D. SUPPORT OF INTERNATIONAL FACILITIES

In addition to the telescopes of the National Facility, the SAAO hosts several other scientific facilities. Sutherland has been chosen as the most appropriate location for these for one or more of the following reasons:

- Geographical position, e.g. as the African part of a global network.
- Good climate.
- Geological stability.
- High-level technical infrastructure, including Internet bandwidth.
- Available technical expertise for maintenance, trouble-shooting, etc.
- South African interest in collaborations in using the output of the facility.

In recent times, there have been more requests for SAAO to host further projects than it has been possible to accommodate with available resources. Several potentially interesting collaborations, particularly robotic telescopes, have therefore been turned away.

D1 INFRARED SURVEY FACILITY (IRSF)

The construction of the IRSF was financed mainly (~90%) from the Ministry of Education (Monbusho), Japan. It forms part of a project called "Thorough Study of the Magellanic Clouds", which has several divisions under the overall Principal Investigator: T Hasegawa (NAOJ). The telescope division was led by S Sato (Nagoya) and the SIRIUS (Simultaneous 3-colour InfraRed Imager for Unbiased Surveys) camera was headed by M Tamura (NAOJ).

The Infrared Survey Facility commenced operation with the SIRIUS camera at the end of 2000. Except for two short periods, the telescope and camera have been in continuous operation at Sutherland since that time. These periods were when the camera went to Hawaii; and secondly, when the mirror cover was changed to one of accordion-type, mirror fans were installed and the secondary mirror was rotated by 120 degrees, resulting in better image quality.

The facility's main purpose, the "Thorough study of the Magellanic Clouds", is a deep JHK_S survey, which is expected to take about 3 years. The main responsibility for this programme lies with Nagoya University, with participation by the Institute of Astronomy of the University of Tokyo. The tele–scope is also being used for various other projects by Japanese and South African astronomers.

Summary of IRSF Usage

Period	Observing Nights	Engineering Nights	No Observer
2001	220	60	85
Jan–Mar '02	79	-	11

T Tanabe and Y Nakada (Tokyo) are interested in searching for variable stars in globular clusters in the Magellanic Clouds, and are also involved in similar searches of galactic globular clusters together with N Matsunaga (Tokyo), M Feast (UCT) and J Menzies (SAAO). Y Ita (Tokyo) and collaborators are doing a search of the LMC bar region, monitor–ing 3 square degrees for red variables.

Y Nakajima (Nagoya), M Tamura (NAOJ), and others are surveying several star forming regions including M17 and Lupus. The first published result will be "Deep Near Infrared Survey Toward M17 Region" by Jiang et al. (accepted by *Astrophysical Journal*).

Surveys near the Galactic Centre are being undertaken by T Nagata (Nagoya) and I Glass (SAAO), the latter in collaboration with a group from Physical Research Laboratory, Ahmedabad, India. The latter is in connection with the ISOGAL project on the ISO satellite, which operated at long infrared wavelengths, of regions in the inner Bulge of the Milky Way galaxy.

A major extragalactic project is being conducted by P Woudt (UCT) on partially obscured galaxies near the Galactic Plane, in the direction of the "Great Attractor". T Nagayama (Nagoya) is also looking at the region near the Galactic Plane for obscured galaxies in collaboration with him.

A group consisting of M Feast (UCT), J Menzies and P Whitelock (SAAO), collaborating with T Tanabe, Y Nakada and Y Ita (Tokyo) is studying galaxies of the local group to search for long-period large-amplitude variables, some of which may have dense circumstellar dust shells that obscure them at visible wavelengths. The first results of this have been accepted for publication in *Monthly Notices of the Royal Astronomical Society*.

Time is allocated by a committee consisting of M Tamura (NAOJ), T Nagata (Nagoya) and I Glass (SAAO). The agreement for the establishment of the facility states that two-thirds of the time is for Japanese astronomers working on the main pro–gramme and the remaining third is divided into three parts; one for other projects by Japanese astronomers, one for projects by South African astronomers and one for joint projects.

The picture on the front cover of this report was taken with the Sirius Camera on the IRSF.

D2 YONSEI SURVEY TELESCOPES FOR ASTRONOMICAL RESEARCH (YSTAR)

In March 2001, a Memorandum of Understanding (MOU) was exchanged between SAAO and YUO in Korea regarding the installation and operation of a small telescope facility on the grounds of SAAO Sutherland. This was followed by another MOU in May with Korea Astronomy Observatory, a partner of YUO for its survey project called YSTAR (Yon–sei Survey Telescopes for Astronomical Research).

The YSTAR project aims to carry out all-sky time-series observations in order to identify and monitor various transient phenomena including variable stars, near-earth objects, and gamma-ray bursts. The 0.5-m wide-field telescope placed in Sutherland is their first overseas facility. The construction of the YSTAR building started in October 2001 and was completed in February 2002.

The principal investigator of the YSTAR project is Y-I Byun (YUO). P Martinez is the contact scientist at SAAO for this YSTAR-SAAO cooperation.

D3 SOUTH AFRICAN GEODYNAMIC OBSERVATORY (SAGOS)

An interdisciplinary program of research in the field of geosciences was set up according to an agree–ment between the GeoForschungsZentrum (GFZ), Germany and the National Research Foundation (NRF), South Africa. The primary facility, a geo–dynamic observatory at SAAO Sutherland is equipped with the following:

- Dual Sphere Super-conducting Gravimeter (SG).
- LaCoste & Romberg Feedback Gravimeter.
- 1 Hz GPS ground station for CHAMP and GRACE mission operations (rapid orbit and radio occultations).

YSTAR building in foreground in February 2002 (photograph SAAO)

- Meteorological sensors for monitoring:
  - atmospheric pressure;
  - temperature inside and outside of the facility and in the ground;
  - humidity inside and outside;
  - rainfall;
  - wind speed and wind direction.
- Ground water table sensor.

All instruments work continuously without inter–ruptions; P Fourie (SAAO) is responsible for all normal maintenance.

For the calibration of the super-conducting gravi–meter and the determination of the absolute gravity value for Sutherland, parallel registrations were performed using two absolute gravimeters in February and March 2001.

- Absolute gravimeter FG5 supplied by the Ecole et Observatoire des Sciences de la Terre, Strasbourg, France; measurement campaign: 1-9 Feb 2001.
- Absolute gravimeter JILAg5 supplied by the Finnish Geodetic Institute, Masala, Finland; measurement campaign: 21–29 Mar 2001.

Foremost results of the Super-conducting Gravi–meter observations are the first high-precision determination of the tidal parameters for the South African area and the detection of the spheroidal-free oscillation mode of the Earth, OS2, and its splitting after the Peru earthquake on 23 June 2001. The free-oscillation modes are important for investi–gating the 3D density structure of the Earth.

D4 SOLAR STATION OF BiSON NETWORK

Operating since 1990, the Sutherland telescope is one of six stations distributed globally, with the aim of obtaining 24-hour coverage of the solar oscil–lations. A site agreement (to run for two years) between Birmingham and the SAAO was signed in

2001. A brief outline of the current status of the project is given in section B6(b).

D5 MONITORING NETWORK OF TELESCOPES (MONET)

In November 2001, the SAAO entered into an agreement with Georg-August-Universität Göttingen, Germany and the University of Texas at Austin, USA to take part in the MONET Consortium. The purpose of the project is to construct and operate a network of two or more robotic telescopes with access to both the northern and southern celestial hemispheres and a wide range of longitudes. Telescopes will be sited at McDonald Observatory near to HET, and at SAAO, near to SALT. The capital funding is from the "Astronomie & Internet" Programme of Alfried Krupp von Bohlen und Halbach Foundation and the project is being led by F V Hessman (Göttingen).

The technical, scientific, educational and public outreach activities of the consortium will be co-ordinated by the MONET Board. The project has a very strong educational component and, after some time period, all data will be available for use by participating schools, colleges or universities provided that its release does not impact the imme–diate scientific goals of the Principal Investigator. Construction of the telescope at Sutherland will commence during 2002 and S Potter will represent SAAO on the MONET Board.

D6 GEOMAGNETIC PULSATION RECORDING SYSTEM

During 2001, it was decided that GFZ and the Hermanus Magnetic Observatory (HMO) should commence a collaborative research project in geo–magnetism at SAAO. The initial phase of this project was to record ULF geomagnetic pulsations on a continuous basis at the GFZ facility at SAAO Sutherland.

HMO has recorded geomagnetic pulsations in Hermanus for many years; however, in recent years the data have been adversely affected by anthro–pogenic noise, probably due to the Cape Peninsula electric railway system. Although the data are still useable, cleaner data are extremely desirable, particularly for distribution to the international research community. It was therefore decided that HMO set up a duplicate geomagnetic pulsation recording system at Sutherland with financial and infrastructure support from GFZ and SAAO respectively.

R Holme (GFZ) and P Sutcliffe (HMO) carried out an initial inspection visit to SAAO Sutherland in April 2001. A follow-up feasibility study, to deter–mine the suitability of Sutherland as a site for geomagnetic pulsation observations, was carried out by two HMO technicians in August 2001. Their investigation indicated that the site was suitable for the recording of geomagnetic pulsations on a continuous basis.

Construction of the facility and installation of the geomagnetic pulsation equipment took place from November 2001 to January 2002. The equipment consists of three induction sensors (2-m long μ-metal rods wound with 100 000 turns of copper wire) oriented magnetically N-S, E-W, and verti–cally; associated electronics comprising amplifier/ filter modules, a GPS module (for time signal), interface module with 16-bit analog to digital signal conversion; and a PC for logging the data. Con–tinuous recording of data commenced on 1 February 2002. The digital H, D, and Z component data are logged at 1 Hz and transferred to HMO via Internet connection.

D7 BROAD-BAND SEISMOGRAPH

Installed in the 1970s, the broad-band seismograph is operated by the University of California, San Diego, as part of the Incorporated Research Institu–tion for Seismology (IRIS). The seismological data are, among other things, utilized as part of the auxiliary seismic network of the International Monitoring System of the Comprehensive Nuclear-Test-Ban Treaty Organization.

D8 SOUTHERN AFRICAN LARGE TELESCOPE (SALT)

SALT is an international collaboration involving partners from the NRF, Nicolous Copernicus Astronomical Institute of the Polish Academy of Science, the Hobby-Eberly Telescope Board, Rutgers – the state university of New Jersey, Georg-August-Universität Göttingen, the Univer–sity of Wisconsin-Madison, the University of Canterbury, the University of North Carolina at Chapel Hill, Carnegie Mellon University and a consortium of UK universities and institutions. Dartmouth joined the project during this reporting period. This is a very brief outline of activities as

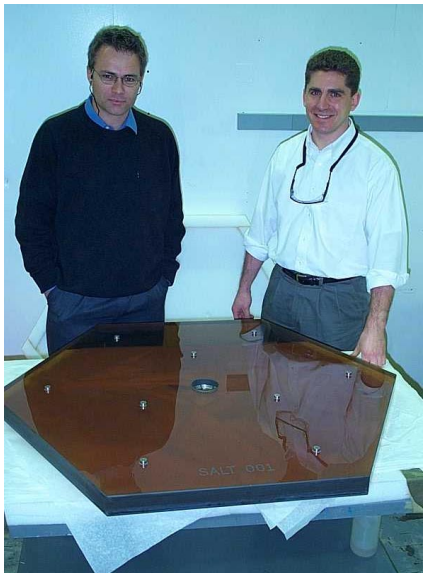
the SALT Foundation produces its own detailed report.

Construction was started soon after the ground-breaking ceremony in 2000, and excellent progress was made during 2001 on the SALT facility build–ing, despite time lost due to large storms which brought snow, ice and very high winds to the site. The main contractor for the construction was WBHO Construction who employed a significant number of people from the Sutherland area to work on the site.

Production of the first batch of 7 (out of a total of 96) mirror blanks was completed at the Litkarino Optical Works outside Moscow. The SALT mirrors are made of Astro-sitall, a glass material with extremely low CTE characteristics. This is critical to ensure that the final shape of each mirror is maintained with variations in temperature. The mirrors were then transported by air from Moscow to the Eastman Kodak Company's facilities in Rochester in the USA in October for shaping and final figuring.

The Board of Directors of the SALT Foundation, under the Chairmanship of Dr Bob Stobie, met in October 2001 at the University of Wisconsin-Madison in the USA for the 10th Board Meeting. The SALT Science Working Group also met at this time. High on the agenda was the preliminary design review of the Prime Focus Imaging Spectro–graph (PFIS), one of the first light instruments that is being designed and built for the telescope. This instrument is being built by the University of Wisconsin-Madison in collaboration with Rutgers University. Following the Board Meeting, a Collateral Benefits Workshop was held to review progress against the Collateral Benefits Plan and to

SALT building construction as at 15 October 2001 (photograph SALT)



J Swiegers (SALT) & F Carbone at Kodak with the first mirror blank, 15 March 2002 (photograph SALT)

discuss new initiatives in this area. This initiative was strongly supported by all the partner institutions.

One of the cornerstones of the Collateral Benefits Plan is that there should be commercial spin-offs to South African industry, and empowerment of South African companies. These factors have weighed considerably in the selection of contractors for the SALT project. Consulting engineers, Ninham Shand, have a track-record of commitment to, and achievements in, empowerment, both in staff profile and in training opportunities. G. Johardien & Associates (a 100% empowerment-owned and staffed company) were appointed as the electrical consulting engineers. WML Construction was contracted to implement a community-based labour model at the SALT site in order to have the trenches for the water supply and communication channels excavated. In general, labour intensive techniques are being used where possible. The main facility construction contract, awarded to WBHO Construction, specifically requires labour to first be recruited in Sutherland. The SALT project requires weekly records to be kept so that the project can verify who was employed, for how long, to do what and from where they came. The contract for the design, manufacture and installation of the telescope structure was awarded to BKS Advantech, a Pretoria based company with a significant empowerment shareholding. It is a condition of their contract that they meet with the Sutherland community with a view to seeing how the community could benefit and to jointly look at opportunities that may arise.