

**ANNUAL REPORT OF THE UNION OBSERVATORY,
JOHANNESBURG
1955**

(Director, Dr. W.H. van den Bos, Union Astronomer)

1. *Astronomical Observations and Research.*

The 26½-inch refractor has been used on 214 nights with the interferometer by Dr Finsen for the measurement of known double stars and the discovery of new ones, and with the micrometer by Mr Churms and Dr van den Bos on 51 nights for the measurement of known double stars.

With the 9-inch refractor 94 occultations and with the 6-inch photovisual refractor 56 occultations of stars by the Moon have been observed by Messrs. Bruwer, Churms and amateur astronomers, members of the Transvaal branch of the Astronomical Society of South Africa, who also used the 9-inch refractor on 84 nights for observations of planets, variable stars etc. and rendered valuable assistance to the Staff on visiting evenings and in many other ways.

The results of the occultation observations have been communicated to H.M. Nautical Almanac Office.

With the Franklin-Adams telescope at the Hartbeespoort Annexe 199 plates for minor planets and 18 plates for comets were obtained by Messrs. Bruwer and Churms and 2 occultations observed. The resulting positions of minor planets and comets have been regularly communicated to the respective Central Bureaus of the International Astronomical Union at Cincinnati and Copenhagen.

Dr. Finsen devoted much of his spare time to the preparation of multiple reproductions, in colour as well as black and white, from the roughly 24,000 exposures on colour film of the planet Mars, obtained in 1954. By this method the disturbing effect of film grain is largely eliminated and the planet's fine surface detail brought out clearly. The results, which are among the best ever obtained for the planet, have amply repaid the time and energy spent on the 1954 Mars opposition.

The card catalogue of double stars south of 19° declination has been kept up-to-date and information supplied to other astronomers on request.

With a 3-inch refractor sunspot counts were obtained on 265 days, the other days of the year being overcast or unsuitable for reliable counts. The results are communicated daily to the Telecommunications Research Laboratory of the South African Council for Scientific and Industrial Research, and monthly to the Magnetic Observatory at Hermanus and the Receiving Station of the South African Broadcasting Corporation at Panorama.

2. *Publications.*

Union Observatory Circular No. 114 and the Annual Report for 1952 have been distributed.

The following papers by members of the staff were published in other periodicals

- W.S. Finsen, New Double Stars. *The Observatory*, 75, 133.
The Orbit of Epsilon Ceti. *MNASSA*, 14, 84
A critical evaluation of Sinton's achromatic interferometer
Journal des Observateurs, 38, 217
Cinematography of Mars. *Research Film*, 2, 20
- J. Hers and P.C.Seligmann, The Union Observatory Time and Frequency
Transmissions.
S.A. Journal of Science.51, 195
- P.C. Seligmann, Quartz Clocks. *MNASSA*, 14, 10.
- W.H. van den Bos, Note on Dr Wilson's specific procedure for the measurement
of close double stars with the filar micrometer.
Astronomical Journal, 60, 363.

3. *Public Services.*

The Time Service is under the general supervision of Dr. Finsen, with Mr. Hers in charge, assisted by Mr. Seligmann and, when necessary, by Messrs. Bruwer and Churms.

In May an Essen ring type quartz crystal, manufactured by the British Post Office, was installed in oscillator 3A. It immediately showed such excellent frequency stability that from the end of June onwards it was used to control the transmitter frequency and all time signal equipment. The very low rate of frequency drift has made frequent adjustments unnecessary and indeed undesirable. It was therefore decided that time signals would no longer be adjusted by means of frequency adjustments, but that where necessary phase adjustments of 20 milliseconds or multiples of 20 milliseconds would be made to the time signals only.

A continuous phase shifter provides a fine control of transmitter frequency and clock rate without the necessity of having to adjust the master oscillator itself. This can

be preset to alter the standard frequency by any integral number of parts in 10^9 within the range of -20 to +20 parts in 10^9 .

Four out of eight oscillators were kept in operation throughout the year without any interruption and towards the end of the year the average rates of frequency drift (in parts in 108 per month) were:

2A	(GT - Western Electric)	+2.0
3A	(ring - BPO)	+0.2
3B	(GT - BPO)	+0.7
3C	(")	+0.5
4A	(")	less than 0.1
4C	(")	+0.8

Equipment for announcing the radio transmitter call sign. ZUO and the time at 15 minutes intervals (in morse code) was put into operation in April. This apparatus, which uses motor-driven cams, was designed at the Observatory and constructed in the workshop.

From August 23 the seconds pulses transmitted from ZUO were shortened from 100 to 10 milliseconds, the minute now being indicated by lengthening the pulse on the 60th second instead of suppressing the 59th pulse, as was done previously.

Prom September the times and frequencies of ZUO have been published in terms of the time signals from both Washington and Rugby.

A diesel generating set is being installed to keep the time equipment, including the transmitter, in operation in the event of a power failure.

Hourly time signals and standard frequencies were sent throughout the year to the Post Office and to the South African Broadcasting Corporation by landline.

228 certificates for stopwatches were issued during the year.

The Wiechert horizontal seismograph was in operation throughout the year.

The following local earth tremors were recorded:

Light	2464
Medium	586
Strong	210
Very strong	108
Very very strong	53
Total	<hr/> 3421

Monthly returns have been sent to the Inspector of Mines and the Bernard Price Institute of Geophysics.

In addition to these local tremors, 17 distant earthquakes were recorded by the instrument. These records are forwarded to the Bernard Price Institute for inclusion in its monthly *Seismological Bulletin*. Several have been lent, on request, to overseas geophysical institutes.

Records of rainfall have been sent monthly to the Weather Bureau, Pretoria.

Certificates for legal purposes have been issued and numerous requests for astronomical information have been answered. A monthly bulleting giving the astronomical phenomena for the coming month has been sent to the Editor, *South African Journal of Science*, and to the South African Press Association for distribution to the Press.

There were 38 visiting nights during the year and the total number of visitors received was 1218. When weather permitted, celestial objects were shown with the various telescopes; in addition, a display of astronomical exhibits was arranged in the library.

4. *General.*

Mr. Hers left for England on March 4 to receive a set of quartz crystal oscillators made by the British Post Office and returned on March 31.

Dr. van den Bos left for Europe on April 23, attended the I.A.U. Assembly at Dublin, visited the observatories at Stockholm, Leiden, Dunsink and Copenhagen and returned on October 31.

Dr. Muller was the Leiden Observer throughout the year.

The Observatory collaborated in an exhibition organized jointly by the Astronomical Society of South Africa (Transvaal Branch) and the Interplanetary Society. This was held in January at the Johannesburg Public Library and aroused considerable interest.

During the year the workshop, which had so far been housed in extremely cramped conditions, was moved to the building which housed the Franklin-Adams telescope before its transfer to the Hartbeespoort Annexe.

Mr. K.S. McArthur, Mechanician, resigned on February 28 and Mrs. E. Hers on December 31.

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