $18^h\ 12^m$, $-34°\ 30'$ and $18^h\ 55^m$—$32°\ 29'$, respectively.

The observations will continue in 1973.

Sherwood, who was the Bochum observer from May to August, has kindly reported about his observations. He observed photoelectrically in the UBV system more than 400 OB^+ stars selected from the Stevenson/Sanduleak Catalogue with $b^{II} \leq 3°$ and $334° — l — 360°$. About 130 stars with the galactic latitude $\leq 5°$ and $30° — l — 45°$ were selected and observed from the Warner & Swasey/

Hamburg Catalogue of OB± stars. In Aguila (19^h, $+5^\circ$) he observed more than 300 O to F stars brighter than B = 14th mag.

Materne reports that he studied the polarization of starlight in five colours for 14 highly-reddened stars of different spectral type and for 7 stars of different types with emission lines. Preliminary reductions have been carried out. More observations are needed for the project.

Metz reports that in continuation of his earlier-started check for elliptical polarization in reflection nebulae he determined at La Silla the full Stokes vector (I, Q, U, V) of 14 standard stars, 25 stars in the Orion nebula, 20 areas in the Orion nebula (including O'Dells 5 areas) and 1 Seyfert Galaxy (3 C 120). The measurements were done as far as possible in B and V and without filters and included a determination of the Muellermatrix of the mirror and a determination of the wavelength dependence of the achromatic $\lambda/4$-plate.

Galactic Clusters

Dachs reports that in his study of the peculiar stars belonging to the galactic cluster NGC 2516 he has found that the star CPD — 60°941 is an Ap (Si) star. The results of his previous analysis of the stars in NGC 2516 have been published (Astron. Astrophys. **21**, 373, 1972).

Koornneef reports that, due to adverse weather conditions, no scientific results were obtained in his programme on observations in the infrared colours K, L, M of stars in the highly-reddened cluster in Ara, found by Westerlund.

Van Rensbergen used the RV Cass spectrograph on the 1.52 m telescope to observe a number of stars in five clusters in a dispersion of 74 Ä/mm. He reports having obtained good spectra of the following number of stars in the various clusters:

NGC 2169: 13 stars, with B-magnitude between 6.85 and 11.29
NGC 2422: 20 stars, with B-magnitude between 5.58 and 10.67
NGC 2301: 13 stars, with B-magnitude between 8.17 and 11.00
NGC 2252: 2 stars, with B-magnitudes of 9.15 and 11.28, resp.
NGC 2287: 4 stars, with B-magnitude between 10.67 and 11.05.

The 52 stars observed are being reclassified and their radial velocities are being determined as well as their membership of the sub-groups of peculiar and metallic-line A stars.

High-latitude Areas

Alcaíno reports that he has completed photoelectric sequences for the following globular clusters: NGC 2298, 4372, 5286 and 6101. The limiting magnitude of the sequences is about 16.2 in visual light. For NGC 2298 the data, including photographic observations, have been reduced and analyzed. The true distance modulus of the cluster is found to be $(m\text{-}M)_0 = 15.46$. Its giant branch rises 3 magnitudes above the horizontal branch at $(B—V)_0 = 1.4$. This is characteristic of a metal-poor object.

Terzan used the ITT 4708 image tube for direct photography at the Cassegrain focus of the 1.5 m telescope. A number of globular clusters were studied for variable stars as well as for studies of the nature of the clusters.

M^{me} Andrillat, Fehrenbach and Swings continued their programme of spectrographic observations of southern planetary nebulae. A number of spectra were obtained by M^{me} Acker using the RV Cass spectrograph of the 1.52 m telescope. Some of the spectra were measured on the ESO Grant machine in Santiago. The measurements and reductions continue.

Oja carried out narrow-band and UBV photometry of southern late-type stars (stars brighter than V = 6 mag and cluster members) in order to improve the calibration of the intrinsic UBV colours and the absolute visual magnitudes as functions of the narrow-band criteria established by Häggkvist and Oja.

The E-region stars measured by the Cape observers were used as standards for the UBV photometry. When the transformation equations between the instrumental system and the UBV system were established it was found that reddened stars deviate considerably from the normal relation for B-V, whereas in V and U-B the differences were negligible.

As a result of the observations there are now UBV and narrow-band photometry available for all the southern late-type stars with V less than 6.05 and B-V greater than 0.56. The final improvement of the calibrations of intrinsic colours and absolute magnitudes will not be attempted until all corresponding northern stars have been observed.

Erikson used the 1 m and 50 cm ESO telescopes for photoelectric observations of stars down to a limiting magnitude of V = 17.4 in a region near the South Galactic Pole. 489 stars were observed, of which 403 were measured twice. Stars in the E regions 1, 2, 3, 4, 8 and 9 were used as primary standards.

The reductions are now being carried out.

The Magellanic Clouds

Azzopardi used the GPO astrograph to study three fields in the direction of the Small Magellanic Cloud. He obtained 12 plates of long exposure, using an interference filter centered on 4370 Å with a pass-band of 270 Å, and reached a limiting magnitude of 14.5 (6-hour exposure and widening of 150 μ). A large number of OB stars have been identified as members of the Small Magellanic Cloud. Microphotometer tracings will be used to study the spectra in more detail.

Also using the GPO astrograph, Burnage obtained a number of plates of regions in the Large Magellanic Cloud as well as of a number of galactic fields.

Bernard continued the programme initiated by Bigay in 1971, using the Bochum telescope for UBV photometry of the integrated light of about 80 clusters in the Large Magellanic Cloud. Most of the clusters were observed with a single diaphragm, all of them at least three times. Six characteristic clusters, three globular and three open, were observed through six diaphragms with diameters between 8″ and 72″ of arc. For about 30 of the clusters, with integrated magnitudes smaller

than 11.6, uvby photometry was added to the UBV measurements. This material will be used for the study of the ages of the clusters as well as for examining the relation between colour and metallicity. The UBV photometry is expected to give the reddening of the clusters; as intrinsic colours those derived for open clusters in the Galaxy will be used.

Using the Chilicass and the Boller & Chivens spectrographs at the Cassegrain focus of the 1.52 m telescope, Dachs obtained a number of spectra of supergiants and emission nebulae in the Wing of the Small Magellanic Cloud and of supergiants in the triple association NGC 1869—71—73 in the Large Cloud.

M[lle] Divan, M[lle] Burnichon and Chalonge continued the programme of determining the interstellar reddening and the absolute magnitudes of stars in the Large Magellanic Cloud by classifying them in the λ_1, D system. 17 stars in the Large Magellanic Cloud were observed, all brighter than V = 11.4. 12 spectra of five different stars in the Small Magellanic Cloud were obtained as well as spectra of a selected galactic supergiant and its faint component. This supergiant is likely to be similar to those in the Large Magellanic Cloud. Its component will permit the determination of the interstellar reddening and the absolute magnitude of the galactic supergiant. The analysis of the spectra has only begun; it is of interest to note here that one of the stars, Radcliffe 45, appears from the λ_1, D measurements to have a later spectral type than the type AOIa previously given.

M[lle] Martin reports that her observations with the GPO astrograph formed a continuation of her work on the Large Magellanic Cloud, which began in 1971 and for which results were published in Astron. Astrophys. **21**, 329 (1972).

Mianes used his automatic photoelectric photometer on the 1 m telescope to observe in six colours about a dozen yellow supergiants in the Large Magellanic Cloud. This programme forms part of a study to determine luminosity criteria and the chemical composition of the stars.

M[me] Rousseau reports that she has observed in the UBV system, using the Bochum telescope and the ESO 50 cm telescope, about 200 OB stars in the Large Magellanic Cloud from those found by M[lle] Martin. About 100 of these stars are of spectral type B1-B0; they are all of magnitudes between V = 13 and 14. About 50 of the stars are of a more advanced type B. Five of the objects were found to be non-stellar and are probably blue clusters. Two OB associations or open clusters were identified.

Schmidt continued the polarization measurements within the Magellanic system and added, in October—November, 192 stars to the list. 180 of these stars are galactic foreground stars. The analysis is under way.

Vigneau carried out UBV photometry of 70 stars in the direction of the Small Magellanic Cloud in order to establish if the stars are members of the Cloud.

External Galaxies

Alcaíno has observed the following galaxies on the average three times, using a 21″ of arc diaphragm: NGC 1433, 1515, 1549, 1553, 1566, 1617, 1672, 1947, 2442, 2997, 3256, 4594, 4976, 5102, 5236, 5253, 6221 and IC 4662.

De Boer and van Albada report on their uvby H β photometry of RR Lyrae stars that a complete coverage of the cycle was obtained for 4 of the 6 programmed stars. The ESO pulse-counting data system was used. The photometric accuracy is approximately 0.01 in all colour indices including H β, based on 30″ integration time per filter.

Elst observed during a period of 20 days the following variable stars with the ESO 50 cm telescope: BS Aqr, SX Phe and AI Vel. In BS Aqr he found a beat wave with a period of $0^d.3885$ and an amplitude of $0^d.025$ magnitudes. In SX Phe a second beat period of 21 days was found, and in AI Vel a second beat period of about 11 days is suspected.

Gahm reports that his team, consisting of Gahm, Nordh, Olofsson and Carlborg, used the ESO 1.52 m with the coudé spectrograph, the 1 m and the 50 cm telescopes for simultaneous spectrographic and photoelectric observations of T-Tauri stars. RU Lupi was followed with the three telescopes over the whole observational period of 11 nights in order to map the relationship between variations occurring in different wavelength regions as well as in the structure and intensity of various emission lines. Two significant "flares" were covered on top of the slow irregular changes that are always taking place on the star.

The Be stars π Aqr and β Psc also were followed simultaneously with the three telescopes during several nights. A preliminary analysis indicates that the excess UV- and IR-radiation that is present is due to free-free and bound-free emission from an envelope at 14000° K. It is also established that this excess radiation has changed considerably since H. L. Johnson's 13-colour measurements in 1967.

A number of coudé spectrograms were also taken at 3 Å/mm of α Sco A and at 12 Å/mm of other late-type supergiants. The velocity structure and its variations in the atmosphere of α Sco A is being investigated by Ahlin, and abundance considerations, with particular emphasis on the s-process elements, are being performed by Hultqvist.

Herczeg continued his observations of HV 2241 in the Large Magellanic Cloud during 10 nights in January 1972 using UBV filters. Altogether, during 1971 and 1972, 471 observations were secured. Both minima are reasonably well defined now. An analysis of the light curve is in progress and is expected to be finished before August 1973. Small transient irregularities of the light curve are real; however, this type of activity is much less conspicuous than it is for instance in the case of β Lyrae, but otherwise not too dissimilar to HV 2241. The question whether one of the reference stars is slightly variable still cannot be answered definitely, in spite of 42 three-colour comparisons between them; but it appears rather unlikely. The scatter of the magnitude difference in V is ±0.02 and it seems now probable that only the much higher uncertainty of the B measurements was responsible for the suspected variations.

The B light curve is considerably less accurate than the U or V curves. This is a purely observational effect, possibly due to incorrect planning of the measurements.

Imbert continued the observations of eclipsing binaries begun in 1971. In particular he concentrated on the six stars which he found in 1971 to present doubling

of lines. These cases, only, are suitable for determinations of the masses and radii of the components. The 56 spectra obtained with camera 1 of the coudé spectrograph have been measured and the radial velocities determined. The determination of the orbital elements and the physical parameters is under way.

Koester used the Bochum telescope on La Silla during October to carry out UBV observations of 30 Mira variables near maximum light. The observations are reduced but the final interpretation, especially concerning a possible delay on maximum light between U, B, and V, remains to be done.

Kwee began a programme on Population II Cepheids with periods between one and three days. Due to the rather unfavourable weather conditions during the winter in 1972 the programme was only completed to 22 percent. Nevertheless, important information for the continuation of the programme was derived. It is of interest to note that Kwee found that the brightness of the sky measured through a diaphragm of 11″ of arc at full moon and about 50° from the full moon corresponds to an ultraviolet magnitude of 12.5. On dark nights the sky brightness in U with a diaphragm of 15″.5 of arc is about 16 mag.

Schneider and Marchal report on their combined photometric-spectrographic programme on cepheids that the following data were obtained for the five cepheids on the programme: the 2 bright cepheids η Aql and χ Pav; 2 cluster cepheids, S Nor and U Sgr; and one cepheid suspected for duplicity, AX Cir.

With the 50 cm telescope 385 observations in the UBV system were carried out; of those 132 referred to the five cepheids, 128 to comparison stars, 42 to other stars in the clusters, and 83 to photometric standards.

With the coudé spectrograph 31 spectra were obtained with a dispersion of 3.2 Å/mm and 53 spectra with a dispersion of 12.2 Å/mm. They cover well the cycles of the cepheids. The measurements of radial velocities of all the spectra were carried out with the Grant machine in the ESO Headquarters in Santiago and with the one at the Yale Observatory, with an Asco record machine borrowed at the Observatoire de Nice and with a Ferranti machine in Haute-Provence.

The analysis of the spectra has begun. For some multiple spectra it is necessary to use a digitized microphotometer to carry out a study of the differential effects of acceleration on different optical depths.

One part of the study aims at determining the corrections for blanketing from analysis of an ultraviolet spectrum in high dispersion.

The asymmetries of some iron lines during the cycles of the cepheids are being analyzed, as well as the inversion effects in the H and K lines.

The aim of the total programme is the determination of the masses of the stars, the analysis of methods for determinations of the radii of the stars and of the quasi-static interpretations of atmospheres, as well as the test of models of evolution and pulsation of these stars. For this, observations of other stars have been carried out at Observatoire de Haute-Provence which also include infrared spectroscopy, absolute measurements and electronographic studies of nebulosities.

Sherwood has carried out UBV and uvby observations of 20 RCB stars in our Galaxy south of declination $+30^\circ$ and of 4 RCB stars in the Magellanic Clouds in order to determine their periods and low amplitude pulsations. The observations were done with the Bochum telescope.

Vogt has undertaken a study of cataclysmic variables, particularly dwarf novae. He observed VW Hyi in which he had found a periodic variation of 1^h48^m during the minimum phase previously. Unfortunately, the star appeared to have one of its rare "supermaxima" lasting throughout the whole observing period. However, during this maximum phase Vogt also observed light variations which seemed to be similar to those he had previously seen at minimum light.

Vogt also observed RR Pic in order to confirm the 3.5-hour period previously found in this old nova by other observers. Four complete cycles were observed on different nights. In BV Pup and BX Pup he observed rapid light variations. However, there is not yet any clear evidence of periodic features in the light curves. The two stars were observed mainly in integral light because of their faintness.

Finally, SY For was observed. Hoffmeister's classification of it as a U-Gem star appears to be wrong. Its colours correspond to those of an M star and Vogt suggests that it may be a flare star. No short time variations could be detected during his observations.

In order to investigate problems of gas streams in semidetached binary systems Walter undertook a photometric study of the eclipsing binaries RW Ara, XZ Sgr, V 505 Sgr, X Gru in four colours U, B, V, and 3900—4000 Å using the 50 cm ESO photometric telescope. Due to the poor weather conditions during the winter of 1972, only 482 measurements were obtained. This is too few for the intended investigation and the continuation will be done in 1973. X Gru gave a surprising result: its partial primary minimum has an amplitude of 4.8 mag in B, which makes it the Algol system with the largest known amplitude. The amplitude, based on photographic measurements, had previously been given as only 2.2.

M^{me} Gerbaldi carried out observations on two programmes:

1. For a study of stars of advanced types G and K on the programme of M^{me} Cayrel and M^{lle} Morguleff.
2. For a study of normal stars of type A as well as of those with metallic lines or peculiar spectra.

The photoelectric observations were carried out with the 1 m telescope in the VRI system.

The spectrographic programme was carried out with the coudé spectrograph of the 1.52 m telescope. The spectral plates obtained cover the region from ultraviolet to infrared, that is from 3600 Å to about 8500 Å. The plates were measured in the ESO Grant machine in Santiago, and densities as function of the wavelengths were obtained on magnetic tape. The transfer of density to intensity is now being done on the IBM 360 computer of INAG at Observatoire de Meudon.

Table 5

Visitors using the 1.52 m telescope from Jan. 1, 1972, to Dec. 31, 1972

Observer	Observatory	Period	Hours	Programme and equipment
Louise	Haute-Provence	Jan. 17—25	52	Special stars in LMC — coudé
M[lle] Burnichon	Paris	Jan. 6—11	44	Spectrophotometry of stars in LMC, SMC LMC Supergiant — "Spectro Chalonge"
Groth	Munich	Jan. 25—Feb. 1 Feb. 28—March 7	146	A and F type supergiants — coudé
Swings (J. P.)	Liège	Feb. 1—11	78	Spectrophotometry of HD 45677 — coudé
Gerbaldi	Paris	Feb. 11—17	50	A-type and metallic line stars — coudé
Deharveng	Marseilles	March 14—23	105	H II Regions — Marseilles interferometer
Sinnerstad	Stockholm	March 29—Apr. 6	86	Spectrophotometry of 75 bright B2 — B5 stars — coudé
Vogt	Bochum	Apr. 6—8	22	Supergiants and bright giants in open clusters (programme Dr. Moffat) — RV Cass
Terzan	Lyon	Apr. 14—20	43	NGC 4590 — Terzan 1, 2, 5, 7 — Zeiss camera image tube
De Boer	Groningen	Apr. 25—29	45	Far-UV spectroscopy for interstellar lines — coudé
Kaufmann	Berlin	Apr. 29—May 9	21 65	Hydrogen-poor stars — coudé Early type stars with abundance anomalies — coudé
Lyngå	Lund	May 15—23	73	Radial velocity and luminosity of stars in Southern Milky Way — RV Cass
Miss Underhill	Greenbelt (NASA)	May 26—June 5	110	a Cen; He-weak stars and early-type supergiants — coudé

Observer	Observatory	Period	Hours	Programme and equipment
Gahm	Stockholm	June 12—23	103	T Tauri stars, M-type supergiants — coudé
Schneider Marchal	Nice	July 3—14	112	High-dispersion obs. of bright Cepheids — coudé
Weiss	Vienna	July 21—Aug. 1	103	Zeeman spectroscopy of Ap stars — coudé with Zeeman analyzer
M^{me} Acker	Strasbourg	Aug. 4—9 Aug. 15—21	48	Planetary Nebulae — RV Cass
Imbert	Marseilles	Aug. 21—25 Sept. 1—14	115	Double stars and eclipsing variables — coudé
Dachs	Bochum	Oct. 1—10	53	Supergiants and Nebulae in the Wing of the SMC and LMC — RV Cass
			29	Same programme — Boller & Chivens
Da Silva	Paris	Oct. 16—30	111	Abnormal-abundance dF and dG stars — coudé
Dubois	Strasbourg	Nov. 7—17	59	Galactic and SMC supergiants — RV Cass
M^{lle} Divan M^{lle} Burnichon Chalonge	Paris	Nov. 24—Dec. 6	108	Supergiants in LMC and SMC — Special Cass. Spectrograph
Van Rensbergen	Brussels	Dec. 12—22	86	Ap stars — RV Cass
M^{me} Chériguène M^{me} Deharveng	Marseilles	Dec. 28—31	33	Fabry-Perot interferometry of H II regions — Own interferometer

Table 6

Visitors using the 1 m telescope from Jan. 1, 1972, to Dec. 31, 1972

Observer	Observatory	Period	Hours	Programme and equipment
Mianes	Lyon	Jan. 3—6 Jan. 11—17 Jan. 25—Febr. 1	22	Supergiants in LMC and Galaxy — ESO photometer
Herczeg	Hamburg	Jan. 6—11 Jan. 20—25	64	HV 2241 in LMC — ESO photometer
M^{me} Gerbaldi	Paris	Feb. 21—March 2	85	A-type and G-K type stars — ESO photometer and RCA 7103
Alcaíno	Santiago	March 10—15	53	UBV photometry of galaxies and globular clusters — ESO photometer
Lub	Amsterdam	March 21—Apr. 3	133	R, I photometry of M giants in Car and Vel — ESO photometer + ITT FW 118
De Boer	Groningen	Apr. 13—25	62	uvby and H β of 6 RR Lyr variables — ESO photometer and GPDAS
Oja	Uppsala	May 1—6	38	UBV and narrow-band photometry of stars in galactic clusters — Pulse counting — GPDAS
Lyngå	Lund	May 6—13	58	Various UBV and IR photometry — Pulse counting — GPDAS
Olofsson	Stockholm	June 12—23	74	T Tauri stars; various colours — ESO photometer ITT tube

Observer	Observatory	Period	Hours	Programme and equipment
Materne	Hamburg	June 23—July 3 July 10—14	91	Colour dependence of stellar polarization — Polarimeter
Kwee	Leiden	July 14—26 Aug. 1—9	94	UBV photometry of 17 Population II cepheids with periods between 1—3 days — ESO photometer and GPDAS
Schröder	Hamburg	Aug. 11—18 Aug. 28—Sept. 4	50	Galactic Bulge Programme; UBV — ESO photometer and GPDAS
Koornneef	Roden	Aug. 18—28	35	K, L and M photometry of highly-reddened cluster in Ara — KLM photometer
Vigneau	Toulouse	Sept. 4—6 Sept. 16—20	12	UBV photometry in SMC — ESO photometer
Erikson	Uppsala	Oct. 5—13 Nov. 3—7	42 38	UBV around South Galactic Pole — ESO photometer
Schmidt	Heidelberg	Oct. 20—Nov. 1 Nov. 1—12	92 45	Polarization measurements of stars in the SMC and LMC — Polarimeter
Metz	Munich	Nov. 17—Dec. 4	116	Polarimetry in Orion Nebula and reflection nebulae — Polarimeter
Vogt	Bochum	Dec. 8—22	98	Cataclysmic variables — ESO photometer
Karlsson	Lund	Dec. 29—31	25	UBV of B-type stars ($225° < l < 270°$) — ESO photometer

Table 7

Visitors using the ESO 50 cm telescope from Jan. 1, 1972, to Dec. 31, 1972

Observer	Observatory	Period	Hours	Programme and equipment
Sinnerstad	Stockholm	March 19—29	106	Hβ, Hγ, He I 4472 and ubvy photometry of 75 B2 — B5 stars — Roden photometer
Oyen	Louvain	Apr. 10—28	109	Early type stars in Cir for galactic structure — Roden photometer
Oja Lyngå	Lund Uppsala	Apr. 29—30	19	UBV photometry — Roden photometer
Oja	Uppsala	May 6—13 May 19—29	89	UBV and narrow-band photometry of bright late-type stars and in galactic clusters — Roden 4711
Lyngå	Lund	May 1—6 May 13—15	54	UBV, Hβ photometry of various objects — Roden 4711
Nordh	Stockholm	June 12—23	75	T Tauri stars — Roden 4711
Schneider Marchal	Nice	June 28—July 16	102	UBV of Cepheids — Roden 4711
Walter	Tübingen	July 26—Aug. 11 Aug. 15—29	17 33	Algol systems — Roden 4711 Variable stars — Roden 4711
Vigneau	Toulouse	Aug. 31—Sept. 4 Sept. 7—16	70	SMC stars in UBV — Roden 4711
Erikson	Uppsala	Oct. 15—31 Nov. 1—3	90 19	UBV at South galactic pole — Roden 4711

Observer	Observatory	Period	Hours	Programme and equipment
Elst	Uccle	Nov. 3—30	142	RR Lyrae stars: SX Phe, BS Aqr, AI Vel — Roden 4711
M^{me} Rousseau	Lyon	Dec. 1—8	36	Detection of bluest stars in LMC — Roden 4711
Karlsson	Lund	Dec. 14—29	107	UBV of B-type stars ($225° < l < 270°$). For Wramdemark: UBV, Hβ of OB stars Roden 4711

Table 8

Visitors using the Objective Prism Astrograph from Jan. 1, 1972, to Dec. 31, 1972

Observer	Observatory	Period	Hours	Programme
Burnage	Haute-Provence	Jan. 5—17	48	LMC fields
		Febr. 3—18	50	Programme for Carozzi, Duflot and Fehrenbach
		Oct. 25—Nov. 16	55	Fehrenbach programme on LMC with and without filter (Radial velocities in LMC)
Terzan	Lyon	Apr. 7—20	4	Programme of M^{lle} Laval (Sco OB 1)
Azzopardi	Toulouse	Oct. 25—Nov. 16	55	Spectrophotometry and spectral classification in SMC
M^{lle} Martin	Marseilles	Nov. 26—Dec. 15	92	Detection and classification of O stars in the LMC
M^{me} Amieux	Nice	Dec. 24—31	43	Radial velocities in the LMC

Table 9

Visitors using the Bochum 61 cm telescope from Jan. 1, 1972, to Dec. 31, 1972

Observer	Observatory	Period	Hours	Programme and equipment
Sherwood	Bochum	June 12—23	24	R CrB and UBV uvby survey of Southern Sky — Bochum photometer
Koester	Kiel	Oct. 1—Nov. 1	163	UBV of Mira variables — Bochum photometer
M^{me} Rousseau	Lyon	Nov. 15—25	70	UBV of O stars in the LMC
		Dec. 8—15	22	UBV of the bluest stars in the LMC
Bernard	Lyon	Dec. 1—8	146	UBV and uvby of LMC clusters; UBV of stars from Sanduleak's list

Groth reports that he obtained a large number of coudé spectra in 12 Å/mm of the A-type supergiant HD 92207. A study of the variation of line intensities and radial velocities has begun. Furthermore Groth obtained high dispersion spectra (3.3 Ä/mm) of α Car and β Ori for the spectral region 3300—7700 Å.

Kaufmann reports that in continuation of the programme on Helium-rich stars, reported by Hunger in 1971, he obtained spectra at a dispersion of 20 Ä/mm of the extreme Helium stars BD-9° 4395, HD 168476, and of the intermediate He-stars CPD-46° 3093, HDE 260858, BD-7° 3007, and CoD-37° 9248. For investigations of non-LTE-effects in rather hot and/or over-luminous stars 4—5 spectra of the following stars were obtained: HD 128220 B, HD 48279, HD 96248, HD 66194, HD 119159. The four latter stars also show N-anomalies. Five spectra in 12 Ä/mm were taken of HD 131120, HD 142301 and HD 144334 for detection of possible He-variations. There may be variations in HD 142301.

The A2V star HD 126983 was not found to show He-lines, as suggested by Hiltner. It is a spectroscopic binary and as its period is about 11 days the observations during 10 days were sufficient to determine the spectroscopic orbit, which will be published soon. The work on stars with abundance anomalies is in progress; especially advanced is the work on BD-9°4395.

Louise observed during seven nights with the coudé spectrograph of the 1.52 m telescope supergiants in the Large Magellanic Cloud, mainly of type P Cygni and F.

About 15 spectra in medium and high dispersion were obtained. The analysis is under way. The study concerns (1) the profiles of the emission lines in order to determine the physical parameters of the envelope and (2) the radial velocities of the various elements.

Da Silva continued his spectrographic programme from previous years. He used camera 3 of the coudé spectrograph to obtain 28 spectra and camera 2 to obtain equally 28 spectra of various stars. The observations of four stars (ζ^1 Ret, ζ^2 Ret, α For and HR 1008) are now completed and are being analyzed.

In a programme aiming at an analysis of the influence of temperature, gravity and rotation on main sequence early B-type stars, Sinnerstad carried out photometric and spectrographic observations of 75 bright stars using the ESO 50 cm telescope and the coudé spectrograph of the 1.52 m telescope. The photoelectric observations were made in the uvby system with additional filters to give the strength of H β, H γ, and the He-line 4471. The internal mean error of one observation as derived from observations in different nights is ±0.006 mag. The β indices were reduced to the Crawford system, and show, together with b-y, c_1, and m_1, good agreement with the measurements by Crawford, Barnes and Golson for the stars in common.

For the spectrographic part of the programme Sinnerstad obtained 210 spectra with a dispersion of 12.4 Å/mm and 25 spectra of the 17 brightest stars with a dispersion of 3.3 Ä/mm. Most of these spectra were recorded on magnetic tape by means of the Grant machine at the ESO Headquarters in Santiago and are now being reduced with the IBM 360/75 computer at Stockholms Datamaskincentral.

J. P. Swings obtained a large number of plates of the 8.5 mag, peculiar Be star HD 45677 at 3, 10 and 20 Å/mm. The high dispersion plate (a 3-night exposure) shows a splitting of the emission lines of Fe II, whereas the forbidden lines remain sharp and single. A tentative interpretation is that the Fe II lines originate in an equatorial ring seen roughly edge-on. A 10 Å/mm plate in the ultraviolet (6-hours exposure) shows that the permitted lines of Cr II, Mn II, Ti II have a deep central absorption that appears to be of the shell-type. From the series of spectra at 10 and 20 Å/mm in the blue region Swings found variations of the profiles of H γ and H δ not only from night to night but also during one night on a time scale of a couple of hours. During that time the radial velocities of emission lines of Fe II [Fe II], [S II] do not vary at all.

A spectrum of η Carinae, at 10 Å/mm, in the blue was obtained to serve as a comparison with a plate taken of MWC 645 by Swings in a joint investigation with Allen, Neugebauer and Becklin. The two objects appear to be rather similar as far as the emission line profiles are concerned, and also with regard to the infrared excess.

During her observing period at La Silla in 1972 Miss Underhill concentrated on HD 125823 a Centauri. She obtained 41 spectrograms of the star with camera 3 and 26 spectrograms with camera 2 of the coudé spectrograph on the 1.52 m telescope. 16 spectrograms were obtained of other stars. Most of the spectrograms of a Centauri have been measured for radial velocity and the spectra are now being traced with a microdensitometer. The radial velocity shown by the He I lines, particularly the singlets, varies in the 8.814 day period of the spectral variations. The lines of N II and Si II and III vary in antiphase. The radial velocity results are consistent with the star being a binary of small range. However, the considerable range in the radial velocity results for one night casts some doubt on the reality of binary motion. Anomalous broad, shallow lines of Fe I appear in the spectrum between phases 0.9 and 0.22.

Using a Zeeman analyser on the coudé spectrograph of the 1.52 m telescope, Weiss looked for new magnetic stars mostly with camera 2. He observed a number of stars to confirm or to find new magnetic field variations, using camera 3. All stars were of Ap type. A total number of 27 spectra were taken with camera 3 and 29 with camera 2. During part of the time the spectroscopic observations were synchronized with photoelectric observations of the same stars with the 50 cm telescope by ESO staff astronomer John Wood. The spectra are now being measured with the new computer-controlled microdensitometer PDS 1000 of the Figl Observatory for Astrophysics in Vienna.

Research by ESO Staff

Much of the work described in the Annual Report for 1971 has been continued during 1972. Several investigations have been completed and the results are being prepared or have already been submitted for publication.

Galactic Structure

Havlen has continued his work in Puppis. He has selected OB stars surrounding the possible OB association Pup OB3 from the Cleveland Southern Luminous Stars Catalogue. UBV photometry for these new candidates (20 stars) is now

complete. Hβ photometry will be completed this year. With these data and supplementary Hβ data on the original suspected members of the association discovered by Westerlund the OB star distribution will be analyzed in more detail. The present Hβ results show the existence of two OB star groupings. The long-period galactic cepheid RS Puppis is at the same distance as one of the groups.

In the general area of Puppis OB1 and OB2, previously analyzed, there are several galactic clusters which are in need of improved and extended photometry. Havlen has completed Hβ photometry on NGC 2467. Very little grouping in distance is noted.

Havlen has also initiated UBV and Hβ photometry on NGC 2483 which lies in the center of Pup OB2. Connection with the association is being investigated. Similar photometry is also planned for NGC 2533 since the 14-day period galactic cepheid BN Pup is a neighbouring cepheid which could be physically related to the cluster.

The Cleveland Southern Luminous Stars Catalogue has shown that a large number of previously unobserved OB stars exist between Pup OB2 and OB3. Havlen has started Hβ and UBV observations of these stars as a logical extension of his previous investigations. These stars are well isolated from the other associations and could form one themselves.

Ardeberg, Maurice and Rickard have continued their investigation of the region of IC 2944 — a key region for the understanding of the streaming motions in the Carina arm.

In addition to previously-reported data, the spectroscopy is now complete to B = 12.3. The analysis of the interstellar K line shows that it has two components separated by approximately 12 km/s. The strength of the more negative component increases toward the center of the H II region and is thought to be spatially associated. The other component is caused by foreground gas.

The Hα line shows no significant velocity variations with position within the H II region. However, the width of the line indicates the presence of internal turbulence, the exact amount of which depends upon assumed electron temperature.

Garnier and Westerlund have continued the investigation of the OB and Hα emission line stars in the S. Coalsack region. The UBV photometry is complete. Sterken and Lelièvre participated in this work. The previously-reported extremely uneven foreground absorption is confirmed. A large number of the emission line stars are variable and observation of them will continue. In addition, Hβ photometry and radial velocity determinations for the OB stars will be undertaken.

Garnier has carried out UBV photometry of stars in and near the very reddened cluster in Norma ($16^h\ 10^m$ $-51^\circ\ 45'$), found by Westerlund. The reddening appears to be somewhat higher than was previously measured photographically. Hβ photometry will be added to the extent possible for these rather faint stars.

Havlen has completed the Hβ photometry for all the stars investigated by Whiteoak in Ara near $l = 337^\circ$. UBV and Hβ photometry has been completed, in

addition, for all OB stars in the same region selected from the Cleveland Catalogue. Analysis of the data is underway. The majority of the 150 stars are located between 1 and 2 kpc from the sun. However, isolated groups can be delineated at $l = 336°5$ and at $l = 338°5$. The distant stars at 2800 pc seen by Whiteoak predominate in the latter grouping.

The galactic cluster NGC 6193 is the nucleus of the Ara OB star grouping at $l = 336°5$. The present data consist of radial velocity spectra for nearly all of the bright B stars of the cluster and UBV plates taken by Westerlund at Mt. Stromlo. Velocity measures are still underway. Photographic reductions are proceeding at the same time using additional faint photoelectric standards (to $V = 15$) obtained by Havlen at La Silla. The cluster is especially interesting because of its apparent intimate relationship with the surrounding dust and obscuring regions and perhaps with the Of star HD 148937. Coudé spectra of the latter are being analyzed by Westerlund and Sterken.

Sterken, Manfroid, Lelièvre and Muratorio have continued the uvby Hβ photometry of the recently identified supergiants of types O — G2. The programme was initiated in 1971 by Westerlund and Garnier.

Rickard's study of the interstellar CaII K-lines has resulted in the discovery of large turbulent motions in the gas in the Sagittarius spiral arm. In addition, the cloud of cold ($T \simeq 25°$ K) neutral hydrogen examined at 21-cm by Riegel and Crutcher has been found to be correlated with the strongest K-line in most stars in the direction of the galactic center. The line profiles have been scanned with the Grant Machine and converted to intensities. These profiles will be published along with the analysis.

Rickard has also traced the line profiles of H α in emission with the Fabry-Perot scanner in 15 of the 28 planetary nebulae recorded. In addition, NGS 6164/65 has been examined in greater detail with interference filter photographs taken with the image tube.

In the South Galactic Pole (SGP) region F. Spite has obtained spectra for radial velocity determinations of a number of stars for which Grenon, Observatoire de Genève, is carrying out photometry in the Geneva 7-colour system.

Havlen has completed uvby photometry for 35 stars in one square degree near the SGP and supplemented it with Hβ photometry. As previously reported, radial velocity spectra are available for all stars in the area brighter than $V = 12$. The aim of the programme is a statistically complete survey to separate Population I, Population II, subdwarfs and metallic line stars out to a greater distance from the galactic plane.

The observations of stars in the ζ Sculptoris cluster region in the UBV and uvby systems have been continued by Garnier, Manfroid, Lelièvre and Muratorio. The aim is to find possible faint cluster members for further investigation as well as to compare quantities in the two systems in a region of rather low interstellar reddening.

The observations for the checking of the zero-points of the E regions have now been completed by Ardeberg and Garnier and the reductions are almost finished.

A programme to obtain spectra of standard stars with the RV Cass spectrograph has been undertaken by Maurice. The programme contains 150 stars of luminosity classes I and II from O5 to M2; for spectral types O9 to BO5 are also included classes III to V. Up to now 37 stars have been observed.

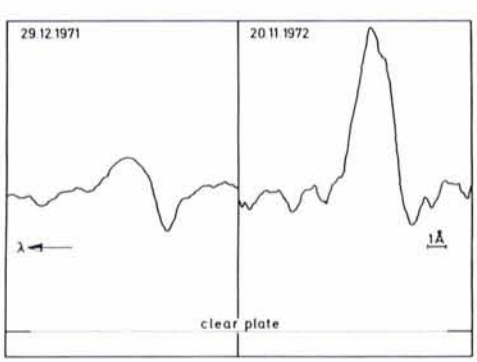
Ardeberg has studied with Virdefors at the Astronomical Institute, Lund, a method for absolute calibration of objective-prism plates suitable for computer reduction (cf. "Publications by ESO Staff", p. 40). Use is made of available information on absolute and relative continuum energy distribution of standard stars within the field of the photographic plate. Both monochromatic magnitudes and absolute gradients in international systems can be directly obtained from the objective-prism plates. A computer programme is discussed and a programme outline is presented.

Blaauw and West continued the photometric and kinematic study of stars in the McCormick fields around the north and south galactic poles, in collaboration with the McCormick Observatory. Special attention was given to the F-type stars.

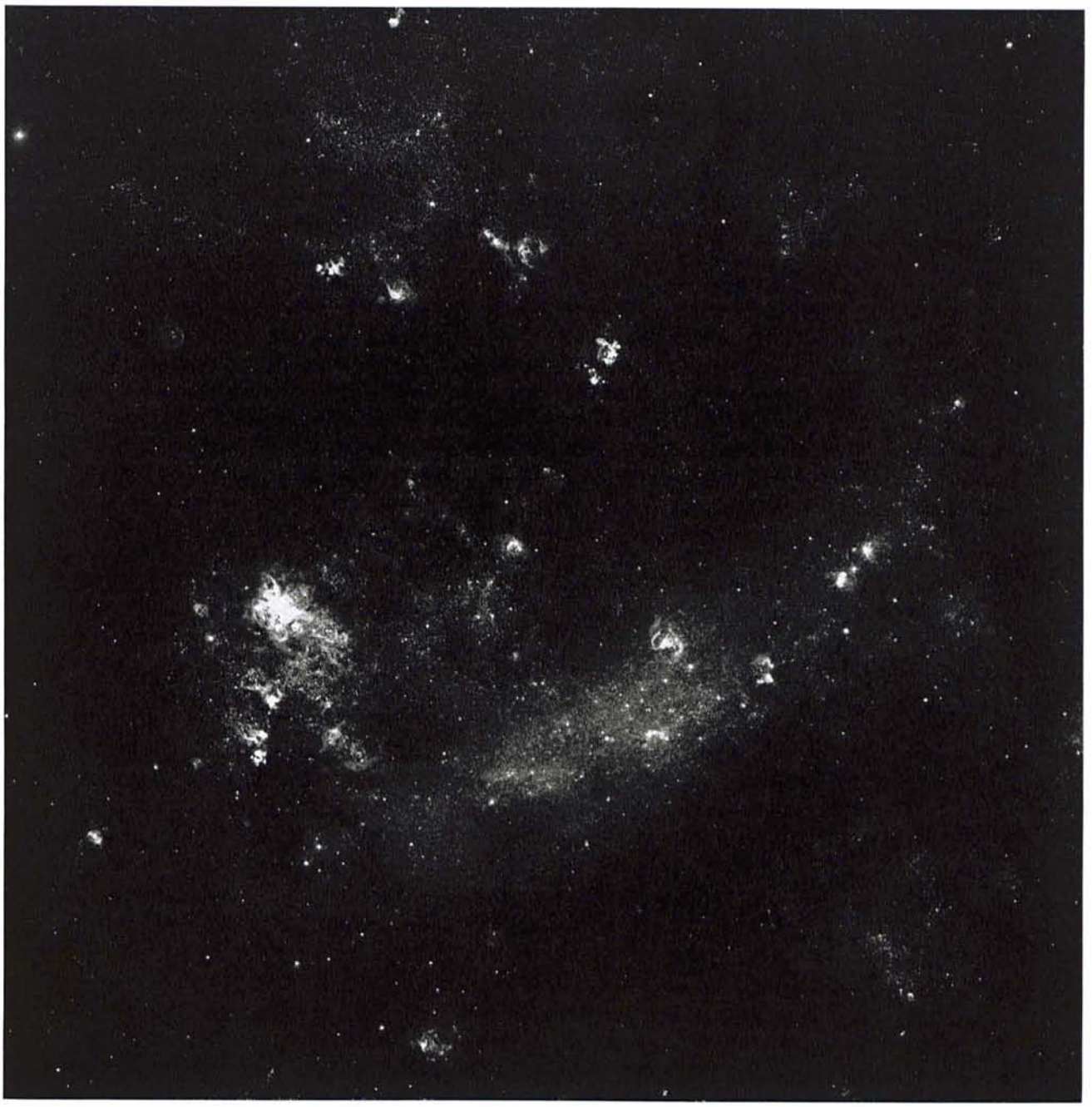
The Magellanic Clouds

As a counterpart of the work in the LMC by Ardeberg *et al* (cf. "Publications by ESO Staff", p. 40) Ardeberg and Maurice have made a similar study of the brightest stars in the SMC. Photoelectric UBV photometry has been obtained as well as Cassegrain spectra for about 50 stars, mainly from Sanduleak's lists.

In the majority of the cases only one spectrum per star has been taken, whereas most stars have been observed three times photoelectrically. For some stars only photometric data are available. The limiting magnitude of the photometry is about B = 13, for the spectroscopy about B = 12.3. The spectral classification and measurements of radial velocities are in progress. The reduction of the photometric measurements is practically finished.



In the picture on the left the position of the extreme A-supergiant HD 7583 in the Wing of the Small Magellanic Cloud is indicated by an arrow. HD 7583 is the brightest star of the Small Magellanic Cloud. The strip chart tracings on the right show the intensity variations of the red shifted Hα-emission component on two different plates, taken with a time interval of one year. This variable Hα-emission is supposed to originate in an existing chromosphere in this star, with a temperature inversion resembling that in the sun.



The Large Magellanic Cloud in ultraviolet light, photographed with the ESO Schmidt telescope.

Ardeberg, Garnier and Westerlund have continued the observations of faint stars in the Wing of the Small Cloud. The areas are selected from the survey for faint blue stars by Westerlund and Glaspey to include areas rich as well as poor in blue stars.

Ardeberg has observed ten stars in the van Wijk sequence extensively in the UBV system, using 5 E regions for standards. In V and (B-V) the results obtained are in very good agreement with previous results. However, for the (U-B) colour indices the differences are considerable. With the present data the ten stars form a very suitable local photometric standard sequence for the Large Magellanic Cloud.

Ardeberg reports also that the photoelectric observations of stars in the area of NGC 1910 in the Bar of the Large Cloud are reduced. The photographic measurements, on a plate material obtained by Westerlund at Mt. Stromlo Observatory, are under reduction.

Maurice has continued the work by Ardeberg *et al* (cf. "Publications by ESO Staff", p. 40) together with Brunet, Muratorio and Prévot at Marseilles Observatory. They have presented new photometric and spectrographic data for 47 supergiants and 40 foreground stars in the direction of the Large Magellanic Cloud. V magnitudes, (B-V) and U-B) colour indices, MK spectral types, radial velocities and remarks concerning positions, spectroscopic features, magnitudes and colours are given.

Westerlund and Garnier are studying stars in selected areas of Constellation III. This region is of particular interest as possibly being the remnant of a super-supernova explosion. Two supernova remnants have also been identified in the ring of the associations which forms its border.

De Groot is continuing his observations of the P Cygni type stars in the Cloud.

Other Galaxies

Rickard is studying the nuclear regions of bright galaxies. Image tube photographs show near-infrared sources in many of them. It is hoped that spectra may be obtained of some of them.

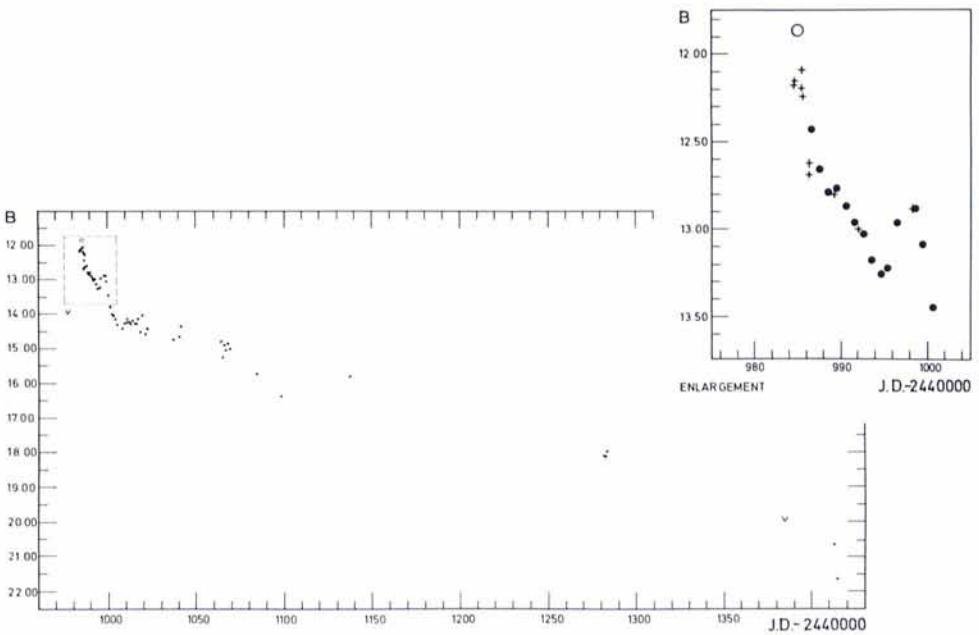
The isodensitometric studies in two colours of selected galaxies photographed by Westerlund at Mt. Stromlo Observatory have continued. For some pairs of galaxies Westerlund and Manfroid have found common envelopes as well as interactions.

Special Objects

Ardeberg and de Groot have presented the results of the photoelectric UBV photometry of Nova Doradus 1971a from observations on 51 nights during a period of 430 days (paper submitted for publication). The observations extend from just at the principal luminosity maximum, corresponding to a visual absolute magnitude of —6.9, to an apparent visual magnitude of +3.0. The light-curve parameters are deduced and discussed as well as the colour curves. Nova Doradus 1971a is found to be of a fast to moderately-fast type, with three marked maxima. It is very blue throughout its evolution.

Discussions of the radiation outburst energy and the ejection of gas are presented. Using Nova Doradus 1971a as an independent distance indicator for the Large Magellanic Cloud, a distance modulus of $18^{m}.5$ is derived.

Ardeberg and de Groot have measured and reduced the spectra of Nova Doradus 1971a for radial velocity data. Spectrophotometric measurements are in progress.



Light curve for the blue spectral region of Nova Doradus 1971 a. The data are from photoelectric photometry made with the ESO 1 m telescope. Several secondary outbursts can be seen superimposed on the general fading.

Two spectrograms of the 1972 supernova in NGC 5253 taken in Cassegrain focus with the 1.5 m telescope. The upper spectrogram is from May 17, 1972, the night after the announcement. The lower spectrogram is from August 28, 1972. The displacement of the very wide emission bands is obvious. In the upper spectrogram a sharp absorption line is faintly visible, originating from light absorption in interstellar calcium in our Galaxy.

Photometric and spectroscopic observations of the supernova in NGC 5253, in May 1972, have been obtained by Ardeberg and de Groot.

Muratorio and Westerlund are analyzing the plate material obtained of Nova Serpentis 1970 at La Silla. Muratorio has identified absorption and emission lines. The velocities of the emitted gas shells are being determined.

Ardeberg and Garnier have continued the UBV observation of the infrared object HD 45677 observed spectroscopically by J. P. Swings on La Silla in February 1972.

The star displays apparently irregular variations from day to day of around 0.02 mag. and, moreover, large time fluctuations of more than 0.10 mag.

Havlen has now obtained spectra of RS Puppis over most of the cycle of visibility of the K line emission. The analysis of the material has begun.

F. and M. Spite report that their work on metal-deficient stars, initiated at Paris Observatory, has continued. Observations of a number of objects have been obtained with the coudé spectrograph and the spectra are being analyzed. They have measured the radial velocities of the components of a new spectroscopic binary HR 7955 (discovered with Electronic Camera), with the ESO Grant machine. Discussions of these results have been submitted for publication.

M. Spite has studied the He abundance in the star 99 Her.; the paper is accepted for publication.

Sterken has obtained a number of plates of Sigma Scorpii, a Beta Can Maj star, with the coudé spectrograph and is studying them spectrophotometrically. He has also observed this star photoelectrically in order to determine very accurately its main period and to obtain more information about the period variation.

The A supergiant star HD 160529 has been observed photoelectrically by Sterken and irregular variations in its brightness have been detected.

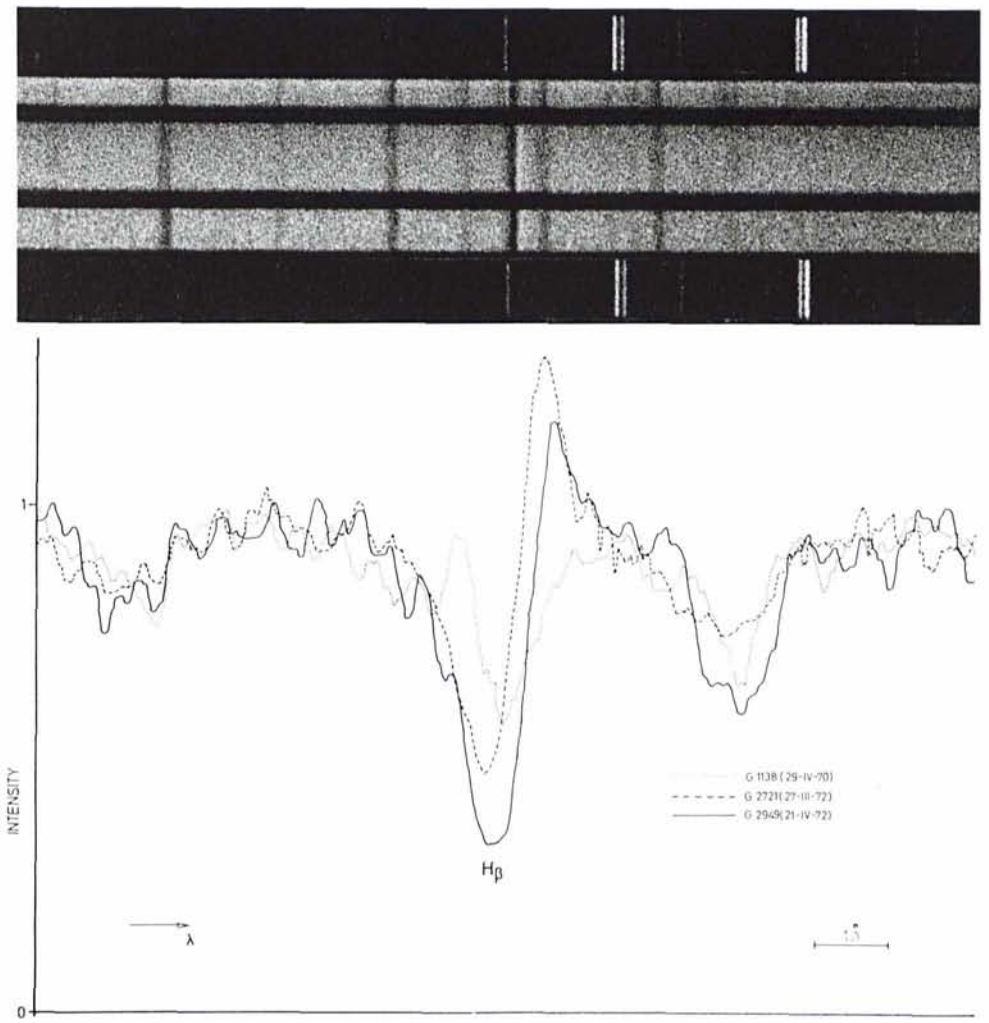
Wolf has finished the analysis of HD 33579 in the Large Magellanic Cloud (cf. "Publications by ESO Staff", p. 41). The fine analysis of HD 7583 in the Small Cloud is in progress. He has obtained high dispersion spectra (12.3 Å/mm) of the B 1.51 Ia-O supergiant R 116 in the LMC for an analysis as well as of some of the most extreme galactic A- and B-supergiants; they are supposed to be comparable in absolute brightness with the brightest supergiants in the Magellanic Clouds.

Indicators for "Chromospheres" like emission in Balmer-lines (H α, H β) and in He 5875 have been found in practically all cases of these A- and B-supergiants; in one case (HD 33579) Wolf also found an emission core in Ca II-K and C II-H.

In the survey of the southern Ap stars for stellar magnetic fields Wood has now a total of seven new magnetic stars. HR 5463 will prove to be the southern counterpart of 2CVa because it is so bright (3.2 mag.). HR 6870 was recently studied for abundances by one of Aller's students. Now, with a known magnetic field, the star becomes even more interesting. HR 2326 (Canopus) probably has a weak, spotty field. It is particularly interesting because it is the first F-type supergiant to show a field — and it does not fit on the Wilson-Bappu relation.

At the suggestion of Bappu and Brian Warner, the magnetic line intensification in the spectrum of Canopus is being studied. Thus, the small anomalous Zeeman shifts observed in the spectrum of Canopus may be confirmed as true magnetic effects.

Other stars discovered in the programme are under study for period determinations.



Evidence of the extreme character of the galactic A-supergiant star HD 160529 is supplied by the intensity and velocity variations of an emission in H β. Short- and long-term changes can be seen in the above illustration of three spectra, two of them taken only one month apart and the third obtained two years earlier. With this information it is possible to reconstruct the undisturbed H β absorption profile. The plates were taken at the coudé of the 1.52 m telescope with a dispersion of 12.3 Å/mm.

Zeeman plates were obtained in August 1972 by Wood and Weiss from Vienna Observatory. In a 10-night run, two new magnetic stars were discovered. A computer-controlled digital microdensitometer in Vienna is used for the analysis.

Wood carried out simultaneous H β and 4-colour photometry of the stars studied for magnetic fields with the Zeeman analyzer.

Joint Research with Universidad de Chile

F. Noël, Departamento de Astronomía, Universidad de Chile, Cerro Calán, reports that during the period November 1, 1971, to October 31, 1972, 216 fundamental series and 37 catalogue series were carried out with the Cerro Calán Astrolabe. A comparison of these 253 observations with the observations made during the preceding years shows an acute shortening of the number of observations due to the extremely bad weather conditions during 1972. However, the observations of catalogue groups A and B were completed during this period.

The computational work of the Astrolabe Catalogue is in progress. Two programmes for electronic computer (IBM 360) are now in operation for the computation of group corrections in time and latitude, using the method of interpolation (Archinard, Paris). The results obtained with this method show a remarkable consistence with those results obtained with the classic method of differences.

The results in latitude have been published by the International Polar Motion Service in its Monthly Notes, and those in time will be published by the "Bureau International de l'Heure" in its Annual Report for 1972.

A report concerning the progress of the Astrolabe project was sent by F. Noël to the Colloquium N° 20 "Meridian Astronomy" of the IAU, held in Copenhagen in September 1972.

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Age and Kinematic Properties; Review Paper presented at IAU Colloquium No. 17 on Stellar Ages held at Paris-Meudon Observatory, September 1972 (Ed. G. Cayrel de Strobel and A. M. Delplace), Chapter XXII.

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Etude photométrique à bande étroite de l'émission dans les étoiles Be (avec A. Peton, J. H. Bigay et G. Paturel). Astron. Astrophys., **17**, 47—54, 1972. Nouvelle contribution à l'étude du bras spiral de la Carène (avec J. H. Bigay, Y. P. Georgelin et Y. M. Georgelin). Astron. Astrophys., **18**, 301—309, 1972.

Simultaneous photometry and spectroscopy of the Ap star 108 Aqr (with C. Mégessier). Astrophys. Letters, **11**, 113—116, 1972.

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Laustsen, S., and Reiz, A. Proceedings of ESO/CERN Conference on Auxiliary Instrumentation for Large Telescopes, Geneva, May 2—5, 1972 (Editors) (with opening words by A. Blaauw and a summary by B. Strömgren. Printed in Switzerland. ESO-Telescope Project Division, CERN, Geneva. 14 + 525 pp. [1972]).

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Rickard, J. J. Calcium II K-line profiles in front of distant OB stars. Astron. Astrophys., **17**, 425—431, 1972.

Calcium II Interstellar Lines in the Southern Sky. Bull. Am. Astron. Soc., **4**, 327.

West, R. M. Automatic classification of G5-K5 stars by means of 166 Å/mm objective prism spectra (4000—4550 Å). Bulletin Abastumani Observatory, Vol. 43, pp. 109—170.

Westerlund, B. E. Meteorological observations on La Silla in 1970. ESO Bull. No. 9, 1972.

Wolf, B. Model atmosphere analysis of the A 3Ia-O Supergiant HD 33579 in the Large Magellanic Cloud. Astron. Astrophys., **20**, 275—285, 1972.

Wood, H. J. Rapid Balmer line variability in Ap stars. IAU Colloquium No. 15, pp. 176—177, 1972.

A computer-controlled digital Spectrum Scanner for La Silla. Auxiliary Instrumentation for Large Telescopes. Conference 1972, pp. 165—168, 1972.

ESO Publications

The following ESO publications were issued:

ESO Bulletin No. 9,

Annual Report 1970,

Proceedings of the ESO/CERN Conference on Auxiliary Instrumentation for Large Telescopes held in Geneva in May, 1972, (editors Laustsen and Reiz) and

Proceedings of the Conference on the Role of Schmidt Telescopes in Astronomy held in Hamburg in March, 1972, (together with the Science Research Council and the Hamburg Observatory — editor U. Haug).

These papers were sent to more than 400 astronomical institutions around the world.

Participation in Scientific Meetings

Many of the astronomical staff participated in the Conference on the Role of Schmidt Telescopes in Astronomy in Hamburg from March 21 to 23, 1972, organized by ESO, the Hamburg Observatory and the Science Research Council of the United Kingdom. The Chairman of the Organizing Committee for this conference was West. The Proceedings were published in August (editor U. Haug, Hamburg Observatory).

About ten ESO astronomers participated in the ESO/CERN Conference on Auxiliary Instrumentation for Large Telescopes in Geneva from May 2 to 5.

Manfroid and Rickard participated in the "Seminario del medio interestelar" in Buenos Aires from August 2 to 17.

Rickard participated in the AAS Meeting in East Lansing, Mich., USA, from August 13 to 18.

Blaauw and Westerlund participated in the first Regional Meeting of the International Astronomical Union held in Athens from September 4 to 9. Blaauw was Chairman of the Scientific Organizing Committee for this meeting.

De Groot participated in the IAU Symposium N° 51 on "Extended Atmospheres and Circumstellar Matter in Spectroscopic Binary Systems" in Parksville, Vancouver Island, Canada, from September 6 to 12.

Blaauw, Garnier, Manfroid, West, Westerlund and Wolf participated in IAU Symposium N° 54 on "Problems of Calibrations of Absolute Magnitudes and Temperatures of Stars" in Geneva from September 12 to 15. This symposium was originally proposed by Westerlund as President of IAU Commission 45 and he continued later as a member of the Organizing Committee.

Blaauw, Garnier, Manfroid and Wolf participated in the IAU Colloquium N° 17 on "Stellar Ages" in Meudon from September 15 to 22.

Ardeberg and de Groot participated in the "Primer Coloquio latinoamericano" on "La fotometría en la astrofísica moderna" in La Plata, Argentina, from October 16 to 17.

Lectures and Colloquia given by ESO Staff

Blaauw gave colloquia at the Ecole polytechnique fédérale of Lausanne and at Vienna Observatory, as well as a series of lectures on Galactic Structure at Groningen University.

Westerlund gave colloquia at the Observatories in Lund, Stockholm, and Uppsala during May.

West gave colloquia at the Vienna and Geneva Observatories.

Wood gave a number of popular lectures in Santiago during the year.

As a practical result of the course in spectroscopy given by Wood during 1971 the participating students from the Departments of Astronomy of the Universidad de Chile and of Universidad Católica prepared a paper "Prismatic spectrograms of southern MK stars".

Pablo Orrego of the Universidad de Chile finished his Master's thesis "Una búsqueda de variaciones en el espectro de Eta Carinae", under the direction of Havlen.

Luis Campusano of the Universidad de Chile worked as a research assistant with several staff astronomers. He began work on his Master's thesis under the direction of Wolf; the subject is an analysis of the extreme galactic supergiant HD 160529, A2Ia-O; the material consists of spectra obtained with the coudé spectrograph of the 1.52 m telescope.

Exhibitions

ESO participated in the annual exhibition in Peñuelas in January with great success. The ESO stand showed the work of the astronomers with emphasis on La Silla.

In October, ESO participated on invitation in an exhibition organized by the Lions Club in Vallenar in order to commemorate the 175th year of the Municipality of Vallenar.

Colloquia given at ESO

Colloquia were given in our Headquarters in Santiago by Dr. H. G. Groth, Munich; Dr. K. G. Henize, NASA; Prof. W. A. Hiltner, Ann Arbor; Dr. Roberta Humphreys, Tucson; Dr. E. Miller, Tucson; Dr. Adelina Gutiérrez de Moreno, Santiago; Dr. A. G. D. Philip, Albany; Dr. Vera Rubin, Washington D. C.; Dr. Anne B. Underhill, NASA; and Dr. M. F. Walker, Santa Cruz. Apart from ESO staff, staff and students from Universidad de Chile and Universidad Católica attended the colloquia.

Study Visits by ESO Staff

Bourlon visited Observatoire de Haute Provence in June for discussions of a new widening mechanism (rocking plate) for the coudé focus of the 1.52 m telescope, which will be needed for the échelle spectrograph (Echelec) scheduled to go into operation in 1973.

Breysacher worked from February through August at Observatoire de Haute Provence in order to learn the operation of the "Echelec" spectrograph, which will

be installed at the coudé focus of the 1.52 m telescope on La Silla during 1973. From September on he is working in the "Laboratoire de Physique Astronomique" at Observatoire de Paris. Under the direction of M. Duchesne he has participated in experiments with the Lallemand caméra électronique. He participates in the construction and testing of the caméra électronique for the Echelec spectrograph.

De Groot visited the Dominion Astrophysical Observatory, Lick Observatory and the Hale Observatories in September for studies of their coudé equipment.

Garnier, Middelburg and Nees visited the ESO TP-Division at various times; the two latter in particular for discussions and work in connection with the development of the new control system for the 1 m telescope.

In June, Schuster visited Kitt Peak National Observatory; Astronomy Department, Northwestern University; Warner & Swasey Observatories and Kodak, Rochester, for studies of plate-handling, developing techniques and photographic material as a preparation for the work on the Sky Survey with the ESO Schmidt telescope; and also the ESO TP Division for discussions of the Sky Atlas.

In June, West visited the Kitt Peak, Dearborn and Leander McCormick Observatories in USA.

Wolf spent one month in Munich making model-atmosphere calculations with the computer-facilities of the Universitäts-Sternwarte München.

Visitors to La Silla

One student from the Universidad de Chile spent some weeks during the summer holidays on La Silla, participating in the work at the 1 m telescope and the GPO astrograph.

This year about 650 visitors were received on La Silla.

The reading-room of the library at Santiago Headquarters.

LIBRARIES

ESO Europe Library, Geneva

The Hamburg astronomical Library and its functions were moved to the TP Division, Geneva, in May 1972. This move was made because it was felt that this library would be of greater use in Geneva than in Hamburg. The associated functions for the Chile libraries (i.e., purchase and distribution of books, periodicals, etc.) were also transferred to Geneva, and the former TP Library was absorbed in a common ESO Europe Library.

A great amount of work went into reorganization due to the new location. The library profited from the initiation of regular service by diplomatic bag between ESO TP and ESO Santiago. By the end of the year, all changes, due to the transfer, had been made, and the library services were again working normally. At the same time a concentration of suppliers of books and periodicals took place. We now employ much the same sources as the CERN Library.

At the end of 1972, ESO subscribed to about 120 astronomical and technical journals, many of these in duplicate for the ESO libraries in Chile and Europe. A somewhat larger number of books were bought than last year, and a steady stream of observatory publications kept flowing in. Many back-issues of the major astronomical publications were traced and placed in the Santiago Library.

ESO Libraries in Chile

254 new books were received in Chile from Hamburg and Geneva during 1972, of which 197 for the Santiago Library and 57 for the La Silla Library.

Two boxes with new observatory publications arrived by container in March, and 150 kg of observatory publications in August, in addition to 22 separate parcels received during the year. 143 volumes of observatory publications were bound, of which 115 for the Santiago Library and 28 for the La Silla Library. The libraries contain 360 different observatory publications; 325 of these are kept in the Santiago Library and 35 in the La Silla Library.

The libraries in Chile received 173 different periodicals during the year. 131 were for the Santiago Library, divided as follows: 104 in astronomy, mathematics and physics, 14 in electronics and 13 technical periodicals. The La Silla Library received 42 different periodicals. During the year, 197 volumes of periodicals were bound, 135 volumes for the Santiago Library and 62 volumes for the La Silla Library.

ESO Santiago Library

The Santiago Library contained at the end of 1972, 2146 volumes: books in mathematics, astronomy, physics and handbooks numbered 898 volumes; catalogues 173 volumes; bound periodicals 820 volumes; bound observatory publications 255 volumes.

ESO La Silla Library

The La Silla Library contained 589 volumes: books in astronomy, mathematics, physics and handbooks 266 volumes; catalogues 167 volumes, bound periodicals 147 volumes and bound observatory publications 9 volumes.

METEOROLOGICAL REPORT

During the year a total number of 211 photometric nights were recorded, i.e. nights with six or more hours of uninterrupted clear sky. This is slightly below average for the past six years; in particular August — October were below the average of photometric nights. The following table gives the total number of clear hours as well as the total number of photometric nights in 1966 — 1972.

	1966	1967	1968	1969	1970	1971	1972
Possible number of observing hours	3681	3681	3690	3681	3681	3681	3690
Actual number of clear hours	2481	2412	2197	1996	2107	2136	2126
Possible number of observing nights	365	365	366	365	365	365	366
Actual number of photometric nights	252	239	223	199	214	221	211

Snow fell on La Silla on June 3, July 5 and 18, August 25 and September 15. Wind velocities over 35 m/sec were recorded once each in the months of June, July, August and September.

The photograph opposite shows the 1:40 scale model of the 3.6 m telescope building, partially dismantled to show a section through the building. The main dome and observing floor have been removed, exposing the telescope to view.

One can clearly distinguish the telescope tube with its Serrurier system struts supporting the prime focus top unit and cage. The centre-piece, main mirror cell and Cassegrain cage are visible as are the fork prongs, horse-shoe and pedestal.

Coudé Floor:

In the immediate foreground is the east coudé laboratory which will be the first in use. On the west side is a symmetrically identical area. The tube connecting the siderostat to the coudé area and which houses the auxiliary telescope is on the extreme right of the picture.

Third Floor:

This floor consists of an electronics laboratory and the computer room, dark-rooms and the hydraulic pumping equipment. The electronic camera laboratory, also on this floor, has been cut away by the section.

Second Floor:

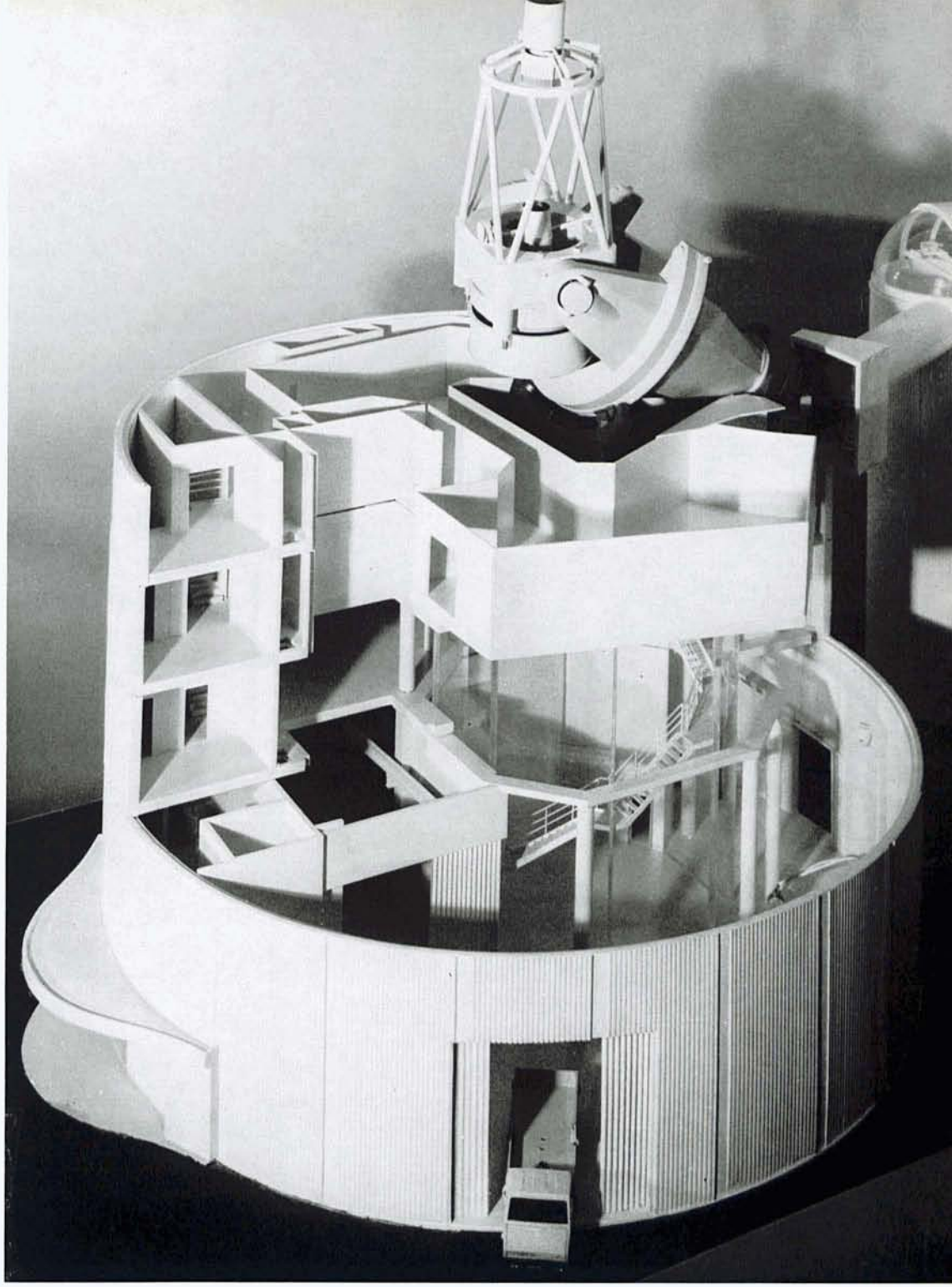
Here are located two major storage areas, two small offices, a dark-room and the distilled water plant.

Ground Floor:

This floor contains the aluminizing plant, a truck-loading area, a storage area to the north and the air conditioning plant. The curved canopy of the visitor's entrance is visible on the southern side.

Running down from the observing floor to the ground is the heavy-duty loading shaft which in the picture is slightly left of centre and partially sectioned.

Note also, in plexiglass on the model, the octagonal concrete pillar (known as construction A) which supports the telescope and is independent of and more stable than the surrounding building.



THE 3.6 m TELESCOPE PROJECT

If 1971 was marked by a surge of concentrated design effort, then 1972 saw the first fruits of this labour with a programme of tendering comprising detailed specifications and technical and commercial discussions with tendering firms that, at the end of the year, resulted in the Division being in a position to award contracts

for the major construction programmes — the building, dome, main structure and main gears of the telescope.

Tendering and Contracts

At its meeting on December 18, the Finance Committee approved the award of the following contracts:

1. The construction of the 3.6 m telescope building to Interbeton B.V. of Rijswijk, Netherlands, for a sum of about US$ 3 070 000 and, annexed to this, the construction of the new power plant building for a sum of around Sw.Fr. 500 000.
2. The main and siderostat domes to Fried. Krupp GmbH of Rheinhausen, Federal Republic of Germany, for a sum of about US$ 1 680 000.
3. The main structure of the telescope to Creusot Loire of Paris, France, for a sum of about US$ 642 000.
4. The assembly, transport and erection of the complete telescope also to Creusot Loire for a sum of about US$ 484 000.
5. The main gears of the telescope to MAAG Gear Wheel Company Zürich, Switzerland, for a sum of about US$ 358 000.
6. The construction of the Danish national 1.5 m telescope building to Interbeton for a sum of about US$ 230 000.

At its previous meeting on October 17 the Finance Committee had authorized the award of the contract for 3 diesel/generator sets of 450 KVA each to Motorenwerke Mannheim, Fed. Republic of Germany, for a sum of about Sw. Fr. 1 300 000. Finally, by written procedure of the F.C., the award of the contract to Sulzer of Winterthur, Switzerland, for the installation of an air conditioning system for the 3.6 m telescope building at a sum of US$ 255 000 was approved.

The year closed with the preparation of the above-mentioned contracts in close collaboration with the CERN contracts office.

In controls, tendering for the control computer system was completed and the purchase from Hewlett Packard of the computer and peripherals was approved by the Finance Committee in its meeting of April 11.

In optics, the main mirror was formally accepted by ESO in February and marked progress continued throughout the year, while in the field of auxiliary instrumentation the detailed planning phase had been reached by the end of the year.

A considerable effort was made in administration to provide the necessary machinery and coordination to allow the project to run smoothly, both in the ESO set-up and within the framework of the ESO/CERN agreement.

Personnel

At the beginning of the year the total staff strength was twenty-two, of whom thirteen were ESO staff members, six CERN staff members and the remaining three on contract from agencies. By the end of the year the numbers had risen to a total of 29 (not including three visiting scientists) of whom seventeen were ESO staff members, six CERN staff members assigned to ESO and the remaining six on

contract from agencies. While the organizational set-up remained essentially unaltered throughout 1972 with three executive groups, viz., building, controls and telescope, under the aegis of the Division Leader's office, it was clear by the end of the year that this would be considerably altered to fit changing needs as the emphasis shifted from design to execution and testing.

A major contribution to the Division's activities was provided by visiting scientists and engineers, notably Professor A. Behr of Hamburger Sternwarte in his role as adviser on the project in general and on optics in particular, Professor A. Reiz of Copenhagen University Observatory, who played a key role in the auxiliary instrumentation programme; and L. K. Randall from Kitt Peak National Observatory, who designed the aluminizing plant for the 3.6 m mirror.

Optics

Formal acceptance of the 3.6 m main mirror took place in February at the Ballainvilliers headquarters of REOSC, the firm to whom the contract for the telescope optics had been awarded some six years previously. REOSC had completed the figuring of the main mirror within the tolerances specified by the contract and had submitted the results of a Hartmann test to ESO which, after verification, pronounced its willingness to proceed with the acceptance.

During the year there was an upsurge of TP activity in optics which included reoptimization of the QRC system using the measured final data of the primary mirror, production of spot diagrams for various solutions, ray traces of basic solutions for QRC focus of the 3.6 m telescope and tolerance analysis for the corrector lens and final focus position. Other calculations were carried out for the specification of QRC and coudé ray paths, and definitive specifications were expected early in 1973.

The question of testing of the optical system, and in particular the secondaries, was thoroughly investigated. A possible method put forward was that of the Hindle sphere; but this solution, although not definitively ruled out, was set aside, mainly on financial grounds. A common test programme emerged from discussions with REOSC, who welcomed the idea of additional testing of the system.

Negotiations with Carl Zeiss of Oberkochen were begun with a view to purchasing the necessary software for serious optical development work.

The optical implications of the auxiliary instrumentation programme were also looked into and the optical problem of the line photometer was analysed. Possible optical schemes were discussed and a proposal made for a Littrow system.

Mechanics

In the early part of the year three design modifications were proposed. These involved the top unit configuration, the replacement of the oil pads of the declination bearing by a solid ring and the introduction of a cylindrical rather than spherical bearing support for the polar axis bearing. Of these proposals, all made by our consultant B. Rule of Pasadena who otherwise thoroughly approved the design principle, the last two were rejected on technical and practical grounds while the first led to a complete modification of the top-unit configuration.

In order to limit the number of spare parts and to rationalize manufacturing procedures, a process of standardization was adopted for the whole telescope. Thus all small mechanical parts (e.g. screws, microswitches, motors and encoders) as well as tolerances, materials, welds etc. conform to a common ESO standard.

Following the work on detailed specifications for the main structure and main gears, 13 firms were invited to tender for the former and 14 for the latter (tenders 1 and 2, respectively). Thereafter the assembly procedure was specified in detail and comprised acceptance of sub-assembly, pre-assembly of the telescope in Europe, shipment to Chile and final erection on the site. Eight firms were invited to tender for this contract (tender 3).

After detailed discussions with the firms which submitted offers, and a careful evaluation of the bids, the Finance Committee was invited to approve the award of the contracts for the main structure and assembly to Creusot Loire of France and that for the main gears to MAAG of Switzerland. Approval was given at the F.C. meeting of December 18.

In the meantime work proceeded on detailed specifications for the radically modified top-unit assembly and the mirror support system (tenders 4 and 5).

Controls

Subsequent to the approval of the Finance Committee in April the computer and peripherals for what is referred to as System 2 were ordered from Hewlett-Packard. The configuration comprises a H.P. 2100 computer with 32 K of core memory, two cartridge disks of capacity 1.25 million words each, two tape units, punched papertape equipment, a card-reader and several CRT terminals for the operation of the system.

Programme development on this computer was continued to produce a system that ensures efficient use of the telescope by providing for routine calculations, coordinate transformations and monitoring of the telescope operation.

The computer which actually controls the telescope, a H.P. 2100 with 8 K of core memory and without peripherals, is the key element in System 1. A specially designed data transmission system forms the interface between this computer and the telescope control elements, such as servo motors, and the 100 or so small motors which position mirrors, adjust focus and exchange top-units. The hardware and software of this system were further developed during the year and programmes now exist for the drive and positioning functions and the automatic interlocks.

These developments for the 3.6 m telescope control led to an adaptation of the system suitable for use on smaller telescopes. In collaboration with ESO Chile, such a system is being built for the ESO 1 m photometric telescope. In addition to the obvious advantages of a modern control system (presetting to catalogue coordinates on a teletype console, etc.) the fact that it can be connected to the 3.6 m telescope computer offers for the smaller telescopes the increased computational capacity and data handling facilities of the larger configuration. Because of this, TP controls group has been asked to build similar systems for the Danish 1.5 m national telescope and the ESO Schmidt telescope.

Site

Final decisions were taken on the exact location of the 3.6 m telescope building, the Danish telescope building and the new power plant building.

Supplies

A rigorous examination of the existing electric power facilities on the observatory site having been concluded in late 1971, this year saw the specification of the new installations required to provide the necessary supply of electric power and endow the observatory with the required degree of autonomy in this field. These requirements were defined as follows:

1. A new autonomous electric power generating station comprising three 450 KVA diesel-generator sets with their control and auxiliary equipment installed in a special building to be erected for this purpose some 3 km from the summit. This would quadruple to observatory power supply.
2. A new main sub-station on the observatory site to replace the present rather outmoded installation.
3. A new transformer post to supply the 3.6 m telescope building.
4. Two sections of 6 KV cable linking the power station to the sub-station and the sub-station to the transformer post.

In June, fifteen firms from the Member States were invited to submit offers for the power-generating plant. Of the eight bids submitted, the most advantageous was deemed to be that of Motorenwerke Mannheim of the Federal Republic of Germany. In its meeting of October 17 the Finance Committee approved the award of the contract to this firm. The order was placed on October 19 and delivery within 12 months was guaranteed.

Three firms were asked to tender for the equipment for the sub-station and transformer post. The order was placed in July with Merlin & Gérin of France for a sum of about Sw.Fr. 81 600 and will be available for the beginning of the construction programme. The section of 6 KV cable linking sub-station to transformer post was ordered in November, following an assessment of several offers, from the French firm Silec for a sum of about Sw. Fr. 23 900 and will be delivered in March 1973. This section had to be ordered before the other since, until the commissioning of the new power plant, the construction site will be supplied via the sub-station from the existing power line from El Pelícano to the observatory.

Buildings

In spring 1972 all design work and specifications had been completed for the 3.6 m telescope building, the dome and the air conditioning installation. Tenders were invited for the three contracts and, slightly later, the specifications for the Danish telescope building were annexed to those of the 3.6 m telescope building. Later still, when the power plant installations were known, the specifications for the power plant building were also annexed to the 3.6 m building tender. It was, however, too late for this to be formally included in the offer.

Five bids were received for the 3.6 m telescope building, five for the Danish national telescope building, five for the 30 m main dome and siderostat dome (including top-unit platform and cranes) and five for the air conditioning system.

At its meeting of 18 December the Finance Committee approved the award of the contracts for the 3.6 m building and Danish telescope building to Interbeton of Rijswijk, Netherlands; for the domes to Fried. Krupp GmbH of Rheinhausen, Federal Republic of Germany; and later, by written procedure, for the air conditioning installation to Gebr. Sulzer, Winterthur, Switzerland.

Included in the award of the 3.6 m building contract was the extra work on the power plant building, where an approximate total cost of around Sw. Fr. 500 000 was estimated on the basis of the unit prices quoted for the telescope building. This sum was not included in any of the bids.

In addition to the various tendering activities of the building section certain other 1972 events are worthy of note. The 1:40 scale model of the telescope building was completed. This shows most details of the building and dome, and the model of the telescope itself has been placed inside it. Dynamic tests for the central concrete pillar of the building were carried out at the University of Lausanne, as were tests on the surrounding building structure. These tests gave vital information on the stressing of the concrete. Right at the end of the year a programme of seismological measurements and tests was begun on the site of the building on La Silla, carried out for TP by the Institut Physique du Globe, Paris.

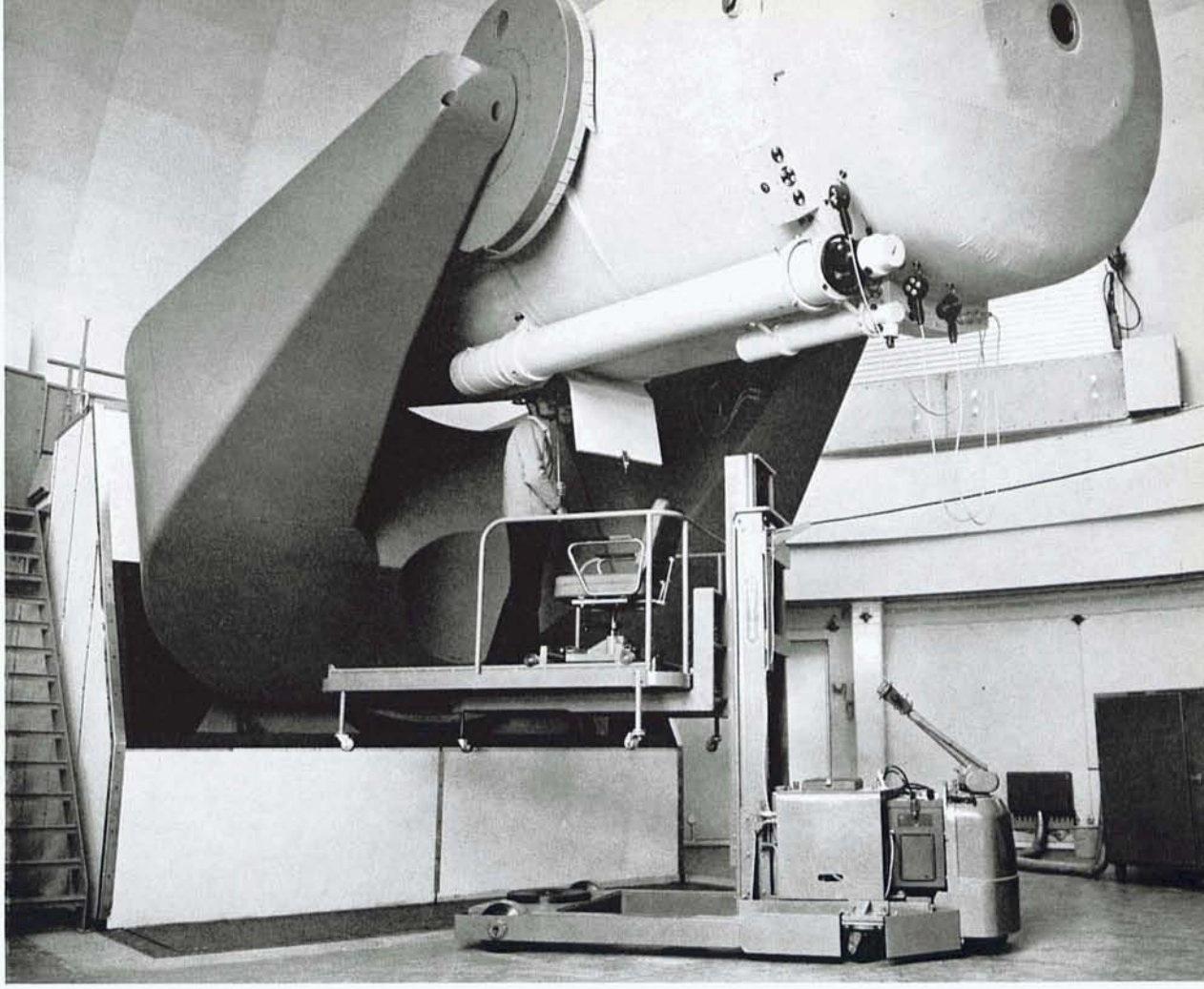
Auxiliary Instrumentation

In collaboration with CERN, INAG and MPIA, ESO co-sponsored a conference from May 2—5 in Geneva. This conference on auxiliary instrumentation, a follow-up to the ESO/CERN conference on large telescopes the previous year, was attended by about 160 astronomers and engineers with specialized knowledge in the field and it gave a comprehensive survey of auxiliary instrumentation in use or being developed for the new generation of large reflectors which will be operational in the mid-seventies. Two special lectures on essential aspects of galactic and extragalactic astronomy were given by G. Münch and E. M. Burbidge. The conference proceedings, edited by S. Laustsen and A. Reiz, were published in June.

A first list of instruments for the 3.6 m telescope was presented at the conference. Planned for 1976, these instruments were proposed with a view to tackling important research problems expected to be in the forefront of astronomical research when the telescope goes into service.

This preliminary list was discussed at the I.C. meeting in June, and thereafter a more detailed proposal was put forward by TP Division with three separate categories of instrumentation, viz., integrated telescope equipment, auxiliary equipment and laboratory equipment. This proposal was discussed at the I.C. meeting in October and the list of instruments proposed was retained, the question of priorities being held over until the next meeting, scheduled for early in 1973.

In the field of integrated telescope equipment, preliminary designs were completed for the instrumentation adaptors and cameras for the prime and Cassegrain foci. These adaptors incorporate remote viewing by closed circuit television, automatic guiders and a number of other salient features. The cameras are designed for automatic exchange of plate and filter.



First tests on the Schmidt telescope were performed at La Silla in 1972.

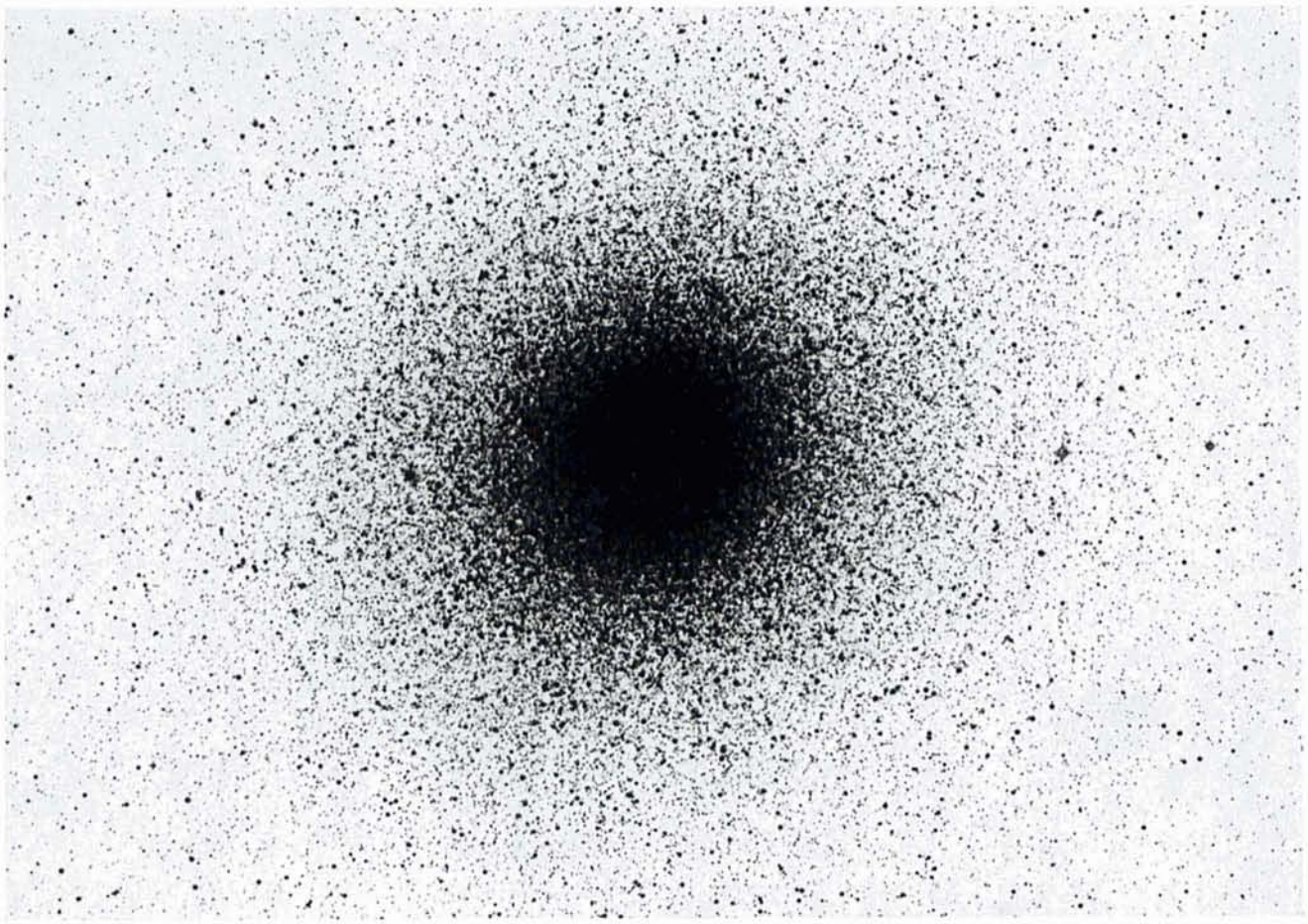
THE SCHMIDT TELESCOPE

After the assembling of the telescope in 1971, tests were continued through 1972. Heckmann left for Europe at the end of February. The responsibility for making the telescope operational was transferred to A. B. Muller, who spent 20 weeks in Chile, divided over three visits in February-March, June-July-August and October-November. Strewinski visited Chile for nearly 10 weeks during July-August-September.

Optics

The corrector plate showed slight zones. However, the performance of the optical system was within the tolerances. The curvatures of the 30×30 cm plateholders had to be slightly adjusted. It was also found necessary to correct the plateholders, allowing the use of the same focus setting for all three of them. Difficulties were experienced with the shutter system, which is still under test.

For long exposure times differential flexure between camera and guiding telescopes caused guiding problems. An optical method allowing guiding in the focal field of the camera was developed by Muller. Tests, including the use of a television system, are foreseen for 1973.



One of the first plates taken with the ESO 1 m Schmidt telescope; it shows the globular cluster 47 Tuc, one of the largest in the sky.

Instruments for the calibration as well as for marking of the photographic plates were designed and were partly finished at the end of the year.

Mounting

The instrument appeared to be rather sensitive to wind. The instrumental response to corrections in right ascension and declination required improvement. Dr. Strewinski spent most of his time on this problem, but the improvements were still below expectations.

The facility for changing the elevation of the polar axis for different declination zones has proved to be extremely useful.

Controls

The electronic control system caused certain difficulties. At the end of the year the problems concerning the telescope setting were not yet quite solved. The tracking of the instrument was satisfactory. Most of these difficulties will probably be overcome in 1973 and 1974 when modifications will be made in connection with a new automatic guiding system.

Notwithstanding the existing limitations, good quality plates were obtained.

Electronic Laboratory on La Silla.

OTHER TELESCOPES AND AUXILIARY INSTRUMENTS

Telescopes

The other telescopes and auxiliary instruments generally performed well throughout the year.

The 1.52 m Telescope

The primary mirror was adjusted in its cell in February and the polar axis was re-oriented. Design work for a new sky baffle was done by Maurice and Wolf.

A device was installed by Bourlon and Hofstadt which allows adjustment of the tracking speed of the telescope and also makes scanning possible.

A new sidereal clock for the console was about to be installed.

The motions of the mobile platform are being improved. Two speeds will be available so that, for instance, heavy equipment may be lifted slowly, whereas a "down" motion, when necessary, can be fast.

The **coudé spectrograph** worked well. The plate holders for cameras 1 and 2 were remodelled in the Santiago Workshop with satisfactory results.

A new 10-step calibration wedge replaced the former with 6 steps.

The **ETA calibration spectrograph** was adjusted and put into operation by Kohler and Giordano from Observatoire de Haute Provence in May. However, continued tests showed that long exposures were not possible as the illumination was too strong. A readjustment of the field illumination led to inhomogeneity over the slit. Further adjustments were necessary.

The **RV Cass spectrograph** worked well. Various improvements were made:

(a) New slits and slitholders. Mounted and ready for use are now 50 μ (0".5); 115 μ (1"); 130 μ (1".2); 137 μ (1".3); 242 μ (2".2) and 300 μ (2".7).

(b) New and larger neutral filters, to facilitate observations of bright stars.

(c) A photographic camera was constructed, to make possible photography of the field around an object on the slit.

(d) A new film cutter was made.

The Clichotheque

A copy of this card catalogue of spectral plates taken at La Silla was deposited in the library of the ESO TP-Division in Geneva.

The original system with handwritten cards was used until August 1972. Since this date handwritten cards have been replaced by punched cards, and special coding forms are now filled in at La Silla.

A programme for the Clichotheque has been written and tested by Monique Spite: When the data written in the dome on the special coding form are punched on cards, the programme processes the coordinates, computes the heliocentric correction for radial velocities and prints a readable editing of the data. Further processing should be made in the future (e.g., filing and sorting by star); but this work would be better done on a larger computer and by a programmer acquainted with file handling technique rather than by scientific computation.

The aluminizing plant was used for the realuminization of the primary mirror of the 1 m telescope and of the Cassegrain secondary mirror of the 1.52 m telescope. Several smaller optical pieces have also been aluminized, such as parts for the K-photometer and prisms for the spectrum scanner.

The 1 m Telescope

The General Purpose Data Acquisition System has worked very well, with the exception of the heavy-duty teletype. It was replaced by a light-duty device.

The new ITT FW108 S1 **multipliers** are good, with low dark current and high gain.

The polarimeter was modified by Materne. It is now possible to cool the cells.

The optics and the prism of **the objective prism astrograph** were repolished and antireflex-coated in France during May—October.

The ESO 50 cm Telescope

This telescope and its dome had some initial problems. Failure of the computer control system, balancing and dome rotation were solved by the staff in Chile. Further improvements are considered.

Auxiliary Equipment

Apart from the equipment referred to in connection with the telescopes it should be noted that

1. a guide-box with a 3-stage image tube finder was built, permitting the Boller & Chivens spectrograph to be used on either the 1 m or the 1.5 m telescope;
2. the K photometer was modified by Bourlon, and laboratory tests indicated that it works satisfactorily;
3. the spectrum scanner awaited programming before being put into operation at the Nasmyth focus of the 1 m telescope;
4. the performance of the KLM photometer built in Groningen was checked by Garnier and Lelièvre.
5. Parts of the Echelec spectrograph arrived. Plans for a laboratory for the Lallemand caméra électronique were worked out by Breysacher and Lelièvre.
6. A tube sensitometer was built for use on La Silla for regular tests of the sensitivities of the spectrographic plates. The instrument was calibrated photoelectrically; the first calibration curves looked satisfactory.

Measuring Equipment

The **Grant machine** functioned well and was heavily used by visiting astronomers and staff. A programme for a first processing of the data issued by the machine in its scanning mode was developed by the Spites.

The **Iris photometer** was used regularly by the staff as well as by staff and students from the Universities in Santiago. A second Iris photometer, planned for La Silla, arrived. A system for automatic output on punched tape was designed by Becker.

The **Joyce-Loebl machines** functioned normally.

The **Schnellphotometer** was optically adjusted and mechanically overhauled. For direct reductions from density to intensity it was equipped with a curve follower.

The **Zeiss Spectrophotometer** was connected for automatic scanning and zero point correction.

The **Hilger-Watts measuring machine** was further improved. Its output is now on punched tape. New support of the microscope was under design. New reticles appropriate for spectra up to 400 μ high were ordered.

All other measuring equipment and calculating machines continued to operate well in the modes previously reported.

Photometric Equipment

The **photometer for the 50 cm ESO telescope** was wired for use in combination with a data acquisition system. At the end of the year most of the hardware was finished.

Muller finished the design of a photometer for measuring the brightness of the night sky. This will be used in combination with the Schmidt Telescope for establishing the exposure times of photographic plates.

DANISH NATIONAL 1.5 m TELESCOPE PROJECT

The progress of the project during the year of 1972 will be dealt with under the same main headings as in last year's report.

Optics

The work on the optics, carried out at l'Institut d'Astrophysique in Liège under the responsibility of Dr. D. Malaise, progressed satisfactorily. The central and outer edge zones mentioned in last year's report were largely removed. Work on the secondary mirror, which was discontinued in late 1971 for technical reasons, was resumed. The completion of the optics suffered an unavoidable but not critical delay due to these circumstances.

The Telescope Mounting

Negotiations with Grubb Parsons in Newcastle-upon-Tyne for the manufacture of the telescope mounting (excluding the electronic drive- and control system) led to a firm offer that was accepted by the Telescope Committee. This decision was communicated to Grubb Parsons, the signing of the contract to take place in early 1973.

The Telescope Building

During the year the Buildings Group of the TP Division finished the design of the telescope building. Tenders for the construction of the building were called in by the TP Division, and the approval for the award of the construction to the Dutch company Interbeton B.V. was given by the Finance Committee at its meeting of December 18.

The Dome

After the Bronswerk-Structural Co. of Utrecht had completed a project study for the construction of a dome of 10.5 m diameter made of reinforced fibre glass, the firm offer resulting from this study was accepted by the Telescope Committee. Construction work was to begin early 1973 and to be completed before the end of that year.

View of the interior of the ESO Sky Atlas Laboratory, December 1972.

ESO SKY SURVEY PROJECT AND SKY ATLAS LABORATORY

The ESO Sky Survey Project

Initial steps to establish the ESO Sky Survey Project were taken by the ESO Directorate early in 1971 while the ESO Schmidt telescope was nearing completion. At the same time, contacts were made between ESO and the Science Research Council of the United Kingdom (SRC), the latter having undertaken to construct a second large Schmidt telescope in the Southern Hemisphere.

An introduction to the ESO Sky Survey Project was given by the Director-General to the Council of ESO at its meeting on November 30 — December 1, 1971. Council agreed to the proposed general planning and decided that an "ESO Sky Atlas Laboratory" should be established for the production of sky atlases. R. M. West was appointed leader of this project.

ESO/SRC Collaboration

During 1972, the cooperation with the SRC 48″ Schmidt Advisory Group continued to develop in a fruitful way. Close contacts were maintained and a valuable coordination of efforts was arrived at.

As their first large joint enterprise, ESO and SRC together with the Hamburg Observatory sponsored a conference on "The role of Schmidt telescopes in astronomy" at Hamburg University, March 21—23, 1972. An Organizing Committee was established with representatives of these three institutes, under the chairmanship of R. M. West, ESO. Approximately 130 astronomers participated in the conference, representing practically all projects and observatories interested in Schmidt work. The conference programme reviewed some fields of research for Schmidt telescopes, and it included a fairly extensive discussion of technical aspects, especially the photographic material to be used, and its handling. At the end of the conference, there was a review and reference to programmes that may be carried out in the future. The proceedings, edited by U. Haug of the Hamburger Sternwarte, were published in October 1972.

Immediately following the conference, a working session was held on March 24, in which participated representatives of ESO and the SRC 48″ Schmidt Advisory Group, several specialists engaged in the field of sky surveys, and a number of radio astronomers actively interested in problems connected with Schmidt telescopes. All aspects of future sky surveys, such as the wavebands to be used, material, time schedules, observing conditions and production and distribution of the atlases, were discussed.

An internal ESO meeting took place in Geneva on March 29, 1972, with the participation of ESO staff astronomers associated with the ESO Schmidt telescope and Sky Atlas Project. On the basis of experience from the Schmidt conference, a proposal was worked out for future collaboration with SRC and the apportionment of the southern sky surveys between the two southern Schmidt telescopes.

Representatives of ESO and SRC met again in Geneva on May 5/6 and in Amsterdam on November 7. A joint visit was paid to the Eastman Kodak photographical laboratories in Rochester, N. Y., U.S.A., on June 13.

At the end of 1972, the status of the ESO/SRC collaboration may be summarized as follows:

Wavebands

Surveys will be carried out initially in the following wavebands:

ESO (B)	IIa-0 + Schott GG385	(3800 — 4900 Å)
ESO (R)	098 — 04 + Schott RG2	(6300 — 6900 Å)
SRC (B)	IIIa-J (sensitized) + Schott GG395	(3800 — 5300 Å)

These may be followed by an objective prism survey (ESO) and ultraviolet/infrared surveys (ESO and/or SRC). The ESO surveys will be preceded by a short multicolour survey of the Magellanic Clouds.

The surveys will be carried out at 606 common 5° centers from declination —90° to —20°.

Exchange of Copies

ESO and SRC will exchange on-glass negative copies of their respective surveys as they proceed. Specifically, the SRC will receive (at cost) for distribution to institutes in the United Kingdom, South Africa and Australia a limited number of on-glass and 14 on-film copies of the ESO (B) survey plates and later a similar number of copies of the ESO (R) and SRC (B) survey plates.

SRC Use of the ESO Sky Atlas Laboratory

An agreement has been drafted according to which ESO will produce for SRC, at cost, copies of plates taken with the SRC 48″ Schmidt. The ESO Sky Atlas Laboratory shall sell copies of SRC plates to third parties for SRC.

Joint ESO/SRC Atlas of the Southern Sky

In the context of the draft agreement an arrangement has been foreseen, according to which a joint ESO/SRC Atlas of the Southern Sky, based on ESO (R) plates and SRC (B) plates, shall be produced and published by the ESO Sky Atlas Laboratory.

This atlas will consist of 1212 prints on-glass or on-film of the ESO 098-04 plates and the SRC IIIa-J plates. The prices will be fixed after a marketing survey (in February 1973) has permitted an estimate of the number of astronomical institutes interested in acquiring the atlas.

At the end of the year, the legal aspects of the ESO/SRC agreement were being looked into by the legal advisors of the two organizations.

The ESO Sky Atlas Laboratory

After approval by the ESO Council in December 1971, the ESO Sky Atlas Laboratory was planned during 1972 and installed in November 1972 at CERN, Geneva, next to the ESO-TP Division. It occupies about 300 m² in the basement of the CERN SB building and has its own air conditioning system and plant for water demineralization. The laboratory is administratively associated with ESO-TP, but its budget is completely separate. The aim is that it will ultimately be self-supporting, through the sale of the atlases. There are presently four staff positions filled, one astronomer-in-charge (project leader), two photographers and one secretary. This staff is not expected to increase, but temporary employment of additional help may be necessary later on.

The laboratory consists of a closed, partly "clean" section (dark-rooms, storage room, control room and measuring room) and a few offices. Chemicals in powder form are mixed outside the dark-rooms to avoid dust and are pumped into large storage containers in the dark-room. It has been a great advantage to install the laboratory on CERN grounds; much effort, time and money have been saved by the easy access to CERN workshops and expertise.

The work of the laboratory is naturally divided into several parts: the making of film atlases and of glass atlases, providing these atlases with additional facilities and information in order to make them more convenient for the user, and the management of atlas sales.

The original plates taken with the Schmidt telescopes in Chile and Australia are too vulnerable to be used for repeated printing. The making of sky atlases therefore involves two steps: an intermediate positive copy of the original plate and negative copies of the positive.

Since the installation of the laboratory, most of the time has been devoted to testing various plate and film types for the positive intermediate copy and for the atlas prints. The making of positives at the ESO and SRC observatories in Chile and Australia and of copy negatives at the ESO Sky Atlas Laboratory is governed by these experiments. At the end of 1972 several details still remain to be worked out, but the final choice of materials and processing methods is expected to be made in early 1973.

The Palomar Atlas of the northern sky was published on-glass (less than 20 copies) and on-paper (about 200 copies). However, with the availability of various films for reproduction of aerial photographs it has become possible to publish the atlases of the southern sky on film, rather than on paper. The transparency of the film makes possible direct measurement in microphotometers. This is especially attractive because the atlas prints are calibrated photometrically.

It is presently estimated that the number of on-film atlases to be made will surpass the number of on-glass atlases by about one order of magnitude. It was therefore from the very beginning clear that a production method permitting automatic film processing must be sought. The advantages would be lower personnel cost and higher uniformity with much easier production control. However, most automatic processors are built for graphic arts and the making of photographic products with a relatively short life-time. Fortunately, it was possible to find a film processor, the Kodak Versamat 317, for which tests clearly showed that the processed aerial film was of archival quality, if only some care was exercised. A machine of this type is now installed in the laboratory.

The atlases will be published in several parts, like the Palomar atlas. The glass plates will be distributed in Tyvek-envelopes, without cover glass. Film copies will be distributed in transparent mylar envelopes that protect the relatively soft surface of the film. The film should remain in these envelopes, except when being measured in a microphotometer.

Together with the atlases, additional information about the prints will be given, i.e., the "story" of each plate (observing date and conditions, etc.). Each survey plate will be measured at the ESO Sky Atlas Laboratory and exact positions given for crosses marked on the original plate. By means of overlay grids it is then possible to determine the position of any object by interpolation, certainly to about 5—10″ but probably even better. This positional information will also facilitate measurement with automatic machines.

Every effort is being made to give the atlases the maximum astronomical value. Many new problems have appeared during the planning of this project and there are still a number to be solved. The experience thus gained will be made available in published form, but all astronomers, and especially those in the ESO member states, who are interested in learning in more detail the techniques that have been applied, are of course very welcome to contact the ESO Sky Atlas Laboratory on this matter.

Dormitories No. 3 and 4 on La Silla, finished in 1972.

BUILDINGS AND GROUNDS

Establishments in Chile

The following has been abstracted from the much more extensive report for 1972 prepared by the Technical Department of ESO in Chile; this is available to Council on request.

Pelícano and La Silla

The high-tension line Pelícano-La Silla was inspected and repaired from end to end. Meanwhile one of the generators was moved to La Silla to supply power from there during inspection hours.

Power Supply

The generators ran a total of 16 220 hours with a total fuel consumption of 250 m^3 of diesel oil. Seven times the power demand exceeded the capacity of the plant with consequent interruptions in the power supply.

Water Supply

The deep-well pumps were provided with a timer each to make them run in sequence. This system replaced the previous one based on control of the water level in the wells. The water was treated in the usual manner and its quality was acceptable.

The water consumption in m^3 was as follows:

	m^3/year	m^3/day	%
Camp Pelícano	6.363	17.5	24.3
Camp La Silla	14.049	38.5	53.5
Treatment, losses, etc.	5.811	16.0	22.2
Water pumped from the wells	26.223	72.0	100.0

Sewage System

All 16 septic tanks (15 in La Silla and 1 in Pelícano) were cleaned and flushed and the material extracted was carried away.

The sewage net was extended in two places:

1 — Connection of Dormitories 3 and 4 to the Hostel net.
2 — Septic tank and run-off pipe for Dormitories 5 and 6.

Heating System

In the central heating plant a chemical feed tank was mounted in the boiler-house to inject into the hot water circuit rust-preventing chemicals intended to protect boilers, pipes and exchangers from corrosion.

The compressor for the expansion tank was replaced by another of higher capacity. A tunnel of 1×1 m and 20 m long was dug on the northern side of the Hostel where the heating pipes, water pipe and electric cables were relocated, to allow extension of the parking area.

The total fuel consumed by the boilers was 162 m^3 of diesel oil.

Telescope Buildings

Interior partitions were made on the ground floor and first floor in the Schmidt building. A room was added to the Bochum building so that the considerably extended auxiliary instrumentation could be properly housed.

Regular maintenance was carried out on lifts, platforms and windscreens. In the Spectrographic dome a leak from the hydraulic line to the shutter was repaired.

The Spectrographic and Photometric domes were cleaned and painted. The 50 cm Telescope domes had to be provided with new carrying wheels, dispatched from Denmark, to replace the original ones.

Cold Storage Room for Photographic Plates

This room contains a Stal-Astra refrigerator, capable of maintaining a temperature of —20° C. It has a concrete floor and roof, walls of hollow concrete blocks and heavy insulation on all sides.

Voltage Stabilization Plant

This room, with the same characteristics as the cold storage room, was built to house equipment to provide stabilized circuit-feeding for all electronic instruments in the present telescope buildings.

A concrete roof was added to the water cooling plant.

Liquid Nitrogen Plant

Dormitories 3, 4, 5 and 6

Living Quarters

The construction of these dormitories, for astronomical and technical personnel, and for night assistants, continued throughout 1972. Substantial delays occurred owing to the difficult situation on the supply market and to strikes in practically all fields concerned.

For the **Maintenance of Hostel and Camp Buildings** a worker from the Technical Department was assigned to carry out all small repairs of locks, curtain rails, change electric bulbs, etc. The electrical shop, which has been operating in a small room in the central heating house, was very busy repairing all kinds of electric apparatus, such as kitchen machines, vacuum cleaners, washing machines, ventilators, etc.

Roads

The public road was maintained in collaboration with CARSO. The private road was graded and rolled as usual and sprinkled with used water from the treating plant in Pelícano.

As for the La Silla roads, a call for tenders to lay an asphalt pavement on 30 000 m^2 was unsuccessful. Therefore, the work was carried out with the means available on La Silla, i.e. with ESO personnel and ESO's grader, loader, dump truck, tractor and vibrating roller. For various reasons, in particular the rather wet winter and the difficulties of obtaining asphalt regularly, the work progressed slowly. However, by the end of 1972, nearly 20 000 m^2 of road surface was covered on the upper part of La Silla.

A total length of about 600 m of parapet wall and 100 m of retaining wall was built of stone masonry in places where safety and a good appearance were necessary. The work will continue along the road between Pelícano and La Silla with metal bars being placed in certain curves and warning road signs in a number of places.

La Serena

Bungalows

Bungalow number 1 was equipped with a heating installation of Chilean manufacture and the whole house was repainted, the roof cleaned, sanitary equipment overhauled and the living-room carpeted. Outside, a parapet wall, new steps and a wood fence were also provided.

The front wall of the Cisternas premises was improved and a contract was made to install a gate at the entrance to the property.

Bungalow number 6 was provided with closet shelves, a garden fence and a garage. Grass and bushes were planted in the garden and a pathway was made to the entrance. The boiler was installed and the heating unit finished, and the house was handed over for occupancy.

Bungalow number 8 was erected by a local contractor. It was completed in August and immediately occupied by a new staff member. Later on, the heating equipment

was connected up, some carpentry work was done inside closets and the garage provided with shelfing. A pathway to the entrance door, a wooden fence and a garden were also provided.

Housing Programme

A piece of land 20×60 m was purchased from a neighbour to enlarge the existing ESO property in Las Cisternas Street.

For the over-all surface area several layouts were analysed, and it was decided to build four more bungalows, with a garage in each.

In December an order was placed for two prefabricated bungalows with 4 bedrooms, two bungalows with 3 bedrooms, and 4 garages.

Santiago Headquarters Building

The main office building was completely occupied, including the basement, and more space for offices was required. Rooms in the basement, originally intended as laboratories and plate storage rooms, were occupied by the administration personnel and draughtsmen. On the ground floor some astronomers and the photographer used part of the measuring rooms as offices, and part of the conference room was used by the secretariat.

Two main store-rooms were organized in the basement: one for stationery, tools, spares for maintenance of the buildings, and the other for foodstuffs. Both were equipped with steel shelves and steel doors. A concrete pavement was built over the whole area of the basement floor of the workshop and the walls were painted.

A steel gate was installed at the entrance to the premises.

A study for paving the driveway was entrusted to an architect from Santiago. It was found necessary to make a detailed topographic survey of the whole area, to locate all underground cables and pipes.

ESO Houses

The Director's house was equipped with a new oil burner for heating, and small repairs were done. Maintenance of the heating, water and power facilities in the Guesthouse continued.

TP Division, Geneva

Annex to ESO TP Pavilion

In March, 1972, the annex to the TP pavilion was opened, construction having been started in November 1971.

The annex (building 572), of surface area 302 m^2, houses 12 offices and two laboratories, one of which serves as a computer room for the Controls Group, the other being a general electronics laboratory for this group.

The whole Controls Group moved into the new premises, which were needed to relieve a space shortage, particularly of laboratory facilities. The inauguration of this annex provided extra space in the main pavilion for the ESO Library which was entirely transferred to TP somewhat later.

ADMINISTRATIVE MATTERS

General

The economic developments in Chile, including supply shortages and rising prices, were naturally followed with great attention by the ESO Administration. Although protected by its Convention with the Chilean Government, ESO, of course, was affected by these developments, which required the Administration to maintain close contacts with the Chilean national authorities. To overcome or to prevent serious shortages, we were enabled to arrange for increased imports from abroad, including food items. New administrative measures introduced by the Chilean Customs resulted in an increased workload for our import section during certain periods of the year. The Ministry of Foreign Affairs in Chile was very helpful in interpreting the new administrative rules issued by the Chilean Ministries and relevant to ESO's work. We report with gratitude many visits by officials of the Ministry of Foreign Affairs and the Customs to La Silla, as well as visits by the ambassadors of the Federal Republic of Germany and the Netherlands.

The Administration in Chile was also increasingly involved in preparations for the new construction phase — i.e., the building programme for the 3.6 m Telescope Project. The Technical Department in Chile was extended by the establishment of a Technical Office in La Serena with the task of planning and supervising local construction projects running parallel to the main building programme for the 3.6 m Telescope Project and of coordinating the maintenance of existing technical installations. Thus effective technical support for the main building programme could be provided.

The ESO Council held its 20th meeting in November in Santiago and on La Silla. A series of sessions was devoted to ESO's current and future programmes in Chile.

Regarding the status of ESO as an international organization in Europe, discussions with Member States in recent years have led to a proposal for a multilateral protocol on privileges and immunities. Upon its implementation, ESO will be accorded privileges and immunities in Member States similar to those enjoyed by most other international organizations. To study this proposal, an ESO Council Working Group was established under the chairmanship of Mr. J. H. Bannier, a former President of Council. The Working Group held three meetings in 1972 and continued its discussions in the beginning of 1973.

Apart from a number of privileges and exemptions to improve the status of ESO and its staff, one of the chief tasks of the Working Group was to consider an internal tax system which would provide exemption from national income tax.

Personnel

In 1972, the development and improvement of the legal and contractual situation of ESO staff, international and local, continued. New regulations for local staff in Chile came into force on January 1, 1972. The result of intensive efforts by the Administration of ESO/Chile, in consultation with representatives of the local personnel, the new regulations provided, for the first time, a clear definition of the legal status of local staff members and a basis for determination of their material conditions. Furthermore, during its meetings in June, 1972, and November, 1972, the Council approved a number of improvements in the regulations for international staff, as well as the "Combined Staff Rules", which deal generally with the situation of both local and international staff. With the introduction of these measures, the previously established Working Group of the Finance Committee for the review of the Staff Rules and Regulations considered the first general revision of these Rules and Regulations as terminated, leaving a few remaining items to be dealt with by the Finance Committee.

Meanwhile, the Directorate initiated another revision of the Staff Rules and Regulations since a corresponding revision went into effect in CERN as of January, 1973. In accordance with Council decisions, the Staff Rules and Regulations of ESO follow CERN's and therefore have to be modified from time to time.

A re-analysis of the functional structure of the local staff in Chile was undertaken, resulting in new and more explicit job descriptions for about 60 persons. In line with previous policy, the total number of personnel was slightly reduced in the course of the year.

In connection with preparations for the 3.6 m Telescope Project and the operations of this telescope, more international staff members with duty station at La Silla were expected to take up residence in La Serena. As the previously-acquired four prefabricated bungalows on our Cisternas site were all occupied in the course of the year, and as it was difficult to find adequate housing in this region, a housing programme was initiated. This entailed the purchase of four additional prefabricated bungalows in 1972 to be erected on the Cisternas site in 1973. In addition, some houses were rented for our personnel.

Mr. J. Bloemkolk, Manager in the Office of the Director-General, resigned from his post per June 30 for reasons of health, after 8½ years of service with ESO. He had been a close collaborator of the Director since the establishment of the Organization. When, after the ratification by the Member States, an office for the Directorate was created, Mr. Bloemkolk had to cope with a great variety of financial and administrative problems. He played an important rôle in the preparation of contracts for the first construction phase in Chile, thus contributing essentially to the realization of the ESO project. Mr. G. Bachmann, formerly in charge of financial matters, succeeded Mr. Bloemkolk with the title of Head of Administration per December 1.

Mr. H. Hyslop-Tuffield, Administrator I in the Office of the Director for Chile, resigned per October 2, having reached retirement age after four years of service with ESO. He entered the Organization soon after the Director for Chile took office and assisted him greatly in the initial stages. A Chilean citizen, enjoying the advantage of an earlier career in the Chilean Government service, Mr. Hyslop

was able to make particularly useful contributions in the important field of relations between ESO and the Chilean authorities. ESO owes Mr. Hyslop a debt of gratitude for his devotion to the joint effort between our European Organization and his native country. He was succeeded by Mr. H. Scheffold, who had earlier taken over part of the administrative responsibilities.

F. B. Schotel, Maintenance Engineer (Head of Domes), left ESO on July 15.

M. Blichfeldt, Electronics Engineer, and S. Lorensen, Astronomer, in Geneva, resigned as per December 31.

Miss B. Wächter, who had been librarian in Hamburg since 1965, preferred not to follow the library to Geneva and resigned from her post on September 30, 1972. Miss E. Sachtschal, formerly in the CERN Library, was employed as full-time librarian from June 15, 1972. R. West supervised the library services in Geneva until November 1, 1972, and was succeeded in this function by A. Reiz.

The following staff members were engaged in grades 9 and higher:

a) **Office of the Director General in Hamburg**

P. Huijmans	Administrative Officer	August 16

b) **Chile**

Ph. Bourlon	Electronics Engineer	January 1
F. Spite	Astronomer	March 1
M. A. Peuch	Assistant Director	October 1
G. Anciaux	Administrative Officer	December 15

c) **TP Division, Geneva**

N. Rodgers	Engineer	May 1
R. Wilson	Senior Physicist	September 1

Visiting Scientists

A. Behr	TP Division, Geneva	January 1
A. Reiz	TP Division, Geneva	January 1
L. Randall	TP Division, Geneva	October 1.

R. West, Astronomer, was transferred to Geneva on March 1. 21 staff members were engaged in grades 8 and lower.

A list of personnel in Grades 9 and higher per December 31, 1972, is given below.

Hamburg Office:

A. Blaauw	Director General
A. B. Muller	Senior Astronomer
G. Bachmann	Head of Administration
R. Doorn	Administrative Officer

J. Meuser	Head, Purchasing and Shipping
P. Huijmans	Administrative Officer
H. W. Marck	Accountant
F. V. De Buck	Auditor

Chile:

B. Westerlund	Director of ESO in Chile
M. A. Peuch	Assistant Director of ESO in Chile
R. Villena	Chief Engineer
H. Scheffold	Senior Administrative Officer
J. Rickard	Astronomer
W. Müller	Construction Engineer
F. Spite	Astronomer
H. J. Wood	Astronomer
A. Ardeberg	Astronomer
M. de Groot	Astronomer
E. Maurice	Astronomer
B. Wolf	Astronomer
Ph. Bourlon	Electronics Engineer
H. E. Schuster	Astronomer
R. Garnier	Astronomer
R. Havlen	Astronomer
H. Straatman	Administrative Officer
M. Becker	Electronics Engineer
J. Haahr	Electro-Mechanical Engineer
W. Nees	Electronics Technician
G. Anciaux	Administrative Officer

3.6 m TP Division, Geneva:

S. Laustsen	Senior Astronomer
J. R. van der Ven	Mechanical Engineer
W. Bauersachs	Senior Mechanical Engineer
R. Wilson	Senior Physicist
B. Malm	Electronics Engineer
M. Blichfeldt	Electronics Engineer
D. Plathner	Mechanical Engineer
N. Rodgers	Engineer
R. Clop	Mechanical Engineer
P. Scharnweber	Electrical Engineer
S. Lorensen	Astronomer

Visiting Scientists:

A. Behr
A. Reiz
L. Randall

Sky Atlas Laboratory, Geneva:

R. West	Astronomer

The CERN budget and accounts format introduced in 1971, together with separate specification of expenditure for the three main establishments of ESO, was maintained in 1972 and made possible a more effective financial presentation of the Organization. Some preliminary experience was gained with commitment accounting.

ESO's external auditors, the Bundesrechnungshof, made a first visit to Chile. The audit team inspected all ESO installations in Chile and studied its financial management over the past five years, especially with a view to suggestions for possible improvements in the management and the structure of the Organization.

As a further step towards the improvement of ESO's financial system, the Finance Committee established a Working Group for the Review of the ESO Financial Rules and Regulations. This Working Group, which held a first meeting on September 12, 1972, was to study a number of problems in connection with the application of the present version of the ESO Financial Rules and Regulations. As a result, some provisional measures were introduced early in 1973.

The following tables show the budget statement 1972, the accumulated expenditure per December 31, 1972, and the budget forecast 1973.

Budget Statement 1972

(in US $ 1 000)

Expenditure

Budget Heading	Approved Budget	Expenditure (incl. commitments and unused credits carried over to 1973) for			
		Directorate Hamburg	Establishment in Chile	3.6 m TP Division Geneva	Total
1 Personnel	2 422	450*	1 236	361	2 047
2 Operations	1 743	385	833	419	1 637
3 Capital Outlays	3 528	18	1 259	1 813	3 090
4 Sky Survey Project	207	207	—	—	207
TOTAL EXPENDITURE	7 900	1 060	3 328	2 593	6 981
Reserve for cost variation/currency revaluation	650	—	—	—	—
TOTAL GENERAL EXPENDITURE	8 550	1 060	3 328	2 593	6 981

* Including visiting scientists associated with the TP Division.

Income

Budget Sub-Heading	Estimate	Actual (incl. receivables)
90 Contributions from Member States	6 000	6 000
91 Unused appropriations from previous years	2 300	2 300
95 Miscellaneous	250	474
	8 550	8 774

Accumulated Expenditure up to December 31, 1972

(in US $ 1 000)

Budget Heading		
1 Personnel		7 753
2 Operations		5 483
3 Capital Outlays		
a) Land, Buildings, Roads	8 824	
b) Instruments	5 656	
c) Architects and Consultants	1 365*	15 845
4 Astronomical and meteorological activity, South Africa		501
5 ESO Sky Survey Project		207
Unforeseen		222
TOTAL EXPENDITURE UP TO DECEMBER 31, 1972		30 011

* Commitments made up to December 31, 1970. From 1971 on these expenses are included under the respective budget headings (capital outlays or operations).

Budget for 1973

(in US $ 1 000)

Expenditure

Budget Heading	Directorate Hamburg	Establish-ment in Chile	3.6 m TP Division Geneva	Total
1 Personnel	732	1 783	604	3 119
2 Operations	419	1 036	376	1 831
3 Capital Outlays	10	969	3 752	4 731
4 ESO Sky Survey Project	278	—	—	278
	1 439	3 788	4 732	9 959
Reserves				
Reserve for cost variation				738
Reserve for the 3.6 m Telescope Project				503
TOTAL EXPENDITURE				11 200

Income

Budget Sub-Heading	Estimate 1973
90 Contributions from Member States	8 000
91 Unused appropriations from previous years	2 173
92 Profit from parity changes as of 31/12/1971	556
94 Sale of Sky Maps	—
95 Miscellaneous	471
TOTAL INCOME	11 200

We shall use the current report for a brief presentation of statistics on some of the functions supervised by the Administration. Data are borrowed from reports by the internal auditor and the ESO Administration.

a) **Use of Hostel and Dormitories at La Silla by Visitors**

This excludes lodgings by personnel semi-permanently stationed on La Silla (technicians, resident astronomers, administrative personnel, kitchen personnel, night assistants, etc.). A total of 4 154 lodgings was provided for visitors in 1972, broken down as follows:

Visiting astronomers for ESO telescopes	1 234	(30 %)
ESO astronomers based in Santiago	680	(16 %)
ESO non-astronomical staff based in Santiago	535	(13 %)
Astronomers connected with "national" telescopes	533	(13 %)
Consultants and specialists, Schmidt telescope	234	(6 %)
ESO staff based in Hamburg or TP Division	167	(4 %)
Miscellaneous and accompanying persons	771	(18 %)
	4 154	(100 %)

b) **Use of Santiago Guesthouse by Visitors**

The annual numbers of lodgings provided by the Guesthouse since 1968 (i.e., not counting the lodgings of in-house personnel) are given in the table below.

Year	1968	1969	1970	1971	1972
Number of lodgings for visitors	881	1932	1784	1438	1532

In these numbers, accompanying wives and children have been counted as half-units. The actual number of lodgings, counting wives and children as whole-units, for 1972 was 2 130. Of these, 239 were for visiting astronomers and the remaining 1 891 for newly-arrived staff and their families, staff from Hamburg and TP Division, auditors, guests, etc.

c) **Purchases**

The totals of purchase orders or contracts placed by the various establishments in the period October 1, 1971, to October 1, 1972, broken down according to their amounts, were:

	Total	Chile	Hamburg	TP Division
Value below DM 10 000	4 189	3 522	443	224
Value DM 10 000 — DM 100 000	50	21	18	11
Value exceeding DM 100 000	6	1	1	4
TOTAL	4 245	3 544	462	239

COUNCIL, COMMITTEES, WORKING GROUPS

a) **Meetings of Council** took place:
on June 8 and 9 at Geneva (19th meeting)
on November 17, 18, 21 and 24 at Santiago and La Silla (20th meeting),

the latter meetings in the context of Council's visit to Chile, which gave Council an opportunity to thoroughly investigate a number of aspects of the Organization's work in Chile. At the end of its stay, on November 24, the President of Council, accompanied by some Council members and by Chairmen of ESO committees, the Director-General and the Director for Chile paid a courtesy visit to the President of the Republic of Chile.

These meetings of Council were preceded by meetings of the
Committee of Council:
on May 19 at Geneva (5th meeting),
on October 31 at Hamburg (6th meeting);

both meetings serving, as usual, for exploratory discussions in connection with the subsequent Council meetings.

b) **The Finance Committee** met three times:
on April 11 at Hamburg (23rd meeting)
on October 17 at Hamburg (24th meeting)
on December 18 at Geneva (25th meeting).

The Committee dealt with a variety of financial and administrative matters, including budgets and financial plans, staff regulations, salaries, allowances and adjudications.

c) **The Scientific Policy Committee** met twice:
on April 25 at Copenhagen (1st meeting)
on October 10 at Hamburg (2nd meeting).

In accordance with the terms of reference of the committee, these meetings were also open to attendance by the standing invitees: the President of Council and the Chairmen of the Finance Committee, the Instrumentation Committee and the Observing Programmes Committee; of these, the I. C. Chairman was specially invited in view of the nature of the agenda (infrared astronomy).

The first meeting, apart from providing a general orientation on the work of the committee, took up the following questions suggested by Council: whether ESO

should engage in infrared astronomy, and whether it should extend its activities beyond the programme defined in the Convention.

The basis for the discussion on infrared astronomy was a review entitled "Infrared Astronomy and ESO", prepared at the invitation of the ESO Directorate by Borgman, Andriesse and van Duinen. The committee discussed the areas for possible participation and development by ESO but concluded that, before recommendations to Council could be formulated, advice from a number of experts should be sought and current developments in the ESO countries investigated.

With regard to the second item mentioned above, there was general agreement in the committee that a reconsideration of the aims of ESO was in order, particularly in relation to the large national projects in optical astronomy; the question of how to define ESO's role in shaping observing programmes for the 3.6 m telescope was the subject of preliminary discussion.

The second meeting involved the participation of three internationally-known experts on infrared astronomy: Connes (Meudon), Neugebauer (Hale Observatories), and Ring (Imperial College, London). This meeting confirmed the importance of a careful determination of ESO's policy with regard to infrared research, considering the rapid developments elsewhere in the world and the excellent opportunities ESO might have to offer in view of the quality of its site and the interest shown by groups in Europe.

The Committee then resumed a discussion, begun at the first meeting, regarding ESO's future role in shaping a scientific policy for the 3.6 m telescope. It was resolved to recommend to Council the formation of a small group of ESO staff with the task of promoting orientation of research for optimal use of the 3.6 m telescope and to help direct the auxiliary instrumentation programme to this end.

d) **The Instrumentation Committee** met three times:
on March 28 at Geneva (34th meeting)
on June 6 at Geneva (35th meeting)
on October 3, 4 at Geneva (36th meeting).

Upon appointment by the Council at its meeting of November 30, December 1, 1971, J. Borgman succeeded Ch. Fehrenbach as Chairman of the committee*. At its November meeting, Council adopted the following terms of reference for the committee:

> "The Instrumentation Committee shall support the Directorate with advice on the preparation and execution of the instrumentation programme. The Instrumentation Committee shall report to Council on these activities and advise it on items of the instrumentation programmes requiring decisions by Council."

Apart from the items regularly figuring on the committee's agenda, such as reports on the status and operation of the equipment in Chile, and on the status of design work for the 3.6 m telescope and its auxiliary equipment (controls, optics, etc.), the committee devoted considerable attention to the following items:

* Subsequently, the membership was revised, the new membership being as listed already in the previous Annual Report, p. 71. See also the list in the present report (Appendix).

1) The acceptance of the 3.6 m main mirror,
2) The conclusions to be derived from the ESO/CERN Conference on Auxiliary Instrumentation,
3) A proposal for the establishment of review teams for the development of auxiliary instruments,
4) The general long-term programme for the development and construction of the auxiliary instrumentation for the 3.6 m telescope. (This resulted in proposals submitted to Council at its November meeting.)

It was decided at the 36th meeting to dissolve the Sub-Committee for Spectrographs, as much of the work on spectrographic development would henceforth be a matter for the I.C. itself.

e) **The Observing Programmes Committee** met twice:
on June 13, at Hamburg (10th meeting)
on December 15 at Heidelberg Observatory (11th meeting).

The main item for both meetings was, as usual, to review applications by visiting astronomers for observing time. These reviews concerned periods 10 (October 1, 1972 — April 1, 1973) and 11 (April 1, 1973 — October 1, 1973) and resulted in recommendations to the ESO Directorate as to the scientific merits of the proposed programmes. With regard to the general policy to be adopted in these recommendations, the committee preferred to assign ample observing time to the more outstanding programmes rather than attempt to satisfy more or less all acceptable applications.

The committee supported the Directorate's proposals with regard to the execution of the Schmidt Sky Surveys, as presented elsewhere in this Report (chapter on ESO Sky Survey Project). It also recommended that observational material collected at La Silla and of interest to other astronomers, after analysis by visiting astronomers at their home institutes, be centralized and listed in Europe. It advised on improvement of the application forms.

f) A **Working Group of Council for the Establishment of a Multilateral Protocol** was created at the Council meeting of June, 1972. It met:
on July 11 at Geneva (1st meeting)
on October 6 at Hamburg (2nd meeting)
on November 6 at The Hague (3rd meeting).

The tasks of the Working Group are described in the chapter on Administrative Matters in this Report. Invaluable help was rendered by Messrs. F. Schmid and J. M. Dufour of the legal services of CERN.

g) A **Working Group of the Finance Committee for the review of the ESO Financial Rules and Regulations** was created at the F. C. meeting of April 11, 1972. The group met once, on September 12, at Hamburg.

The tasks of the Working Group are described in the chapter on Administrative Matters in this Report.

APPENDIX

List of Members of Council, Committees and Working Groups per August 1, 1973

Council

Belgium:	A. G. Velghe L. Poulaert / M. Deloz
Denmark:	M. Rudkjøbing P. A. Koch
France:	A. Lallemand A. Alline (President)
Federal Republic of Germany:	R. Kippenhahn C. Zelle
The Netherlands:	H. G. van Bueren J. H. Bannier
Sweden:	P. O. Lindblad M. Fehrm

Committee of Council

A. Alline (France), President
J. H. Bannier (Netherlands)
J. Borgman (President of the Instrumentation Committee)
M. Deloz / L. Poulaert (Belgium)
M. Fehrm (Sweden; President of the Finance Committee)
P. Ledoux (President of the Observing Programmes Committee)
P. A. Koch (Denmark)
B. Strömgren (President of the Scientific Policy Committee)
C. Zelle (Federal Republic of Germany)

Scientific Policy Committee

	Standing invitation
L. Biermann	A. Alline (President of Council)
J.-C. Pecker	J. Borgman (President of the Instrumentation Committee)
B. Strömgren (Chairman)	P. Ledoux (President of the Observing Programmes Committee)
L. Woltjer	M. Fehrm (President of the Finance Committee)

Finance Committee

Belgium:	M. Deloz
Denmark:	H. Grage
France:	H. Dumont
	C. Bonnet
Federal Republic of Germany:	C. Zelle
The Netherlands:	P. J. Fierst van Wijnandsbergen
Sweden:	M. Fehrm (Chairman)
	B. Samuelsson

Instrumentation Committee

K. Bahner
J. Borgman (Chairman)
R. Cayrel
G. Courtès
Aina Elvius
Ch. Fehrenbach
D. J. Malaise
P. E. Nissen
E. H. Schroeter

Observing Programmes Committee

	Substitute
G. Wlérick	J. Lequeux
E. P. J. van den Heuvel	P. S. The
E. B. Holmberg	Aina Elvius
P. Ledoux (Chairman)	P. Swings
M. Rudkjøbing	—
K. Hunger	Th. Schmidt-Kaler

Working Group for a Multilateral Protocol

J. H. Bannier (Chairman)
L. Delrot
H. Dumont
A. Freytag
M^me^ M. R. d'Haussy
C. E. I. M. Hoogeweegen
O. Ottosson

Working Group for Financial Rules and Regulations

C. Bonnet
M. Deloz (Chairman)
P. J. Fierst van Wijnandsbergen
G. Friborg
H. Grage
S. C. J. von Welck

ADDRESSES

ESO Directorate	131 Bergedorfer Straße, D-205 Hamburg 80, Fed. Rep. of Germany. Telephone: 7 21 30 01. Telex: 2 17 856. Telegrams: EURASTRO — Hamburg.
ESO TP Division and ESO Sky Atlas Laboratory	(Telescope Project Division), CH-1211 Genève 23, Switzerland. Telephone: (022) 41 98 11; ext. for TP Div.: 22 35; ext. for Atlas Lab.: 48 34. Telex: 28 491. Telegrams: CERNLAB — Genève.
ESO Headquarters Chile	Alonso de Córdova 3107, Vitacura. Casilla 16 317 — Santiago 9, Chile. Telephone: 28 50 06. Telex: 40 853. Telegrams: ESOSER — Santiago de Chile.
ESO Guesthouse	Gustavo Adolfo 4634, Santiago de Chile. Telephone: 48 42 54 (near cross-roads Avenida Cristóbal Colón and Amerigo Vespucio, then through Félix de Amesti).
ESO Local Office La Serena	Casilla 27 D. Cisternas 2020, La Serena, Chile. Telephone: 11 67, 11 77. Telegrams: ESOSER — La Serena.

The ESO Observatory on La Silla can best be reached by mail, telegrams etc. via Santiago Headquarters (address see above).

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