

**THE
ASTRONOMICAL SOCIETY
OF
SOUTHERN AFRICA**

HANDBOOK FOR

1965

THE ASTRONOMICAL SOCIETY OF SOUTHERN AFRICA

1964 - 1965

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The Astronomical Society of South Africa was formed in July 1922, by the amalgamation of the Cape and Johannesburg Astronomical Associations which had been in active existence for several years. Its name was changed to the Astronomical Society of Southern Africa in 1956. The declared objects of the Society are:—

- (1) The encouragement and stimulation of the study of Astronomy in Southern Africa;
- (2) The association of observers and their organisation in the work of astronomical observation and research;
- (3) The dissemination throughout Southern Africa of such current astronomical information as may be helpful to observers;
- (4) The publication from time to time of the results of the work accomplished by the Society.

Membership is open to all who are interested in Astronomy. The Society issues, usually, eleven numbers of "The Monthly Notes of the Astronomical Society of Southern Africa" (M.N.A.S.S.A.) each year, and distributes to each member copies of "Sky and Telescope", an illustrated monthly astronomical magazine published in the United States.

Candidates for election as members of the Society must be proposed and seconded by two members (not associate or student members). The annual subscription for members is R5.00 with an entrance fee of R2.50.

M.N.A.S.S.A. is also on sale to non-members of the Society. Enquiries concerning subscriptions and remittances by non-members should be addressed to the Circulation Manager, Mr. H. E. Krumm, 3, Leeuwendal Crescent, Cape Town.

All other communications for the Society should be addressed to the Hon. Secretary, Astronomical Society of Southern Africa, c/o The Royal Observatory, Observatory, Cape Province.

SOCIETY'S CALENDAR FOR 1965

Material and Notes for M.N.A.S.S.A. by 20th of the month.

Nominations for Gill Medal by April 8.

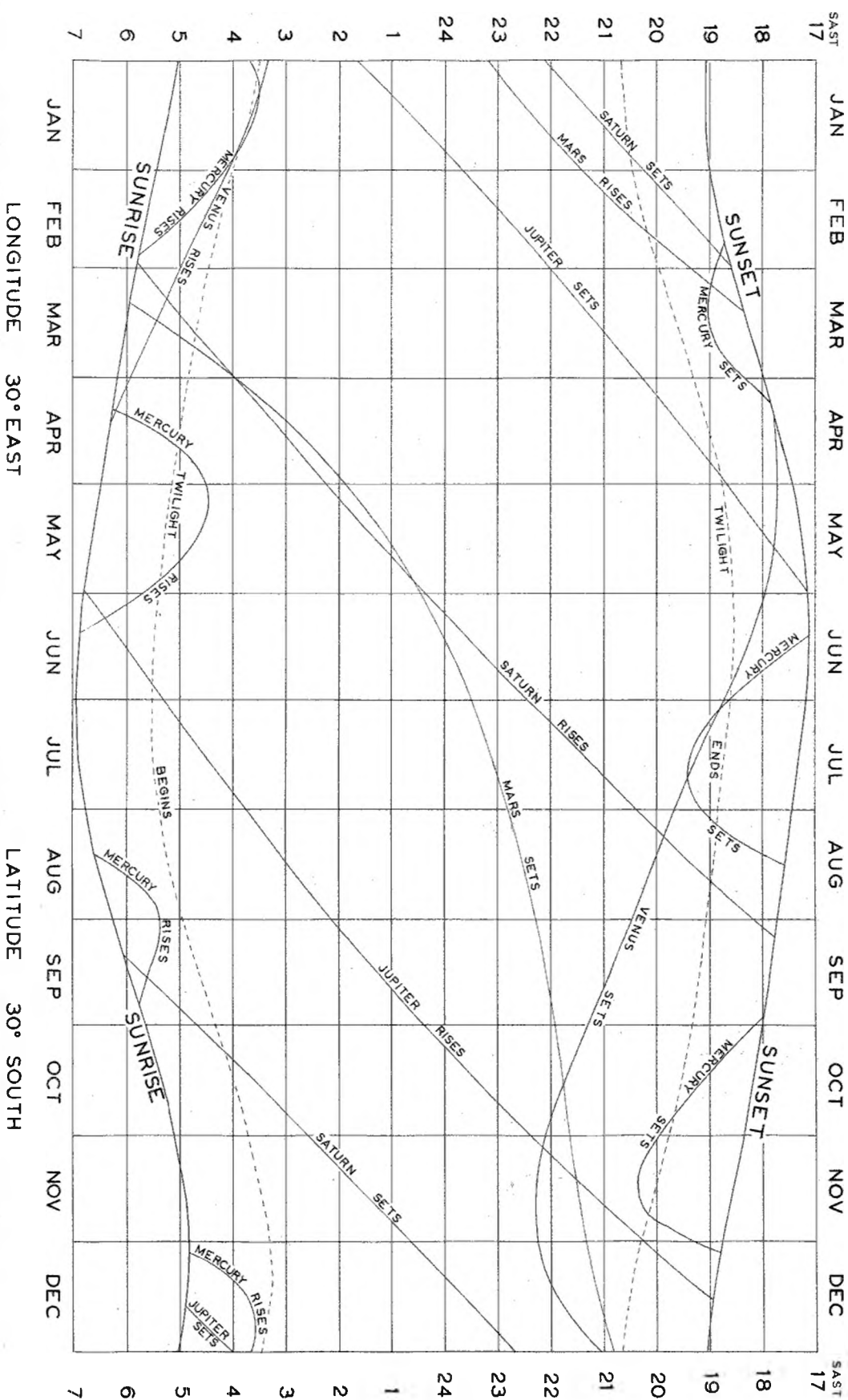
Essay Competition closes May 31.

Nominations for Officers and Council by June 15.

Subscriptions due July 1.

Annual General Meeting at all Centres 4th Wednesday in July.

THE PLANETS AS SEEN FROM SOUTH AFRICA — 1965



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Although every care has been taken in the compilation of this Handbook, it is distributed and sold on the explicit condition that neither the Astronomical Society of Southern Africa nor any of its members accepts any responsibility for errors.

INTRODUCTION

All the times given in this booklet are South African Standard Time, that is, mean solar time for a meridian 30° , or two hours, east of Greenwich. This is also the Standard Time in use in Rhodesia, Zambia, the Protectorates, Mozambique, and the eastern part of the Congo Republic.

To obtain the local mean time at other places the longitude differences shown in Table I must be applied to the ordinary S.A.S.T.

TABLE I

CORRECTION FOR LONGITUDE

Bloemfontein	- 15 ^m	Grahamstown	--14. ^m
Cape Town	- 46	Johannesburg	- 08
Durban	+ 04	Port Elizabeth	- 18
East London	- 08	Pretoria	- 07
Salisbury	+ 04	Bulawayo	- 06

Conversely to obtain the S.A.S.T. from the local mean time these longitude corrections must be applied with the sign reversed. Thus the S.A.S.T. of local mean noon (i.e. 12h 00m local mean time) at Salisbury is 11h 56m. .

Owing to the fact that the Earth does not go round the Sun with uniform circular motion in the plane of the Earth's equator, the local apparent solar time (i.e. the time shown by a sundial) differs from the local mean solar time by a quantity which is usually referred to as the "Equation of Time". The Equation of Time must be added to the mean solar time to give the apparent solar time. Its effect is shown in the third column of Table II which gives the S.A.S.T. of apparent noon, that is, of the Sun's transit over the meridian.

For example, the S.A.S.T. of apparent noon at Salisbury on 1965 November 7 is 11.39 S.A.S.T., found by applying the longitude correction of -04m to the tabulated value for 30° E.

For many purposes, sidereal time, that is, local time as measured by the stars, is extremely useful. The sidereal time can be found by applying the S.A.S.T. (on a 24 hour basis) to the corresponding "Sidereal Time at 0 hours S.A.S.T." which is given in the fourth column of Table II, and correcting for longitude by means of Table I. A further

small correction is needed to allow for the four-minute difference in length between the solar and sidereal days.

The correction is +1m for times between 03.00 and 09.00 S.A.S.T., +2m between 09.00 and 15.00, +3m between 15.00 and 21.00, and +4m between 21.00 and 23.59.

Example: Find the Sidereal time at 8.30 p.m. on October 8 at Bloemfontein.

Sid. time at 00h 00m S.A.S.T. on October 8	1 05
S.A.S.T. elapsed	20 30
	21 35
Correction for longitude	-15
Interval correction	+ 3
Required sidereal time	21 23

For recording the time of variable star observations, the Julian Day calendar is usually used. This numbers the days consecutively from the beginning of the Julian era in 4713 B.C. The Julian Day begins at Greenwich mean noon, that is, at 14.00 (2 p.m.) S.A.S.T.

The position of a star in the sky is fixed by its right ascension and declination, much as the position of a point on the Earth is fixed by its longitude and latitude. In fact, the right ascension and declination of any star are the longitude and latitude of the point on the Earth directly beneath it at zero hours sidereal time at Greenwich. Latitude and declination are always measured in degrees north or south of the equator. Longitude and right ascension are measured either in degrees or in time, 360° being equal to 24 hours (1° equals 4 minutes; 15' equals 1 minute). Right ascension is always measured eastwards from the zero celestial meridian, and thus is the equivalent of the longitude measured eastwards from the Greenwich meridian.

For considering the motions of the Sun, Moon, and planets, the system of co-ordinates known as celestial latitude and longitude is very convenient. These co-ordinates define the position of a celestial body with reference to the ecliptic in exactly the same way as right ascension and declination define its position with reference to the celestial equator. The (celestial) latitude is the angular distance of the body north or south of the ecliptic, while the longitude is the distance from the vernal equinox as measured eastwards along the ecliptic. Celestial latitude and longitude are usually measured in degrees.

The ecliptic is defined by the apparent path of the Sun about the Earth. The latitude of the Sun is therefore always (approximately) zero, whilst its longitude increases by approximately 1° per day.

TABLE II

Date 1965	Julian Date at 14 hours	S. A. S. T. of Sun's transit Longitude 30°E			Sidereal Time for Longitude 30° E	
					S.A.S.T. 0 hours	S.A.S.T. 18 hours
		h.	m.	s.	h. m.	h. m.
January 1	2,438,762.0	12	02	59	6 41	0 44
" 11	772.0	12	07	23	7 21	1 24
" 21	782.0	12	10	46	8 00	2 03
" 31	792.0	12	12	55	8 40	2 43
February 10	802.0	12	13	43	9 19	3 22
" 20	812.0	12	13	14	9 59	4 01
March 2	822.0	12	11	39	10 38	4 41
" 12	832.0	12	09	16	11 17	5 20
" 22	842.0	12	06	23	11 57	6 00
April 1	2,438,852.0	12	03	22	12 36	6 39
" 11	862.0	12	00	31	13 16	7 19
" 21	872.0	11	58	08	13 55	7 58
May 1	882.0	11	56	29	14 35	8 37
" 11	892.0	11	55	43	15 14	9 17
" 21	902.0	11	55	53	15 53	9 56
" 31	912.0	11	56	56	16 33	10 36
June 10	922.0	11	58	41	17 12	11 15
" 20	932.0	12	00	47	17 52	11 55
" 30	942.0	12	02	54	18 31	12 34
July 10	2,438,952.0	12	04	38	19 10	13 13
" 20	962.0	12	05	39	19 50	13 53
" 30	972.0	12	05	46	20 29	14 32
August 9	982.0	12	04	52	21 09	15 12
" 19	992.0	12	03	00	21 48	15 51
" 29	2,439,002.0	12	00	22	22 28	16 31
September 8	012.0	11	57	08	23 07	17 10
" 18	022.0	11	53	36	23 46	17 49
" 28	032.0	11	50	08	0 26	18 29
October 8	2,439,042.0	11	47	02	1 05	19 08
" 18	052.0	11	44	38	1 45	19 48
" 28	062.0	11	43	15	2 24	20 27
November 7	072.0	11	43	07	3 04	21 07
" 17	082.0	11	44	22	3 43	21 46
" 27	092.0	11	47	01	4 22	22 25
December 7	102.0	11	50	50	5 02	23 05
" 17	112.0	11	55	29	5 41	23 44
" 27	122.0	12	00	27	6 21	0 24

		CAPE TOWN		DURBAN		BLOEMFONTEIN	
		SUNRISE	SUNSET	SUNRISE	SUNSET	SUNRISE	SUNSET
Jan	1	05 ^h 38 ^m	20 ^h 01 ^m	04 ^h 58 ^m	19 ^h 01 ^m	05 ^h 21 ^m	19 ^h 18 ^m
	11	05 46	20 02	05 06	19 02	05 29	19 18
	21	05 55	19 59	05 14	19 00	05 37	19 17
Feb	1	06 07	19 52	05 24	18 55	05 46	19 13
	11	06 17	19 44	05 32	18 48	05 54	19 06
	21	06 26	19 33	05 41	18 39	06 02	18 57
Mar	1	06 33	19 23	05 46	18 30	06 08	18 48
	11	06 41	19 11	05 53	18 19	06 13	18 38
	21	06 49	18 58	05 59	18 08	06 18	18 27
Apr	1	06 58	18 41	06 06	17 53	06 25	18 13
	11	07 04	18 30	06 11	17 43	06 30	18 03
	21	07 13	18 17	06 17	17 31	06 35	17 52
May	1	07 20	18 05	06 24	17 22	06 42	17 44
	11	07 28	17 57	06 31	17 14	06 49	17 36
	21	07 34	17 50	06 36	17 08	06 54	17 30
Jun	1	07 43	17 45	06 43	17 04	07 01	17 27
	11	07 48	17 44	06 48	17 03	07 05	17 26
	21	07 51	17 44	06 51	17 04	07 08	17 27
Jul	1	07 53	17 48	06 53	17 07	07 10	17 30
	11	07 51	17 52	06 51	17 11	07 08	17 34
	21	07 47	17 58	06 48	17 16	07 05	17 39
Aug	1	07 39	18 06	06 42	17 22	07 00	17 45
	11	07 30	18 13	06 34	17 29	06 53	17 51
	21	07 19	18 20	06 24	17 35	06 42	17 55
Sep	1	07 06	18 27	06 12	17 40	06 31	18 01
	11	06 52	18 34	06 00	17 46	06 19	18 06
	21	06 38	18 41	05 48	17 51	06 07	18 10
Oct	1	06 25	18 48	05 37	17 57	05 57	18 16
	11	06 12	18 55	05 25	18 03	05 45	18 22
	21	05 58	19 04	05 12	18 09	05 33	18 27
Nov	1	05 46	19 13	05 02	18 17	05 24	18 35
	11	05 38	19 23	04 55	18 26	05 17	18 44
	21	05 31	19 33	04 49	18 34	05 12	18 52
Dec	1	05 29	19 43	04 48	18 42	05 11	19 00
	11	05 28	19 50	04 48	18 50	05 11	19 07
	21	05 32	19 57	04 52	18 57	05 15	19 14

The table gives for five typical places in Southern Africa the S.A.S.T. of Sunrise and Sunset, i.e. the times when the upper limb of the Sun, as affected by refraction, is on the horizon. The last three columns give the approximate duration of Twilight at Durban, Bloemfontein and Johannesburg. For Cape Town the durations given must be increased by 2, 4, and 6 minutes for Civil, Nautical and Astronomical Twilight respectively, while for Luanshya they must be decreased by 3, 6, and 9 minutes.

	JOHANNESBURG				LUANSHYA				DURATION OF TWILIGHT (mins)		
	SUNRISE		SUNSET		SUNRISE		SUNSET		CIVIL	NAUTICAL	ASTRON
Jan 1	05 ^h	18 ^m	19 ^h	04 ^m	05 ^h	44 ^m	18 ^h	38 ^m	27	59	94
11	05	25	19	05	05	50	18	42	27	59	92
21	05	33	19	04	05	55	18	42	26	57	90
Feb 1	05	42	19	00	05	59	18	40	25	55	87
11	05	49	18	55	06	03	18	37	25	54	85
21	05	56	18	47	06	06	18	34	25	53	83
Mar 1	06	00	18	39	06	09	18	31	25	53	81
11	06	06	18	29	06	10	18	25	24	52	80
21	06	11	18	19	06	11	18	18	24	52	79
Apr 1	06	17	18	06	06	12	18	09	24	52	79
11	06	21	17	56	06	13	18	04	24	52	79
21	06	25	17	47	06	14	17	58	24	52	79
May 1	06	31	17	38	06	15	17	53	24	52	80
11	06	37	17	31	06	17	17	50	25	53	81
21	06	41	17	26	06	20	17	48	25	54	83
Jun 1	06	47	17	23	06	23	17	47	25	55	84
11	06	52	17	22	06	26	17	47	25	55	84
21	06	55	17	24	06	28	17	48	26	55	85
Jul 1	06	57	17	27	06	31	17	51	26	55	85
11	06	55	17	30	06	31	17	54	26	55	84
21	06	53	17	35	06	30	17	57	25	54	84
Aug 1	06	48	17	41	06	27	18	00	25	54	83
11	06	41	17	46	06	24	18	01	25	53	81
21	06	32	17	50	06	19	18	02	25	52	80
Sep 1	06	21	17	54	06	13	18	03	24	52	79
11	06	11	17	59	06	05	18	03	24	52	79
21	05	59	18	03	05	57	18	03	24	52	79
Oct 1	05	50	18	08	05	51	18	04	25	52	80
11	05	39	18	12	05	44	18	05	25	52	81
21	05	27	18	17	05	38	18	06	25	54	83
Nov 1	05	19	18	24	05	33	18	09	25	55	85
11	05	13	18	32	05	30	18	13	25	55	87
21	05	08	18	39	05	29	18	17	26	57	89
Dec 1	05	07	18	46	05	31	18	22	26	59	92
11	05	08	18	53	05	33	18	27	27	60	94
21	05	12	19	00	05	37	18	32	27	60	94

Civil Twilight is defined as beginning or ending when the Sun's centre is 6° below the horizon and includes the time during which operations requiring daylight may still continue. Nautical Twilight begins and ends when the Sun's centre is 12° below the horizon which, for all practical purposes, is the time when it is "dark". The limit of Astronomical Twilight corresponds to the Sun's centre being 18° below the horizon, at which time there is no light from the Sun whatever.

PERIGEE			APOGEE		
Date	S. D.	H. P.	Date	S. D.	H. P.
Jan 17 ^d 03 ^h	16' 44"	61' 24"	Jan 2 ^d 16 ^h	14' 42"	53' 56"
Feb 14 13	16 34	60 48	Jan 29 20	14 43	53 59
Mar 14 11	16 19	59 55	Feb 26 12	14 45	54 06
Apr 9 13	16 09	59 16	Mar 26 08	14 47	54 14
May 5 03	16 17	59 45	Apr 23 03	14 47	54 15
Jun 1 20	16 30	60 34	May 20 22	14 46	54 10
Jun 30 02	16 40	61 11	Jun 17 12	14 44	54 03
Jul 28 11	16 43	61 23	Jul 14 19	14 42	53 58
Aug 25 21	16 39	61 06	Aug 10 22	14 43	53 59
Sep 23 01	16 28	60 24	Sep 7 06	14 44	54 04
Oct 20 13	16 13	59 33	Oct 4 22	14 46	54 11
Nov 14 10	16 10	59 20	Nov 1 17	14 47	54 14
Dec 11 08	16 24	60 11	Nov 29 14	14 46	54 11
			Dec 27 09	14 44	54 03

S.D. = Semi-diameter

H.P. = Horizontal Parallax

The distance of the Moon from the Earth in miles may be found by dividing 817,500,000 by the H.P. in seconds of arc.

MAXIMUM LIBRATION

Longitude				Latitude			
+ West Limb exposed				+ North Limb exposed			
- East Limb exposed				- South Limb exposed			
Jan 11	-7°5	Jul 6	+7°4	Jan 9	+6°8	Jul 4	-6°7
23	+7.8	22	-7.4	21	-6.7	18	+6.7
Feb 8	-6.5	Aug 3	+7.9	Feb 5	+6.6	31	-6.6
20	+6.9	20	-6.8	18	-6.5	Aug 14	+6.6
Mar 6	-5.3	Sep 1	+7.6	Mar 4	+6.6	27	-6.5
20	+5.8	16	-5.6	17	-6.5	Sep 10	+6.6
Apr 2	-5.0	29	+6.7	31	+6.6	23	-6.5
17	+5.0	Oct 12	-4.6	Apr 13	-6.6	Oct 7	+6.7
29	-5.7	26	+5.7	27	+6.7	21	-6.7
May 13	+5.2	Nov 8	-4.8	May 10	-6.7	Nov 4	+6.8
27	-6.6	22	+5.2	25	+6.8	17	-6.8
Jun 9	+6.3	Dec 6	-5.9	Jun 6	-6.8	Dec 1	+6.9
24	-7.3	18	+5.8	21	+6.8	14	-6.8
						28	+6.8

MOONRISE AND MOONSET

1965 JANUARY

DAY	At 0 ^h S.A.S.T.		JOHANNESBURG		CAPE TOWN	
	J.D. 2438000+	AGE	MOONRISE	MOONSET	MOONRISE	MOONSET
			S.A.S.T.	S.A.S.T.	S.A.S.T.	S.A.S.T.
F 1	761.4	27.9	3 ^h 59 ^m	18 ^h 06 ^m	4 ^h 20 ^m	19 ^h 04 ^m
S 2	762.4	28.9	4 44	18 57	5 05	19 56
S 3	763.4	0.0	5 33	19 45	5 53	20 44
M 4	764.4	1.0	6 26	20 30	6 46	21 27
T 5	765.4	2.0	7 20	21 11	7 42	22 05
W 6	766.4	3.0	8 14	21 49	8 39	22 40
T 7	767.4	4.0	9 09	22 24	9 37	23 11
F 8	768.4	5.0	10 02	22 57	10 35	23 41
S 9	769.4	6.0	10 57	23 30	11 33	.....
S 10	770.4	7.0	11 53	.....	12 33	0 10
M 11	771.4	8.0	12 50	0 04	13 35	0 39
T 12	772.4	9.0	13 50	0 38	14 39	1 11
W 13	773.4	10.0	14 55	1 19	15 48	1 46
T 14	774.4	11.0	16 02	2 02	16 59	2 27
F 15	775.4	12.0	17 12	2 54	18 11	3 16
S 16	776.4	13.0	18 19	3 54	19 19	4 14
S 17	777.4	14.0	19 20	5 01	20 19	5 20
M 18	778.4	15.0	20 16	6 11	21 10	6 32
T 19	779.4	16.0	21 03	7 20	21 54	7 46
W 20	780.4	17.0	21 45	8 28	22 31	8 57
T 21	781.4	18.0	22 22	9 31	23 04	10 05
F 22	782.4	19.0	22 56	10 30	23 35	11 09
S 23	783.4	20.0	23 30	11 28	.....	12 10
S 24	784.4	21.0	.....	12 24	0 05	13 10
M 25	785.4	22.0	0 04	13 19	0 35	14 09
T 26	786.4	23.0	0 39	14 14	1 06	15 06
W 27	787.4	24.0	1 16	15 08	1 40	16 03
T 28	788.4	25.0	1 56	16 01	2 19	16 58
F 29	789.4	26.0	2 41	16 52	3 02	17 51
S 30	790.4	27.0	3 29	17 42	3 49	18 41
S 31	791.4	28.0	4 21	18 28	4 41	19 25

PHASES OF THE MOON

New Moon	Jan 2 ^d	23 ^h 07 ^m
First Quarter	10	23 00
Full Moon	17	15 38
Last Quarter	24	13 07

MOONRISE AND MOONSET

1965 FEBRUARY

DAY	At 0 ^h S.A.S.T.		JOHANNESBURG		CAPE TOWN	
	J.D. 2438000+	AGE	MOONRISE	MOONSET	MOONRISE	MOONSET
			S.A.S.T.	S.A.S.T.	S.A.S.T.	S.A.S.T.
M 1	792.4	29.0	5 ^h 15 ^m	19 ^h 11 ^m	5 ^h 36 ^m	20 ^h 06 ^m
T 2	793.4	0.2	6 09	19 49	6 33	20 41
W 3	794.4	1.2	7 03	20 25	7 31	21 14
T 4	795.4	2.2	7 58	20 59	8 29	21 44
F 5	796.4	3.2	8 53	21 32	9 28	22 13
S 6	797.4	4.2	9 48	22 04	10 27	22 42
S 7	798.4	5.2	10 44	22 38	11 27	23 11
M 8	799.4	6.2	11 41	23 16	12 30	23 45
T 9	800.4	7.2	12 42	23 56	13 34	.....
W 10	801.4	8.2	13 46	.....	14 42	0 21
T 11	802.4	9.2	14 52	0 42	15 51	1 05
F 12	803.4	10.2	15 57	1 37	16 58	1 57
S 13	804.4	11.2	17 00	2 38	18 00	2 57
S 14	805.4	12.2	17 58	3 45	18 55	4 05
M 15	806.4	13.2	18 50	4 55	19 43	5 18
T 16	807.4	14.2	19 35	6 03	20 23	6 30
W 17	808.4	15.2	20 15	7 09	20 59	7 41
T 18	809.4	16.2	20 51	8 13	21 31	8 49
F 19	810.4	17.2	21 26	9 13	22 02	9 54
S 20	811.4	18.2	22 00	10 12	22 33	10 56
S 21	812.4	19.2	22 36	11 08	23 04	11 57
M 22	813.4	20.2	23 13	12 05	23 38	12 56
T 23	814.4	21.2	23 53	13 00	.....	13 55
W 24	815.4	22.2	.....	13 54	0 15	14 51
T 25	816.4	23.2	0 37	14 47	0 57	15 46
F 26	817.4	24.2	1 23	15 37	1 43	16 36
S 27	818.4	25.2	2 14	16 24	2 33	17 23
S 28	819.4	26.2	3 06	17 08	3 28	18 04

PHASES OF THE MOON

New Moon	Feb 1 ^d	18 ^h 36 ^m
First Quarter	9	10 53
Full Moon	16	02 27
Last Quarter	23	07 40

MOONRISE AND MOONSET

1965 MARCH

DAY	At 0 ^h S.A.S.T.		JOHANNESBURG		CAPE TOWN	
	J.D. 2438000+	AGE	MOONRISE	MOONSET	MOONRISE	MOONSET
			S.A.S.T.	S.A.S.T.	S.A.S.T.	S.A.S.T.
M 1	820.4	27.2	4 ^h 01 ^m	17 ^h 49 ^m	4 ^h 24 ^m	18 ^h 41 ^m
T 2	821.4	28.2	4 57	18 25	5 23	19 15
W 3	822.4	29.2	5 52	19 00	6 22	19 46
T 4	823.4	0.5	6 47	19 33	7 21	20 16
F 5	824.4	1.5	7 43	20 06	8 21	20 45
S 6	825.4	2.5	8 39	20 39	9 22	21 14
S 7	826.4	3.5	9 37	21 15	10 24	21 46
M 8	827.4	4.5	10 37	21 55	11 28	22 21
T 9	828.4	5.5	11 39	22 39	12 34	23 02
W 10	829.4	6.5	12 44	23 29	13 41	23 49
T 11	830.4	7.5	13 48	.....	14 48	.....
F 12	831.4	8.5	14 50	0 26	15 50	0 45
S 13	832.4	9.5	15 48	1 29	16 45	1 49
S 14	833.4	10.5	16 40	2 35	17 34	2 57
M 15	834.4	11.5	17 25	3 43	18 16	4 08
T 16	835.4	12.5	18 07	4 49	18 53	5 19
W 17	836.4	13.5	18 44	5 53	19 27	6 27
T 18	837.4	14.5	19 20	6 54	19 59	7 34
F 19	838.4	15.5	19 55	7 54	20 29	8 37
S 20	839.4	16.5	20 31	8 53	21 01	9 40
S 21	840.4	17.5	21 08	9 51	21 34	10 42
M 22	841.4	18.5	21 48	10 49	22 11	11 43
T 23	842.4	19.5	22 30	11 45	22 51	12 41
W 24	843.4	20.5	23 16	12 39	23 36	13 37
T 25	844.4	21.5	.....	13 31	.....	14 30
F 26	845.4	22.5	0 11	14 19	0 25	15 18
S 27	846.4	23.5	1 03	15 04	1 17	16 01
S 28	847.4	24.5	1 51	15 46	2 13	16 40
M 29	848.4	25.5	2 46	16 23	3 11	17 15
T 30	849.4	26.5	3 42	16 59	4 10	17 46
W 31	850.4	27.5	4 37	17 33	5 10	18 17

PHASES OF THE MOON

New Moon	Mar 3 ^d	11 ^h 56 ^m
First Quarter	10	19 53
Full Moon	17	13 24
Last Quarter	25	03 37

MOONRISE AND MOONSET

1965 APRIL

DAY	At 0 ^h S.A.S.T.		JOHANNESBURG		CAPE TOWN	
	J.D. 2438000+	AGE	MOONRISE	MOONSET	MOONRISE	MOONSET
			S.A.S.T.	S.A.S.T.	S.A.S.T.	S.A.S.T.
T 1	851.4	28.5	5 ^h 34 ^m	18 ^h 06 ^m	6 ^h 09 ^m	18 ^h 46 ^m
F 2	852.4	29.5	6 30	18 40	7 11	19 15
S 3	853.4	0.9	7 28	19 15	8 14	19 47
S 4	854.4	1.9	8 29	19 54	9 21	20 20
M 5	855.4	2.9	9 33	20 37	10 26	21 00
T 6	856.4	3.9	10 37	21 25	11 34	21 46
W 7	857.4	4.9	11 42	22 21	12 42	22 40
T 8	858.4	5.9	12 44	23 21	13 45	23 40
F 9	859.4	6.9	13 42	.....	14 42	.....
S 10	860.4	7.9	14 35	0 26	15 32	0 46
S 11	861.4	8.9	15 22	1 31	16 15	1 55
M 12	862.4	9.9	16 04	2 36	16 53	3 04
T 13	863.4	10.9	16 42	3 39	17 26	4 12
W 14	864.4	11.9	17 17	4 40	17 57	5 17
T 15	865.4	12.9	17 51	5 40	18 27	6 22
F 16	866.4	13.9	18 26	6 38	18 58	7 24
S 17	867.4	14.9	19 02	7 36	19 30	8 26
S 18	868.4	15.9	19 41	8 34	20 06	9 28
M 19	869.4	16.9	20 23	9 32	20 44	10 29
T 20	870.4	17.9	21 07	10 29	21 27	11 27
W 21	871.4	18.9	21 56	11 22	22 15	12 22
T 22	872.4	19.9	22 47	12 12	23 06	13 12
F 23	873.4	20.9	23 41	12 59	.....	13 57
S 24	874.4	21.9	.....	13 42	0 02	14 38
S 25	875.4	22.9	0 35	14 21	0 58	15 13
M 26	876.4	23.9	1 30	14 56	1 57	15 46
T 27	877.4	24.9	2 25	15 30	2 55	16 16
W 28	878.4	25.9	3 20	16 03	3 55	16 45
T 29	879.4	26.9	4 17	16 37	4 56	17 14
F 30	880.4	27.9	5 14	17 12	5 58	17 45

PHASES OF THE MOON

New Moon	Apr 2 ^d	02 ^h 21 ^m
First Quarter	9	02 40
Full Moon	16	01 03
Last Quarter	23	23 07

MOONRISE AND MOONSET

1965 MAY

DAY	At 0 ^h S.A.S.T.		JOHANNESBURG		CAPE TOWN	
	J.D. 2438000+	AGE	MOONRISE	MOONSET	MOONRISE	MOONSET
			S.A.S.T.	S.A.S.T.	S.A.S.T.	S.A.S.T.
S 1	881.4	28.9	6 ^h 15 ^m	17 ^h 49 ^m	7 ^h 03 ^m	18 ^h 18 ^m
S 2	882.4	0.4	7 19	18 31	8 11	18 56
M 3	883.4	1.4	8 25	19 19	9 21	19 41
T 4	884.4	2.4	9 32	20 14	10 31	20 33
W 5	885.4	3.4	10 37	21 14	11 38	21 32
T 6	886.4	4.4	11 39	22 18	12 39	22 38
F 7	887.4	5.4	12 34	23 24	13 31	23 47
S 8	888.4	6.4	13 22	.....	14 16	.....
S 9	889.4	7.4	14 04	0 29	14 54	0 55
M 10	890.4	8.4	14 42	1 32	15 28	2 03
T 11	891.4	9.4	15 17	2 32	15 59	3 07
W 12	892.4	10.4	15 51	3 31	16 29	4 11
T 13	893.4	11.4	16 25	4 29	16 59	5 12
F 14	894.4	12.4	17 00	5 27	17 29	6 15
S 15	895.4	13.4	17 36	6 24	18 02	7 15
S 16	896.4	14.4	18 18	7 21	18 40	8 17
M 17	897.4	15.4	19 01	8 18	19 21	9 15
T 18	898.4	16.4	19 48	9 13	20 07	10 12
W 19	899.4	17.4	20 39	10 05	20 57	11 05
T 20	900.4	18.4	21 32	10 53	21 51	11 53
F 21	901.4	19.4	22 25	11 38	22 48	12 35
S 22	902.4	20.4	23 19	12 18	23 45	13 12
S 23	903.4	21.4	.....	12 54	.....	13 46
M 24	904.4	22.4	0 15	13 28	0 43	14 15
T 25	905.4	23.4	1 08	14 01	1 41	14 45
W 26	906.4	24.4	2 03	14 34	2 39	15 13
T 27	907.4	25.4	2 59	15 07	3 40	15 42
F 28	908.4	26.4	3 57	15 43	4 44	16 14
S 29	909.4	27.4	5 00	16 23	5 50	16 49
S 30	910.4	28.4	6 05	17 08	6 59	17 31
M 31	911.4	0.0	7 14	18 01	8 12	18 21

PHASES OF THE MOON

New Moon	May 1 ^d	13 ^h	56 ^m
First Quarter	8	08	20
Full Moon	15	13	53
Last Quarter	23	16	41
New Moon	30	23	13

MOONRISE AND MOONSET

1965 JUNE

DAY	At 0 ^h S.A.S.T.		JOHANNESBURG		CAPE TOWN	
	J.D. 2438000+	AGE	MOONRISE	MOONSET	MOONRISE	MOONSET
			S.A.S.T.	S.A.S.T.	S.A.S.T.	S.A.S.T.
T 1	912.4	1.0	8 ^h 22 ^m	19 ^h 00 ^m	9 ^h 22 ^m	19 ^h 19 ^m
W 2	913.4	2.0	9 28	20 05	10 29	20 25
T 3	914.4	3.0	10 27	21 14	11 26	21 35
F 4	915.4	4.0	11 19	22 21	12 14	22 46
S 5	916.4	5.0	12 04	23 26	12 55	23 55
S 6	917.4	6.0	12 44	.....	13 31	.....
M 7	918.4	7.0	13 19	0 27	14 03	1 01
T 8	919.4	8.0	13 53	1 26	14 33	2 04
W 9	920.4	9.0	14 26	2 24	15 01	3 06
T 10	921.4	10.0	15 00	3 21	15 31	4 07
F 11	922.4	11.0	15 36	4 18	16 03	5 07
S 12	923.4	12.0	16 15	5 14	16 39	6 08
S 13	924.4	13.0	16 57	6 10	17 18	7 07
M 14	925.4	14.0	17 42	7 06	18 02	8 04
T 15	926.4	15.0	18 32	7 59	18 51	8 59
W 16	927.4	16.0	19 24	8 49	19 44	9 49
T 17	928.4	17.0	20 18	9 34	20 39	10 32
F 18	929.4	18.0	21 12	10 16	21 36	11 12
S 19	930.4	19.0	22 05	10 53	22 33	11 45
S 20	931.4	20.0	22 59	11 27	23 30	12 17
M 21	932.4	21.0	23 53	12 00	.....	12 46
T 22	933.4	22.0	.....	12 32	0 28	13 13
W 23	934.4	23.0	0 47	13 04	1 26	13 41
T 24	935.4	24.0	1 43	13 37	2 26	14 10
F 25	936.4	25.0	2 41	14 14	3 29	14 43
S 26	937.4	26.0	3 44	14 56	4 37	15 21
S 27	938.4	27.0	4 50	15 44	5 47	16 06
M 28	939.4	28.0	6 00	16 41	6 59	17 00
T 29	940.4	29.0	7 08	17 45	8 08	18 04
W 30	941.4	0.7	8 12	18 54	9 12	19 14

PHASES OF THE MOON

First Quarter	Jun 6 ^d	14 ^h	12 ^m
Full Moon	14	04	00
Last Quarter	22	07	37
New Moon	29	06	53

MOONRISE AND MOONSET

1965 JULY

DAY	At 0 ^h S.A.S.T.		JOHANNESBURG		CAPE TOWN	
	J.D. 2438000+	AGE	MOONRISE	MOONSET	MOONRISE	MOONSET
			S.A.S.T.	S.A.S.T.	S.A.S.T.	S.A.S.T.
T 1	942.4	1.7	9 ^h 10 ^m	20 ^h 05 ^m	10 ^h 06 ^m	20 ^h 28 ^m
F 2	943.4	2.7	9 59	21 13	10 52	21 41
S 3	944.4	3.7	10 42	22 18	11 31	22 50
S 4	945.4	4.7	11 20	23 19	12 04	23 56
M 5	946.4	5.7	11 55	.....	12 35	.....
T 6	947.4	6.7	12 29	0 18	13 04	1 00
W 7	948.4	7.7	13 02	1 16	13 35	2 01
T 8	949.4	8.7	13 37	2 12	14 05	3 01
F 9	950.4	9.7	14 15	3 09	14 39	4 02
S 10	951.4	10.7	14 55	4 05	15 17	5 01
S 11	952.4	11.7	15 39	5 00	16 00	5 58
M 12	953.4	12.7	16 28	5 53	16 47	6 54
T 13	954.4	13.7	17 19	6 45	17 38	7 44
W 14	955.4	14.7	18 12	7 32	18 33	8 31
T 15	956.4	15.7	19 06	8 15	19 29	9 11
F 16	957.4	16.7	20 00	8 54	20 27	9 47
S 17	958.4	17.7	20 54	9 29	21 24	10 19
S 18	959.4	18.7	21 46	10 02	22 20	10 48
M 19	960.4	19.7	22 40	10 33	23 17	11 15
T 20	961.4	20.7	23 34	11 04	.....	11 43
W 21	962.4	21.7	.....	11 36	0 15	12 10
T 22	963.4	22.7	0 29	12 10	1 16	12 41
F 23	964.4	23.7	1 28	12 48	2 19	13 14
S 24	965.4	24.7	2 31	13 32	3 26	13 55
S 25	966.4	25.7	3 38	14 23	4 36	14 43
M 26	967.4	26.7	4 45	15 23	5 45	15 41
T 27	968.4	27.7	5 51	16 30	6 52	16 49
W 28	969.4	28.7	6 52	17 40	7 51	18 02
T 29	970.4	0.4	7 47	18 51	8 41	19 17
F 30	971.4	1.4	8 34	20 01	9 24	20 31
S 31	972.4	2.4	9 16	21 06	10 01	21 40

PHASES OF THE MOON

First Quarter	Jul 5 ^d	21 ^h	37 ^m
Full Moon	13	19	02
Last Quarter	21	19	54
New Moon	28	13	45

MOONRISE AND MOONSET

1965 AUGUST

DAY	At 0 ^h S.A.S.T.		JOHANNESBURG		CAPE TOWN	
	J.D.	AGE	MOONRISE	MOONSET	MOONRISE	MOONSET
			S.A.S.T.	S.A.S.T.	S.A.S.T.	S.A.S.T.
S 1	2438973.4	3.4	9 ^h 53 ^m	22 ^h 08 ^m	10 ^h 34 ^m	22 ^h 48 ^m
M 2	974.4	4.4	10 28	23 07	11 05	23 51
T 3	975.4	5.4	11 02	.....	11 35	.....
W 4	976.4	6.4	11 33	0 05	12 07	0 54
T 5	977.4	7.4	12 14	1 03	12 40	1 55
F 6	978.4	8.4	12 54	2 00	13 17	2 55
S 7	979.4	9.4	13 38	2 56	13 58	3 53
S 8	980.4	10.4	14 24	3 50	14 44	4 49
M 9	981.4	11.4	15 15	4 41	15 34	5 41
T 10	982.4	12.4	16 08	5 29	16 27	6 29
W 11	983.4	13.4	17 02	6 14	17 24	7 11
T 12	984.4	14.4	17 55	6 54	18 21	7 48
F 13	985.4	15.4	18 49	7 30	19 18	8 21
S 14	986.4	16.4	19 42	8 03	20 15	8 51
S 15	987.4	17.4	20 35	8 36	21 12	9 19
M 16	988.4	18.4	21 29	9 07	22 09	9 46
T 17	989.4	19.4	22 23	9 38	23 08	10 13
W 18	990.4	20.4	23 20	10 10	.....	10 42
T 19	991.4	21.4	.....	10 45	0 09	11 13
F 20	992.4	22.4	0 20	11 26	1 13	11 49
S 21	993.4	23.4	1 23	12 12	2 19	12 34
S 22	994.4	24.4	2 28	13 07	3 27	13 25
M 23	995.4	25.4	3 32	14 08	4 33	14 27
T 24	996.4	26.4	4 35	15 16	5 35	15 36
W 25	997.4	27.4	5 32	16 26	6 29	16 50
T 26	998.4	28.4	6 22	17 37	7 15	18 05
F 27	999.4	0.1	7 07	18 45	7 55	19 17
S 28	2439000.4	1.1	7 46	19 50	8 30	20 27
S 29	001.4	2.1	8 23	20 52	9 02	21 34
M 30	002.4	3.1	8 58	21 53	9 33	22 40
T 31	003.4	4.1	9 34	22 52	10 05	23 43

PHASES OF THE MOON

First Quarter	Aug 4 ^d	07 ^h	48 ^m
Full Moon	12	10	23
Last Quarter	20	05	51
New Moon	26	20	51

MOONRISE AND MOONSET

1965 SEPTEMBER

DAY	At 0 ^h S.A.S.T.		JOHANNESBURG		CAPE TOWN	
	J.D. 2439000+	AGE	MOONRISE	MOONSET	MOONRISE	MOONSET
			S.A.S.T.	S.A.S.T.	S.A.S.T.	S.A.S.T.
W 1	004.4	5.1	10 ^h 12 ^m	23 ^h 52 ^m	10 ^h 38 ^m	 ^m
T 2	005.4	6.1	10 51	.....	11 14	0 46
F 3	006.4	7.1	11 34	0 49	11 54	1 46
S 4	007.4	8.1	12 19	1 45	12 39	2 44
S 5	008.4	9.1	13 09	2 37	13 27	3 37
M 6	009.4	10.1	14 01	3 27	14 21	4 27
T 7	010.4	11.1	14 55	4 12	15 17	5 10
W 8	011.4	12.1	15 49	4 54	16 13	5 49
T 9	012.4	13.1	16 43	5 31	17 12	6 23
F 10	013.4	14.1	17 37	6 05	18 09	6 53
S 11	014.4	15.1	18 31	6 38	19 07	7 22
S 12	015.4	16.1	19 25	7 09	20 04	7 49
M 13	016.4	17.1	20 19	7 40	21 02	8 16
T 14	017.4	18.1	21 16	8 12	22 04	8 45
W 15	018.4	19.1	22 13	8 46	23 05	9 15
T 16	019.4	20.1	23 15	9 24	.....	9 49
F 17	020.4	21.1	.....	10 08	0 11	10 30
S 18	021.4	22.1	0 18	10 58	1 17	11 18
S 19	022.4	23.1	1 22	11 55	2 23	12 13
M 20	023.4	24.1	2 23	12 59	3 24	13 18
T 21	024.4	25.1	3 20	14 07	4 18	14 28
W 22	025.4	26.1	4 12	15 15	5 07	15 41
T 23	026.4	27.1	4 57	16 23	5 45	16 54
F 24	027.4	28.1	5 39	17 29	6 24	18 04
S 25	028.4	29.1	6 16	18 33	6 57	19 13
S 26	029.4	0.8	6 52	19 35	7 29	20 20
M 27	030.4	1.8	7 28	20 36	8 01	21 25
T 28	031.4	2.8	8 05	21 37	8 33	22 30
W 29	032.4	3.8	8 45	22 36	9 09	23 33
T 30	033.4	4.8	9 27	23 34	9 48	.....

PHASES OF THE MOON

First Quarter Sep 2^d 21^h 28^m
 Full Moon 11 01 32
 Last Quarter 18 13 59
 New Moon 25 05 18

MOONRISE AND MOONSET

1965 OCTOBER

DAY	At 0 ^h S.A.S.T.		JOHANNESBURG		CAPE TOWN	
	J.D. 2439000+	AGE	MOONRISE	MOONSET	MOONRISE	MOONSET
			S.A.S.T.	S.A.S.T.	S.A.S.T.	S.A.S.T.
F 1	034.4	5.8	10 ^h 12 ^m	 ^m	10 ^h 32 ^m	0 ^h 34 ^m
S 2	035.4	6.8	11 02	0 30	11 20	1 30
S 3	036.4	7.8	11 54	1 21	12 12	2 21
M 4	037.4	8.8	12 47	2 09	13 07	3 08
T 5	038.4	9.8	13 41	2 51	14 05	3 48
W 6	039.4	10.8	14 35	2 30	15 02	4 23
T 7	040.4	11.8	15 29	4 05	16 00	4 55
F 8	041.4	12.8	16 23	4 38	16 57	5 24
S 9	042.4	13.8	17 17	5 09	17 55	5 51
S 10	043.4	14.8	18 12	5 41	18 55	6 19
M 11	044.4	15.8	19 09	6 13	19 55	6 47
T 12	045.4	16.8	20 08	6 46	20 58	7 17
W 13	046.4	17.8	21 09	7 24	22 04	7 50
T 14	047.4	18.8	22 12	8 07	23 11	8 29
F 15	048.4	19.8	23 16	8 54	.....	9 14
S 16	049.4	20.8	.....	9 50	0 17	10 08
S 17	050.4	21.8	0 48	10 50	1 19	11 09
M 18	051.4	22.8	1 16	11 56	2 14	12 16
T 19	052.4	23.8	2 07	13 02	3 03	13 26
W 20	053.4	24.8	2 52	14 08	3 45	14 36
T 21	054.4	25.8	3 34	15 13	4 22	15 46
F 22	055.4	26.8	4 12	16 16	4 55	16 54
S 23	056.4	27.8	4 47	17 18	5 26	18 00
S 24	057.4	28.8	5 22	18 19	5 57	19 06
M 25	058.4	0.3	5 59	19 20	6 29	20 11
T 26	059.4	1.3	6 37	20 21	7 03	21 16
W 27	060.4	2.3	7 19	21 21	7 41	22 19
T 28	061.4	3.3	8 03	22 19	8 23	23 19
F 29	062.4	4.3	8 52	23 13	9 10	.....
S 30	063.4	5.3	9 43	.....	10 01	0 13
S 31	064.4	6.3	10 37	0 02	10 56	1 03

PHASES OF THE MOON

First Quarter	Oct 2 ^d	14 ^h	38 ^m
Full Moon	10	16	14
Last Quarter	17	21	00
New Moon	24	16	12

MOONRISE AND MOONSET

1965 NOVEMBER

DAY	At 0 ^h S.A.S.T.		JOHANNESBURG		CAPE TOWN	
	J.D. 2439000+	AGE	MOONRISE	MOONSET	MOONRISE	MOONSET
			S.A.S.T.	S.A.S.T.	S.A.S.T.	S.A.S.T.
M 1	065.4	7.3	11 ^h 31 ^m	0 ^h 47 ^m	11 ^h 53 ^m	1 ^h 45 ^m
T 2	066.4	8.3	12 25	1 28	12 50	2 23
W 3	067.4	9.3	13 19	2 03	13 48	2 56
T 4	068.4	10.3	14 13	2 37	14 45	3 25
F 5	069.4	11.3	15 07	3 09	15 43	3 53
S 6	070.4	12.3	16 01	3 40	16 41	4 20
S 7	071.4	13.3	16 57	4 12	17 42	4 47
M 8	072.4	14.3	17 55	4 44	18 45	5 16
T 9	073.4	15.3	18 58	5 20	19 51	5 48
W 10	074.4	16.3	20 02	6 02	20 59	6 25
T 11	075.4	17.3	21 07	6 49	22 08	7 10
F 12	076.4	18.3	22 11	7 43	23 13	8 01
S 13	077.4	19.3	23 11	8 43	.....	9 01
S 14	078.4	20.3	.....	9 48	0 12	10 08
M 15	079.4	21.3	0 06	10 55	1 03	11 17
T 16	080.4	22.3	0 52	12 01	1 47	12 28
W 17	081.4	23.3	1 34	13 05	2 24	13 36
T 18	082.4	24.3	2 11	14 06	2 57	14 42
F 19	083.4	25.3	2 47	15 07	3 27	15 47
S 20	084.4	26.3	3 21	16 06	3 57	16 52
S 21	085.4	27.3	3 56	17 06	4 28	17 56
M 22	086.4	28.3	4 32	18 07	5 00	19 00
T 23	087.4	29.3	5 12	19 07	5 34	20 04
W 24	088.4	0.7	5 55	20 06	6 16	21 05
T 25	089.4	1.7	6 42	21 02	7 01	22 03
F 26	090.4	2.7	7 33	21 54	7 51	22 54
S 27	091.4	3.7	8 26	22 41	8 45	23 41
S 28	092.4	4.7	9 21	23 24	9 41	.....
M 29	093.4	5.7	10 15	.....	10 38	0 19
T 30	094.4	6.7	11 09	0 02	11 36	0 54

PHASES OF THE MOON

First Quarter	Nov 1 ^d	10 ^h 26 ^m
Full Moon	9	06 16
Last Quarter	16	03 54
New Moon	23	06 10

MOONRISE AND MOONSET

1965 DECEMBER

DAY	At 0 ^h S.A.S.T.		JOHANNESBURG		CAPE TOWN	
	J.D. 2439000+	AGE	MOONRISE	MOONSET	MOONRISE	MOONSET
			S.A.S.T.	S.A.S.T.	S.A.S.T.	S.A.S.T.
W 1	095.4	7.7	12 ^h 02 ^m	0 ^h 35 ^m	12 ^h 32 ^m	1 ^h 25 ^m
T 2	096.4	8.7	12 54	1 08	13 29	1 53
F 3	097.4	9.7	13 47	1 38	14 26	2 20
S 4	098.4	10.7	14 42	2 09	15 25	2 46
S 5	099.4	11.7	15 39	2 41	16 26	3 14
M 6	100.4	12.7	16 39	3 15	17 31	3 44
T 7	101.4	13.7	17 43	3 54	18 39	4 19
W 8	102.4	14.7	18 50	4 38	19 49	5 01
T 9	103.4	15.7	19 57	5 31	20 58	5 50
F 10	104.4	16.7	21 01	6 30	22 02	6 48
S 11	105.4	17.7	21 59	7 36	22 57	7 55
S 12	106.4	18.7	22 50	8 44	23 45	9 06
M 13	107.4	19.7	23 34	9 52	.....	10 17
T 14	108.4	20.7	.....	10 58	0 25	11 28
W 15	109.4	21.7	0 14	12 00	1 00	12 35
T 16	110.4	22.7	0 49	13 01	1 31	13 40
F 17	111.4	23.7	1 23	14 00	2 01	14 44
S 18	112.4	24.7	1 57	14 58	2 31	15 47
S 19	113.4	25.7	2 32	15 57	3 01	16 50
M 20	114.4	26.7	3 09	16 56	3 35	17 53
T 21	115.4	27.7	3 51	17 55	4 13	18 54
W 22	116.4	28.7	4 35	18 52	4 55	19 53
T 23	117.4	0.0	5 24	19 46	5 43	20 47
F 24	118.4	1.0	6 17	20 36	6 36	21 36
S 25	119.4	2.0	7 12	21 21	7 31	22 17
S 26	120.4	3.0	8 07	21 59	8 29	22 53
M 27	121.4	4.0	9 00	22 34	9 25	23 26
T 28	122.4	5.0	9 54	23 07	10 22	23 54
W 29	123.4	6.0	10 45	23 38	11 10	.....
T 30	124.4	7.0	11 37	.....	12 14	0 20
F 31	125.4	8.0	12 30	0 07	13 11	0 47

PHASES OF THE MOON

First Quarter	Dec 1 ^d	07 ^h 25 ^m
Full Moon	8	19 22
Last Quarter	15	11 52
New Moon	22	23 03
First Quarter	31	03 47

ECLIPSES

During 1965 there are four eclipses, two of the Sun and two of the Moon.

1. May 30 Total eclipse of the Sun, invisible in Southern Africa.
2. June 14 Partial eclipse of the Moon.
3. November 23 Annular eclipse of the Sun, invisible in Southern Africa.
4. December 8 Penumbral eclipse of the Moon, the beginning invisible in Southern Africa.

Partial Eclipse of the Moon

June 14

Moon enters penumbra	14 ^d 01 ^h 15 ^m	S.A.S.T.	
Moon enters umbra	14 02 58		in P.A. 34° East of north point.
Middle of the eclipse	14 03 49		
Moon leaves umbra	14 04 40		in P.A. 17° West of north point.
Moon leaves penumbra	14 06 22		
Magnitude of eclipse	0.181		

Penumbral Eclipse of the Moon

December 8

Moon enters penumbra	8 ^d 17 ^h 08 ^m	S.A.S.T.	in P.A. 122° East of north point.
Middle of the eclipse	8 19 10		
Moon leaves penumbra	8 21 12		in P.A. 145° West of north point.
Magnitude of eclipse	0.908		

This eclipse belongs to the initial penumbral series preceding the umbral eclipse of 2146 March 28.

OCCULTATIONS OF BRIGHT STARS

Date	Z.C.	Sp	Mag	(1950.0) Dec.	Ph	Cape Town			
						P.A.	h. m.	a	b
Jan									
9	66	A0	6.8	- 2° 04'	D	-	-	-	-
10	192	A2	5.3	+ 3 21	D	-	-	-	-
10	202	G5	7.0	+ 4 29	D	31°	23 25.0	-0.5	+2.4
20	1651m	F5	4.1	+10 48	D	-	-	-	-
20	1651m	F5	4.1	+10 48	R	314	23 56.7	-0.8	-2.0
27	2353	K0	4.6	-19 55	R	-	-	-	-
Feb									
11	839	B3	5.3	+24 00	D	-	-	-	-
11	853	F2	7.0	+24 12	D	-	-	-	-
12	1030	G5	3.2	+25 11	D	-	-	-	-
12	1030	G5	3.2	+25 11	R	-	-	-	-
Mar									
9	628	A3	4.8	+20 27	D	-	-	-	-
9	628	A3	4.8	+20 27	R	-	-	-	-
9	633	B8	5.4	+21 01	D	92	20 04.6	-1.9	+0.8
9	642	F8	6.9	+20 55	D	-	-	-	-
10	789	K0	6.9	+23 57	D	-	-	-	-
11	966	B9	7.2	+25 13	D	-	-	-	-
11	977	K0	6.6	+25 05	D	-	-	-	-
12	1117	G5	5.1	+25 09	D	-	-	-	-
20	2022	F5	5.5	-09 05	R	-	-	-	-
20	2110	G5	6.4	-12 38	D	-	-	-	-
20	2110	G5	6.4	-12 38	R	-	-	-	-
24	2523	A0	4.9	-23 56	R	-	-	-	-
25	2659	M3	6.4	-24 56	R	-	-	-	-

Z.C. is the number in the "Catalogue of 3539 Zodiacal Stars for the Equinox 1950.0" by James Robertson (U.S. Naval Observatory, 1939). This is the catalogue most generally used by occultation observers.

m indicates that a star is not single.

Date	Z.C.	Sp	Mag	(1950.0) Dec.	Ph	Cape Town			
						P.A.	h. m.	a	b
Apr									
5	595	G5	6.8	+20° 04'	D	-	-	-	-
7	918	KO	7.0	+25 27	D	123°	19 22.9	-1.8	-0.3
8	1085m	GO	7.0	+25 49	D	116	20 34.5	-1.6	0.0
8	1094	AO	6.9	+25 50	D	82	22 13.4	-1.3	+1.2
10	1373	AO	6.1	+21 29	D	135	21 03.5	-1.6	-1.0
11	1499	KO	7.3	+16 23	D	-	-	-	-
13	1621	M3	7.5	+11 34	D	125	00 14.5	-1.4	-0.5
14	1739	F5	6.5	+ 5 50	D	96	00 57.3	-2.1	+0.4
18	2209	KO	5.9	-16 33	R	312	05 37.9	-1.5	-0.8
18	2322m	B3	4.3	-19 20	D	66	22 56.4	-1.5	-0.3
18	2322m	B3	4.3	-19 20	R	347	23 40.0	+0.4	-3.5
19	2343	KO	6.4	-20 06	D	31	04 13.2	Grazed	
19	2343	KO	6.4	-20 06	R	10	04 30.2		
May									
5	1046	F8	6.9	+25 49	D	179	20 06.2	Grazed	
5	1046	F8	6.9	+25 49	R	200	20 18.8		
5	1049	A2	6.6	+25 43	D	-	-	-	-
7	1334	G5	7.0	+22 03	D	-	-	-	-
9	1586	KO	7.5	+12 38	D	-	-	-	-
18	2678	B2p	6.2	-25 17	D	-	-	-	-
18	2678	B2p	6.2	-25 17	R	-	-	-	-
19	2834	A5	5.0	-24 36	D	14	23 31.3	Grazed	
19	2834	A5	5.0	-24 36	R	358	23 40.8		
22	3089	AO	5.3	-21 24	R	-	-	-	-
22	3106	KO	5.4	-20 52	R	235	05 22.3	-2.2	+1.5
24	3349	K5	4.2	-13 51	D	-	-	-	-
24	3349	K5	4.2	-13 51	R	-	-	-	-
27	170	KO	6.2	+ 2 11	R	-	-	-	-
Jun									
4	1416	KO	7.2	+20 16	D	-	-	-	-
7	1773	KO	5.1	+ 3 35	D	-	-	-	-
9	2008	KO	6.6	- 7 55	D	132	22 58.1	-1.6	-1.2
10	2020	AO	6.6	- 8 39	D	115	03 00.3	-0.4	+0.3
10	2097	KO	7.1	-12 01	D	150	18 11.7	-0.2	-2.4
10	2110	G5	6.4	-12 38	D	75	22 13.4	-3.5	+1.0
11	2218	B3	5.6	-16 41	D	128	19 06.0	-0.5	-2.0
13	2376	F0	4.6	-21 22	D	139	01 12.0	-2.0	-2.1
16	2809m	F5	4.9	-25 21	R	-	-	-	-
19	3175	G5	4.8	-19 06	R	225	00 40.6	-1.3	+0.8
20	3304	AO	6.4	-14 51	R	308	00 53.3	-0.5	-3.9

Date	Z.C.	Johannesburg				Luanshya			
		P.A.	h. m.	a	b	P.A.	h. m.	a	b
Apr									
5	595	72°	18 25.5	-1.6	+1.3	33°	18 50.5	-1.8	+2.8
7	918	98	19 40.3	-1.7	+0.5	60	19 53.3	-2.4	+1.7
8	1085m	86	20 53.5	-1.8	+0.9	30	21 20.9	-	-
8	1094	-	-	-	-	-	-	-	-
10	1373	102	21 17.4	-2.2	0.0	56	21 29.9	-	-
11	1499	-	-	-	-	150	23 56.0	-0.5	-1.8
13	1621	81	00 33.1	-2.2	+1.3	-	-	-	-
14	1739	-	-	-	-	-	-	-	-
18	2209	-	-	-	-	-	-	-	-
18	2322m	-	-	-	-	-	-	-	-
18	2322m	-	-	-	-	-	-	-	-
19	2343	-	-	-	-	-	-	-	-
19	2343	-	-	-	-	-	-	-	-
May									
5	1046	123	19 55.5	-0.5	-0.2	83	19 58.8	-1.2	+0.7
5	1046	-	-	-	-	-	-	-	-
5	1049	-	-	-	-	94	20 25.5	-0.8	+0.3
7	1334	-	-	-	-	162	20 45.9	0.0	-2.5
9	1586	-	-	-	-	176	23 43.9	+0.5	-3.2
18	2678	180	22 06.7	Graze		-	-	-	-
18	2678	207	22 22.3			267	22 33.2	-1.1	-0.4
19	2834	-	-	-	-	-	-	-	-
19	2834	-	-	-	-	-	-	-	-
22	3089	231	00 34.0	-1.2	+0.6	278	00 32.3	-0.6	-0.8
22	3106	248	05 56.6	-2.5	+1.4	-	-	-	-
24	3349	-	-	-	-	126	02 24.6	-0.8	-3.2
24	3349	-	-	-	-	191	03 06.1	-1.4	+4.4
27	170	-	-	-	-	235	03 54.8	-0.4	+0.7
Jun									
4	1416	102	17 52.8	-2.3	-0.1	-	-	-	-
7	1773	160	21 16.6	-0.7	-2.2	119	20 56.2	-2.1	-1.1
9	2008	92	23 14.6	-2.3	+0.7	-	-	-	-
10	2020	-	-	-	-	-	-	-	-
10	2097	120	18 00.3	-0.9	-1.8	-	-	-	-
10	2110	-	-	-	-	-	-	-	-
11	2218	96	19 02.2	-1.5	-1.1	-	-	-	-
13	2376	106	01 25.7	-2.3	-0.1	52	01 42.6	-2.3	+3.4
16	2809m	198	05 03.8	+0.5	+4.7	245	05 37.8	-0.8	+1.4
19	3175	257	00 57.5	-1.8	-0.3	315	00 36.5	-	-
20	3304	-	-	-	-	-	-	-	-

Date	Z.C.	Sp	Mag	(1950.0) Dec.	Ph	Cape Town			
						P.A.	h. m.	a	b
Jul									
1	1373	A0	6.1	+21° 29'	D	-	-	-	-
2	1499	K0	7.3	+16 23	D	-	-	-	-
3	1621	M3	7.5	+11 34	D	164	18 36.9	-0.5	-2.0
4	1739	F5	6.5	+ 5 50	D	131	18 46.0	-1.5	-1.1
5	1856m	F5	6.6	- 0 41	D	148	21 09.7	-1.0	-1.4
6	1976	A3	6.9	- 6 27	D	90	22 39.2	-1.6	+1.1
6	1978	K0	6.6	- 6 35	D	92	23 14.8	-1.2	+1.1
7	2088	F8	6.2	-12 06	D	141	23 51.3	-1.1	-1.1
9	2209	K0	5.9	-16 33	D	70	01 06.7	-0.9	+2.2
19	3506	K2	6.3	- 6 39	R	291	00 59.6	-1.5	-2.8
Aug									
5	2275m	B5	5.9	-19 14	D	-	-	-	-
6	2296	A2	7.1	-19 42	D	146	00 11.0	-1.3	-1.4
6	2302m	B1	2.9	-19 40	D	112	01 13.0	-0.5	+0.4
6	2303	B1	5.1	-19 40	D	111	01 13.1	-0.5	+0.5
8	2703	G0	7.4	-25 43	D	-	-	-	-
9	2719	B8	5.8	-25 04	D	72	02 46.5	-0.5	+1.7
10	2861	A3p	5.7	-24 50	D	113	01 53.2	-2.2	-0.1
10	2864m	B9	4.7	-25 00	D	-	-	-	-
16	49	K0	6.3	- 2 30	R	180	02 48.1	0.0	+3.8
20	517	K0	6.4	+17 40	R	-	-	-	-
31	2114m	A2p	5.8	-13 57	D	-	-	-	-
Sep									
3	2507	K0	6.7	-23 48	D	13	19 31.8		
3	2507	K0	6.7	-23 48	R	13	19 31.8	Graze	
3	2510	K0	6.3	-24 12	D	122	19 47.6	-2.4	-1.5
3	2513	F0	4.3	-24 08	D	95	20 36.1	-2.4	+0.3
4	2523	A0	4.9	-23 56	D	10	00 16.0		
4	2523	A0	4.9	-23 56	R	348	00 29.0	Graze	
4	2652	K0	6.4	-25 38	D	-	-	-	-
5	2678	B2p	6.2	-25 17	D	124	02 19.0	-0.5	+0.1
5	2809m	F5	4.9	-25 21	D	93	22 14.7	-2.5	+0.4
6	2934	K5	7.5	-24 02	D	66	22 01.9	-2.4	+1.4
6	2934	K5	7.5	-24 02	R	-	-	-	-
7	3062	K0	7.5	-22 12	D	-	-	-	-
8	3175	G5	4.8	-19 06	D	-	-	-	-
17	631	A5	5.6	+21 28	R	173	02 49.9	-	-
17	634	A0p	5.3	+21 39	R	193	03 51.6	-0.2	+2.1

Date	Z.C.	Johannesburg				Luanshya			
		P.A.	h. m.	a	b	P.A.	h. m.	a	b
Jul									
1	1373	101°	18 03.2	-1.1	+0.4	40°	18 24.1	-	-
2	1499	-	-	-	-	181	19 15.4	+1.0	-3.7
3	1621	122	18 37.5	-1.4	-0.6	77	18 39.2	-3.2	+1.2
4	1739	89	19 02.9	-2.7	+0.7	-	-	-	-
5	1856m	109	21 16.2	-1.4	0.0	-	-	-	-
6	1976	-	-	-	-	-	-	-	-
6	1978	41	23 45.8	-	-	-	-	-	-
7	2088	110	23 58.7	-1.0	+0.1	53	24 14.1	-0.7	+3.2
9	2209	30	01 38.3	-	-	-	-	-	-
19	3506	-	-	-	-	-	-	-	-
Aug									
5	2275m	164	19 01.8	-1.0	-4.2	119	18 27.6	-2.6	-1.6
6	2296	123	00 15.6	-0.8	-0.3	77	00 20.3	-0.3	+1.0
6	2302m	-	-	-	-	-	-	-	-
6	2303	-	-	-	-	-	-	-	-
8	2703	-	-	-	-	109	22 12.5	-3.5	-1.0
9	2719	64	03 01.3	0.0	+1.6	-	-	-	-
10	2861	105	02 13.3	-1.6	+0.3	66	02 25.2	-0.7	+1.3
10	2864m	-	-	-	-	118	02 50.1	-1.8	-0.9
16	49	179	03 18.1	+0.1	+4.0	215	03 59.3	-1.6	+2.5
20	517	-	-	-	-	244	01 18.9	-0.5	+0.4
31	2114m	148	20 40.1	-1.0	-1.6	98	20 32.8	-1.1	+0.2
Sep									
3	2507	-	-	-	-	-	-	-	-
3	2507	-	-	-	-	-	-	-	-
3	2510	91	20 08.7	-2.7	+0.4	31	20 40.1	-	-
3	2513	68	21 06.9	-1.9	+2.0	-	-	-	-
4	2523	-	-	-	-	-	-	-	-
4	2523	-	-	-	-	-	-	-	-
4	2652	128	20 19.9	-3.1	-2.2	78	20 14.1	-3.3	+0.9
5	2678	-	-	-	-	-	-	-	-
5	2809m	79	22 43.2	-1.9	+1.2	35	23 10.9	-0.6	+3.1
6	2934	52	22 37.7	-1.8	+2.4	350	23 33.1	Graze	
6	2934	-	-	-	-	323	23 53.9		
7	3062	128	21 01.3	-	-	73	20 48.9	-3.2	+0.8
8	3175	96	18 14.9	-0.9	-1.2	47	18 15.6	-1.4	+1.4
17	631	179	03 09.2	-	-	224	03 40.8	-1.8	+1.7
17	634	196	04 15.2	-0.9	+2.7	233	04 42.7	-2.4	+1.5

Date	Z.C.	Sp	Mag	(1950.0) Dec.	Ph	Cape Town			
						P.A.	h. m.	a	b
Sep									
21	1270	A5	6.1	+24° 19'	R	-	-	-	-
29	2330	A0	6.3	-20 59	D	158°	21 23.7	-1.4	-2.3
Oct									
3	2899	K0	7.4	-25 02	D	-	-	-	-
7	3284	F5	7.1	-15 12	D	58	00 45.0	-1.2	+2.0
15	742m	K0	6.0	+23 52	R	209	00 54.2	-0.1	+1.0
16	900	B2	4.9	+25 57	R	-	-	-	-
19	1363	G5	5.2	+22 15	R	-	-	-	-
19	1365	G5	6.1	+22 12	R	245	04 15.5	-0.8	-0.4
27	2403	A0	7.5	-22 39	D	-	-	-	-
29	2703	G0	7.4	-25 43	D	86	21 28.3	-0.6	+1.3
Nov									
1	3106	K0	5.4	-20 52	D	91	22 43.3	-1.4	+1.1
2	3116	K0	6.7	-20 33	D	94	00 24.0	-0.5	+1.1
2	3228m	A2	6.5	-17 12	D	37	21 56.0	-1.0	+2.6
4	3358	K0	7.2	-12 27	D	-	-	-	-
4	3478	K0	6.5	- 7 44	D	30	22 31.2	-1.1	+2.5
12	852	B3	5.0	+25 52	R	262	00 27.2	-1.5	-0.6
17	1570	K0	5.6	+14 28	R	-	-	-	-
24	Mercury	-	0.8	-24 21	D	-	-	-	-
24	Mercury	-	0.8	-24 20	R	-	-	-	-
25	2627	K0	6.9	-25 46	D	-	-	-	-
29	3175	G5	4.8	-19 06	D	-	-	-	-
30	3304	A0	6.4	-14 51	D	59	20 23.5	-1.6	+1.9
Dec									
1	3425	B5	4.6	- 9 27	D	341	23 02.5	-	-
1	3428m	A0	5.2	- 9 53	D	-	-	-	-
1	3428m	A0	5.2	- 9 53	R	-	-	-	-
3	95	F8	7.1	- 0 01	D	-	-	-	-
4	219	K2	5.1	+ 5 53	D	-	-	-	-
11	1270	A5	6.1	+24 19	R	-	-	-	-
12	1274	F0	5.7	+24 15	R	-	-	-	-
12	1279	K0	6.4	+24 15	R	-	-	-	-
16	1773	K0	5.1	+ 3 35	R	-	-	-	-
25	3009	F5	7.1	-22 37	D	32	20 45.3	+0.5	+2.3
27	3265	G5	6.6	-16 04	D	69	20 31.8	-0.7	+1.7
30	62	F0	7.5	- 1 24	D	-	-	-	-

Date	Z.C.	Johannesburg				Luanshya			
		P.A.	h. m.	a	b	P.A.	h. m.	a	b
Sep									
21	1270	-	-	-	-	320°	04 57.4	-2.1	-2.6
29	2330	134°	21 23.7	-0.7	-0.7	-	-	-	-
Oct									
3	2899	-	-	-	-	111	22 57.6	-2.0	-0.5
7	3284	59	01 09.2	-0.8	+1.8	27	01 36.4	0.0	+2.4
15	742m	213	01 06.1	-0.6	+1.2	250	01 17.0	-1.8	+0.4
16	910	236	01 00.7	-0.7	+0.2	274	00 59.3	-1.6	-0.6
19	1363	259	03 51.0	-1.2	-0.5	294	03 40.3	-1.5	-1.3
19	1365	259	04 23.3	-1.5	-0.5	293	04 13.3	-1.8	-1.3
27	2403	85	19 35.0	-0.4	+1.1	30	19 59.6	+1.2	+3.9
29	2703	79	21 40.8	-0.1	+1.2	-	-	-	-
Nov									
1	3106	89	23 02.7	-0.9	+1.0	57	23 18.9	-0.2	+1.5
2	3116	89	00 34.3	0.0	+0.9	-	-	-	-
2	3228m	37	22 23.5	-0.6	+2.5	356	23 04.4	-	-
4	3358	134	01 41.1	-	-	-	-	-	-
4	3478	33	23 00.8	-1.0	+2.6	356	23 42.4	+0.6	+4.4
12	852	266	00 40.5	-2.2	-0.4	309	00 25.9	-	-
17	1570	267	02 30.3	-0.7	-0.8	302	02 16.2	-0.8	-1.4
24	Mercury	157	17 38.7	-	-	100	17 27.5	-1.0	+0.7
24	Mercury	207	18 06.7	-	-	262	18 32.0	-0.1	+0.7
25	2627	-	-	-	-	77	18 51.2	-0.4	+0.9
29	3175	85	20 17.5	-1.7	+1.1	53	20 36.9	-0.8	+1.8
30	3304	61	20 52.1	-1.2	+1.9	30	21 20.3	-0.4	+2.5
Dec									
1	3425	-	-	-	-	-	-	-	-
1	3428m	136	23 22.2	Graze		85	23 21.0	-0.8	+0.7
1	3428m	161	23 36.3			-	-	-	-
3	95	-	-	-	-	95	20 11.7	-4.5	-0.3
4	219	28	19 24.7	-1.1	+2.0	340	20 09.6	-	-
11	1270	-	-	-	-	251	23 28.5	-1.0	+0.3
12	1274	-	-	-	-	253	01 03.7	-2.2	+0.3
12	1279	230	01 53.3	-2.5	+1.4	270	02 00.5	-2.7	-0.2
16	1773	236	04 15.3	-	-	282	04 14.7	-2.1	-0.9
25	3009	-	-	-	-	-	-	-	-
27	3265	67	20 49.5	-0.3	+1.5	36	21 11.5	+0.2	+1.9
30	62	-	-	-	-	91	22 16.7	-1.1	+0.5

THE PLANETS

The chart (frontispiece) shows the S.A.S.T. of the rising and setting of the Sun and planets for position 30° E, 30° S. The approximate times for other places can be found by applying the longitude differences shown in Table I with the sign reversed, e.g. for Cape Town add 46 minutes, for Durban subtract 4 minutes. The correction for latitude will, in general, be sufficiently small to be ignored and in no case will it exceed 15 minutes. The approximate positions of the planets in the constellations, given in the table opposite, are intended for identification purposes.

Mercury will be best seen shortly after sunset near the greatest elongation on July 19 and may possibly be glimpsed at the greatest elongations in March and November. The best morning visibility, just before sunrise, will occur near the greatest western elongation on May 6. It should still be seen at the greatest elongations in January and December, but that of early September will be less favourable.

Venus, having overtaken the Earth in its orbit during 1964, begins the year in the morning sky, gradually drawing closer to the Sun. On April 12 it passes round the far side of the Sun and from then on will appear in the evening sky. It becomes a prominent object towards the end of the year, reaching greatest brilliancy (magnitude -4.4) on December 21.

Mars becomes an evening object soon after the beginning of the year, reaching maximum brightness (magnitude -1.0) near the time of opposition (March 9). The stationary points, occupied by the planet on January 29 and April 21, mark the extremes of the loop against the star background characteristic of the motion of superior planets near opposition. After opposition Mars fades gradually and at the end of the year is a relatively faint object.

Jupiter begins the year as a prominent object in the evening sky. After conjunction on May 30 it will appear in the morning sky. By the end of the year it will have returned to the evening sky, reaching maximum brightness (magnitude -2.3) at opposition on December 18.

The movement of Saturn is similar to that of Jupiter. Conjunction occurs somewhat earlier (February 26), and the planet will appear in the evening sky ahead of Jupiter. The planet is in opposition on September 6 at the time of maximum brightness (magnitude 0.6).

Uranus (at opposition March 3) and Neptune (at opposition May 9) require optical aid, but can be found fairly easily from the ephemerides given on the opposite page.

THE PLANETS IN THE CONSTELLATIONS

	Venus	Mars	Jupiter	Saturn
January	Sagittarius	Virgo	Aries	Aquarius
February	Capricornus	Virgo	Aries	Aquarius
March	Aquarius	Leo	Aries	Aquarius
April	Pisces	Leo	Taurus	Aquarius
May	Taurus	Leo	Taurus	Aquarius
June	Gemini	Leo	Taurus	Aquarius
July	Leo	Virgo	Taurus	Aquarius
August	Virgo	Virgo	Taurus	Aquarius
September	Virgo	Libra	Taurus	Aquarius
October	Scorpius	Scorpius	Gemini	Aquarius
November	Sagittarius	Sagittarius	Gemini	Aquarius
December	Capricornus	Sagittarius	Taurus	Aquarius

EPHEMERIDES FOR URANUS AND NEPTUNE

	Uranus		Neptune	
	R.A.	Dec.	R.A.	Dec.
Jan 1	11 ^h 05 ^m .2	+ 6° 43'	15 ^h 09 ^m .4	- 15° 54'
21	11 03.8	+ 6 53	15 11.2	- 16 00
Feb 10	11 01.3	+ 7 09	15 12.1	- 16 02
Mar 2	10 58.1	+ 7 29	15 12.1	- 16 01
22	10 54.9	+ 7 47	15 11.3	- 15 57
Apr 11	10 52.2	+ 8 05	15 09.8	- 15 50
May 1	10 50.5	+ 8 15	15 07.7	- 15 41
21	10 49.9	+ 8 17	15 05.6	- 15 33
Jun 10	10 50.7	+ 8 11	15 03.6	- 15 25
30	10 52.8	+ 7 58	15 02.1	- 15 19
Jul 20	10 55.9	+ 7 38	15 01.3	- 15 17
Aug 9	10 59.9	+ 7 13	15 01.2	- 15 18
29	11 04.4	+ 6 45	15 02.1	- 15 23
Sep 18	11 09.0	+ 6 15	15 03.7	- 15 31
Oct 8	11 13.5	+ 5 47	15 06.0	- 15 41
28	11 17.5	+ 5 23	15 08.8	- 15 53
Nov 17	11 20.6	+ 5 04	15 11.7	- 16 05
Dec 7	11 22.5	+ 4 53	15 14.7	- 16 16
27	11 23.1	+ 4 50	15 17.3	- 16 26

The coordinates are apparent geocentric positions for the equinox of date.

METEOR CALENDAR 1965

Date	Shower	Radiant R.A. Dec	Maximum		
			Date	Hourly Rate	Transit of Radiant
Jan 3	Quadrantids	227° + 46°	Jan 3	40	08 ^h 30 ^m
Mar 12	Hydraids	184 - 27	Mar 25	?	00 00
-Apr 25					
Mar 1	Virginids	200 - 6	Apr 3	?	00 00
-May 10					
Apr 2	Lyrids	273 + 35	Apr 21	12	04 00
-Apr 24					
Apr 29	Eta Aquarids	338 - 1	May 6	10	07 36
-May 21					
Apr 20	Sco - Sgr System	270 - 30	Jun 14	?	00 30
-Jul 30					
Jul 25	Delta Aquirids	343 - 17	Jul 28	20	02 00
-Aug 10					
Jul 18	Alpha Capricornids	304 - 12	?	?	-- --
-Jul 30					
Jul 20	Perseids	43 + 56	Aug 12	50	05 36
-Aug 19					
Aug 16	Piscids	0 + 14	Sep 12	?	00 30
-Oct 8					
Oct 11	Orionids	94 + 16	Oct 22	20	04 24
-Oct 30					
Sep 24	Taurids	58 + 21	Nov 13	6	00 36
-Dec 10					
Nov 16	Leonids	151 + 21	Nov 16	6	06 32
Dec 5					
-Dec 12	Geminids	113 + 30	Dec 12	30	02 00
Dec 5	Velaids	149 - 51	Dec 29	?	03 30
-Jan 7					

The hourly rates would apply if the radiants were in the observer's zenith. The orbits of the cometary currents are closely related to the orbits of the comets named; the orbits of ecliptical currents to those of certain minor planets.

Recommended S&ST of watch	Conditions at Maximum	Nature of current	Appearance
Difficult in SA.			
22h - 24h	Favourable	Unknown	
22h - 24h	Favourable	Ecliptical	
02h - 04h	Unfavourable	Cometary: Comet 1861 I	Swift with streaks
03h - dawn	Favourable	Cometary: Halley	Very swift, long paths
20h - 24h	Favourable	Ecliptical	
23h - 02h	Favourable	Ecliptical	Slow, long paths
22h - 02h	-	Cometary: Comet 1881 IV	Very slow, bright
03h' - dawn	Unfavourable*	Cometary: Comet 1862 III	
22h - 24h	Favourable	Ecliptical	
02h30m - 04h30m	Unfavourable	Cometary: Halley	Swift, with streaks
22h - 24h	Favourable	Ecliptical	
03h - dawn	Unfavourable**	Cometary: Comet 1866 I	
23h - 02h	Unfavourable	Ecliptical	Medium speed, white
23h - 03h30m	Favourable	Unknown	

* In view of the high northern declination of its radiant, this shower is difficult to observe from South Africa, and then only from low latitudes.

** Although the period of this shower is $33\frac{1}{4}$ years, (next expected maximum 1966), there was a slight increase in activity three years ago. Last spectacular shower, 1866: those of 1899 and 1932 - 33 disappointing (perturbation by Jupiter). Close watch for possible increase in activity recommended during coming years.

ASTRONOMICAL DIARY

JANUARY 1965

d. h.

Jan	2	19	Earth at perihelion.
	7	00	Saturn 4° N of Moon.
	7	09	Mercury $1^{\circ}.2$ N of Venus.
	8	11	Mercury at greatest elongation, 23° W.
	12	19	Jupiter 2° N of Moon.
	24	10	Mercury $0^{\circ}.5$ S of Venus.
	31	03	Venus 2° N of Moon.

FEBRUARY 1965

d. h.

Feb	17	02	Uranus 5° S of Moon
	18	00	Mars 1° S of Moon.
	22	03	Neptune $0^{\circ}.8$ S of Moon.
	24	05	Mercury in superior conjunction.
	26	12	Saturn in conjunction with Sun.

MARCH 1965

d. h.

Mar	3	16	Uranus at opposition.
	5	22	Pluto at opposition.
	9	14	Mars at opposition.
	12	03	Mars nearest to Earth.
	16	19	Mars 1° S of Moon.
	20	22	Equinox.
	21	22	Mercury at greatest elongation, 19° E.

APRIL 1965

	d.	h.	
Apr	3	02	Mars 3° N of Uranus.
	8	15	Mercury in inferior conjunction.
	12	06	Venus in superior conjunction.
	17	20	Neptune $0^{\circ}.4$ S of Moon.
	27	05	Saturn 4° N of Moon.

MAY 1965

	d.	h.	
May	6	15	Mercury at greatest elongation, 27° W.
	6	17	Mars $1^{\circ}.1$ N of Uranus.
	9	14	Neptune at opposition.
	9	21	Uranus 5° S of Moon.
	9	22	Mars 4° S of Moon.
	15	02	Neptune $0^{\circ}.5$ S of Moon.
	21	06	Venus 6° N of Aldebaran.
	30	09	Jupiter in conjunction with Sun.
	30	23	Total eclipse of the Sun, invisible in Southern Africa.

JUNE 1965

	d.	h.	
Jun	6	18	Mars 5° S of Moon.
	11	21	Mercury in superior conjunction.
	14	04	Partial eclipse of the Moon.
	21	03	Saturn 4° N of Moon.
	21	17	Solstice.
	25	19	Venus 5° S of Pollux.
	30	18	Venus 2° S of Moon.

JULY 1965

	d.	h.	
Jul	3	12	Earth at aphelion:
	4	02	Mercury $0^{\circ}.04$ S of Venus.
	4	23	Mars 5° S of Moon.
	19	01	Mercury at greatest elongation, 27° E.
	24	20	Venus $1^{\circ}.2$ N of Regulus.

AUGUST 1965

	d.	h.	
Aug	1	17	Juno at opposition.
	4	18	Neptune $0^{\circ}.4$ S of Moon.
	6	19	Pallas at opposition.
	8	18	Mars $1^{\circ}.8$ N of Spica.
	15	21	Mercury in inferior conjunction.

SEPTEMBER 1965

	d.	h.	
Sep	2	03	Mercury at greatest elongation, 18° W.
	6	18	Saturn at opposition.
	7	15	Venus 2° N of Spica.
	8	05	Uranus in conjunction with Sun.
	8	05	Mercury $0^{\circ}.7$ N of Regulus.
	9	02	Pluto in conjunction with Sun.
	17	23	Mars 3° S of Neptune.
	18	20	Ceres at opposition.
	23	08	Equinox.
	27	17	Mercury in superior conjunction.

OCTOBER 1965

d. h.

Oct	7	18	Saturn 3° N of Moon.
	16	06	Jupiter 3° S of Moon.
	16	14	Mars 4° N of Antares.
	17	17	Venus 2° N of Antares.
	19	17	Venus $1^{\circ}.6$ S of Mars.

. NOVEMBER 1965

d. h.

Nov	4	00	Saturn 3° N of Moon.
	9	10	Mercury $1^{\circ}.9$ N of Antares.
	12	10	Neptune in conjunction with Sun.
	13	05	Mercury at greatest elongation, 23° E.
	15	22	Venus at greatest elongation, 47° E.
	23	06	Annular eclipse of the Sun, invisible in Southern Africa.

DECEMBER 1965

d. h.

Dec	3	06	Mercury in inferior conjunction.
	8	19	Penumbral eclipse of the Moon, the beginning invisible in Southern Africa.
	18	11	Jupiter at opposition.
	21	19	Venus at greatest brilliancy.
	22	00	Mercury at greatest elongation, 22° W.
	22	04	Solstice.
	28	11	Vesta at opposition.
	28	19	Saturn 3° N of Moon.

BRIGHT VARIABLE STARS

Name	Position (1950)		Range	Period Days	Expected Maxima 1965
	R.A.	Dec.			
o Ceti (Mira)	02 ^h 16 ^m .8	- 3° 12'	2.6-9.4	331	Jan 31, Dec 29
R Doradus	04 36.2	-60 11	5.3-6.4	Irr.	
R Pictoris	04 44.8	-49 20	6.9-9.2	172?	
L ₂ Puppis	07 12.0	-44 33	3.1-6.3	140?	
R Carinae	09 31.0	-62 34	4.5-9.4	309	May 3
S Carinae	10 07.8	-61 18	5.7-8.3	149	Feb 28, Jul 28, Dec 30
R Hydrae	13 27.0	-23 01	4.7-9.6	386	Jun 29
T Centauri	13 38.9	-33 21	6.0-8.2	90	Mar 11, Jun 10, Sep 9, Dec 9
R Centauri	14 12.9	-59 41	5.7-12.0	547	Oct 8
R Aquarii	23 41.2	-15 34	6.7-11.6	387	May 17

THE GILL MEDAL

Medallists

1956	H. Knox Shaw	1958	J. Jackson
1957	W. P. Hirst	1960	W. H. van den Bos
1963	A. W. J. Cousins		

The Gill Medal commemorates Sir David Gill, H. M. Astronomer at the Cape (1879 - 1907) renowned for his numerous researches, especially in positional and mathematical astronomy and geodesy, and for his part in consolidating astronomical science in Southern Africa.

The medal was designed by Dr. P. Kirchhoff, President of the Society at the time, in 1955. The obverse carries a bas-relief portrait of Gill: the reverse incorporates a representation of the heliometer with which Gill undertook much of his positional work including a determination of the solar parallax. The medal which is struck in silver is awarded by Council for services to astronomy with special consideration to services in southern Africa.

SOUTH AFRICAN OBSERVATORIES

Name	Place	E. Long.	S. Lat.	Alt.	Director
		1h+		ft	
Public	Johannesburg	52m 18s.0	26°10'55"3	5925	W. S. Finsen
Public Annexe	Hartebeespoort	51m 30s	25°46'22"	4002	
Royal Observatory	Cape Town	13m 54s.6	33°56'02"5	26	R. H. Stoy
Adcliffe	Pretoria	52m 54s.9	25°47'18"	5059	A. D. Thackeray
Lyden	Bloemfontein	45m 37s.4	29°02'20"	4550	J. Dommange
Lyden	Hartebeespoort	51m 30s	25°46'22"	4002	D. F. Stevens
People's	Port Elizabeth	42m 19s.2	33°57'11"	330	P. E. Centre
Mont-Hussey	Bloemfontein	44m 56s.8	29°05'46"1	4825	F. Holden
Smithsonian					
satellite-Tracking	Olifantsfontein	52m 59s.6	25°57'33"9	5066	R. Citron
Station					
Radio Space Research	Krugersdorp	48m 16s.3	25°53'14"5	4515	D. Hogg
Station					
S.O. Station	Zeekoegat	29m 51s.2	33°05'15"	3200	H. Petit
Bell	Johannesburg	52m 05s.8	26°08'10"6	5210	
H. Botham	Johannesburg	52m 17s.3	26°11'23"3	5605	
G. Fuhr	Cape Town	13m 54s.5	33°57'09"	26	
M. Hoogenhout	Pretoria	52m 58s.6	25°46'46"	4725	
L. Jooste	Pretoria	52m 47s.2	25°45'14"	4359	
F. G. Knipe	Johannesburg	52m 11s.6	26°11'18"3	5915	
D. Overbeek	Germiston	52m 33s.7	26°11'42"	5605	
C. Venter	Pretoria	52m 46s.9	25°40'14"8	4050	
N. Williams	Johannesburg	52m 28s.4	26°12'00"	5590	
L. van Zyl	Boksburg	52m 58s.9	26°12'05"	5429	

PAST PRESIDENTS

1922 - 23	S. S. Hough	1943 - 44	W. H. van den Bos
1923 - 24	R. T. A. Innes	1944 - 45	A. W. J. Cousins
1924 - 25	J. K. E. Halm	1945 - 46	R. H. Stoy
1925 - 26	W. Reid	1946 - 47	W. P. Hirst
1926 - 27	H. Spencer Jones	1947 - 48	J. Jackson
1927 - 28	A. W. Roberts	1948 - 49	A. E. H. Bleksley
1928 - 29	A. W. Long	1949 - 50	W. S. Finsen
1929 - 30	H. E. Wood	1950 - 51	H. E. Krumm
1930 - 31	D. Cameron-Swan	1951 - 52	A. D. Thackeray
1931 - 32	H. L. Alden	1952 - 53	J. C. Bentley
1932 - 33	H. Spencer Jones	1953 - 54	David S. Evans
1933 - 34	D. G. McIntyre	1954 - 55	P. Kirchhoff
1934 - 35	J. K. E. Halm	1955 - 56	W. H. van den Bos
1935 - 36	J. Jackson	1956 - 57	S. C. Venter
1936 - 37	H. E. Houghton	1957 - 58	M. W. Feast
1937 - 38	J. S. Paraskevopoulos	1958 - 59	H. Haffner
1938 - 39	T. MacKenzie	1959 - 60	P. Smits
1939 - 40	R. A. Rossiter	1960 - 61	G. G. Cillie
1940 - 41	E. B. Ford	1961 - 62	M. D. Overbeek
1941 - 42	H. Knox Shaw	1962 - 63	A. J. Wesselink
1942 - 43	A. F. I. Forbes	1963 - 64	A. G. F. Morrisby

HONORARY MEMBERS

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Sir Richard Woolley	Dr. J. Schilt	Dr. H. Shapley
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1922 August	T. MacKenzie
1923	C. L. O'Brien Dutton
1923 October	H. E. Houghton
1930 July	S. Skewes
1931	H. Horrocks
1934 November	H. W. Schonegevel
1935	A. Menzies

OBSERVING SECTIONS

The Observing Sections exist to encourage amateurs in carrying out useful research. Enquiries about their activities should be addressed to the Directors of the Observing Sections, whose names and addresses are given below:—

Comets and Meteors:

Mr. S. C. Venter, P.O. Box 1416, Pretoria.

Variable Stars:

Mr. R. P. de Kock, The Royal Observatory, Observatory, Cape.

Nova Search Section:

The Rev. L. L. Dawson, 94 Tramway Street, Turffontein, Johannesburg.

A number of autonomous local Centres of the Society exists, which hold regular meetings. Information on local activity in fields such as "Moonwatch" (observation of artificial satellites), and telescope construction can be obtained through Centre Secretaries. Details of Centre organisation are as follows:—

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Chairman: Mr. R. F. Horn.
Vice-Chairman: Mr. G. R. Atkins.
Hon. Secretary: Mr. J. Bondietti.
Hon. Treasurer: Mr. H. E. Krumm.
Hon. Auditor: Mr. A. Menzies.
Members of Committee: Dr. A. W. J. Cousins, Messrs. A. P. Fairall, R. R. Hirschberg, H. B. Molyneux and N. Saville.

Centre Representative on Council:

Mr. W. C. Bentley.

Meetings in winter on 2nd Wednesday of month at the Royal Observatory.

Secretarial address, c/o The Royal Observatory, Observatory, Cape.

TRANSVAAL CENTRE:

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Representative: Mr. G. F. G. Knipe.
Pretoria Representative: Mr. K. J. Sterling.
Curator of Instruments: Mr. T. E. Geary.
Hon. Librarian: Mrs. M. M. FitzGerald.

Observing and lecture meetings in alternate months.

Secretarial address, 8, Eider Road, Florida Lake, Transvaal.

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Members of Committee: Messrs. J. Arnold, E. Blignaut, D. Blood, S.A. Foster, D. Leemans, W. L. Schlesinger, B. A. Simpson, J. W. Taylor, E. Warring and G. White.

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Centre Representative on Council: Mr. N. Lincoln.

Secretarial address, P.O. Box 1050, Bloemfontein.

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For information apply to:

Mr. Gregory Roberts, c/o Laboratory, Lever Brothers (Pty.) Ltd. Maydon Wharf, Durban.