ASSA Symposium 2004

This year's ASSA Symposium was held under the auspices of the Johannesburg Centre of the Society at the SA Military History Museum in Saxonwold.

About 70 members of ASSA and its Centres attended, including several from distant parts of the country. The programme consisted of talks by amateur astronomers, professionals and others with allied interests outside the formal boundaries of astronomy, as well as visits to places of interest. The local arrangements, including teas and lunches, proceeded flawlessly and those who attended agreed that the Johannesburg Centre under the leadership of Brian Fraser had done a magnificent job. Lerika Cross helped with the organization of the Symposium and helped to arrange speakers. Sharon Tait organized the name tags and the teas at the *Observatory and the Planetarium. Members* of the Centre went out of their way to ensure that the visitors were well looked after.

Attendees had the unusual opportunity during the breaks to stroll around displays of military hardware from the time of the South African War to the latest giant cannons of the SA Army, not to mention many interesting pieces of equipment captured during the Angolan campaign.

14 October 2004 Thursday

The Symposium opened with the reading of a letter from Sir Patrick Moore offering greetings and best wishes. It was written on his ancient but famous typewriter, used for creating more than 100 books!

The first speaker was the South African science writer Dr Kelvin Kemm (Stratek), on 'Star Wars and Little Green Men in the Karoo', a wide-ranging talk which ended up with a plea to make more of the national pride aspect of astronomy and to seek more *publicity for our work. It is little known that* Patrick Moore composed a number of military marches and we were treated to a recording on one of them after Dr Kemm's talk.

Group photograph of Symposium attendees.

Dr I.S. Glass (SAAO) spoke on 'Recent Studies of Mira and Semi-regular variables'. Infrared techniques have led to the discovery of a well-defined period-luminosity relation for Miras, which makes them one of the 'standard candles' useful for distance *determinations. By* combining the results of massive variability surveys such as MA-

CHO and 2MASS, unexpected regularities have also been found among the so-called 'semi-regular' variables.

Dr Barbara Cunow (UNISA) presented 'Stars and Dust in Galaxies'. Edwin Hubble stated that elliptical galaxies should not have gas and dust, but Barbara talked of elliptical galaxies that were unaware that they shouldn't.

Magda Streicher of Pietersburg/Polokwane spoke in Afrikaans on her deep sky observations. She emphasized that good discipline regarding the recording of observing *conditions and equipment will prove invaluable* in later years when old observations are referred to.

Prof Derck Smits (UNISA) talked about 'Determining the Primordial Helium Abundance'. The hydrogen/helium ratio tells us something about events 100 seconds after the Big Bang. Otherwise, observations are limited to times of 300 000 years or more afterwards.

Brian Fraser, convenor of the 2004 Symposium, addressing the attendees.

Robbie Yates, formerly Lighting Engineer of the Johannesburg Electricity Department, gave a presentation 'Light Pollution - Current News'. About 14% of the pollution comes from public street lighting and he showed how designs can be improved to reduce wastage of light in the upward direction. He spoke about a scheme to classify environments in need of un-polluted skies, for example national parks.

Tim Cooper, Pretoria Centre, spoke on "*Analysis of Comet Brightness from SA* Observations". He explained how comet brightnesses can be described by a formula:

$m_1 - 5 \log \Delta = 2.5n \log r + H_0$,

where m_1 is the total visual cometary magnitude, Δ and r are the geocentric and heliocentric distances respectively, n is a factor which describes how fast the comet brightness rises or falls with proximity to the Sun, and H_0 is the absolute magnitude of the comet. Stars can be de-focussed to imitate comets for photometric purposes. Comet Hale-Bopp was the subject of over 400 observations in Southern Africa and a good agreement was found between ASSA results and those of the BAA.

Jacques van Delft, an amateur astronomer from Bloemfontein, spoke on the controversial subject of 'Solar Activity and Climatic Change'. The relatively recent discovered Coronal Mass Ejections were among the phenomena likely to disturb the Earth's magnetosphere and affect the weather.

That evening, the participants were invited to the Johannesburg Planetarium by Dr Claire Flanagan. We had a special show to illustrate the capabilities of the impressive pre-WW2 Zeiss projector, which relies on mechanical technology rather than comput-

ers. After the show, Claire answered many questions on the projector and explained its details in response to questions from a fascinated audience.

15 October Friday

The day's proceedings commenced with a talk by Prof Phil Charles, the new Director of SAAO, on 'Black Hole Masses in Galactic X-ray Binaries'. He explained that an isolated black hole cannot be detected, but if one exists in an interacting binary then it becomes visible as a result of the X-rays produced as matter falls towards the black hole. Black holes in binaries are formed by a supernova explosion of one of the two components, but if too much matter is blown off in the explosion then the binary will become unbound and the two stars will separate. There are observed to be about 200 currently active X-ray binaries in the Milky Way, most of which involve accreting neutron stars. However, there are a growing number of X-ray binaries which display transient behaviour, of which a few dozen have visible counterparts, and roughly 3/4 of this class appear to be black holes. Much of the material falling towards a black hole is ejected as 'jets' and the result is a 'micro-quasar'. The maximum mass of a neutron star is thought to be 3 solar masses, but, unlike the case of a white dwarf (1.4 solar masses), it is not a definitely known quantity. The known galactic black hole masses cluster around 10 solar masses. Investigations of these sources will be a fruitful area for SALT - the Southern African Large Telescope, now nearing completion.

Phil Charles, new Director of SAAO, addressing the Symposium.

Dr Peter Kotze of Hermanus Magnetic Observatory spoke on 'Living on a Giant Magnet'. Starting with a history of geomagnetism, he discussed the phenomena of Coronal Mass Ejections, which are very substantial, the material of one event being comparable to the total mass of the Himalayas. The strength of the geomagnetic field at Hermanus has decreased by 20% since 1940. This and other interesting variations of the field, such as 'geomagnetic jerks', where the direction of change in the magnetic declination reverses, were discussed. The polarity of the geomagnetic field reverses 4 or 5 times every million years, but the process is far from being a rapid one.

After tea, Dr Roger Gibson (WITS) gave a fascinating talk on impact craters, of which about 180 are now known on Earth. The impact of an asteroid causes immense pressures of order 100 GPa and instant vaporization of stony material, which creates unusual crystalline structures that are not seen in ordinary, slowly evolved, minerals.

Southern African craters now include Roter Kammm (Namibia), Morokweng, Vredefort, Kalkkop, Kgagodi (Botswana) and the well-known Tswaing crater north of Pretoria, whose age is a mere 200 000 years. He gave a detailed account of the Vredefort Ring structure, the remains of the central portion of a crater 250-300km across, that formed 2 billion years ago and was probably the result of a 10-15 km diameter asteroid collision that would have made a hole 5km deep and released 100 million million megatons of TNT equivalent (compare the most extreme atom bomb explosion of 60 Megatons).

Ian Glass handing over the Gill Medal to Berto Monard on behalf of Case Rijsdijk, President of ASSA.

Brian Fraser and Tim Cooper gave a joint account of 'Alexander William Roberts - the Man and His Observations'. Roberts, who taught at Lovedale, the precursor of Fort Hare, was a socially progressive person who later became the 'Native Representative' in the Union Senate, at a time when no direct representation was allowed. As an amateur astronomer, he left about 70 000 variability observations of about 99 stars. These were never published but ended up at the Boyden Observatory outside Bloemfontein. The difficulties of reconstructing his magnitudes was explained, but his data are now being captured on computer. Some of the totals of other well-known SA variable star observers were given: Danie Overbeek (287 150), R.P. de Kock (160777) and Berto Monard (29000 and increasing).

In the afternoon, I.S. Glass read Berto Monard's Gill medal citation to him on behalf of Case Rijsdijk, the Society's President at the time of the award, who was unable to be present [*the citation appears on p 170*].

The first lecture of the afternoon was 'Saturn over the Years', by Dr Barbara Cunow (UNISA), wearing her amateur cap. It was illustrated by a series of pencil drawings showing the ring and shadow phenomena of the planet.

Magda Streicher (Pietersburg/Polokwane) talked on the 'Cyril Jackson Observatory' in Haenertsburg. She prefaced her description of the ruins of the buildings by an outline of the career of Jackson (1903–1988) himself. His early career was at the Union Observatory and later he worked for the Yale-Columbia Station in SA and Australia (after its move). A sign has been

erected to commemorate the site of his private observatory and protection is being sought for its remains.

'History of Exploration of Mars' was the title of an entertaining talk given by Johan Smit (Centurion). He listed the various attempts to reach Mars by spacecraft and further efforts to land instruments and rovers on the surface. A disturbing number of these failed for one reason or another, the most notorious case being the mix-up between metric and imperial units that occurred on one occasion. However, the tasks involved were formidable and it was indeed remarkable when successes were eventually achieved.

Magda Streicher and Mr Mickael Gardner, mayor of Haenertsburg, in front of the ruins of Cyril Jackson's observatory. Jackson built the observatory on top of a hill on his farm in the 1950s. The inscription on the doorway to the observatory read "Erno Star house 1955".

The last talk of the day was by Emmanuel Petrakakis (Maputo) on 'Inca Archaeo-astronomy', largely devoted to descriptions of astronomical alignments and solar observation platforms on Machi Picchu, Peru.

On Friday evening, a star party was held at the former Transvaal/Union/Republic Observatory in Johannesburg. The 26½-inch refractor was opened and trained on 47 Tuc but the rather overcast weather did not allow it to show off its best performance. The Johannesburg Centre provided a fine spread of eats for the occasion. It was also possible to visit the top of the hill and see the 6-inch/7-inch Franklin-Adams double Cooke refractor there. The site now belongs to SAASTA (SA Agency for Science and Technology Advancement) who stated some time ago that they intend to use it for a science education centre.

16 October, Saturday

On Saturday morning participants found their various ways to Broederstroom (Toppieshoek), the former location of the Leiden Southern Satation and the present home of the Franklin-Adams and Rockefeller telescopes. The site is now owned by the Tshwane University of Technology and is used as a student motivation and team-building/training centre (see p 170 of this issue). Brian Fraser spoke on 'The Franklin Adams Telescope and its Contribution to Astronomy'. Franklin-Adams was a British amateur astronomer who commissioned a special wide-angle lens (Cooke Triplet) and telescope from Cooke of York and had it erected first at the Royal Observatory in Cape Town. After surveying the southern sky, he took it back to England to cover the remainder. Following that, it was sent back to South Africa, to the Union Observatory. The first all-sky photographic atlas, issued

by the Royal Astronomical Society, was based on this work and later the 'Union Charts' were issued. The most famous discovery associated with it was that of the nearest star, Proxima Centauri, first found as a high proper-motion star in 1915 by R.T.A. Innes by blinking a pair of Franklin-Adams plates taken several years apart.

A lunch of potjiekos was enjoyed by all before we headed towards the Hartebeesthoek Radio Astronomy Observatory. After meeting in their educational display facility we heard three more talks, given by members of the Observatory staff:

Dr Mike Gaylard provided an overview of HartRAO, its history and devlopment as an observatory. He noted that that the antenna originally operated at 30cm wavelength, but thanks to resurfacing now works down to 2.5cm and a new receiver is being built to take it to 1.3cm. He noted that mapping the radio sky, star birth and star death are major research areas. The space geodesy programme is an offshoot of the ability of radio telescopes to operate in intercontinental networks, providing precise positioning at the sub-millimeter level, with many scientific and practical spinoffs. This capability has also led to the operation of a satellite laser ranger, in a joint project with NASA, and a network of GPS base-stations across southern Africa.

PhD student Sarah Buchner spoke on the nature of pulsars and on pulsar observations, which are made in collaboration with Dr. Claire Flanagan of the Johannesburg Planetarium. A major interest of the HartRAO observers is the detection of 'glitches', or sudden changes in the rate of spin-down of pulsars. She showed that monitoring the recovery of pulsars from such events enables us to probe the interiors of ultra-dense collapsed stars.

The 26-m HartRAO radio telescope.

Dr Sharmila Goedhart spoke on star formation processes and how we can investigate the dense, opaque clouds of dust and gas in which they occur through their infrared radiation and the strong stimulated radio emission that arises from water, hydroxyl and methanol molecules. She showed the latest results from the methanol masers that have been monitored at HartRAO. Some of have been found to show variability of a periodic nature. She also described how she imaged the masers in one star-forming region using the Very Long Baseline radio telescope array in the USA.

Following the talks and some welcome refreshments on this very hot day, the participants were given a tour of the facilities, ending up in the control room of the telescope.