

A. OVERVIEW AND HIGHLIGHTS : JANUARY 2001 – MARCH 2002

The construction of the 10-m Southern African Large Telescope (SALT), and associated activities dominated the reporting period¹. The SALT project is a multi-national collaboration involving partners from the United States, Germany, New Zealand, Poland and the United Kingdom who are joining with South Africa to construct, then operate, this world-class telescope. Excellent progress was made, not only on the telescope itself, which is the subject of a separate report, but also on the first light instrumentation and the associated collateral benefits.

The research productivity of the users of the SAAO National Facility remained high during 2001, despite the redirection of SAAO effort into support and development for SALT; 137 papers were published, 66% of which were in refereed journals.

Scientific highlights included the first results from the SIRIUS camera on the Japanese/South African Infrared Survey Facility. Considerable data were obtained on the primary project – a “*thorough study of the Magellanic Clouds*”, but results on “*star-forming regions in M17 and Lupus*” and on “*dwarf galaxies in the local group*” were also submitted for publication.

The distance scale remains a broad problem with repercussions for understanding a wide variety of astrophysical phenomena. Two recent studies of globular clusters, both based on new calibrations of subdwarfs from Hipparcos parallaxes, have provided insight into the problem. A new distance to the globular cluster 47 Tucanae was derived via main-sequence fitting and new subdwarf *UBVRI* photometry. This led to a distance modulus which is significantly less than values determined earlier by similar methods, but in good agreement with white dwarf sequence fits. Another group used the subdwarf calibration to derive absolute infrared *K* magnitudes for Mira variables in globular clusters. The Period-Luminosity relation so derived can be compared to that from the Magellanic Clouds and leads to a distance scale in good agreement with the one from Cepheid variables.

As in the past, much of the work done from SAAO is part of large international collaborations, often

taking place over several years. These cover many diverse areas, from the search for planets around other stars via microlensing, through studies of AGB stars and planetary nebulae in the Bulge, to work on hydrogen-deficient and extreme-helium stars. However, the most extensive collaborations were usually those aimed at detailed studies of pulsating stars – an area in which SAAO has considerable expertise. The major activity was directed towards studies of subdwarf B pulsators, Cepheids, δ Scuti and γ Doradus stars, rapidly oscillating Ap stars and pulsating white dwarfs.

Interacting binaries are proving particularly rewarding targets and various recent studies have considered symbiotic stars, cataclysmic variables, accreting pulsars and a number of eclipsing systems. A survey of faint cataclysmic variables has been started and detailed studies, including photometry, spectroscopy and polarimetry, are being made of individual magnetic CVs – polars and intermediate polars. Many of these were first detected by their X-ray emission and it seems that only the combination of data over a wide wavelength-range will lead to significant progress in understanding their underlying physics.

The main efforts of the instrumentation division centred around the design of SALTICAM – the verification instrument and first-light camera for SALT. These were adequately rewarded when, in February 2002, SALTICAM was well received at its preliminary design review and the project given the go-ahead to proceed to final design review. Instrumentation division personnel also continued the normal efficient maintenance and troubleshooting essential to the smooth running of the telescopes of the National Facility and the other international facilities based at Sutherland.

The development of citizens skilled in science, engineering and technology is critical to the future of South Africa and to transformation in astronomy. SAAO continued to play a significant role in education through the presentation of workshops for teachers and learners. Over 80 workshops for nearly 3 300 learners were held. At tertiary level, SAAO is involved in post-graduate training of astronomy students and in-service training of technikon students. During the period under review, SAAO committed substantial resources to the development of an Astrophysics Programme at the University of the North West. An initiative by Rutgers University (one of the SALT partner institutions) has allowed SAAO to assist suitably qualified black students to pursue PhD studies at

¹This report covers the 15 months between January 2001 and March 2002; future reports will be annual, starting in April 2002.

Rutgers University. The first student under this programme commenced studies in August 2001.

SAAO played a leading role in the establishment of the STARTEC initiative, an undertaking among the world's largest ground-based telescopes to co-operate in education and public outreach initiatives.

SAAO received a tremendous amount of publicity during the period under review. A search of the web to find references to SALT recorded over 800 pertinent hits worldwide. SAAO/SALT featured over 290 times in the local print media, and over 100 times in radio/TV programmes.

SAAO's computing infrastructure continues to be developed to exploit improvements in information and communication technology. To protect SAAO's IT resources from illegitimate use or attack, a firewall was set up to isolate the Cape Town and Sutherland networks. SAAO's website is growing in importance. During 2001, about 8 000 requests per day were received. There was a steady growth rate of about 290 requests per day every month over this time. The average data transfer rate was about 73MB/day and the number of distinct hosts connected to the site averaged 11 700 per month, growing at a rate of 460 new hosts every month.

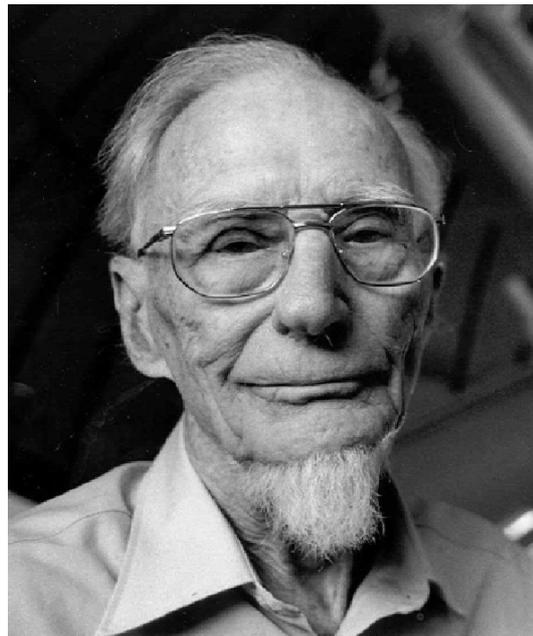
In February 2001, SAAO co-organised a Strategic Planning Workshop which brought together the South African astronomy and space science community. The aim of the workshop was to develop a roadmap for the future of astronomy and space science into the SALT era and beyond. An initiative that emerged from this was the establishment of an African Institute of Space Science. The concept was embraced by the Board of the NRF in June 2001 for testing in a wider forum.

The National Astrophysics and Space Science Programme (NASSP) also grew from the strategic planning exercise in an attempt to maximize the

interaction between postgraduate students and the experts distributed amongst the country's universities and National Facilities. The idea has captured the imagination of the astronomy community and funders alike – its first classes will be held early in 2003.

SAAO continues to be a major promoter of the development of astronomy and space science in Africa. The Working Group on Space Sciences in Africa produced (through SAAO) two issues of the *African Skies/Cieux Africains* Newsletter, which was distributed by the United Nations to over 1 200 addresses worldwide. SAAO also hosted three scientists from Ethiopia, Uganda and Zambia respectively for periods up to six months under a UNESCO-funded pilot programme of this Working Group to initiate an African Network for Education and Research in Astronomy (ANERA).

Alan Cousins died in May 2001 at the age of 97 and the SAAO celebrated the unique contributions he made to astronomy during the 77 year interval that separated his first and last publications.



Alan at 96: Photograph taken in 1999 in the "McLean" dome, Cape Town (photograph Christian Barnett)