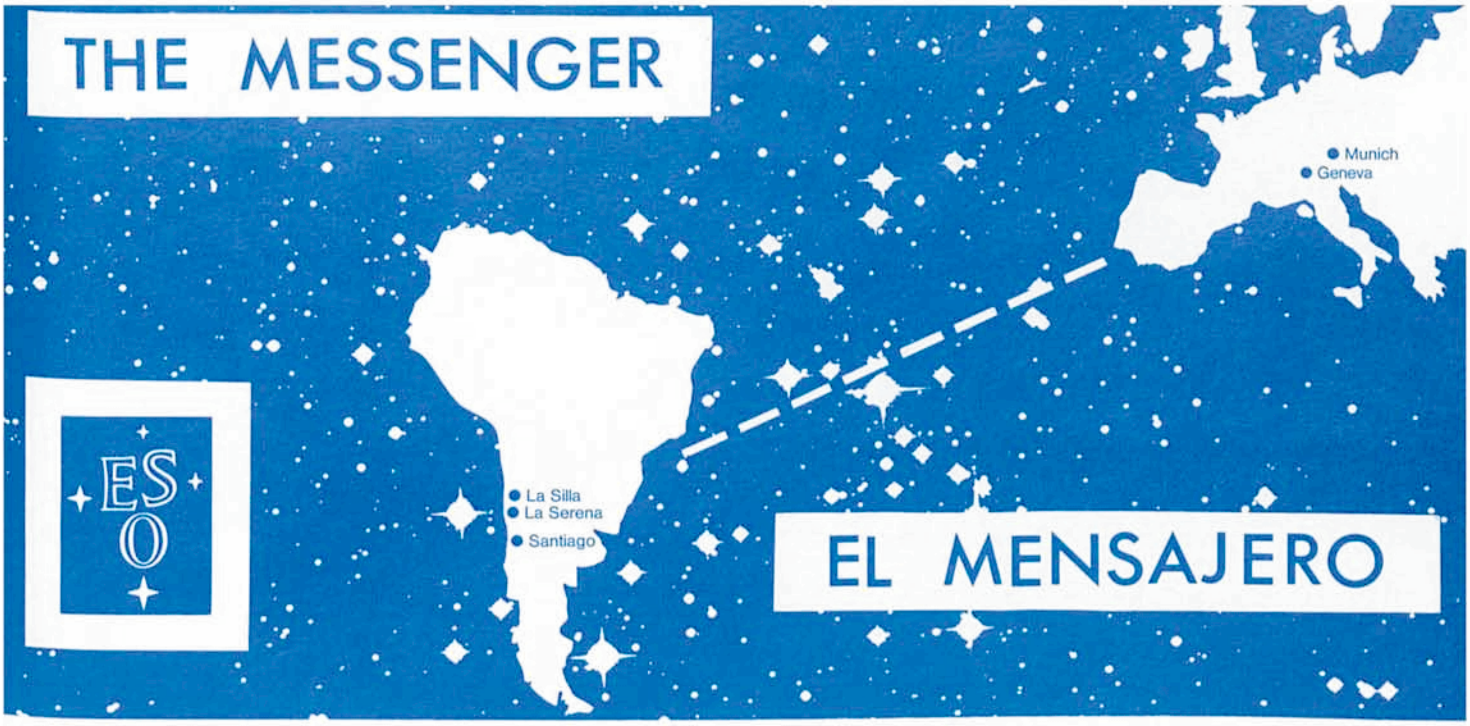


THE MESSENGER

EL MENSAJERO

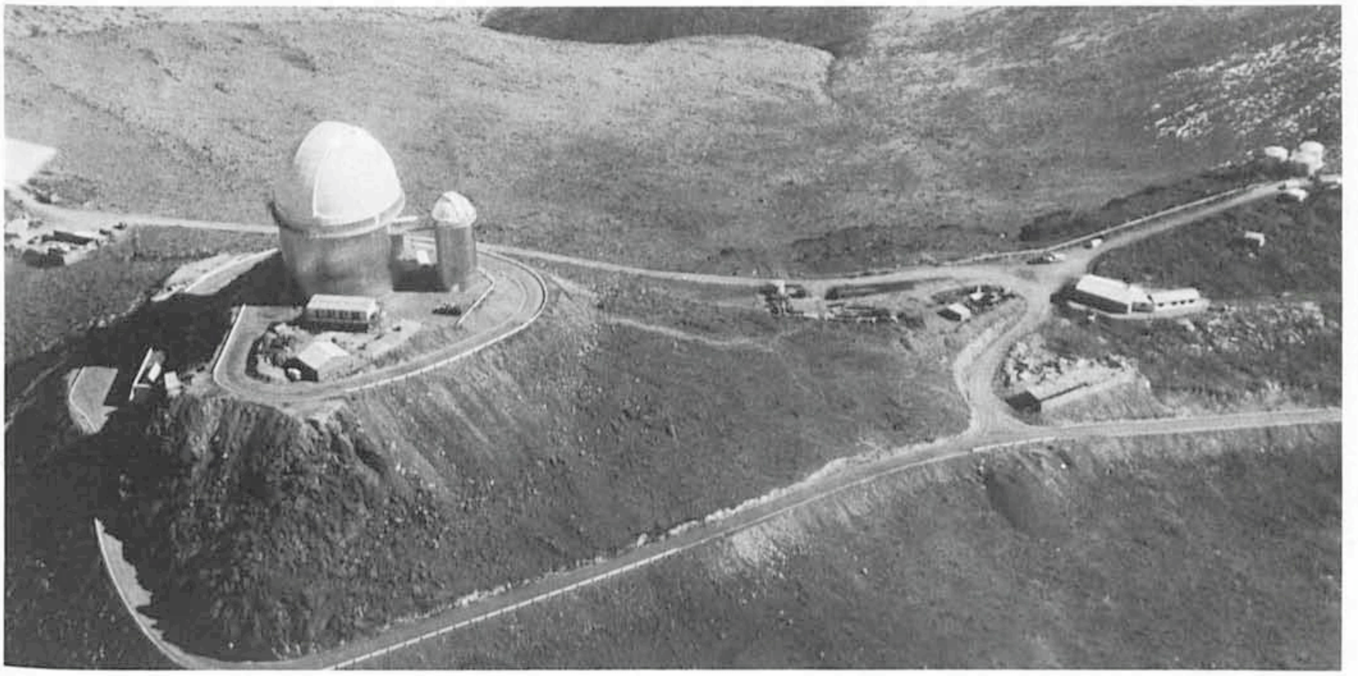
No. 6 – September 1976

Mechanical Assembly of 3.6 m Telescope Completed

The 3.6 m telescope erection is proceeding well, informs Dr. Laustsen from La Silla. His report was written on the first day of August:

By the end of July, the mechanical erection of the telescope was nearly completed. Three weeks earlier, the team of Creusot-Loire had installed the upper ring onto the Serrurier struts of the tube. The "machine" thereby recuperated its proper appearance—it looks again like a real telescope.

Three months of hard work were spent to reach that stage. More than 150 crates were opened and piece after piece of the telescope was transported the last 1.5 km from the unpacking area up to and then into the telescope building. Cleaning and assembly work was normally done on the ground floor before the 35-ton crane of the dome took over



Aerial view of the 3.6 m dome on the summit of La Silla, July 1976. Photo by S. Laustsen and R. Donarsky.

and lifted the piece up through the shaft to the observing floor. A few pieces, or sub-assemblies, weighed more than 30 tons. The heaviest one, the assembled horseshoe, weighed about 40 tons and was, with great care, used as a test load, before the crane was entrusted with the task to lift the piece into place.

Thanks to the fact that a pre-assembly was made in Europe, the assembly work on La Silla went through pretty smoothly. Problems were mainly encountered in areas where tests could not be completed in Europe, and then, as one could expect, in the inferface between building and telescope. Some of the problems gave rise to a few days' extra work. Nothing more important was encountered so far.

During the last days of July, the telescope was turned around both polar axis and declination axis by means of a simple motor control box.

The control system for the telescope has been installed in the building, and the cabling, which is a huge job, is well advanced. August is going to be a busy month for the Electronics Group; and in September we expect to install the main mirror and start with the Hartmann tests. The aluminizing plant ist being installed these days. But about these activities we shall report later.

PROFILE OF A VISITOR'S PROGRAMME:

OH/IR Sources

Astronomers from the Max Planck Institute for Radioastronomy (MPI) in Bonn, Fed. Rep. of Germany, have recently succeeded in measuring infrared (IR) radiation from OH radio sources (emission from the hydroxyl radical). Dr. W. A. Sherwood reports about the significant progress made in this exciting programme:

In July 1968 Wilson and Barrett at MIT discovered OH radio emission from some infrared (IR) stars. The rate of detection for prime candidates was about 10 %, but later the rate fell to 5 % in a larger sample. My colleagues at MPI have also searched for OH in IR stars selected to have very late spectral types, extreme red colours and large amplitude variations in the infrared from 1 μ to 20 μ and have had a very high success rate in a small sample. The reason for the small sample ist that the criteria are almost mutually exclusive: for the spectral type to be known, the object must be visible, implying less than extreme reddening. In addition very few objects have been sufficiently observed for the criteria to be met.

There are predominantly two types of OH radio emission associated with IR stars: one of the main lines (1665 or 1667 MHz) or the satellite line at 1612 MHz is the strongest. The OH emission associated with the latter type shows the following characteristics:

1. The line profile is usually split into two components separated by 10 to 50 km/s^{-1}.
2. There is no polarization.
3. There is no radio continuum source.
4. Line components are narrow having widths between 1 and 6 km/s^{-1}.
5. Most sources vary (OH and IR apparently in phase).

Early in the 1970s OH mapping surveys at 1612 MHz were started. What we now wondered was whether all OH sources having these criteria also had IR stars. Up to the 1973 IAU General Assembly in Sydney, searches for the IR stars had largely been unsuccessful for two reasons: the uncertainty in the radio coordinates for the new OH sources was too large and the wavelength of 2.2 μ used for the IR search was too short. The high brightness temperature in contrast to the low temperature derived from the line width implied maser excitation. The lack of a radio continuum source suggested to us that the infrared pumping mechanism rather than another mechanism, such as collisional excitation, was a possibility. The pump could operate at 2.8 μ, 35 μ or at longer wavelengths. Since the IR stars in which OH emission had been discovered were bright at 2.2 μ, the 2.8 μ mechanism was considered to be the likely one and searches were made at the 2.2 μ atmospheric window. On the other hand, Georg Schultz noticed that the IR sources with OH had a larger infrared excess at 3.5 μ than at 2.2 μ, and because, too, our equipment initially wasn't very sensitive, he made a successful pilot survey without filter to detect sources which are brighter at wavelengths longer than 2.2 μ.

In order to make firm identifications of the OH sources with IR stars, it was necessary to improve the accuracy of the radio coordinates to ±10–15 arcseconds using the 100 m telescope at Effelsberg. It was also necessary to improve the method of determining the optical coordinates on the ESO 1 m telescope on La Silla—in the infrared one requires an astrometric photometric telescope, since the objects can only be found by scanning or setting on accurately-known positions. The effort pays off in increased efficiency, meaning more observing time. Our day-time success is a result of this effort and was reported by Willem Wamsteker of ESO in the June 1976 issue of the *Messenger*.

Using the ESO 1 m telescope and infrared equipment developed by Ernst Kreysa, we scanned at 3.8 μ 30 sources from the list of Anders Winnberg. Before our run in July 1976 we had discovered 50 % of the expected number of IR sources. The Table shows that the detection rate is clearly a function of the brightness of the OH sources. In July with more sensitive equipment we detected a few more sources but the 100 % level may require the use of the ESO 3.6 m telescope.

FREQUENCY OF DETECTING OH SOURCES SEARCHED AT 3.8 μ

No. of OH sources scanned	With OH flux (1612 MHz) $\times 10^{-26}$ watt $m^{-2}Hz^{-1}$	With IR counterpart	% with IR counterpart	Without IR counterpart
5	≦ 16 f.u.	4	80	1
10	≦ 12 f.u.	8	80	2
15	≦ 10 f.u.	9	60	6
15	< 10 f.u.	6	40	9
Total 30		15	50	15

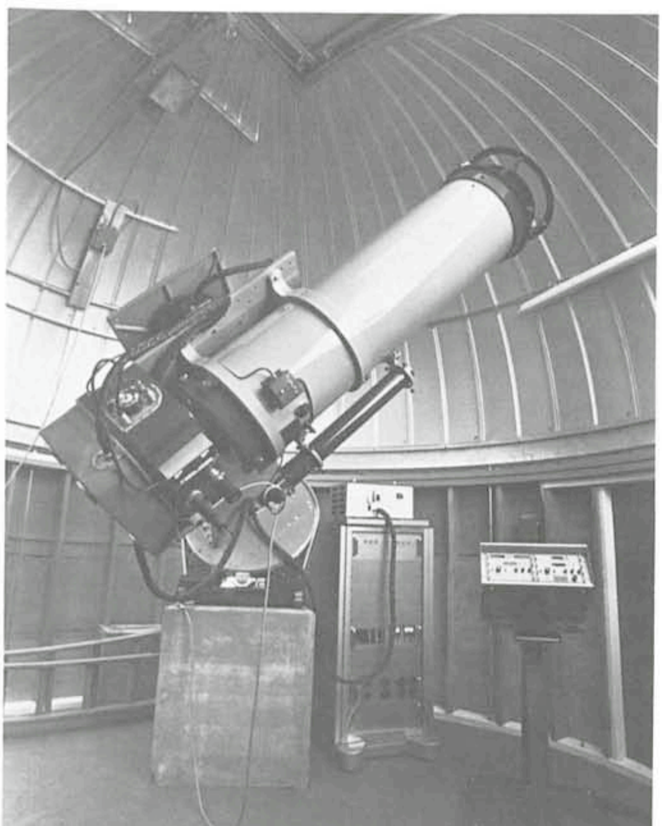
Multicoulor photometry for a few objects suggests that our sample of OH/IR objects are redder than the previously known ones. Some of the sources are up to 100 times fainter at 2.2 μ than they are at 3.7 μ. In at least two objects the intensity appears to be still rising even at 20 μ. Winnberg's OH survey yielded the most sources within 1/2° of the galactic plane. The IR magnitudes and colours plus the local standard-of-rest velocities indicate that the new objects are reddened distant objects, perhaps more luminous on the average than the objects first found by Wilson and Barrett.

At this stage we may divide our research into two parts: the specific and the general study of OH/IR sources. In the specific study we note that the OH survey ist statistically complete between $18° \leqq l \leqq 50°$ with $|b| \leqq 1°$ and in order to analyse the data the IR observations ought to be as complete as possible: 100 % of all the IR sources, extended wavelength coverage (1 μ to 35 μ from the earth) and increased resolution in both wavelength and time. We have OH and IR observations at 6-month intervals extending over 18 months and know that the sources vary. The variation (phase and amplitude) contains information about the pumping mechanism, mass loss and the density of the dust cloud surrounding the star. We hope to derive the absolute luminosity, distance and reddening of each system.

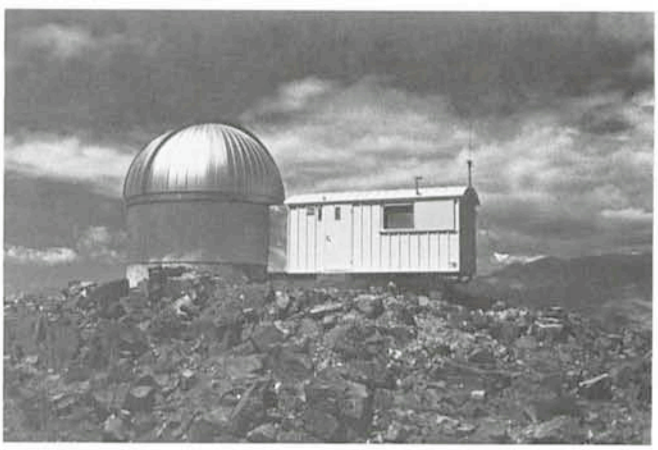
In the general study the OH/IR sources are probes in the study of the dynamics of the Milky Way. We are working with Dutch and German astronomers in identifying the IR counterparts of those high-velocity OH/IR sources found near the galactic centre. This project is complimentary to the one described by Blaauw in the June 1976 issue of the *Messenger*. Combining IR distances with OH radial velocities will allow a detailed study of the gravitational potential and mass distribution of the central part of the Galaxy while the McCormick Areas Programme is a study of the "local" galactic evolution.

Swiss Astronomers on La Silla

Last year saw the installation of a Swiss telescope on La Silla and the arrival of the first observers. Here Dr. F. Rufener, of the Geneva Observatory, tells about the telescope and some of the observing programmes which are being carried out:



The 40 cm Cassegrain telescope of the Geneva Observatory on La Silla. The photoelectric photometer is at the Cassegrain focus.

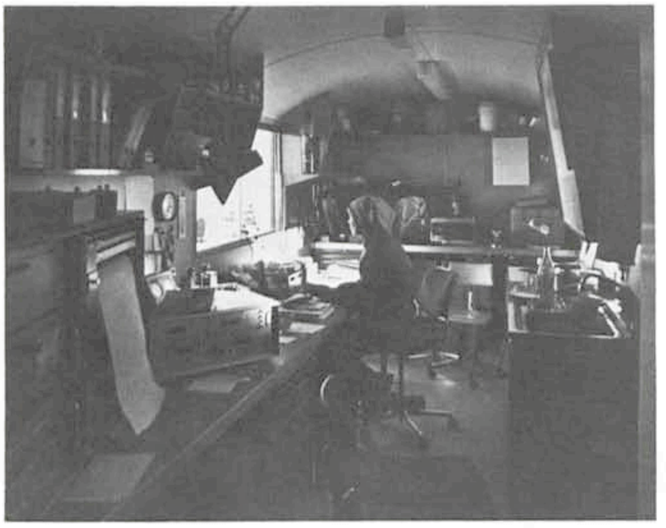


The Geneva Observatory station on La Silla.

Following a convention established in 1974, the Council of ESO has authorized the Geneva Observatory to set up a provisional observing station on La Silla. It has an Ash-dome of 4.60 m diameter which is linked to a working-site hut. This hut was shipped to La Silla as a container and consists of a sheltered observation post, a workbench with emergency repairs equipment and a kitchenette. The dome protects the equatorial table on which a Cassegrain telescope of 40 cm aperture and 7.20 m focal length has been mounted. The controls of the equatorial table allows an accurate setting by the reading of the digital display of the celestial coordinates (right ascension and declination). A special control panel situated near the strip-chart recorder offers the observer offsetting facilities (small-angle displacement of the telescope).

The Telescope

The telescope is equipped with a classical photoelectric photometer on which UBV B_1 B_2 V_1 G filters of the photometric system of the Geneva Observatory have been mounted. The acquisition procedure is very simple; measures in direct



Interior view of the working-site hut, with the observation post tq the left.

current are made through an amplifier with total counter-reaction and an analogue recording on roll-paper. A calibration device allows to check the dynamics of the sensitivity ranges (10^4). Presently, this instrument obtains accurate photometric observations, in seven colours, for stars of magnitude $4 \leqq m_V \leqq 10$. An achromatic attenuator reduces the flux of the bright stars which may therefore be observed without saturation problems (the magnitude scale is shifted by 4.5 units).

The Observations

Several astronomical programmes are undertaken and pursued simultaneously. Of great importance is the establishment of a network of standard stars in the southern sky, which must be rigidly tied—in magnitude and in colours—to our standard stars in the northern sky. We also want to complete a variety of stellar samples already observed in the northern hemisphere, e.g. stars in the solar neighbourhood, the brighter stars, O-stars, B-stars of known distances (i.e. in the Scorpius-Centaurus association) and the stars of peculiar chemical composition. Some fields close to the southern galactic pole are observed methodically. We are also interested, in connection with stellar structure studies currently undertaken in Geneva, in having many, very complete and very accurate sequences of open star clusters.

Since the 10th November 1975, when this installation entered into operation, teams of two observers of the Geneva Observatory take turns on La Silla. They carry out the observations and the maintenance of the equipment. Several thousands of the measurements in seven colours have already been obtained and reduced in Geneva. The photometric quality of the site is really remarkable, and the number of clear nights is so high that it can be very tiring even for our best teams!

Visiting Astronomers

(October 1976—March 1977)

Observing time has now been allocated for period 18 (October 1, 1976 to April 1, 1977). The demand for telescope time was again much greater than the time actually available.

This abbreviated list gives the names of the visiting astronomers, by telescope and in chronological order. The complete list, with dates, equipment and programme titles, is available at request from ESO/Munich.

152 cm Spectrographic Telescope

Oct. 1976: Breysacher/Muller/Schuster/West, Wamsteker, v. d. Heuvel, Maurice.

Nov. 1976: Maurice, Seitter, Divan, Chincarini/Materne, Breysacher/Muller/Schuster/West, Pakull.

Dec. 1976: Pakull, Westerlund/Olander, Ardeberg/Lyngå/Cullum, Bergwall/Ekman/Lauberts/Westerlund, Dennefeld, Materne.

Jan. 1977: Materne, Denoyelle, Havlen/Quintana, Breysacher/Muller/Schuster/West, Breysacher/Westerlund, J. P. Swings.

Feb. 1977: J. P. Swings, Kohoutek, Alloin, Moffat/Solf/Kohoutek.

March 1977: Moffat/Solf/Kohoutek, Ilovaisky, Wamsteker, Gieren, Havlen.

100 cm Photometric Telescope

Oct. 1976: Havlen, Breysacher/Muller/Schuster/West, Mianes/Rousseau/Rebeirot.

Nov. 1976: Mianes/Rousseau/Rebeirot, Wamsteker, Crane, Chincarini/Materne, Alcaino, Crane, Westerlund/Olander.

Dec. 1976: Westerlund/Olander, Pakull, Ardeberg, Maitzen, Alcaino.

Jan. 1977: Denoyelle, Haug, Wamsteker, Borgman, Wlérick, Adam, Breysacher/Muller/Schuster/West, Tinbergen.

Feb. 1977: Tinbergen, Vogt, Kohoutek, Danks, Chevalier

March 1977: Chevalier, Wamsteker, Chevalier, Sherwood, Wamsteker, Vogt.

50 cm ESO Photometric Telescope

Oct. 1976: Duerbeck.

Nov. 1976: Duerbeck, Seitter, Pakull, Elst.

Dec. 1976: Elst, Heck, Vogt, Heck, Vogt.

Jan. 1977: Heck, Haug, Borgman, Vogt.

Feb. 1977: Knoechel, Vogt, Manfroid, Vogt, Krautter.

March 1977: Krautter, Gieren, Ilovaisky.

Objective Prism Astrograph (GPO)

Oct. 1976: Blaauw/West, Azzopardi, Heudier, Muller/Schuster/West.

Nov. 1976: Pakull, Blaauw/West, Heudier, Muller/Schuster/West.

Dec. 1976: Zeuge, Blaauw/West, Zeuge, Gieseking, Heudier.

Feb. 1977: Blaauw/West, Gieseking, Muller/Schuster/West.

March 1977: Amieux, Denoyelle, Gieseking, Blaauw/West, Muller/Schuster/West.

60 cm Bochum Telescope

Dec. 1976: Hardorp, Oblak.

50 cm Danish Telescope

Jan. 1977: Haug, Kohoutek.

Feb. 1977: Kohoutek, Sterken/Jerzykiewicz, Renson.

March 1977: Renson.

The ESO Optics Group and some Recent Achievements

R. N. Wilson

DEVELOPMENT OF THE OPTICS GROUP

The ESO Optics Group was formed in March 1973. The need was already pressing at that time with many problems connected with the optical tolerancing and testing of the 3.6 m telescope requiring urgent attention. Also required was a major optical design effort on prime focus correctors and ancillary optics for the adapters (interface units between astronomer and telescope providing viewing, guiding, focusing and other facilities). The auxiliary instrumentation programme, then in its initial phases, also placed heavy demands—not only for optical design, but also on basic layout determined by the astronomical/optical interface.

It became evident very early that the founder member of the OG, Ray Wilson, could not cope alone with this large and increasing volume of work.The first extension of the OG was Francis Franza, a technical assistant in mechanics, who joined us in January 1973. His first major task was the opto-mechanical layout of the prime focus and Cassegrain adapters in collaboration with the (then) coordinator, Bernth Malm.

At the end of 1973 an extremely powerful optical design programme, ACCOS V, was purchased from the USA. This was put into use with the CERN CDC 7600 computer and rapidly proved a most powerful and efficient tool. However, a full-time optical designer was required to exploit it. In September 1974, Maurice Le Luyer, one of France's most experienced optical designers, joined the OG. He took over responsibility for the whole optical design and computer side of the OG operations. The most urgent tasks were the computation of the adapter optics and the prime focus correctors.

The decision had been taken in late 1972 to build an optics laboratory next door to the mechanics assembly hall. It was the group leader's philosophy from the start that optical *manufacture* was not a sensible field of activity for ESO, since there is ample manufacturing capacity available in industry. The role of the laboratory was thus to be principally optical assembly and testing. To take charge of the Optics Laboratory, equip it and assume responsibilities in the mounting load of work in auxiliary instrumentation, Daniel Enard was engaged in February 1975. At the same time Guy Ratier joined the OG for a year, on leave from the Pic-du-Midi Observatory. Guy's main task was to advance the design of a coudé spectrometer as well as assisting with the adapters and with certain specialized problems connected with the 3.6 m telescope.

Until this year, it had been impossible for the OG to take any significant interest in existing equipment in Chile—the manpower simply did not permit it. However, contact was established by a visit by Ratier in 1975 and by Enard and Wilson in February 1976. The major purpose of the latter visit was to prepare the way for the installation and test phase of the optics of the 3.6 m telescope. A fruit of this contact has been the decision to engage an optical engineer for La Silla. Max Lizot will be joining the Operations Group in August 1976. He will not be a formal member of our OG but will maintain very close liaison with us to the mutual benefit, we are confident, of both ESO-Geneva and ESO-La Silla. To complete the basic manpower of the OG, an optical technician will be engaged within the next few weeks. His work will be the assembly and test of equipment in the Optics Laboratory.

SOME RECENT ACHIEVEMENTS

1. Telescope Optics

The end of the current year should mark the end of an era for the OG in which the requirements of the 3.6 m telescope have dominated our activities.

Several man-years of capacity have been devoted to the *adapters* alone in one way or another. The *simplified prime focus adapter*, designed round the Gascoigne plate corrector, has recently been assembled and adjusted and has now left for Chile. It is an essential element in the initial prime focus use of the telescope. A major effort of assembly, adjustment and test will take place over the next few months on the *Cassegrain adapter*, for which the optics was recently delivered. A prime focus *adapter for the triplet corrector* is under development.

After considerable design analysis, it was decided to equip the telescope with two types of prime focus corrector. (It should be remembered that the naked primary of our quasi-Ritchey-Chrétien telescope does not yield a corrected image without corrector.) The first type is called the *Gascoigne plate (GP)* and provides a field of about 0°.25 with a single aspheric plate. Two such plates have been manufactured, one optimized for the red spectral region and one for the blue. These ESO plates are among the first to be made: the manufacture is difficult and its success depends on a rigorous test procedure. A special optical system for this test was developed in the OG. The GPs should provide maximum efficiency correctors with particularly good ghost-image performance. Combined with an electronographic image tube (Spectracon), they should give maximum penetration into space for photographic work. The *triplet* correctors (again a "red" and "blue" one) are currently being manufactured and will be available for integration into the adapter towards the end of this year. They will provide a field of 1° with rather stronger ghost images and will be used with classic photographic plates (or perhaps film) where a larger field is useful. *Doublet* correctors, giving intermediate characteristics, have also been calculated, but it is felt that the others cover sufficiently our present requirements.

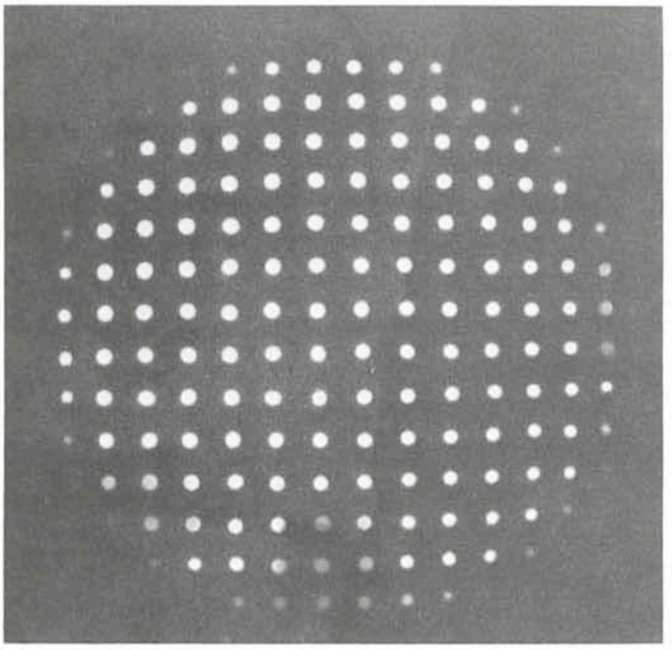


Fig. 1. Hartmann plate for f/5 paraboloid of 600 mm diameter tested at centre of curvature.

2. Testing and Adjustment of Telescopes and Other Optics

Telescopes are very expensive instruments. The quality demands placed on the manufacturer of the optics are considerably more severe than those customary before the last war. Such quality is only possible or verifiable with highly sophisticated test procedures. The standards of test and adjustment in *maintenance* must be correspondingly high, otherwise the heavy economic investment in potential quality is wasted in astronomical practice.

The expected performance of the 3.6 m telescope on the basis of existing test material has been analysed in great detail. In particular, the prime mirror support system has been the subject of a careful analysis which suggests that the telescope should, even with the least favourable interpretation, be well within the specification. The final quality will be known before the end of this year. A comprehensive adjustment and test schedule has been planned, based on visual and photographic tests but above all on *Hartmann testing* with a 2-dimensional screen. This rigorous test procedure, pioneered in its general 2-dimensional form at Lick, Kitt Peak and the Optical Sciences Center in Tucson, provides a means of analysing telescope quality in scope and precision quite impossible in the pre-computer era. A basic programme kindly supplied by Kitt Peak has been considerably extended to give comprehensive analysis of the different possible errors which can affect the image due to manufacturing irregularities in the mirror surfaces or distortions of cells or the tube. This development is certainly one of the most important undertaken by the OG. Apart from the computer side, it requires sophisticated plate-measuring equipment with computerized output. Such facilities exist in the Sky-Atlas Laboratory in Geneva and similar developments have been undertaken by ESO-Chile for plate measurements at La Silla. Trial Hartmann tests have been performed on the 1 m telescope of the Pic-du-Midi and on the ESO 1 m photometric telescope. Routine Hartmann testing should have a major impact in future in maintaining high optical quality of all ESO telescopes.

An analogous programme development which is also of great significance allows the *computer analysis of interferograms.* Such interferograms provide one of the best methods of establishing the quality of optical elements and systems. Such analysis has already been of great value in assessing the quality of the Gascoigne plate correctors and of parabolic mirrors destined for use in holographic grating production.

It is not possible in a general article like this to go into details of Hartmann or interferometric testing. However, it is instructive to see what a typical Hartmann plate and interferogram look like and what computer analysis produces. Figure 1 shows a Hartmann plate exposed for an f/5 parabolic mirror, tested in auto-collimation at its centre of curvature. A screen containing a set of holes in a rectangular mesh arrangement is placed in front of the mirror and a photographic plate placed *near*, but not *at*, the pinhole image at the centre of curvature. If the mirror were a perfect *sphere*, the image would be perfect and the Hartmann plate produced would be a perfect reproduction on a small scale of the screen. Aberration of the image produces distortions of the positions of the spots. In this case, the major barrel-type distortion does not correspond to errors of the mirror, but to aberration produced by its desired parabolic form. If the spot coordinates are measured with an accurate measuring machine, a sophisticated computer programme can analyse the errors in terms of a defined polynomial with a statistical or higher order residual. After removing the term corresponding to the parabolic form,

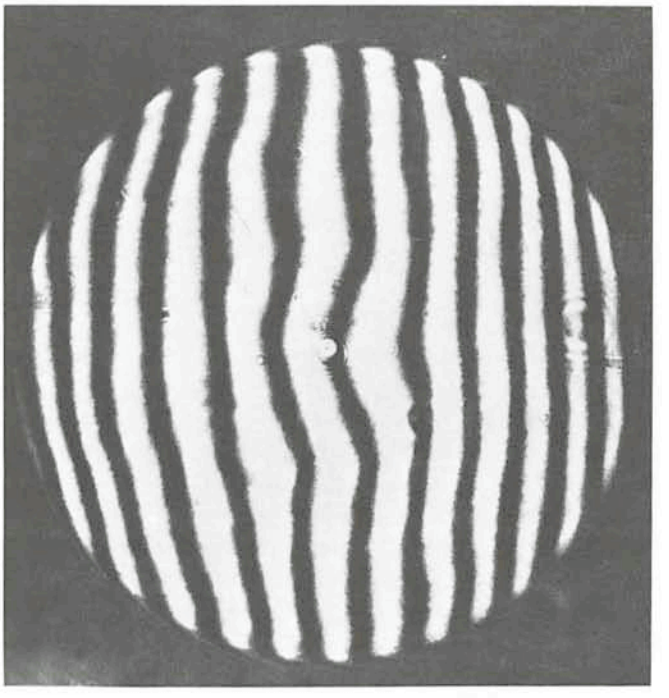


Fig. 2. Interferogram of same f/5 paraboloid tested at centre of curvature with compensating lens to remove spherical aberration.

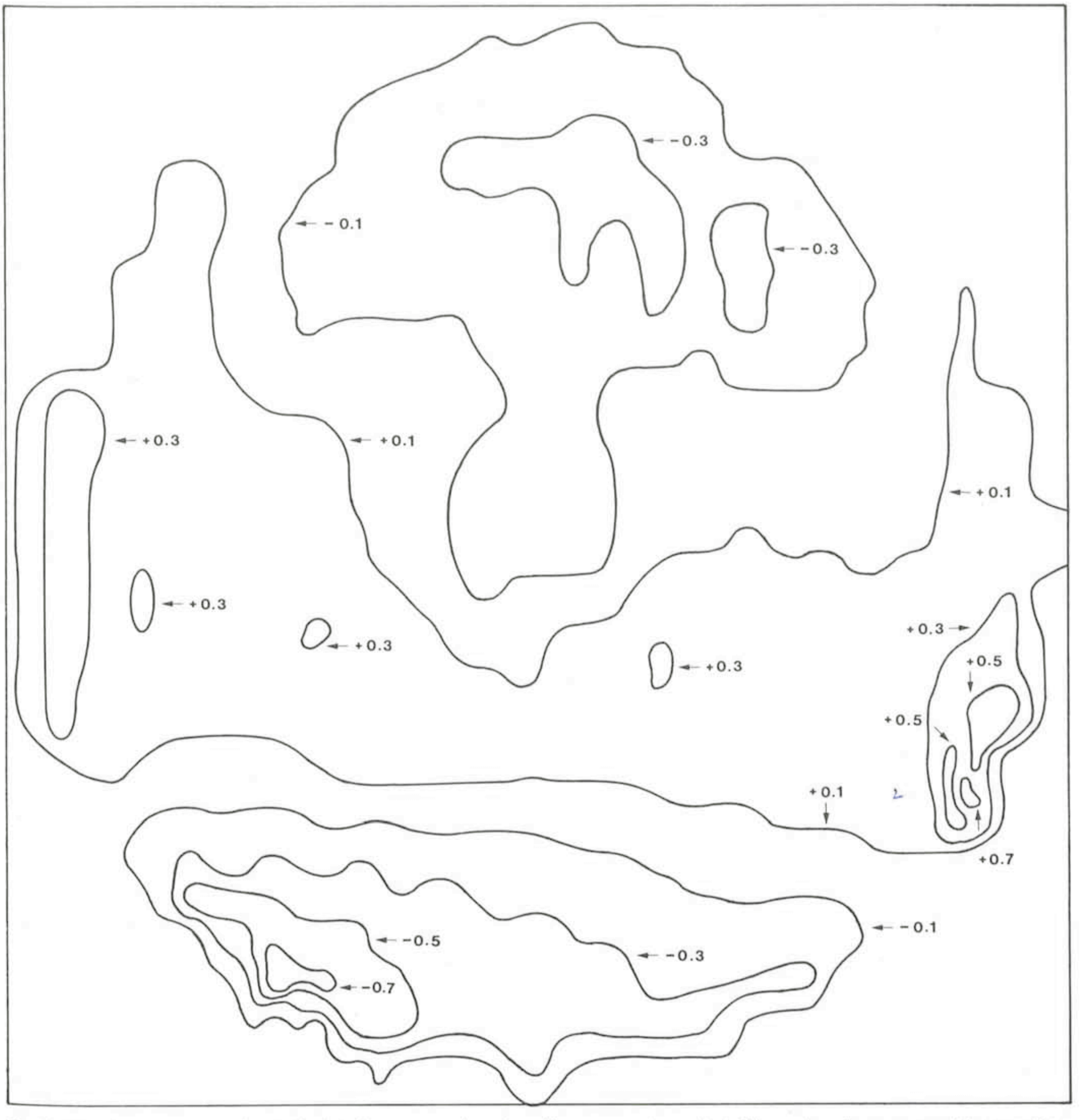


Fig. 3. Wavefront corresponding to the interferogram and produced from computer analysis. The contour lines represent the error from a perfect wavefront in wavelengths as units.

the analysis reveals in this case that the most serious error is astigmatism of about 0.75 λ (λ = wavelength of light 500 nm).

The interferogram (Fig. 2) is of the same mirror, but with the important difference that the aberration caused by the parabolic form has been removed by a compensating lens. The error in straightness of the fringes thus represents the manufacturing errors directly. The astigmatism is only obvious to the practised eye, but the central "hole" in the wavefront is very evident.

Figure 3 shows a contour map of the wavefront compared with a perfect sphere. This is part of the output from the computer analysis. In this case, the map was deduced from the interferogram, but an analogous map can be obtained from the Hartmann plate. This map shows clearly the basic "saddle" form corresponding to astigmatism.

3. Optics Laboratory

Telescope testing is perhaps the most important application, but many such Hartmann plates and interferograms will be produced, as with the paraboloid discussed above, in our own Optics Laboratory shown in Figure 4. Apart from normal small equipment of optical benches, light sources, etc., the main equipment consists of a Matra "Acofam" Optical

Test Bench, which permits detailed analysis of lens systems, a heavy optical bench in stone, a Laser Unequal Path Interferometer and a photometer. The photo also shows a HP 2100 computer of the sort which will be used for the controls of the 3.6 m telescope and for Hartmann analysis.

4. Auxiliary Instrumentation for the 3.6 m Telescope

A word should now be said about recent work on auxiliary instrumentation, without which the utility of the telescope would be very limited. We make no attempt here to list or discuss the instrumentation programme in general (such an article will appear in a future issue), but mention only those projects on which the OG has worked.

A conceptual design has been worked out for a *coudé echelle spectrometer,* and this has been approved by the Review Team advising on the project. The detailed design study will be pursued as soon as the 3.6 m initiation phase is complete. Similarly, a conceptual design for a *Cassegrain echelle spectrograph* has been prepared for discussion in the appropriate Review Team. Optical design work is under way on a *focal reducer* for the prime focus of the 3.6 m telescope. The optics of the *coudé auxiliary telescope (CAT)* will be tendered within the next few weeks. A *coma device* (a device devised by A. Behr for testing the centering of telescopes) is in an advanced state of manufacture.

Depending on priorities, pressure on development capacity and availability of suitable products from industry, it may be in ESO's interest to buy a complete instrument. In the case of an instrument in which optics assumes a dominant role, the definition and processing of the contract followed by acceptance and testing, form a part of our work which should not be underestimated. An example is the *Boller and Chivens spectrograph* which has just been delivered for immediate use at the Cassegrain focus of the 3.6 m telescope as soon as this focus becomes available.

5. Other ESO Equipment

Coming now to the general support side of the Observatory's other equipment apart from the 3.6 m telescope, the development of a novel *off-set guiding system for the 1 m Schmidt telescope* should be mentioned. This will permit off-set guiding even with the objective prism. The optical design is complete and its manufacture should be possible soon. Preliminary work has also been completed for ordering a new "blue" Schmidt plate which should make the Schmidt telescope more effective in the blue spectral region. Other projects actively being pursued are improvements in the *Zeiss camera* (TV guiding on the 1.5 m telescope) and the *Echelec spectrograph.*

6. Other Observatories and Institutes

Finally, the OG has fruitful contacts with observatories and institutes of the member states. These include assistance and advice (usually in both directions) with the Pic-du-Midi and OHP in France, with Danish observatories (e.g. supply of a focal reducer), cooperation on optics with ESA in the working group of a Space Astrometry project, and supply of optics for holographic grating production for Göttingen Observatory. Last but not least, our "sister" organization in Geneva, CERN, has built a prototype of the Cerenkov Counter optical system proposed by the OG. We have also assisted them in the manufacturing contracts for eight such systems which are in course of delivery. The result seems very promising and should be of major importance in the CERN research programmes.

In this article we have made no attempt to cover in any depth any of our activities, but rather to give an idea how numerous they are. We hope you will be indulgent if we have had no time yet for *your* problem. We hope we can tackle it soon!

Fig. 4. ESO Optics Laboratory. At the right the ACOFAM test bench; left foreground the stone bench with interferometer; centre background HP 2100 computer.

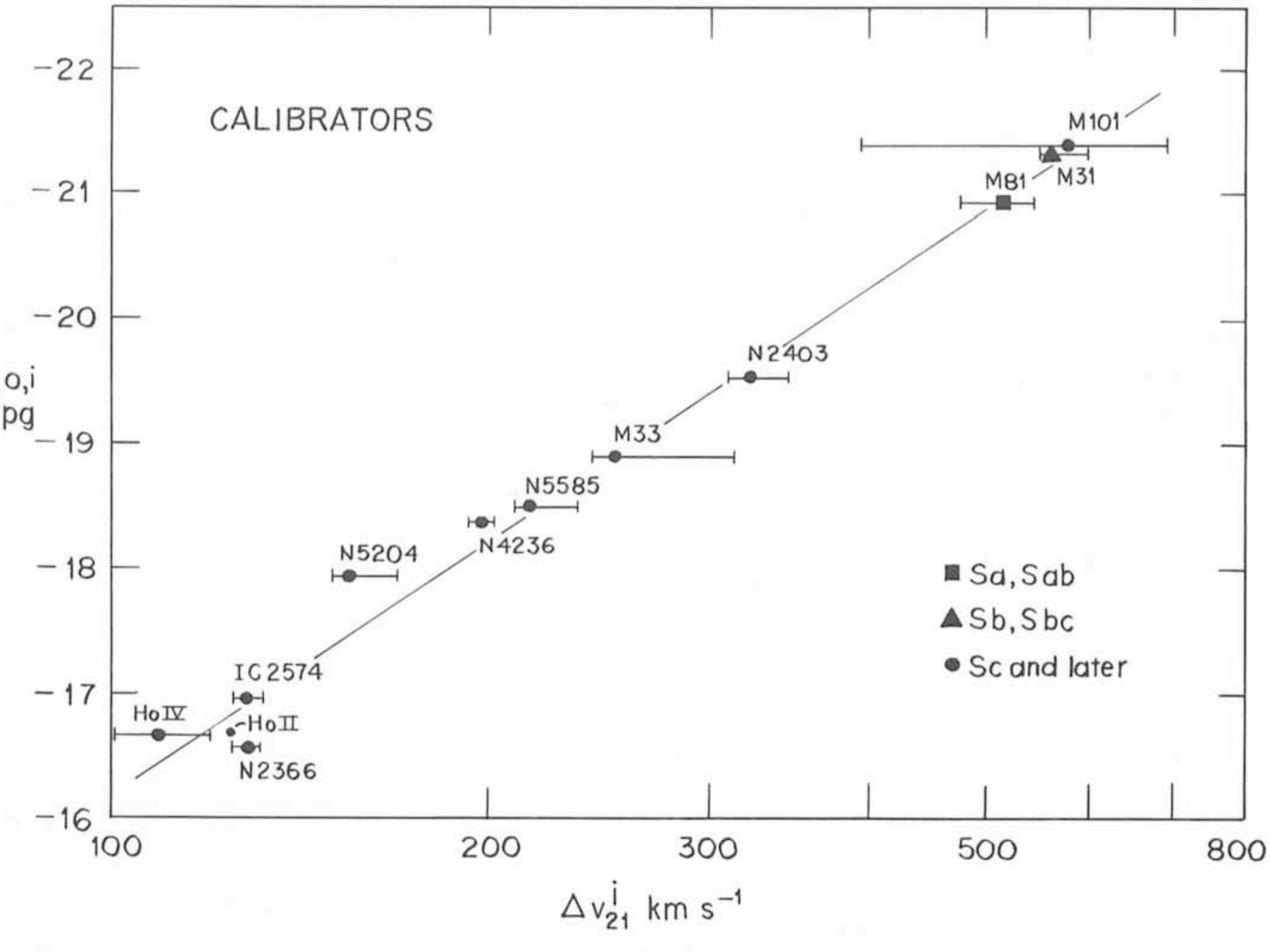
A New Method to Derive the Distances of Spiral Galaxies

G. A. Tammann

A new method to determine the distances of spiral galaxies has recently been proposed by R. B. Tully and J. R. Fisher (to be published in *Astronomy and Astrophysics,* 1976). Their method is remarkable for two reasons: (1) it uses a distance-independent parameter which is measured at radio wavelengths (21 cm); so far radio astronomy has been slow in providing good distance determinations; and (2) the parameter correlates with the total optical luminosity of a spiral galaxy; up to now only few, if any, luminosity indicators, besides van den Bergh's luminosity classification, have been known for spiral galaxies.

Professor Gustav Tammann of the University of Basel, Switzerland, is presently spending part of his time with the ESO Scientific Group in Geneva as associate astronomer. He is well known for his work on the extragalactic distance scale, culminating in a recent, but already classical series of papers in the Astrophysical Journal, *under joint authorship with Dr. Allan Sandage of the Hale Observatories. We are delighted to bring here the very latest news about the recently discovered 21-cm-line galaxy luminosity (and thus distance) indicator.*

The new method uses the line width of the 21-cm line of external galaxies as measured with single-dish radio telescopes. The width of the Doppler-broadened line is determined by the internal motion of the neutral hydrogen, i.e. essentially by the rotation of the galaxy. Hence, the total line width is expected to be equal to $2 \cdot v_{max}$, where v_{max} is the maximum rotational velocity. Of course the line width can only be determined for galaxies with well-determined 21-cm-line profiles, and this limits the method to spiral and late-type irregular galaxies. It is also evident that the line width reflects only the component of v_{max} in the line of sight; the *true* line width, denoted Δv_{21}^{i}, is directly observable only in edge-on galaxies—the measured line width of other galaxies must be corrected for the inclination i between the rotation axis and the line of sight (by dividing by



The correlation between the absolute photographic magnitude $M_{pg}^{o,i}$ (corrected for absorption in our Galaxy and within the external galaxy) and log Δv_{21}^{i} (the inclination-corrected 21-cm line width) for galaxies with independently-known distances (from Sandage and Tamman, 1976). Spirals of different types are shown with different symbols. The error bars indicate the observational uncertainties of Δv_{21}^{i}.

sin i). Since the correction becomes very large for nearly face-on galaxies, their true line width cannot be reliably determined.

Some correlation between the true line width Δv_{21}^{i} and the optical absolute magnitude M of a galaxy is expected: the line width is correlated with the rotation velocity of a disc galaxy and hence with its mass, and the mass of a galaxy determines to a large extent its luminosity. The only surprising result is that Tully and Fisher found such a tight correlation between line width and absolute magnitude in spite of the fact that other independent parameters were neglected—parameters which are expected to influence as well the mass and luminosity (like the radial distance of the point where v_{max} occurs, the form of the rotation curve, and the subtype of the spiral galaxy). Thus the theoretical background of the correlation is not yet understood, but the good empirical correlation between Δv_{21}^{i} and M suggests that it should be used as a tool to determine distances.

Tully's and Fisher's main result was a confirmation (to within ±10 per cent) of the distances to the M 81 and M 101 groups of galaxies, which formed the basis for the new value of the Hubble constant of $H_0 = 55$ km s^{-1} Mpc^{-1}. However, from a few spiral galaxies, which are members of the Virgo cluster, they determined a distance of this cluster of only 13 megaparsec (cf. *Bull. Amer. Astron. Soc.* **7**, 426, 1975), which is in open contradiction with the distance of 20.0 ± 2.0 Mpc indicated by several other good distance indicators. This contradiction seemed to cast considerable doubt on the 21-cm-line method.

In a rediscussion of the Virgo cluster problem, A. Sandage and G. A. Tammann (to be published in *Astrophysical Journal*, November 15, 1976) have used a larger sample of cluster galaxies and have found from the Δv_{21}^{i} data a cluster distance of 19.2 ± 2.0 Mpc. This is now in very good agreement with other distance determinations and with a value of $H_0 = 55$ km s^{-1} Mpc^{-1}.

How can it be explained that the 21-cm distance of the Virgo cluster seemed originally so small? The reason is an additional difficulty: the apparent magnitude of external galaxies is dimmed by the internal absorption of interstellar dust. The amount of internal absorption increases with the inclination angle i. For nearly edge-on galaxies the magnitude correction is very large (more than one magnitude), but actually the exact amount is still poorly known. Thus the above-mentioned advantage of edge-on galaxies for the determination of the true 21-cm line width is offset by their large and uncertain correction for internal absorption. It seems therefore that galaxies with intermediate inclination ($30° \lesssim i \lesssim 70°$) should be given the highest weight.

The new empirical correlation between the 21-cm line width and the optical luminosity of favourably inclined spiral galaxies already seems to provide a valuable check of the extragalactic distance scale, which is characterized by a Hubble constant of 55 km s^{-1} Mpc^{-1}. Once the theoretical background of the correlation shall be better understood, and accurate determinations of the inclination angle and of the internal absorption shall become possible, 21-cm line widths may become a major route to the distances of many late-type field galaxies. This would be yet another example for the prolific interaction between radio and optical observations.

STAFF MOVEMENTS

Since the last issue of the "Messenger", the following staff movements have taken place:

ARRIVALS

Munich

Marianne Fischer, German, secretary
Hannelore Heubes, German, clerk-typist
Lindsay Holloway, British, clerk-shorthand typist
Martin Hoffmann-Remy, German, accountant
Imke Heidtmann, Swedish, clerk-typist

Geneva

Walter Nees, German, technical assistant
Jacques Ottaviani, French, laboratory technician

Chile

Max Jean Lizot, French, optical engineer

DEPARTURES

Hamburg

Petrus Huijmans, Dutch, finance officer
Gladys Wastavino, German, clerk-typist
Ulrike Schütz, German, secretary
Ingrid Knoth, German, administrative assistant
Brenda Bülow, British, secretary
Heinz-Werner Marck, German, accountant

Chile

Emile Leroy, Belgian, senior engineer
Martin de Groot, Dutch, astronomer
Horst Franz, German, engineer
Lennart Ulltjärn, Swedish, programmer
André Theisen, Belgian, personnel officer

The ESO Administration now in Munich

On July 1, 1976 the ESO Office of the Director-General was transferred from Hamburg-Bergedorf to Garching near Munich, about two kilometres from the site reserved for the construction of the European Headquarters of the Organization. (See "The Messenger" No. 4, March 1976).

When the ESO Council at its December meeting last year accepted the German Government's offer of a site and building for the future headquarters of the Organization at Garching near Munich, hardly anyone of the Hamburg staff thought that he would be in Munich only half a year later.

But the decision to transfer the Office of the Director-General to Garching was taken without delay. Already in February the staff was officially informed that the Administration would move to Garching towards the middle of the year. The decision for this move—before the construction of the headquarters had even started—was mainly taken in order to be on the spot during the construction activities and to improve communications with Geneva. Also, when in 1979 the ESO departments in Geneva in their turn move to Garching, the Administration will be in a better position to assist them and to facilitate a smooth continuation of activities. Most staff members saw no difficulty in following the Administration and began immediately to search for suitable accommodation. The many possibilities for sports and excursions in the surroundings of Munich will partly compensate them for the separation from their relatives and friends in Hamburg. A few staff members were unfortunately not able to follow the Organization and decided to stay in Hamburg.

The removal of the Office of the Director-General took place between June 24 and 30, and most staff members managed to have their private removal done during the same period.

On July 1, the Office of the Director-General resumed its activities and everybody has been working hard ever since to make up for the time lost during the removal period. The staff members who decided to stay in Hamburg have meanwhile been replaced and business operations have now returned to normal.

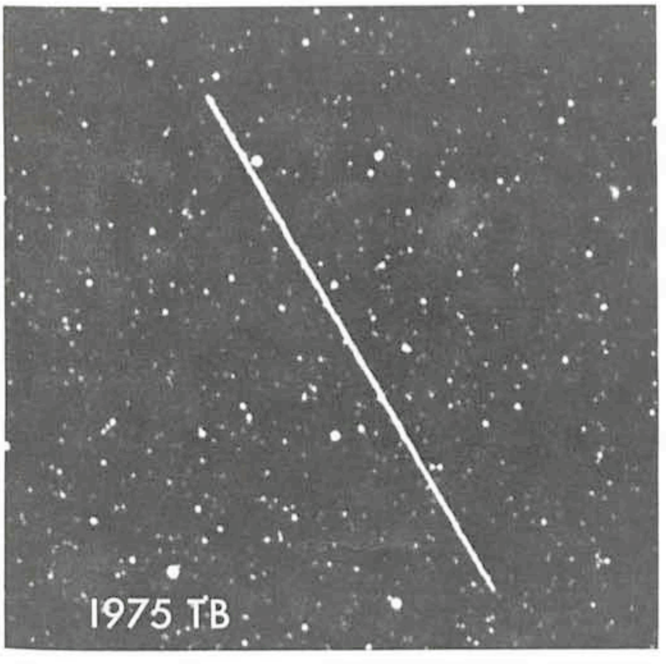
Minor Planets Discovered at ESO

Since the discovery on January 1, 1801 of the first minor planet (asteroid), more than 2,000 have been observed and catalogued. They have once been called "the vermin of the sky" by a distinguished astronomer and not quite without reason. Most of them move in orbits of low inclination, i.e. close to the Ecliptic (the plane of the Earth's orbit around the Sun), and photographs of sky areas in the neighbourhood of the Ecliptic always show some of these minor planets. It goes without saying that the larger the telescope, the fainter are the planets that can be recorded and the larger are the number that may be seen on a plate.

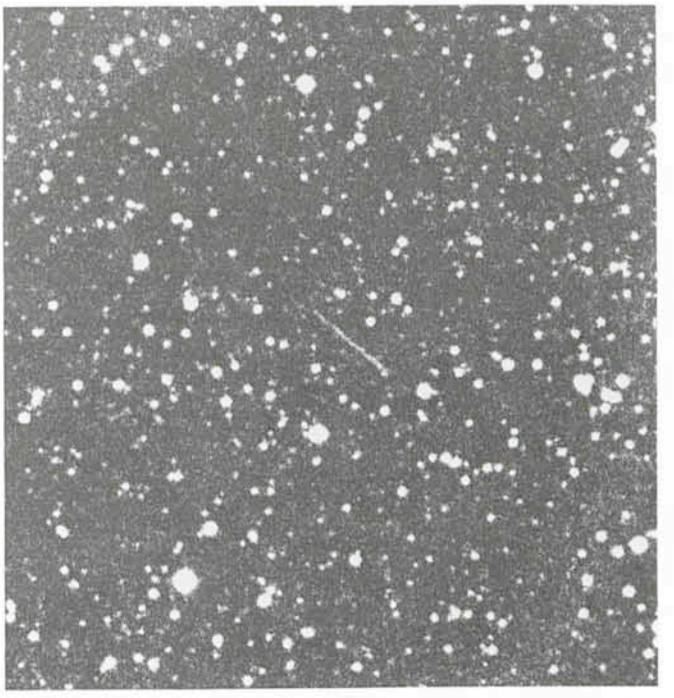
1. Trails on ESO Schmidt Plates

The ESO 1 m Schmidt telescope combines a large aperture with a fast focal ratio (f/3) and is therefore an ideal instrument for the discovery and observation of minor planets. On long-exposure plates, each minor planet in the field is recorded as a trail, due to the planet's movement, relative to the stars, during the exposure. On the ESO Quick Blue Survey plates (cf. *Messenger* No. 5, June 1976), which are exposed during 60 minutes, most asteroid trails are about 0.3 to 0.7 millimeters long. Asteroids down to about $19^{\mathrm{m}}.0$—$19^{\mathrm{m}}.5$ are seen on these plates. (Fainter minor planets may be observed if the telescope follows the planet, whereby the light is concentrated on the same spot of the photographic plate and not "wastefully" spread along the trail.)

Several of the ESO QBS plates show something like one hundred asteroid trails! It is completely impossible from a



This 5-millimetre asteroid trail was found on a 60 min ESO Schmidt plate, taken on October 2, 1975. The asteroid moved with the unusually high speed of 2.5 degrees/day, indicating that it was rather close to the Earth. By a strange coincidence, the trail is situated almost at the very centre of the Sculptor dwarf galaxy, a member of the Local Group of Galaxies.



Minor planet 1975 YA was found in December 1975 at Hale Observatories by C. Kowal. It moves in an orbit slightly outside that of the Earth. During its closest approach to the Earth in 1976, which took place in late June, it came within 55 million kilometres. Unfortunately, at that time it was far south and could not be observed with northern telescopes. However, this trail of 1975 YA was obtained on July 3, with the ESO Schmidt telescope under rather bad weather conditions. Exposure time 10 min on 103a-O emulsion, magnitude of 1975 YA approximately 17.4. The position has already enabled an improved orbit to be computed at the Minor Planet Center at the Cincinnati Observatory.

practical point of view to measure and follow up so many asteroids and the ESO astronomers who work with the Schmidt plates have therefore taken the natural decision that only "interesting" planets will be re-observed in order to establish their orbit.

2. "Interesting" Minor Planets

But when is a minor planet "interesting"? Clearly, first of all when it is large (bright) or if it follows a path that deviates significantly from that of most other planets. Therefore, the positions of bright trails are regularly checked with the "Minor Planet Ephemeris" Yearbook to see whether the trail belongs to an already known planet. "Long trails" (longer than 2 minutes of arc, i.e. a motion larger than 48'/day, which indicates that the asteroid is rather close to Earth), are also picked out. So are trails which are found far from the Ecliptic, pointing to an unusually high orbital inclination. In this way, several tens of "interesting" minor planets have been detected on ESO Schmidt plates.

Due to the extremely heavy workload on the ESO Schmidt telescope, only a few of these discoveries have so far been followed up. Plates of solar-system objects (minor planets and comets) have in practice only been obtained during bad weather conditions or with moon when no other plates were scheduled or could be taken. Examples are two new planets of the Phocaea group, one of the very rare Pallas family (only 5 known), and one Apollo-type asteroid (1975 TB). In all cases the plates were measured at ESO-Geneva and the orbits were computed by Dr. B. Marsden, Smithsonian Observatory, Cambridge, Massachusetts, USA.

3. Asteroids Recovered

It frequently happens that a minor planet is so far south that it cannot be observed with telescopes in the northern hemisphere. If, moreover, the planet is on the "critical" list, i.e. its orbit is not accurately known and it may therefore get lost, observations by southern telescopes become urgent. The ESO 1 m Schmidt telescope is one of the most efficient southern telescopes for such work and during the past year, several "critical" observations have been made. For instance, a valuable observation was made on June 12, 1976, at declination −58°5, of Apollo-type asteroid (1580) Betulia, when it was rapidly receding from Earth after the close encounter (19.5 million km) on May 23, 1976. On the night of the ESO observation it was already at distance 53.4 million km and of magnitude 15.

In order to improve the possibilities for following up the discoveries of new asteroids (and making urgent observations of already known ones), ESO astronomers A. B. Muller, H.-E. Schuster and R. M. West will start using the ESO 40 cm astrograph from October 1976. By using sensitized photographic plates they hope to be able to observe all but the faintest of these asteroids, which must still—if possible—be observed with the Schmidt telescope.

4. Why Observe Minor Planets?

Some people may well ask why astronomers still observe minor planets. With over 2,000 known, what do a few more or less matter? They will probably agree that a thorough knowledge of asteroid orbits may be useful when their great-grandchildren make the trip to the Jupiter-Ganymede base. But even now the minor planets are important enough to justify continued observations. Their orbits outline the gravitational field of the solar system and their distribution speaks of events in its early history. The physical study of asteroids shows us early solar-system matter, and a soft landing on a suitable asteroid is quite possible within the next decade. As a matter of fact, one of the top-candidates for this honour, Minor Planet 1976 AA, was discovered with the Schmidt telescope on Mount Palomar, California, in January 1976. So the Europeans, keep trying!

Instrumentation Plan for 3.6 m Telescope

A new and updated plan for the instrumentation of the 3.6 m telescope has been developed within ESO. The plan, which covers instrumentation developments for the period 1977–1980, was presented on May 12 by the Director-General to the Instrumentation Committee, which gave its unanimous support. The plan will be considered by Finance Committee and Council later this year.

A first step in the preparation of the instrumentation plan was a survey of the scientific programmes which the users of the ESO facilities wish to carry out and of the instrumental parameters they consider optimal. For this survey, questionnaires were sent to all persons who have used the La Silla facilities during the last five years. The response was very good with nearly half of the astronomers providing replies. Research plans cover a very wide range of subjects. Roughly one-third of the respondents wish to engage principally in extragalactic and nebular work. Most of the others are planning studies in stellar spectroscopy, especially at medium and high resolutions. Among the instrumental wishes, a rather high-dispersion Cassegrain spectrograph is at the top of the list. The use of efficient modern panoramic detectors is regarded as essential by many respondents.

Some instrumentations for the 3.6 m telescope is already under construction at present. Included are various correctors, a 4–6-channel photometer, a low-dispersion spectrograph with attached image-dissector scanner and a vidicon for direct imaging.

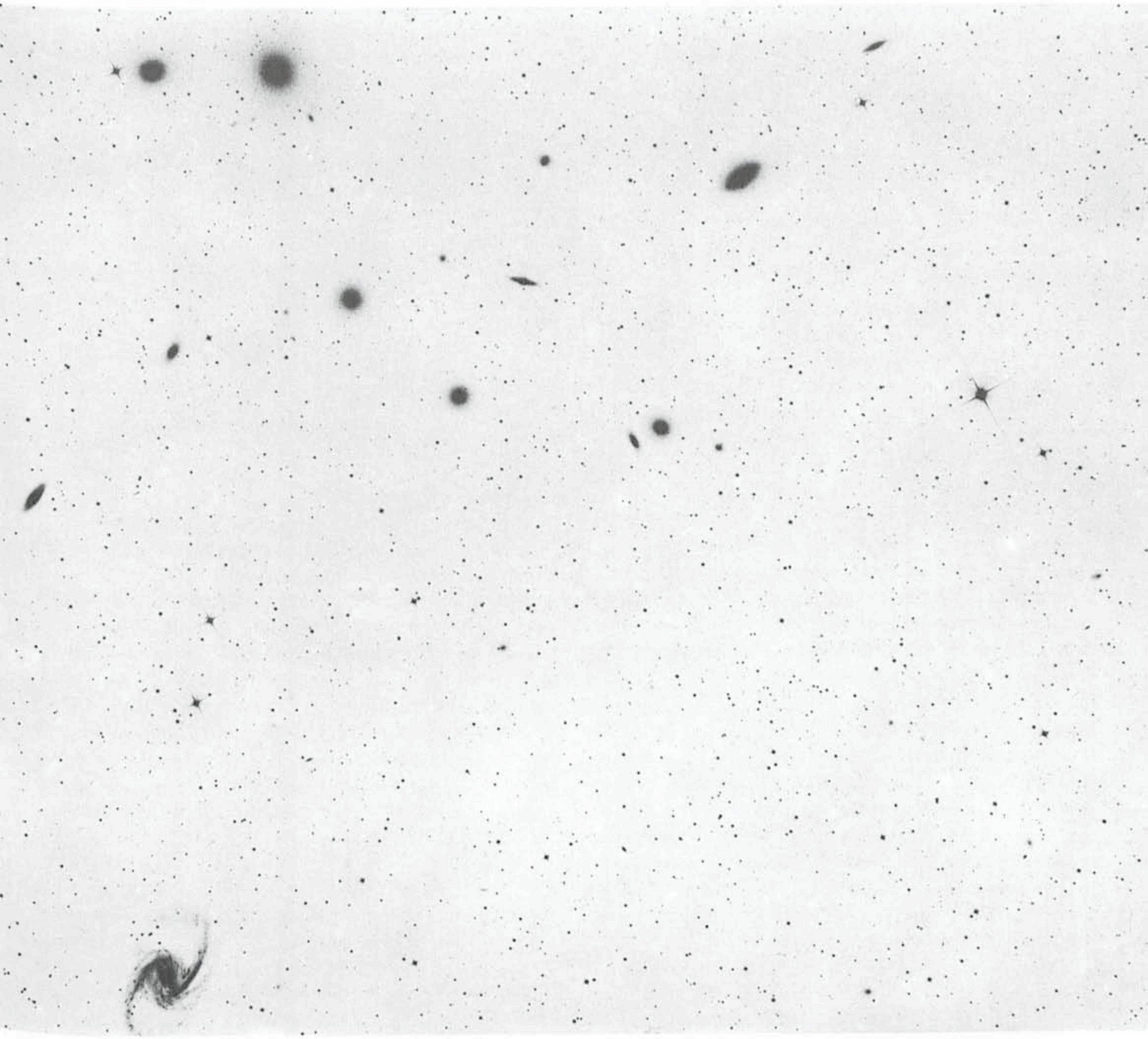
In the instrumentation plan, several new developments are foreseen. Highest priority is given to a cross-dispersed Cassegrain echelle spectrograph and to a high-resolution coudé spectrometer. The former should allow the observation of faint stars at reasonably high dispersions (5 A/mm) when used in conjunction with a modern detector, and the latter observations of brighter objects at very high spectral resolution. Other spectrographs, including one for the near infrared, and a radial-velocity photometer are also being planned. The acquisition of a variety of the newer detectors forms an important element in the plan, since these detectors and the equipment needed for their effective use are essential both for direct imaging and for spectroscopy.

Infrared developments also are given much attention. A special top ring with wobbling secondary is foreseen for the telescope to make it reasonably "clean" in the infrared, and photometric and other accessory instruments are planned.

Clusters of Galaxies

Why do galaxies cluster? Are these clusters stable over long periods or will they slowly disperse? Is there "hidden" mass in the galaxy clusters? These problems are central in current astronomical research, and the answers may tell us how the very young universe looked like, some 15,000–20,000 million years ago. Dr. Jürgen Materne from the Hamburg Observatory holds a fellowship with ESO's Scientific Group in Geneva. Here he tells what is being done at ESO in this important field of astronomical research:

The basis of one of the large catalogues of galaxies—the NGC catalogue—was laid by observations by the Herschel family of astronomers, nearly two hundred years ago. In this catalogue, galactic nebulae and extragalactic objects were still mixed, because the astronomers at that time did not know that many of the nebulae were far outside our own galaxy, the Milky Way. Nevertheless, already the Herschels noticed that the nebulae (in our case the galaxies) often formed groups. They detected among others the Virgo and Fornax clusters.



This is the centre of the medium-size Fornax cluster of galaxies, which also contains a strong radio source. The cluster was photographed with the ESO Schmidt telescope. The beautiful bright spiral galaxy with the pronounced bar is NGC 1365. At least twenty-five other galaxies may be seen in this photo.

Groups and Clusters

The difference between groups and clusters seems to be artificial, it is a question of richness: a *group* mostly contains from a couple to a few dozen galaxies, a *cluster* may have from around fifty members like the Fornax cluster to ten thousand like the Coma cluster. In addition to these, we have so-called "solar system"-like groups, a large galaxy with a few dwarf companions. Our Milky Way is a fairly large galaxy and has several such small companions: e.g. the Sculptor, the Draco and the Ursa Major galaxies. The clustering over all sizes is amazing and is not at all explained by the current theories of galaxy formation.

With all these different sizes, a few questions arise at once:

(1) Do the clusters show substructure, or

(2) do clusters of galaxies form superclusters, and

(3) do *real* field galaxies exist, i.e. galaxies which do not belong to any cluster of galaxies?

Superclusters?

The French-American astronomer de Vaucouleurs claims that the nearby groups of galaxies, including the Local Group to which our Milky Way belongs, are contained in the *Local Supercluster* with the Virgo cluster at the centre. But this ist questioned by other astronomers who say that the Local Supercluster is only a chance configuration in the sky. Chincarini and Rood recently found a companion cluster of galaxies to the Coma cluster. These two (and others?) may form a supercluster. On the other hand, the application of the mathematical tools of cluster analysis which we are developing at ESO, shows that the Fornax cluster for example tends to break down into relatively well-defined subclusters, although it is not completely clear at the moment how significant these subclusters are. And the problem whether the spiral galaxies and the elliptical galaxies in the Virgo cluster form different subsets is not solved either.

Field Galaxies

Only very few field galaxies have been detected but it is always difficult to be sure if they do not belong to a nearby cluster with high internal velocity dispersion. And it is nearly impossible to find out whether seemingly single galaxies do not form small clusters with dwarf galaxies (to build what is called *Hyper-galaxies* by Estonian astronomer J. Einasto), because these dwarf galaxies are too faint to be observed.

Although the problems of how to define a cluster of galaxies correctly and how to assign the proper membership of individual galaxies are not solved, astronomers try to look for differences in the contents of different clusters. Rich and dense clusters contain mostly elliptical galaxies and sometimes a *supergiant* elliptical galaxy with a large halo in the centre of the cluster. A programme is now underway at ESO to measure the internal velocity dispersion of such supergiant galaxies in order to deduce their masses and to confirm if they are really, as some astronomers surmise, one hundred times more massive than normal elliptical galaxies. Irregular and loose clusters, on the other hand, have a large fraction of spiral galaxies and it seems that the hydrogen content in the spiral galaxies depends on the type of the surrounding cluster.

Missing Mass?

The correct membership assignment is also vital for calculating the mass of clusters of galaxies and for investigating the dynamical state of a cluster. Often one finds that the sum of the masses of its member galaxies, i.e. the "visible" cluster mass, is not enough to make the cluster gravitationally stable, to keep it from falling apart. Is there a hidden, "invisible" mass, perhaps as an intra-cluster medium? But neutral hydrogen has not yet been found in large amounts, so Materne and Crane started collaborations with radio astronomers to look more carefully for hydrogen in small clusters. In rich clusters, however, X-ray radiation has been detected. That means that some clusters are filled with a very hot gas, but unfortunately the amount does not seem to be enough to keep the cluster together.

The ESO Programme

In order to tackle some of these problems we start this winter at ESO a programme to measure the radial velocities of galaxies in the region of the Eridanus, Fornax and Doradus clusters as well as possible. These velocities must be measured with high precision, because the subgroups have only a velocity dispersion of around 40 km/sec. Then we can test and refine our new models of clusters. We shall also try to detect the hot gas in the optical region by measuring the Hβ emission with a modified photometer. In a long-range programme in collaboration with other institutes, we shall determine the velocity distribution and the distribution of galaxy types and luminosities in X-ray clusters and non-X-ray clusters. We think that all these observations will give us a better insight into the phenomenon of galaxy clustering.

Tentative Meeting Schedule

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

October 26	Instrumentation Committee, Garching
October 28	Committee of Council, Garching
November 25/26	Observing Programmes Committee, Amsterdam
Nov. 30/Dec. 1	Finance Committee, Garching
December 2/3	Council, Munich

On the Vertical Support of Astronomical Research in Cassegrain Cages

Yes, you are right: these three chairs represent the latest in European modernity! ESO is proud to present, probably for the first time in the history of astronomy, the autumn 1976 fashion in astronomical furniture. But to avoid misunderstandings with the auditors, let us quickly affirm the great importance of these pieces of equipment for the safe performance of observational astronomy on La Silla. Briefly explained, since most human beings, astronomers included, unfortunately do not equal Tarzan in physical strength and agility, they must be firmly supported when taking a ride in the spacious Cassegrain cage of the ESO 3.6 m telescope (at the lower end of the telescope tube). To solve this mainly anatomical problem, the brain-trust of the ESO Mechanical Group in Geneva, headed by Mr. W. Richter, studied the suspension of astronomical bodies at various elevations and angles. We are happy to prove the survival of the courageous volunteers by publishing this report, which was compiled by Mr. Richter, after the successful termination of the experiments:

To work as an astronomer at the Cassegrain focus of a big telescope often causes problems because the instruments there are not so easily accessible. Even if one assumes that the astronomer needs not to spend long time in the cage, because the observational data nowadays are transmitted directly to a computer terminal, there ist always the necessity to go into the cage for the initial adjustment of the instrumentation which is becoming more and more complex.

Many trials have been made to design astromer's chairs for the Cassegrain areas of large telescopes. However, most of these solutions must be abandoned because the chairs become too space-consuming in the cages.

Now ESO proposes for its 3.6 m telescope a new approach which is the result of a development which is shown by the three photos:

- The first version (No. 1) was designed for observations within a range of ± 15° around the zenith. We found that it was too difficult to handle this chair due to its weight of 24 kg.
- The second version (No. 2) was light enough (10 kg) and covered a much wider range, but it was much less comfortable to sit in such a big ring than we thought.
- The third version (No. 3) looks more promising: the chair can be used wherever the telescope points between zenith and horizon. Easy to operate are the adjustment possibilities which allow to turn the chair around its stem, to move it up and down and to turn the chair in the ring. It is also not difficult to move the whole unit—only 10 kg —from one hole in the cage-floor to the next. The main technical problem was to get the overall size and the weight down. Now it is up to the astronomers to find out how this chair suits their needs. They will probably say that handling and sitting on this chair are sufficiently comfortable. However, one needs some experience to select the correct hole in the floor and sometimes it is difficult to climb up to the chair.

ESO, the European Southern Observatory, was created in 1962 to . . . establish and operate an astronomical observatory in the southern hemisphere, equipped with powerful instruments, with the aim of furthering and organizing collaboration in astronomy . . . It is supported by six countries: Belgium, Denmark, France, the Federal Republic of Germany, the Netherlands and Sweden. It now operates the La Silla observatory in the Atacama desert, 600 km north of Santiago de Chile, at 2,400 m altitude. Seven telescopes with apertures up to 1.5 m are in operation; a 3.6 m telescope will become operational in 1976. The astronomical observations on La Silla are carried out by visiting astronomers—mainly from the member countries—and, to some extent, by ESO staff astronomers, often in collaboration with the former.

The ESO Headquarters in Europe will be located in Garching, near Munich, where in 1979 all European activities will be centralized. The Office of the Director-General (mainly the ESO Administration) has recently moved from Hamburg to Garching, whereas the scientific-technical group is still in Geneva, at CERN (European Organization for Nuclear Research), which since 1970 has been the host Organization of ESO's 3.6 m Telescope Project Division.

ESO has about 120 international staff members in Europe and Chile and about 150 local staff members in Santiago and on La Silla. In addition, there are a number of Fellows and Scientific Associates.

The ESO MESSENGER is published in English four times a year: in March, June, September and December. It is distributed free to ESO employees and others interested in astronomy.

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ALGUNOS RESUMENES

Terminado el montaje del telescopio de 3,6 m

En los primeros dias de agosto, nada más acabar de escribir estas líneas, la construcción mecánica del telescopio estaba casi terminada.

Tres meses de arduos trabajos fueron necesarios para llegar a esta fase. Hubieron de abrirse más de 150 cajones y de transportarse los componentes del telescopio, pieza por pieza, a través del kilómetro y medio que distaba entre el lugar de desembalaje y el edificio del telescopio.

Los trabajos de limpieza y montaje se realizaron en la planta baja, antes de que la grúa de 35 toneladas, situada sobre la cúpula, elevara las piezas a la planta de observación. Algunas piezas o bloques armados pesaban más de 30 toneladas. La pieza más pesada fue la herradura del eje polar ya ensemblada, con un peso de 40 toneladas!

Como en Europa ya se realizó un montaje previo a título de prueba, los problemas que se presentaron durante los trabajos de montaje en La Silla fueron de menor importancia.

Astrónomos suizos en La Silla

Siguiendo un acuerdo establecido en 1974, el Consejo de la ESO autorizó al Observatorio de Ginebra la construcción de una estación provisional de observación en La Silla.

Dicha estación, que fue instalada el año pasado, tiene una cúpula de 4,60 m de diámetro y está unida a una caseta de servicio. Esta caseta alberga un puesto de observación, un banco de trabajo con equipos para reparaciones de emergencia y una pequeña cocina. Bajo la cúpula se ha instalado una mesa ecuatorial, sobre la que hay montado un telescopio Cassegrain de 40 cm de anchura y 7,20 m de longitud focal. El telescopio está equipado con un fotómetro fotoeléctrico convencional.

Desde noviembre de 1975, fecha en que se puso en servicio la instalación, han acudido a La Silla repetidas veces grupos de dos astrónomos del Observatorio de Ginebra. Dichos astrónomos han quedado sumamente impresionados de la calidad fotométrica del sitio y opinan que el número de noches claras es tan elevado que el trabajo de observación resulta fatigante hasta para sus mejores especialistas.

First Slides from ESO Schmidt Telescope Available

A series of 20 slides from the ESO 1 m Schmidt telescope is available at the European Southern Observatory. The 5 x 5 cm black-and-white slides are accompanied by brief descriptions and show some of the southern sky's most spectacular and beautiful objects, including the Magellanic Clouds, the Eta Carinae nebula and Omega Centauri.

The price of this magnificent slide set is Swiss francs 16.— (or the equivalent) for Europe, and US$ 6.— by surface mail to all other countries, or US$ 8.50 by airmail (to be paid in advance).

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LATEST NEWS

Professor A. Blaauw Next President of the IAU

We have just learned that the Executive Committee of the International Astronomical Union has nominated the former Director-General of ESO (1970–74), Professor A. Blaauw, for election to the presidency of the IAU (1976–79). The election will take place during the second plenary meeting on September 2, 1976, at the time of the XVIth General Assembly in Grenoble, France. By that time, this issue of the *Messenger* will already have been published, but trusting that the IAU will not deviate from the traditional practice of electing a presidential nominee by acclamation, we extend our heartiest congratulations and best wishes to Professor and Mrs. Blaauw.

Professor Blaauw is the second ESO Director-General to reach this high office; his predecessor in ESO, Professor O. Heckmann, was IAU President from 1967 to 1970. Of the six Presidents of the ESO Council, three have also been Presidents of the IAU: Professors J. H. Oort (ESO Council: until 1965, IAU: 1958–61); B. Lindblad (ESO Council: 1965, IAU: 1948–52); and B. Strömgren (ESO Council: 1975–, IAU: 1970–73).