astronomical society
of southern africa

handbook
for
1969

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astronomical society of southern africa
1968 – 1969

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. In addition to this Handbook, the Society issues twelve numbers of "The Monthly Notes of the Astronomical Society of Southern Africa" (MNASSA) 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 R6.00 with an entrance fee of R2.50.

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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.

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contents

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* * *

time systems

All the times given in this booklet are South African Standard Time. This is also the Standard Time in use in Rhodesia, Zambia, Lesotho, Botswana and Mozambique.

Local Mean Time

Local mean time is a uniform time system taken from the local meridian. South African Standard Time (S.A.S.T.) is the local mean time for the meridian 30^{o}, or two hours, east of Greenwich. The local mean time for points not on the 30^{o} E meridian can be found by applying a longitude correction to S.A.S.T. as given in Table I.

TABLE I

Reduction From S.A.S.T. To Local Mean Time

Bloemfontein	-15^{m}	Johannesburg	-08^{m}
Bulawayo	- 06	Kimberley	- 21
Cape Town	- 46	Kitwe	- 07
Durban	+ 04	Port Elizabeth	- 18
East London	- 08	Pretoria	- 07
Grahamstown	- 14	Salisbury	+ 04

Conversely to obtain S.A.S.T. from local mean time, the same table can be used with the sign reversed. For example, at Johannesburg, local mean noon (i.e. 12h 00m local mean time) occurs at 12h 08m S.A.S.T.

Local Apparent Solar Time

This is the local time taken directly from the Sun (i.e. the time shown by a sundial). At noon in this system a shadow cast by the Sun will lie exactly in a north-south line.

The Equation of Time

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 differs from the 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 second column of Table II which gives the S.A.S.T. of apparent noon, that is, of the Sun's transit over the 30^{o} E meridian.

For example, on January 1, the S.A.S.T. of apparent noon at Longitude 30^{o} E is 12.03; thus the S.A.S.T. of apparent noon at Johannesburg is 12.11, found by applying the longitude correction of Table I with the sign reversed.

Sidereal Time

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 third column of Table II, and correcting for longitude by mean 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 8.15 p.m. on November 7 at Durban

Sidereal time at 00h 00m S.A.S.T. on November 7	3	04
S.A.S.T. elapsed	20	15
	23	19
Correction for longitude		+04
Interval correction		-03
Required sidereal time	23	26

Had this final result exceeded 24 hours, then of course 24 hours would have had to be subtracted.

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. 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^{o} being equal to 24 hours (1^{o} 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.

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. Hence the right ascension of a star crossing the local meridian at a particular time is given by the corresponding local sidereal time.

The Julian Day Calendar

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 $14^{h}.00$ (2.00 p.m.) S.A.S.T.

Note

The tabulated data in the table are given at intervals of 10 days. It is necessary to interpolate to find values for intermediate days.

TABLE II

Date 1969		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	12 03 35	6 42	0 44
	11	12 07 57	7 21	1 24
	21	12 11 22	8 00	2 03
	31	12 13 31	8 40	2 43
February	10	12 14 18	9 19	3 22
	20	12 13 49	9 59	4 02
March	2	12 12 14	10 38	4 41
	12	12 09 51	11 18	5 20
	22	12 06 59	11 57	6 00
April	1	12 03 57	12 36	6 39
	11	12 01 05	13 16	7 19
	21	11 58 44	13 55	7 58
May	1	11 57 04	14 35	8 38
	11	11 56 18	15 14	9 17
	21	11 56 29	15 54	9 56
	31	11 57 33	16 33	10 36
June	10	11 59 17	17 12	11 15
	20	12 01 24	17 52	11 55
	30	12 03 30	18 31	12 34
July	10	12 05 13	19 11	13 14
	20	12 06 15	19 50	13 53
	30	12 06 21	20 29	14 32
August	9	12 05 27	21 09	15 12
	19	12 03 36	21 48	15 51
	29	12 00 56	22 28	16 31
September	8	11 57 42	23 07	17 10
	18	11 54 12	23 47	17 50
	28	11 50 43	0 26	18 29
October	8	11 47 36	1 05	19 08
	18	11 45 14	1 45	19 48
	28	11 43 51	2 24	20 27
November	7	11 43 43	3 04	21 07
	17	11 45 00	3 43	21 46
	27	11 47 37	4 23	22 26
December	7	11 51 27	5 02	23 05
	17	11 56 06	5 41	23 44
	27	12 01 03	6 21	0 24

	CAPE TOWN		DURBAN		BLOEMFONTEIN	
	SUNRISE	SUNSET	SUNRISE	SUNSET	SUNRISE	SUNSET
Jan 1	05h 38m	20h 01m	04h 58m	19h 01m	05h 21m	19h 18m
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		
	SUNRISE		SUNSET		SUNRISE		SUNSET		CIVIL	NAUTICAL	ASTRON
Jan 1	05h	18m	19h	04m	05h	44m	18h	38m	27m	59m	94m
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^{o} 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^{o} 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^{o} below the horizon, at which time there is no light from the Sun whatever.

the moon 1969

DATE	At 0^h S.A.S.T.		JOHANNESBURG		CAPE TOWN	
	J.D. 2440000+	AGE	MOONRISE	MOONSET	MOONRISE	MOONSET
			S.A.S.T.	S.A.S.T.	S.A.S.T.	S.A.S.T.
Jan						
1 W	222.4	12.2	$17^h\ 30^m$	$3^h\ 02^m$	$18^h\ 33^m$	$3^h\ 19^m$
2 T	223.4	13.2	18 23	3 48	19 27	4 04
3 F	224.4	14.2	19 13	4 39	20 16	4 55
4 S	225.4	15.2	19 58	5 34	20 59	5 52
5 S	226.4	16.2	20 39	6 31	21 36	6 51
6 M	227.4	17.2	21 15	7 28	22 08	7 51
7 T	228.4	18.2	21 48	8 24	22 36	8 52
8 W	229.4	19.2	22 19	9 20	23 03	9 52
9 T	230 4	20.2	22 49	10 15	23 29	10 52
10 F	231.4	21.2	23 19	11 11	23 54	11 53
11 S	232.4	22.2	23 53	12 10	.....	12 57
12 S	233.4	23.2	.....	13 11	0 23	14 03
13 M	234.4	24.2	0 29	14 17	0 55	15 13
14 T	235.4	25.2	1 12	15 26	1 34	16 27
15 W	236.4	26.2	2 04	16 37	2 21	17 41
16 T	237.4	27.2	3 04	17 46	3 20	18 50
17 F	238.4	28.2	4 12	18 48	4 29	19 50
18 S	239.4	29.2	5 24	19 41	5 44	20 38
19 S	240.4	0.7	6 36	20 25	7 00	21 18
20 M	241.4	1.7	7 44	21 04	8 13	21 51
21 T	242.4	2.7	8 47	21 38	9 21	22 20
22 W	243.4	3.7	9 47	22 09	10 26	22 47
23 T	244.4	4.7	10 44	22 39	11 28	23 13
24 F	245.4	5.7	11 40	23 10	12 29	23 39
25 S	246.4	6.7	12 36	23 43	13 28	.....
26 S	247.4	7.7	13 31	.....	14 28	0 08
27 M	248.4	8.7	14 27	0 19	15 27	0 39
28 T	249.4	9.7	15 23	0 59	16 26	1 16
29 W	250.4	10.7	16 17	1 43	17 22	1 59
30 T	251.4	11.7	17 08	2 33	18 12	2 48
31 F	252.4	12.7	17 55	3 27	18 57	3 43
Feb						
1 S	253.4	13.7	18 38	4 23	19 36	4 42
2 S	254.4	14.7	19 15	5 21	20 10	5 43
3 M	255.4	15.7	19 50	6 18	20 40	6 45
4 T	256.4	16.7	20 21	7 15	21 07	7 46
5 W	257.4	17.7	20 52	8 11	21 33	8 47

Date	J.D.	Age	Johannesburg Rise	Johannesburg Set	Cape Town Rise	Cape Town Set
			h m	h m	h m	h m
6 T	258.4	18.7	21 22	9 07	21 58	9 48
7 F	259.4	19.7	21 54	10 04	22 25	10 50
8 S	260.4	20.7	22 29	11 04	22 55	11 54
9 S	261.4	21.7	23 08	12 07	23 31	13 02
10 M	262.4	22.7	23 55	13 13	.....	14 13
11 T	263.4	23.7	.....	14 21	0 13	15 25
12 W	264.4	24.7	0 49	15 29	1 06	16 33
13 T	265.4	25.7	1 52	16 32	2 08	17 35
14 F	266.4	26.7	3 01	17 27	3 19	18 27
15 S	267.4	27.7	4 12	18 15	4 34	19 11
16 S	268.4	28.7	5 21	18 56	5 47	19 47
17 M	269.4	0.2	6 27	19 32	6 59	20 17
18 T	270.4	1.2	7 29	20 05	8 06	20 45
19 W	271.4	2.2	8 29	20 36	9 11	21 11
20 T	272.4	3.2	9 26	21 07	10 13	21 38
21 F	273.4	4.2	10 23	21 40	11 14	22 07
22 S	274.4	5.2	11 20	22 15	12 16	22 37
23 S	275.4	6.2	12 17	22 54	13 16	23 12
24 M	276.4	7.2	13 14	23 37	14 16	23 53
25 T	277.4	8.2	14 09	.....	15 13	.....
26 W	278.4	9.2	15 02	0 25	16 06	0 40
27 T	279.4	10.2	15 50	1 17	16 52	1 33
28 F	280.4	11.2	16 34	2 13	17 34	2 30
Mar						
1 S	281.4	12.2	17 14	3 10	18 10	3 31
2 S	282.4	13.2	17 49	4 08	18 41	4 33
3 M	283.4	14.2	18 22	5 06	19 09	5 35
4 T	284.4	15.2	18 53	6 03	19 35	6 37
5 W	285.4	16.2	19 24	7 00	20 02	7 38
6 T	286.4	17.2	19 56	7 58	20 29	8 41
7 F	287.4	18.2	20 30	8 58	20 58	9 46
8 S	288.4	19.2	21 08	10 00	21 32	10 54
9 S	289.4	20.2	21 52	11 06	22 12	12 05
10 M	290.4	21.2	22 44	12 14	23 00	13 16
11 T	291.4	22.2	23 43	13 20	23 59	14 25
12 W	292.4	23.2	.....	14 24	.....	15 27
13 T	293.4	24.2	0 48	15 20	1 05	16 21
14 F	294.4	25.2	1 57	16 09	2 16	17 06
15 S	295.4	26.2	3 05	16 52	3 29	17 43
16 S	296.4	27.2	4 10	17 28	4 39	18 15
17 M	297.4	28.2	5 12	18 02	5 46	18 44
18 T	298.4	29.2	6 13	18 33	6 52	19 11
19 W	299.4	0.7	7 11	19 05	7 55	19 38

Date	J.D.	Age	Johannesburg Rise	Johannesburg Set	Cape Town Rise	Cape Town Set
20 T	300.4	1.7	8h 09m	19h 36m	8h 58m	20h 05m
21 F	301.4	2.7	9 06	20 11	10 00	20 35
22 S	302.4	3.7	10 04	20 49	11 02	21 08
23 S	303.4	4.7	11 02	21 30	12 03	21 47
24 M	304.4	5.7	11 59	22 16	13 02	22 32
25 T	305.4	6.7	12 52	23 07	13 57	23 22
26 W	306.4	7.7	13 43	.....	14 46	.....
27 T	307.4	8.7	14 28	0 02	15 30	0 18
28 F	308.4	9.7	15 09	0 58	16 07	1 17
29 S	309.4	10.7	15 47	1 55	16 40	2 18
30 S	310.4	11.7	16 20	2 53	17 09	3 20
31 M	311.4	12.7	16 52	3 50	17 36	4 21
Apr						
1 T	312.4	13.7	17h 23m	4h 47m	18h 03m	5h 23m
2 W	313.4	14.7	17 54	5 45	18 29	6 27
3 T	314.4	15.7	18 28	6 45	18 58	7 33
4 F	315.4	16.7	19 06	7 48	19 31	8 41
5 S	316.4	17.7	19 49	8 55	20 10	9 52
6 S	317.4	18.7	20 39	10 04	20 57	11 05
7 M	318.4	19.7	21 37	11 13	21 53	12 17
8 T	319.4	20.7	22 41	12 18	22 57	13 22
9 W	320.4	21.7	23 48	13 16	.....	14 19
10 T	321.4	22.7	.....	14 07	0 07	15 06
11 F	322.4	23.7	0 56	14 51	1 18	15 45
12 S	323.4	24.7	2 01	15 28	2 28	16 17
13 S	324.4	25.7	3 03	16 02	3 35	16 46
14 M	325.4	26.7	4 02	16 33	4 39	17 13
15 T	326.4	27.7	5 00	17 04	5 42	17 38
16 W	327.4	28.7	5 57	17 35	6 44	18 05
17 T	328.4	0.2	6 54	18 08	7 45	18 34
18 F	329.4	1.2	7 52	18 44	8 48	19 06
19 S	330.4	2.2	8 50	19 24	9 50	19 43
20 S	331.4	3.2	9 47	20 09	10 50	20 25
21 M	332.4	4.2	10 43	20 59	11 47	21 13
22 T	333.4	5.2	11 35	21 51	12 39	22 08
23 W	334.4	6.2	12 22	22 47	13 24	23 05
24 T	335.4	7.2	13 05	23 43	14 04	.....
25 F	336.4	8.2	13 43	.....	14 38	0 05
26 S	337.4	9.2	14 17	0 40	15 08	1 05
27 S	338.4	10.2	14 49	1 36	15 36	2 05
28 M	339.4	11.2	15 20	2 32	16 02	3 06
29 T	340.4	12.2	15 51	3 29	16 28	4 08
30 W	341.4	13.2	16 23	4 28	16 56	5 12

Date	J.D.	Age	Johannesburg Rise	Johannesburg Set	Cape Town Rise	Cape Town Set
May						
1 T	342.4	14.2	16h 59m	5h 30m	17h 27m	6h 19m
2 F	343.4	15.2	17 41	6 36	18 04	7 31
3 S	344.4	16.2	18 30	7 46	18 49	8 45
4 S	345.4	17.2	19 27	8 57	19 43	10 01
5 M	346.4	18.2	20 31	10 07	20 46	11 11
6 T	347.4	19.2	21 39	11 10	21 57	12 13
7 W	348.4	20.2	22 48	12 04	23 09	13 04
8 T	349.4	21.2	23 54	12 50	.....	13 46
9 F	350.4	22.2	.....	13 30	0 20	14 20
10 S	351.4	23.2	0 57	14 04	1 28	14 50
11 S	352.4	24.2	1 57	14 36	2 32	15 17
12 M	353.4	25.2	2 54	15 06	3 35	15 42
13 T	354.4	26.2	3 50	15 37	4 35	16 08
14 W	355.4	27.2	4 46	16 09	5 36	16 36
15 T	356.4	28.2	5 43	16 43	6 38	17 06
16 F	357.4	29.2	6 41	17 22	7 39	17 41
17 S	358.4	0.6	7 38	18 04	8 40	18 21
18 S	359.4	1.6	8 35	18 52	9 38	19 07
19 M	360.4	2.6	9 28	19 44	10 32	20 00
20 T	361.4	3.6	10 17	20 38	11 19	20 56
21 W	362.4	4.6	11 01	21 34	12 01	21 55
22 T	363.4	5.6	11 40	22 30	12 37	22 54
23 F	364.4	6.6	12 15	23 26	13 08	23 54
24 S	365.4	7.6	12 47	.....	13 35	.....
25 S	366.4	8.6	13 18	0 20	14 01	0 53
26 M	367.4	9.6	13 48	1 15	14 27	1 52
27 T	368.4	10.6	14 19	2 12	14 53	2 54
28 W	369.4	11.6	14 52	3 12	15 23	3 59
29 T	370.4	12.6	15 31	4 14	15 56	5 07
30 F	371.4	13.6	16 16	5 22	16 37	6 20
31 S	372.4	14.6	17 10	6 34	17 27	7 36
Jun						
1 S	373.4	15.6	18 13	7 46	18 28	8 51
2 M	374.4	16.6	19 22	8 54	19 39	9 58
3 T	375.4	17.6	20 34	9 55	20 54	10 56
4 W	376.4	18.6	21 44	10 45	22 08	11 42
5 T	377.4	19.6	22 49	11 28	23 19	12 20
6 F	378.4	20.6	23 51	12 05	.....	12 52
7 S	379.4	21.6	.....	12 38	0 26	13 20
8 S	380.4	22.6	0 49	13 09	1 29	13 46
9 M	381.4	23.6	1 46	13 39	2 30	14 12
10 T	382.4	24.6	2 42	14 10	3 30	14 39

Date	J.D.	Age	Johannesburg Rise	Johannesburg Set	Cape Town Rise	Cape Town Set
11 W	383.4	25.6	3h 38m	14h 44m	4h 31m	15h 09m
12 T	384.4	26.6	4 35	15 21	5 31	15 41
13 F	385.4	27.6	5 32	16 02	6 32	16 20
14 S	386.4	28.6	6 28	16 48	7 31	17 04
15 S	387.4	29.6	7 22	17 38	8 27	17 54
16 M	388.4	1.0	8 13	18 33	9 16	18 50
17 T	389.4	2.0	8 59	19 28	10 00	19 47
18 W	390.4	3.0	9 39	20 24	10 37	20 47
19 T	391.4	4.0	10 15	21 19	11 09	21 45
20 F	392.4	5.0	10 47	22 13	11 37	22 44
21 S	393.4	6.0	11 18	23 06	12 03	23 42
22 S	394.4	7.0	11 47	.....	12 28	.....
23 M	395.4	8.0	12 17	0 01	12 53	0 41
24 T	396.4	9.0	12 49	0 57	13 20	1 42
25 W	397.4	10.0	13 23	1 56	13 50	2 47
26 T	398.4	11.0	14 04	3 01	14 27	3 55
27 F	399.4	12.0	14 53	4 09	15 12	5 08
28 S	400.4	13.0	15 51	5 21	16 07	6 24
29 S	401.4	14.0	16 58	6 32	17 14	7 36
30 M	402.4	15.0	18 10	7 36	18 28	8 39
Jul						
1 T	403.4	16.0	19h 24m	8h 34m	19h 46m	9h 33m
2 W	404.4	17.0	20 34	9 21	21 01	10 16
3 T	405.4	18.0	21 39	10 02	22 12	10 51
4 F	406.4	19.0	22 41	10 37	23 18	11 21
5 S	407.4	20.0	23 39	11 09	.....	11 49
6 S	408.4	21.0	.....	11 41	0 21	12 15
7 M	409.4	22.0	0 36	12 12	1 24	12 42
8 T	410.4	23.0	1 33	12 45	2 25	13 11
9 W	411.4	24.0	2 30	13 21	3 26	13 43
10 T	412.4	25.0	3 26	14 01	4 26	14 19
11 F	413.4	26.0	4 23	14 45	5 26	15 01
12 S	414.4	27.0	5 18	15 35	6 22	15 50
13 S	415.4	28.0	6 10	16 27	7 13	16 44
14 M	416.4	29.0	6 57	17 23	7 59	17 41
15 T	417.4	0.3	7 39	18 19	8 37	18 41
16 W	418.4	1.3	8 16	19 14	9 11	19 40
17 T	419.4	2.3	8 50	20 09	9 41	20 39
18 F	420.4	3.3	9 20	21 02	10 07	21 36
19 S	421.4	4.3	9 50	21 56	10 31	22 34
20 S	422.4	5.3	10 18	22 50	10 56	23 33
21 M	423.4	6.3	10 48	23 46	11 22	.....
22 T	424.4	7.3	11 21	.....	11 50	0 35

Date	J.D.	Age	Johannesburg Rise	Johannesburg Set	Cape Town Rise	Cape Town Set
			h m	h m	h m	h m
23 W	425.4	8.3	11 58	0 47	12 22	1 40
24 T	426.4	9.3	12 41	1 52	13 01	2 49
25 F	427.4	10.3	13 33	2 59	13 50	4 01
26 S	428.4	11.3	14 35	4 09	14 51	5 13
27 S	429.4	12.3	15 44	5 16	16 01	6 20
28 M	430.4	13.3	16 57	6 17	17 17	7 18
29 T	431.4	14.3	18 10	7 09	18 35	8 06
30 W	432.4	15.3	19 19	7 53	19 50	8 45
31 T	433.4	16.3	20 24	8 32	21 00	9 18
Aug						
1 F	434.4	17.3	21 26	9 06	22 07	9 47
2 S	435.4	18.3	22 25	9 39	23 11	10 15
3 S	436.4	19.3	23 24	10 11	.....	10 43
4 M	437.4	20.3	.....	10 44	0 14	11 11
5 T	438.4	21.3	0 22	11 20	1 17	11 43
6 W	439.4	22.3	1 20	11 59	2 19	12 18
7 T	440.4	23.3	2 17	12 42	3 20	12 58
8 F	441.4	24.3	3 13	13 30	4 17	13 45
9 S	442.4	25.3	4 06	14 22	5 10	14 38
10 S	443.4	26.3	4 55	15 16	5 57	15 34
11 M	444.4	27.3	5 38	16 13	6 38	16 33
12 T	445.4	28.3	6 17	17 09	7 13	17 33
13 W	446.4	29.3	6 52	18 04	7 44	18 32
14 T	447.4	0.7	7 23	18 58	8 11	19 31
15 F	448.4	1.7	7 53	19 52	8 36	20 29
16 S	449.4	2.7	8 22	20 46	9 01	21 28
17 S	450.4	3.7	8 51	21 42	9 25	22 29
18 M	451.4	4.7	9 23	22 40	9 52	23 32
19 T	452.4	5.7	9 57	23 41	10 23	.....
20 W	453.4	6.7	10 37	.....	10 58	0 38
21 T	454.4	7.7	11 24	0 46	11 42	1 47
22 F	455.4	8.7	12 20	1 54	12 36	2 58
23 S	456.4	9.7	13 24	3 00	13 39	4 05
24 S	457.4	10.7	14 34	4 02	14 52	5 05
25 M	458.4	11.7	15 46	4 57	16 08	5 56
26 T	459.4	12.7	16 56	5 44	17 24	6 38
27 W	460.4	13.7	18 03	6 25	18 36	7 14
28 T	461.4	14.7	19 07	7 01	19 46	7 45
29 F	462.4	15.7	20 09	7 35	20 52	8 13
30 S	463.4	16.7	21 09	8 08	21 57	8 42
31 S	464.4	17.7	22 09	8 41	23 03	9 10
Sep						
1 M	465.4	18.7	23 09	9 16	.....	9 41

Date	J.D.	Age	Johannesburg Rise	Johannesburg Set	Cape Town Rise	Cape Town Set
			h m	h m	h m	h m
2 T	466.4	19.7	.....	9 55	0 06	10 15
3 W	467.4	20.7	0 08	10 36	1 09	10 54
4 T	468.4	21.7	1 05	11 24	2 09	11 39
5 F	469.4	22.7	1 59	12 14	3 04	12 30
6 S	470.4	23.7	2 50	13 09	3 53	13 26
7 S	471.4	24.7	3 35	14 05	4 37	14 24
8 M	472.4	25.7	4 16	15 01	5 13	15 24
9 T	473.4	26.7	4 52	15 56	5 45	16 23
10 W	474.4	27.7	5 25	16 51	6 14	17 22
11 T	475.4	28.7	5 55	17 46	6 40	18 22
12 F	476.4	0.1	6 24	18 40	7 05	19 21
13 S	477.4	1.1	6 54	19 36	7 30	20 22
14 S	478.4	2.1	7 25	20 34	7 57	21 24
15 M	479.4	3.1	7 59	21 35	8 26	22 30
16 T	480.4	4.1	8 37	22 40	9 00	23 39
17 W	481.4	5.1	9 22	23 45	9 40	.....
18 T	482.4	6.1	10 13	.....	10 30	0 48
19 F	483.4	7.1	11 13	0 51	11 29	1 56
20 S	484.4	8.1	12 20	1 53	12 37	2 57
21 S	485.4	9.1	13 29	2 48	13 49	3 49
22 M	486.4	10.1	14 38	3 37	15 03	4 33
23 T	487.4	11.1	15 45	4 19	16 15	5 10
24 W	488.4	12.1	16 49	4 56	17 24	5 42
25 T	489.4	13.1	17 51	5 30	18 32	6 11
26 F	490.4	14.1	18 52	6 04	19 38	6 39
27 S	491.4	15.1	19 53	6 37	20 43	7 08
28 S	492.4	16.1	20 53	7 11	21 48	7 37
29 M	493.4	17.1	21 54	7 49	22 53	8 11
30 T	494.4	18.1	22 53	8 30	23 55	8 48
Oct						
1 W	495.4	19.1	23 50	9 16	.....	9 32
2 T	496.4	20.1	.....	10 06	0 53	10 21
3 F	497.4	21.1	0 43	10 59	1 47	11 15
4 S	498.4	22.1	1 30	11 54	2 32	12 12
5 S	499.4	23.1	2 12	12 51	3 11	13 12
6 M	500.4	24.1	2 50	13 46	3 45	14 11
7 T	501.4	25.1	3 24	14 41	4 15	15 10
8 W	502.4	26.1	3 55	15 36	4 42	16 10
9 T	503.4	27.1	4 25	16 31	5 07	17 09
10 F	504.4	28.1	4 54	17 27	5 32	18 10
11 S	505.4	29.1	5 25	18 26	5 59	19 13
12 S	506.4	0.5	5 58	19 26	6 27	20 20
13 M	507.4	1.5	6 36	20 31	7 00	21 29

Date	J.D.	Age	Johannesburg Rise	Johannesburg Set	Cape Town Rise	Cape Town Set
14 T	508.4	2.5	$7^h\ 19^m$	$21^h\ 37^m$	$7^h\ 39^m$	$22^h\ 39^m$
15 W	509.4	3.5	8 09	22 44	8 26	23 48
16 T	510.4	4.5	9 07	23 48	9 23	.....
17 F	511.4	5.5	10 12	.....	10 28	0 51
18 S	512.4	6.5	11 20	0 45	11 39	1 46
19 S	513.4	7.5	12 28	1 34	12 51	2 32
20 M	514.4	8.5	13 33	2 17	14 02	3 10
21 T	515.4	9.5	14 37	2 55	15 10	3 43
22 W	516.4	10.5	15 38	3 29	16 17	4 12
23 T	517.4	11.5	16 38	4 02	17 21	4 40
24 F	518.4	12.5	17 38	4 34	18 26	5 08
25 S	519.4	13.5	18 38	5 07	19 32	5 36
26 S	520.4	14.5	19 38	5 44	20 36	6 08
27 M	521.4	15.5	20 39	6 24	21 41	6 43
28 T	522.4	16.5	21 37	7 07	22 41	7 24
29 W	523.4	17.5	22 33	7 56	23 37	8 12
30 T	524.4	18.5	23 23	8 49	.....	9 04
31 F	525.4	19.5	.....	9 44	0 25	10 01
Nov						
1 S	526.4	20.5	0 07	10 40	1 07	11 00
2 S	527.4	21.5	0 47	11 36	1 44	11 59
3 M	528.4	22.5	1 21	12 30	2 14	12 58
4 T	529.4	23.5	1 53	13 24	2 42	13 56
5 W	530.4	24.5	2 23	14 18	3 08	14 54
6 T	531.4	25.5	2 52	15 13	3 33	15 54
7 F	532.4	26.5	3 22	16 10	3 58	16 56
8 S	533.4	27.5	3 55	17 10	4 26	18 01
9 S	534.4	28.5	4 31	18 14	4 57	19 10
10 M	535.4	29.5	5 13	19 22	5 34	20 22
11 T	536.4	1.0	6 01	20 31	6 19	21 35
12 W	537.4	2.0	6 58	21 38	7 15	22 42
13 T	538.4	3.0	8 02	22 39	8 19	23 42
14 F	539.4	4.0	9 11	23 32	9 30	.....
15 S	540.4	5.0	10 20	.....	10 43	0 31
16 S	541.4	6.0	11 27	0 17	11 54	1 11
17 M	542.4	7.0	12 30	0 56	13 03	1 45
18 T	543.4	8.0	13 31	1 31	14 08	2 15
19 W	544.4	9.0	14 30	2 03	15 12	2 43
20 T	545.4	10.0	15 29	2 35	16 15	3 09
21 F	546.4	11.0	16 27	3 07	17 19	3 37
22 S	547.4	12.0	17 27	3 41	18 22	4 08
23 S	548.4	13.0	18 27	4 19	19 27	4 41
24 M	549.4	14.0	19 26	5 01	20 28	5 20

Date	J.D.	Age	Johannesburg Rise	Johannesburg Set	Cape Town Rise	Cape Town Set
25 T	550.4	15.0	20h 23m	5h 48m	21h 26m	6h 04m
26 W	551.4	16.0	21 15	6 39	22 18	6 55
27 T	552.4	17.0	22 02	7 34	23 03	7 51
28 F	553.4	18.0	22 43	8 30	23 41	8 49
29 S	554.4	19.0	23 19	9 25	.....	9 48
30 S	555.4	20.0	23 51	10 20	0 13	10 46
Dec						
1 M	556.4	21.0	.....	11 14	0 42	11 44
2 T	557.4	22.0	0 21	12 07	1 08	12 41
3 W	558.4	23.0	0 51	13 00	1 32	13 39
4 T	559.4	24.0	1 19	13 54	1 57	14 38
5 F	560.4	25.0	1 50	14 52	2 23	15 41
6 S	561.4	26.0	2 23	15 53	2 52	16 47
7 S	562.4	27.0	3 02	16 59	3 26	17 58
8 M	563.4	28.0	3 48	18 08	4 07	19 11
9 T	564.4	29.0	4 42	19 19	4 59	20 23
10 W	565.4	0.5	5 45	20 24	6 00	21 28
11 T	566.4	1.5	6 55	21 23	7 12	22 23
12 F	567.4	2.5	8 06	22 13	8 27	23 08
13 S	568.4	3.5	9 17	22 55	9 42	23 45
14 S	569.4	4.5	10 23	23 32	10 54	.....
15 M	570.4	5.5	11 25	.....	12 01	0 18
16 T	571.4	6.5	12 25	0 06	13 06	0 46
17 W	572.4	7.5	13 23	0 37	14 09	1 13
18 T	573.4	8.5	14 21	1 09	15 12	1 40
19 F	574.4	9.5	15 20	1 42	16 15	2 09
20 S	575.4	10.5	16 19	2 19	17 18	2 41
21 S	576.4	11.5	17 18	2 59	18 20	3 18
22 M	577.4	12.5	18 15	3 44	19 18	4 00
23 T	578.4	13.5	19 09	4 33	20 12	4 49
24 W	579.4	14.5	19 57	5 26	20 59	5 43
25 T	580.4	15.5	20 40	6 22	21 39	6 40
26 F	581.4	16.5	21 18	7 18	22 14	7 39
27 S	582.4	17.5	21 52	8 13	22 44	8 38
28 S	583.4	18.5	22 23	9 06	23 10	9 36
29 M	584.4	19.5	22 51	9 59	23 34	10 32
30 T	585.4	20.5	23 19	10 51	23 58	11 29
31 W	586.4	21.5	23 48	11 43	.....	12 26

LUNAR OCCULTATIONS

Occultations of all stars down to magnitude 7.5, visible from the three stations whose coordinates are tabulated below, are given in the following lists.

	Longitude	Latitude
Cape Town	-18°.475	-33°.933
Johannesburg	-28.075	-26.182
Salisbury	-31.040	-17.788

Explanation:

Z.C. - is the number in the "Catalogue of 3539 Zodical Stars for the equinox 1950.0" by James Robertson (U.S. Naval Observatory 1939). This is the catalogue most generally used by occultation observers. An "m" after the Z.C. number indicates that a star is not single.

Sp - is the spectral classification of the star.

Mag - is the visual magnitude.

Dec - is the Declination in 1950.0 coordinates.

Ph - is the Phase. D = Disappearance; R = Reappearance.

h.m. - is the time of the occultation in S.A.S.T.

The approximate time of an occultation at a place $\Delta\lambda$ degrees west and $\Delta\phi$ degrees north of one of the standard stations given above may be found from:

$$\text{Approximate time} = \text{predicted time} + a.\ \Delta\lambda + b.\ \Delta\phi$$

where a and b are in minutes of time.

P.A. - the position angle measured from the Moon's north point eastward around the limb.

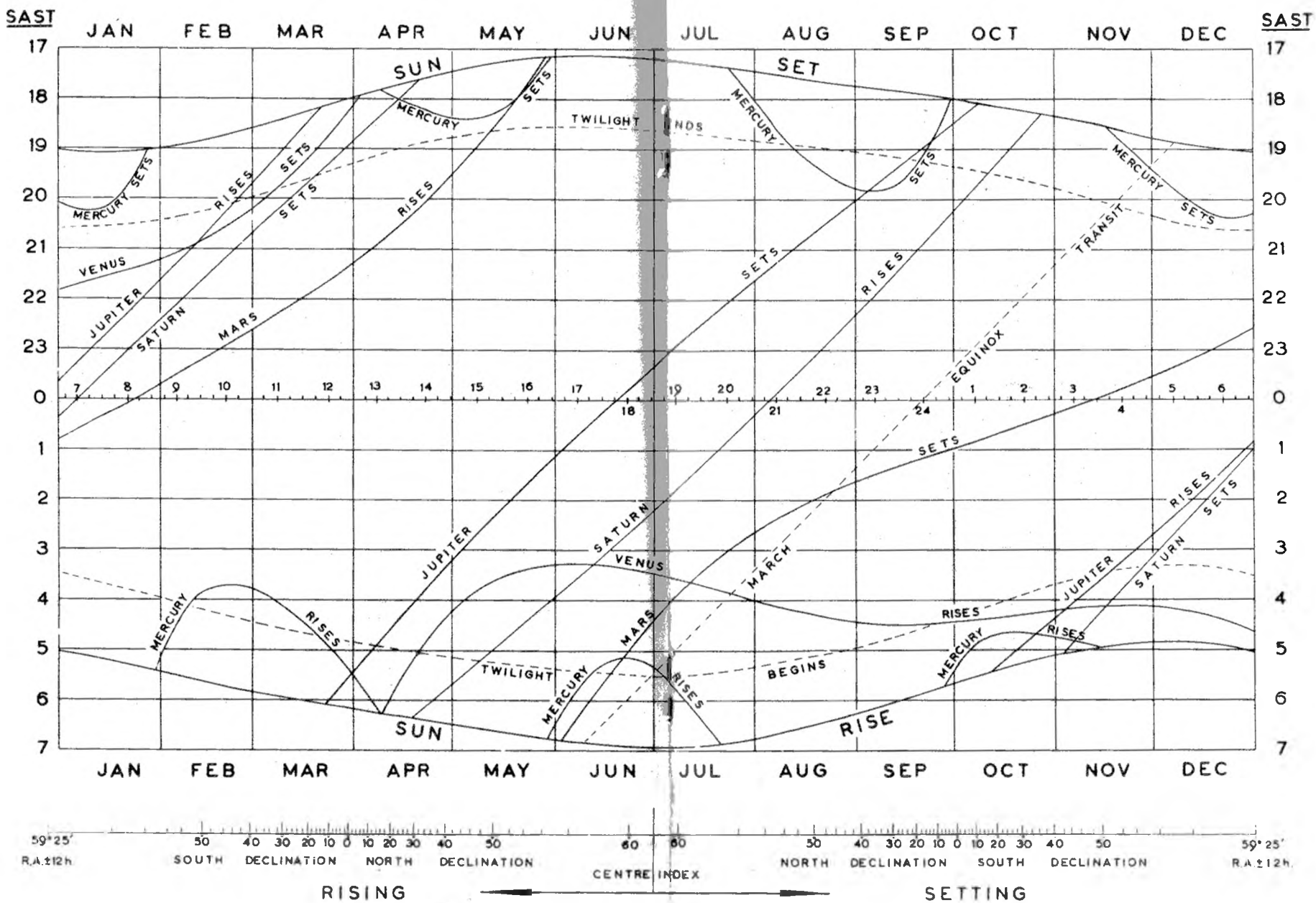
Index of occulted stars, brighter than magnitude 5.0					
Z.C.			Z.C.		
810	β	Tau	2366	α	Sco
1122	ι	Gem	2554	χ	Sgr
1149	υ	Gem	2617	38B	Sgr
1609	χ	Leo	3078	η	Cap
1644	σ	Leo	3190	δ	Cap
1712	β	Vir	3237	ι	Aqr
1925	α	Vir	3307	σ	Aqr
2268	A	Sco			

Date	Z.C.	Sp	Mag	(1950.0) Dec.	Ph	Cape Town P.A.	h.	m.	a	b	Johannesburg P.A.	h.	m.	a	b	Salisbury P.A.	h.	m.	a	b
Jan																				
2	810	B8	1.8	+28° 35'	D	140°	02	49.4	-0.3	-0.5	102°	02	55.8	-0.7	+0.5	73°	03	05.7	-1.1	+1.2
2	810	B8	1.8	+28 35	R	232	03	43.5	-1.6	+2.5	-	-	-	-	-	-	-	-	-	-
9	1644	AO	4.1	+06 12	D	198	03	33.8	-	-	151	03	14.1	-1.2	-2.3	127	03	01.8	-2.1	-1.7
9	1644	AO	4.1	+06 12	R	246	04	07.9	-	-	298	04	37.3	-2.2	-1.0	325	04	30.2	-1.5	-2.0
12	1971	KO	5.8	-12 16	R	0	04	43.6	+0.3	-3.4	-	-	-	-	-	-	-	-	-	-
16	2554	F8	4.4-5.0	-27 49	R	283	04	40.8	+0.1	-1.1	318	04	26.4	+0.5	-1.8	-	-	-	-	-
20	3310	FO	6.4	-11 04	D	70	20	28.4	-0.2	+1.4	-	-	-	-	-	-	-	-	-	-
21	3430	F2	5.7	-05 18	D	-	-	-	-	-	-	-	-	-	-	81	19	23.7	-0.9	+0.9
21	3437	AO	6.7	-04 51	D	-	-	-	-	-	75	20	24.7	-0.4	+1.2	-	-	-	-	-
27	603	F8	7.5	+26 08	D	-	-	-	-	-	-	-	-	-	-	44	19	35.3	-2.4	+1.8
27	616	FO	5.6	+26 24	D	86	22	25.1	-2.2	+0.9	67	22	54.8	-1.9	+1.6	39	23	18.9	-2.3	+2.9
29	897	A2	6.4	+28 57	D	-	-	-	-	-	-	-	-	-	-	152	22	33.9	-	-
Feb																				
6	1712	F8	3.8	+01 56	D	-	-	-	-	-	-	-	-	-	-	183	00	02.1	0.0	-3.8
6	1712	F8	3.8	+01 56	R	-	-	-	-	-	-	-	-	-	-	263	00	54.6	-3.6	0.0
11	2332	B9	6.2	-25 24	R	278	02	42.8	-0.3	-1.2	310	02	34.1	-0.1	-1.7	341	02	15.8	+0.6	-2.6
11	2366	MO,A3	1.2	-26 22	D	66	09	20.2	-2.0	+1.9	24	10	04.0	-	-	-	-	-	-	-
11	2366	MO,A3	1.2	-26 22	R	312	10	27.6	-1.9	-1.0	346	10	29.9	-	-	-	-	-	-	-
12	2505	K2	5.4	-28 07	R	220	04	27.7	-	-	271	04	43.1	-1.3	-0.8	302	04	36.5	-0.8	-1.6
20	196m	FO	6.9	+11 23	D	-	-	-	-	-	61	19	41.0	-0.9	+1.7	42	19	59.1	-0.7	+2.0
21	317	F5	6.4	+17 05	D	-	-	-	-	-	29	20	21.7	-1.2	+2.6	-	-	-	-	-
22	438m	A3	6.7	+21 30	D	132	20	20.3	-	-	107	20	34.6	-1.2	+0.3	83	20	44.0	-1.2	+0.9
23	569m	A3	5.4	+25 29	D	73	20	46.6	-2.0	+1.3	52	21	18.2	-1.8	+2.1	13	21	51.3	-	-
25	810	B8	1.8	+28 35	D	-	-	-	-	-	-	-	-	-	-	107	14	07.2	-1.0	-1.3
25	810	B8	1.8	+28 35	R	-	-	-	-	-	183	14	47.5	-	-	215	15	03.5	+0.1	+1.4
25	850	B5	6.0	+29 12	D	111	22	34.1	-1.4	+0.3	80	22	54.8	-1.6	+1.2	43	23	16.8	-2.6	+3.2
27	1119	FO	5.7	+27 42	D	169	20	38.6	-	-	139	20	39.2	-2.4	-1.8	116	20	34.7	-3.0	-1.1

Feb																				
27	1122	KO	3.9	+27°	52'	D	106°	20	51.8	-2.5	-0.7	84°	21	16.3	-3.1	+0.3	53°	21	37.7	-	-
27	1132	KO	6.6	+27	37	D	115	23	04.7	-1.8	-0.1	79	23	28.8	-2.5	+1.2	-	-	-	-	-
Mar																				
7	1925	B2	1.2	-11	00	D	131	08	33.8	-0.4	-0.2	107	06	36.3	0.0	+0.2	-	-	-	-	-
7	1925	B2	1.2	-11	00	R	275	09	28.9	+0.1	+0.8	-	-	-	-	-	-	-	-	-	-
8	2017	KO	6.4	-14	50	R	333	01	07.9	-0.4	-2.4	-	-	-	-	-	-	-	-	-	-
9	2269	B5	5.4	-24	27	R	233	23	45.5	-0.9	0.0	273	23	46.8	-0.4	-0.9	298	23	38.6	0.0	-1.2
10	2286	B8	5.4	-24	45	R	281	02	00.3	-0.9	-1.3	318	01	54.7	-0.5	-2.1	355	01	31.9	+0.8	-3.7
10	2298	KO	5.1	-25	47	R	-	-	-	-	-	-	-	-	-	-	247	05	11.9	-3.5	+1.7
12	2617	KO	4.7	-28	28	R	254	03	06.0	-0.9	-0.5	292	03	05.9	-0.7	-1.5	328	04	49.8	-0.1	-2.8
12	2631	AOp	6.4	-28	55	R	-	-	-	-	-	214	02	49.7	-	-	258	05	10.3	-2.6	+0.2
23	638	KO	5.1	+27	17	D	49	19	09.1	-2.2	+1.9	10	19	58.9	-	-	-	-	-	-	-
24	788	FO	6.9	+28	53	D	114	21	04.1	-1.0	+0.4	-	-	-	-	-	-	-	-	-	-
26	1081	B9	6.2	+28	14	D	138	22	14.7	-0.6	-0.4	101	22	24.2	-1.2	+0.5	66	22	37.5	-2.0	+1.8
27	1206	KO	5.9	+25	29	D	-	-	-	-	-	-	-	-	-	-	166	23	31.9	+0.7	-2.3
Apr																				
5	2227	KO	5.8	-23	03	R	359	23	19.1	+1.1	-3.5	-	-	-	-	-	-	-	-	-	-
6	2237	KO	5.1	-23	43	R	279	01	13.8	-1.6	-1.0	318	01	15.0	-1.1	-2.2	356	00	51.4	+0.4	-4.3
7	2405	AO	6.4	-27	24	R	-	-	-	-	-	235	01	54.8	-3.4	+1.8	275	02	05.8	-2.4	-0.5
7	2545	A5	6.4	-27	52	R	320	23	07.0	+0.7	-1.9	-	-	-	-	-	-	-	-	-	-
20	731	F2	5.9	+27	51	D	-	-	-	-	-	-	-	-	-	-	164	18	52.5	-	-
22	1032	KO	5.5	+29	00	D	73	19	46.8	-2.3	+1.4	-	-	-	-	-	-	-	-	-	-
23	1149	K5	4.2	+26	58	D	-	-	-	-	-	172	19	21.1	-	-	137	19	05.6	-1.4	-1.4
24	1270	A5	6.1	+24	15	D	140	19	12.1	-1.6	-1.2	107	19	25.4	-2.4	-0.2	77	19	36.8	-3.8	+1.1
24	1274	FO	5.7	+24	11	D	70	21	11.9	-3.0	+1.8	-	-	-	-	-	-	-	-	-	-
26	1479	FO	6.3	+15	54	D	48	18	36.7	-	-	-	-	-	-	-	-	-	-	-	-
26	1479	FO	6.3	+15	54	R	18	18	58.7	-	-	-	-	-	-	-	-	-	-	-	-
26	1485	F8	7.2	+15	19	D	116	20	09.7	-2.1	-0.9	71	20	38.0	-	-	-	-	-	-	-
28	1696	F5	7.0	+02	32	D	-	-	-	-	-	-	-	-	-	-	166	22	25.1	-0.6	-2.7

THE PLANETS AS SEEN FROM SOUTH AFRICA 1969

FOR EXPLANATION SEE NOTES ON PLANETS



Date	Z.C.	Sp	Mag	(1950.0) Dec.	Ph	Cape Town P.A.	h.	m.	a	b	Johannesburg P.A.	h.	m.	a	b	Salisbury P.A.	h.	m.	a	b
May																				
1	1925	B2	1.2	-11° 00'	D	159°	01	07.2	-0.9	-2.3	118°	01	10.1	-1.7	-0.6	82°	01	17.2	-2.4	+1.0
1	1925	B2	1.2	-11 00	R	272	02	10.6	-1.8	+0.9	308	02	25.3	-1.2	-0.6	343	02	15.5	-0.9	-2.7
4	2366	MO,A3	1.2	-26 22	D	67	04	56.9	-1.4	+1.8	41	05	26.5	-0.3	+3.3	-	-	-	-	-
4	2366	MO,A3	1.2	-26 22	R	305	06	00.6	-1.4	-0.3	325	06	08.7	-1.7	-1.6	-	-	-	-	-
4	2505	K2	5.4	-28 07	R	217	23	11.2	-	-	270	23	28.7	-1.4	-0.7	301	23	22.8	-0.9	-1.5
9	3190	A5	3.0	-16 16	D	0	06	17.4	-	-	-	-	-	-	-	-	-	-	-	-
18	810	B8	1.8	+28 35	D	-	-	-	-	-	-	-	-	-	-	147	16	38.7	-0.3	-2.2
18	810	B8	1.8	+28 35	R	-	-	-	-	-	-	-	-	-	-	229	17	31.3	-2.4	+2.7
22	1342	G5	7.5	+21 17	D	-	-	-	-	-	-	-	-	-	-	172	18	37.4	+0.1	-3.0
Jun																				
2	2617	KO	4.7	-28 28	R	244	01	22.4	-2.2	+0.9	274	01	47.7	-2.4	-0.1	307	01	47.9	-2.9	-2.0
6	3268	KO	5.6	-12 59	R	267	01	59.8	-0.9	-1.0	302	01	57.4	-1.8	-3.6	-	-	-	-	-
9	98	G5	6.2	+06 34	R	190	05	57.1	-0.1	+2.2	-	-	-	-	-	-	-	-	-	-
20	1506	GO	7.1	+12 47	D	-	-	-	-	-	-	-	-	-	-	176	18	52.0	+0.3	-3.1
21	1609	FO	4.7	+07 30	D	128	18	57.4	-1.6	-0.9	81	19	18.7	-3.2	+1.4	-	-	-	-	-
22	1716	A5	6.4	+00 43	D	120	22	10.8	-0.9	0.0	80	22	25.7	-1.0	+1.6	-	-	-	-	-
23	1817	K2	6.9	-05 56	D	-	-	-	-	-	-	-	-	-	-	148	22	46.0	-0.7	-1.6
24	1925	B2	1.2	-11 00	D	121	19	33.9	-1.8	-1.3	70	19	58.3	-	-	-	-	-	-	-
24	1925	B2	1.2	-11 00	R	319	20	54.9	-1.5	-1.5	8	20	42.2	-	-	-	-	-	-	-
26	2183	K2	5.7	-22 17	D	141	20	33.5	-1.1	-2.2	100	20	38.8	-2.4	-0.6	58	20	53.4	-	-
28	2366	MO,A3	1.2	-26 22	D	67	01	38.7	-1.2	+1.8	44	02	05.3	-0.2	+2.9	-	-	-	-	-
28	2373	KO	6.2	-26 29	D	82	02	32.0	-0.9	+1.2	67	02	49.4	-0.3	+1.5	39	03	05.9	+0.5	+2.6
28	2366	MO,A3	1.2	-26 22	R	302	02	40.9	-1.3	-0.1	320	02	49.3	-1.4	-1.1	-	-	-	-	-
28	2505	K2	5.4	-28 07	D	-	-	-	-	-	143	18	46.9	+0.1	-2.3	112	18	32.9	-0.4	-1.1
Jul																				
2	3078	A3	4.9	-19 59	R	233	05	30.8	-0.9	+1.8	232	05	52.5	-0.6	+1.7	-	-	-	-	-
10	538	B8	5.6	+24 45	R	-	-	-	-	-	240	04	49.9	-0.5	0.0	259	04	52.0	-1 2	-0.2

Jul																				
21	1887	KO	6.4	-09°	33'	D	97°	19	47.5	-2.2	+0.4	-	-	-	-	-	-	-	-
21	1888	K2	6.2	-10	10	D	-	-	-	-	-	-	-	-	-	163°	21	20.4	-0.8	-2.7
21	1900	K5	7.2	-10	13	D	103	23	26.1	-0.3	+0.6	-	-	-	-	-	-	-	-
22	2018	A2	6.4	-16	12	D	138	00	02.8	-0.6	-0.5	-	-	-	-	-	-	-	-
23	2134f	K5	6.1	-21	17	D	169	23	17.9	-	-	135°	23	16.7	-1.2	-0.9	106	23	16.5	-0.9	0.0
24	2268	B3	4.8	-25	14	D	187	21	34.4	-	-	131	21	22.3	-2.1	-1.6	99	21	22.5	-2.4	-0.1
24	2273	B8	5.9	-25	09	D	133	21	35.4	-1.9	-1.6	101	21	49.9	-2.1	0.0	69	22	03.0	-2.0	+1.6
26	2470	B9	6.1	-27	44	D	103	03	30.3	-0.2	+0.6	-	-	-	-	-	-	-	-	-
26	2474	F2	6.6	-27	46	D	117	04	07.2	-0.2	+0.3	-	-	-	-	-	-	-	-	-
26	2617	KO	4.7	-28	28	D	104	21	31.7	-1.9	-1.0	73	21	52.6	-2.4	+0.7	38	22	15.4	-2.2	+3.2
27	2644	F8	6.3	-28	18	D	125	02	19.9	-1.8	-0.4	117	02	32.9	-1.2	-0.1	96	02	37.3	-0.7	+0.3
31	3307	AO	4.9	-10	50	R	190	04	05.1	-0.2	+2.8	186	04	28.8	+0.1	+3.0	201	04	52.5	-0.2	+2.5
Aug																				
15	1658	FO	6.4	+04	02	D	131	19	15.0	-0.3	-0.2	-	-	-	-	-	-	-	-
18	1968	GO	6.9	-14	04	D	127	19	48.4	-1.3	-0.5	95	20	01.6	-1.1	+0.6	56	20	18.3	-0.8	+3.2
19	2095	KO	7.2	-19	48	D	114	22	38.0	-0.6	+0.2	97	22	45.5	-0.1	+0.6	-	-	-	-
20	2220f	A3	7.0	-24	23	D	-	-	-	-	-	-	-	-	-	-	173	21	13.9	-	-
22	2536	F5	7.4	-28	24	D	74	19	51.2	-2.3	+0.5	38	20	29.4	-2.1	+3.7	-	-	-	-	-
22	2540	B8	7.0	-28	55	D	-	-	-	-	-	-	-	-	-	-	129	21	21.1	-3.0	-1.9
23	2727	B9	7.2	-28	19	D	-	-	-	-	-	-	-	-	-	-	117	21	18.1	-3.2	-1.4
23	2743m	A5	7.4	-27	48	D	118	23	47.3	-2.3	-0.5	109	24	06.0	-1.8	0.0	88	24	13.5	-1.2	+0.6
26	3078	A3	4.9	-19	59	D	90	01	31.8	-1.9	+0.7	91	01	55.4	-1.6	+0.7	76	02	07.0	-1.1	+1.0
Sep																				
18	2505	K2	5.4	-28	07	D	60	21	23.9	-0.9	+2.0	47	21	46.5	-0.1	+2.3	14	22	11.2	-	-
19	2660	A2	6.1	-28	27	D	-	-	-	-	-	-	-	-	-	-	24	18	38.9	-	-
23	3307	AO	4.9	-10	50	D	82	22	56.2	-2.4	+0.3	83	23	24.7	-2.6	+0.6	68	23	40.0	-2.1	+1.2
29	518m	A2	5.9	+24	22	R	-	-	-	-	-	-	-	-	-	-	275	22	42.8	-1.1	-0.8
30	529	AO	6.2	+25	14	R	263	02	39.2	-2.2	-0.3	263	03	03.7	-2.8	+0.2	270	03	13.2	-3.6	-0.3

Date	Z.C.	Sp	Mag	(1950.0) Dec.	Ph	Cape Town P.A.	h.	m.	a	b	Johannesburg P.A.	h.	m.	a	b	Salisbury P.A.	h.	m.	a	b
Oct																				
1	810	B8	1.8	+28° 35'	R	-		-	-	-	-		-	-	-	214°	23	51.3	+0.5	+1.3
2	824	F5	6.2	+29 10	R	-		-	-	-	278	02	06.5	-2.0	-1.0	298	02	01.9	-3.0	-1.9
16	2617	KO	4.7	-28 28	D	-		-	-	-	90	19	28.1	-1.6	+0.7	69	19	40.8	-1.0	+1.2
16	2643	KO	6.7	-27 44	D	31°	23	21.4	+0.8	+2.2	-		-	-	-	-		-	-	-
17	2796	KO	6.8	-27 10	D	-		-	-	-	-		-	-	-	20	18	22.2	-0.9	+4.2
17	2805	FO	7.0	-26 56	D	77	19	49.1	-1.8	+1.0	70	20	14.4	-1.3	+1.3	52	20	30.8	-0.7	+1.7
17	2824	K2	7.4	-26 14	D	69	23	39.1	0.0	+1.4	66	23	48.0	+0.2	+1.2	-		-	-	-
20	3237	B8	4.4	-14 01	D	-		-	-	-	-		-	-	-	64	18	21.2	-2.2	+0.8
20	3245	F5	6.9	-13 27	D	71	19	40.6	-2.0	+0.3	65	20	07.1	-2.2	+1.0	48	20	25.6	-1.8	+1.8
21	3267	G5	7.2	-11 48	D	46	01	22.2	-0.3	+1.9	43	01	37.9	0.0	+1.7	-		-	-	-
21	3383	MO	6.5	-06 44	D	90	21	18.5	-2.8	-0.2	92	21	47.8	-3.3	+0.1	77	22	01.4	-2.7	+0.9
27	616	FO	5.6	+26 24	R	177	23	51.4	-	-	179	24	06.9	-	-	205	24	32.3	-1.0	+2.4
Nov																				
8	1925	B2	1.2	-11 00	D	124	05	15.1	0.0	-1.6	104	05	04.3	-0.2	-1.2	80	04	58.2	-0.5	-0.3
8	1925	B2	1.2	-11 00	R	299	06	12.4	-0.2	-1.6	323	06	00.9	-0.2	-2.0	348	05	41.7	+0.2	-2.6
11	2366	MO,A3	1.2	-26 22	D	52	12	11.4	-	-	-		-	-	-	-		-	-	-
11	2366	MO,A3	1.2	-26 22	R	347	12	54.2	-	-	-		-	-	-	-		-	-	-
17	3222	F5	7.1	-13 10	D	0	00	10.3	+0.6	+2.9	-		-	-	-	-		-	-	-
27	1022m	B8	5.8	+28 18	R	-		-	-	-	-		-	-	-	211	01	51.0	-	-
27	1026	KO	6.5	+28 14	R	-		-	-	-	-		-	-	-	224	03	26.8	-	-
28	1149	K5	4.2	+26 58	D	38	02	27.4	-	-	-		-	-	-	-		-	-	-
28	1149	K5	4.2	+26 58	R	351	03	06.3	-	-	-		-	-	-	-		-	-	-
28	1251	AO	5.9	+24 07	R	-		-	-	-	-		-	-	-	332	23	07.1	-1.9	-3.4
Dec																				
12	3014	G5	7.3	-21 06	D	-		-	-	-	353	19	31.8	-	-	-		-	-	-
13	3181	A5	5.9	-14 53	D	44	22	37.1	+0.1	+1.7	-		-	-	-	-		-	-	-
16	30	AO	7.0	+04 05	D	96	23	00.5	-1.3	+1.0	87	23	18.8	-0.7	+1.0	68	23	30.4	-0.5	+1.2
19	387	G5	6.9	+20 27	D	-		-	-	-	31	19	52.7	-1.1	+1.6	17	20	13.7	-0.8	+2.7
23	810	B8	1.8	+28 35	D	-		-	-	-	-		-	-	-	146	01	08.8	-	-
23	810	B8	1.8	+28 35	R	-		-	-	-	-		-	-	-	228	02	08.5	-	-

PERIGEE

Date	S. D.	H. P.
Jan 17^{d} 02^{h}	16' 38"	61' 02"
Feb 14 06	16 24	60 11
Mar 13 04	16 10	59 22
Apr 7 02	16 14	59 33
May 4 13	16 28	60 24
Jun 1 17	16 39	61 07
Jun 30 02	16 44	61 26
Jul 28 11	16 42	61 16
Aug 25 17	16 32	60 40
Sep 22 13	16 18	59 49
Oct 18 06	16 09	59 15
Nov 13 04	16 19	59 52
Dec 11 02	16 34	60 47

APOGEE

Date	S. D.	H. P.
Jan 1^{d} 17^{h}	14' 42"	53' 58"
Jan 29 05	14 44	54 04
Feb 26 00	14 46	54 11
Mar 25 20	14 47	54 14
Apr 22 16	14 46	54 10
May 20 07	14 44	54 03
Jun 16 17	14 42	53 57
Jul 13 20	14 42	53 56
Aug 10 03	14 43	54 00
Sep 6 17	14 45	54 08
Oct 4 11	14 47	54 14
Nov 1 08	14 46	54 13
Nov 29 03	14 45	54 07
Dec 26 19	14 43	54 00

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. The Moon is at Perigee when it is closest to the Earth in its orbit, and at Apogee when it reaches its furthest point.

MAXIMUM LIBRATION

Longitude				Latitude			
+ West Limb exposed - East Limb exposed				+ North Limb exposed - South Limb exposed			
Jan 10	-7.°0	Jul 6	+7.°6	Jan 3	-6.°6	Jun 29	+6.°5
Jan 22	+7.2	Jul 22	-7.5	Jan 16	+6.5	Jul 12	-6.6
Feb 7	-5.8	Aug 3	+7.5	Jan 30	-6.7	Jul 26	+6.6
Feb 19	+6.0	Aug 18	-6.4	Feb 12	+6.7	Aug 8	-6.7
Mar 5	-5.1	Aug 31	+6.7	Feb 26	-6.8	Aug 22	+6.7
Mar 19	+4.9	Sep 14	-5.2	Mar 12	+6.8	Sep 4	-6.8
Apr 1	-5.5	Sep 28	+5.7	Mar 25	-6.8	Sep 18	+6.8
Apr 14	+4.8	Oct 11	-5.0	Apr 8	+6.7	Oct 1	-6.8
Apr 28	-6.6	Oct 25	+5.0	Apr 21	-6.8	Oct 16	+6.7
May 11	+5.8	Nov 7	-5.7	May 5	+6.6	Oct 29	-6.7
May 26	-7.5	Nov 20	+5.2	May 19	-6.6	Nov 12	+6.6
Jun 7	+7.0	Dec 5	-6.9	Jun 1	+6.5	Nov 25	-6.6
Jun 24	-7.9	Dec 17	+6.4	Jun 15	-6.6	Dec 9	+6.5
						Dec 22	-6.6

PHASES OF THE MOON

Lunation	New Moon	First Quarter	Full Moon	Last Quarter
569	-	-	Jan 3d 20h 28m	Jan 11d 16h 01m
570	Jan 18d 06h 59m	Jan 25d 10h 24m	Feb 2 14 56	Feb 10 02 09
571	Feb 16 18 26	Feb 24 06 31	Mar 4 07 18	Mar 11 09 45
572	Mar 18 06 52	Mar 26 02 49	Apr 2 20 46	Apr 9 15 59
573	Apr 16 20 16	Apr 24 21 45	May 2 07 14	May 8 22 12
574	May 16 10 27	May 24 14 16	May 31 15 19	Jun 7 05 40
575	Jun 15 01 09	Jun 23 03 45	Jun 29 22 04	Jul 6 15 18
576	Jul 14 16 12	Jul 22 14 10	Jul 29 04 46	Aug 5 03 39
577	Aug 13 07 17	Aug 20 22 04	Aug 27 12 33	Sep 3 18 58
578	Sep 11 21 56	Sep 19 04 25	Sep 25 22 22	Oct 3 13 06
579	Oct 11 11 40	Oct 18 10 32	Oct 25 10 45	Nov 2 09 14
580	Nov 10 00 12	Nov 16 17 46	Nov 24 01 54	Dec 2 05 51
581	Dec 9 11 43	Dec 16 03 10	Dec 23 19 36	-

the planets 1969

The Chart (Centre pages) shows the S.A.S.T. of the rising and setting of the Sun and planets for position 30^{o} E, 30^{o} 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.

Along the midnight line are numerals that indicate the sidereal time at midnight; in other words. the right ascension of an object on the meridian at midnight on the date in question.

The scale at the bottom of the chart is for finding rising or setting times of any object whose right ascension and declination are known. Set dividers or a strip of

paper from the index at the centre of the scale to the object's declination and in the direction desired for either rising or setting. Measure this same distance and direction along the midnight line, beginning at the object's right ascension indicated by the numerals. Should this end point fall outside the chart, 12 hours should be added to or subtracted from the right ascension. Reset the dividers using the end of the scale instead of the centre index, and measuring in the opposite direction to that first used. Through the point established draw a line parallel to the March Equinox transit line (indicated by the dashed line on the chart). The point of intersection of this line with the time scale down the sides of the diagram will show the time of rising or setting of the object at latitude 30° South. The approximate positions of the planets in the constellations, given in the table overleaf, are intended for identification purposes.

Mercury can best be seen near its greatest elongation, (see Astronomical Diary). The largest western elongation occurs on February 23 when the planet will rise about two hours before sunrise (mag 0.3). The best evening visibility will occur on September 3 (mag 0.4) setting about two hours after sunset. The planet will be brightest about August 9 (mag -1.7). Close conjunction with the Moon takes place on March 16 and August 15.

Venus reaches greatest elongation east on January 27. It then moves westward relative to the Sun reaching inferior conjunction on April 8. Its greatest brilliancy occurs on March 3 (mag -4.3). About mid-April it appears as a morning object in the east, rising progressively earlier than the Sun and reaching greatest brilliancy on May 14 (mag -4.2) and greatest western elongation on June 17. An occultation will occur on January 21.

Mars will be very prominent during the year as opposition occurs on May 31 (mag -1.9). The nearest approach to the Earth takes place on June 9 when the planet will be at a distance of 0.48 astronomical units. (semi-diameter 9.76"). This opposition will be particularly favourable to southern hemisphere observers, because of the planet's large southern declination at the time. The planet then recedes from the Earth and at the end of the year sets about 3½ hours after sunset.

Jupiter is at opposition on March 21 (mag -2.0). The polar disc will then subtend an angle of 41" and the planet will be 414 million miles away. Thereafter Jupiter appears to move closer to the Sun and at the end of September will be lost in the evening twilight. Conjunction with the Sun takes place on October 10 after which it rises before sunrise.

At the beginning of the year Saturn sets about midnight. Early in April it will be lost in the evening twilight, conjunction with the Sun taking place on April 18. After this it rises before sunrise and increases in brightness, reaching a maximum of 0.1 magnitude at opposition on October 29. The polar diameter will then subtend an angle of 18" and the planet will be 766 million miles away. The rings will appear widest (13.94") at the end of September, their southern surface being observed.

Optical aid is required to observe Uranus and Neptune. The opposition of the former occurs on March 22 (mag 5.7) and the opposition of the latter occurs on May 18 (mag 7.7).

THE PLANETS IN THE CONSTELLATIONS

MONTH	VENUS	MARS	JUPITER	SATURN
January	Aquarius	Libra	Virgo	Pisces
February	Pisces	Libra	Virgo	Pisces
March	Pisces	Ophiuchus	Virgo	Pisces
April	Pisces	Ophiuchus	Virgo	Pisces
May	Pisces	Ophiuchus	Virgo	Pisces
June	Aries	Scorpio	Virgo	Aries
July	Taurus	Scorpio	Virgo	Aries
August	Gemini	Scorpio	Virgo	Aries
September	Leo	Sagittarius	Virgo	Aries
October	Virgo	Sagittarius	Virgo	Aries
November	Virgo	Capricornus	Virgo	Aries
December	Ophiuchus	Aquarius	Virgo	Aries

EPHEMERIDES FOR URANUS AND NEPTUNE

DATE	URANUS		NEPTUNE	
	R.A.	Dec.	R.A.	Dec.
Jan 1	$12^h\ 15.8^m$	$-\ 0^o\ 54'$	$15^h\ 43.6^m$	$-\ 18^o\ 02'$
21	12 15.6	− 0 52	15 45.8	− 18 08
Feb 10	12 14.2	− 0 42	15 47.1	− 18 12
Mar 2	12 11.7	− 0 25	15 47.5	− 18 12
22	12 08.6	− 0 05	15 47.0	− 18 09
Apr 11	12 05.5	+ 0 15	15 45.7	− 18 04
May 1	12 02.9	+ 0 31	15 43.8	− 17 58
21	12 01.2	+ 0 42	15 41.7	− 17 50
Jun 10	12 00.7	+ 0 44	15 39.5	− 17 43
30	12 01.5	+ 0 38	15 37.7	− 17 38
Jul 20	12 03.6	+ 0 23	15 36.5	− 17 35
Aug 9	12 06.7	+ 0 02	15 36.2	− 17 35
29	12 10.6	− 0 24	15 36.6	− 17 38
Sep 18	12 15.0	− 0 53	15 38.0	− 17 44
Oct 8	12 19.6	− 1 23	15 40.1	− 17 51
28	12 24.1	− 1 51	15 42.7	− 18 01
Nov 17	12 28.0	− 2 16	15 45.7	− 18 11
Dec 7	12 31.0	− 2 35	15 48.8	− 18 21
27	12 32.9	− 2 46	15 51.6	− 18 29

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

THE SATELLITES OF JUPITER

Details of phenomena, occurring between the end of Astronomical Twilight and Midnight, and when the planet is above the horizon in Southern Africa, are tabulated below. The predicted times are for mid-phenomena and are not instantaneous.

Explanation of Table:

The date and time of the phenomenon are given.

Sat. - is the satellite concerned: I - Io III - Ganymede
II - Europa IV - Callisto

Phen. - is the particular phenomenon. The first column gives the type.

Ec - Eclipse: the satellite passes through the shadow of Jupiter.

Oc - Occultation: the satellite is obscured by the disc of Jupiter.

Tr - Transit: the satellite crosses the disc of Jupiter.

Sh - Shadow transit: the shadow of the satellite transits the disc.

The second column gives the phase of the phenomenon.

D - Disappearance R - Reappearance
I - Ingress E - Egress

	S.A.S.T.	Sat	Phen		S.A.S.T.	Sat	Phen
Jan 16	22h 49m	I	Tr I	Feb 20	22h 51m	II	Oc R
16	23 54	I	Sh E	23	22 43	I	Ec D
23	23 33	I	Sh I	24	20 40	I	Tr I
25	23 02	III	Oc R	24	22 18	I	Sh E
31	22 35	I	Ec D	24	22 52	I	Tr E
Feb 1	22 10	I	Sh E	26	21 42	III	Sh I
1	22 50	III	Ec R	27	21 26	II	Ec D
1	23 07	I	Tr E	Mar 3	21 58	I	Sh I
1	23 51	III	Oc D	3	22 24	I	Tr I
4	21 17	II	Sh E	4	21 43	I	Oc R
4	23 06	II	Tr E	8	20 50	II	Sh E
8	21 49	I	Sh I	8	21 26	II	Tr E
8	22 42	I	Tr I	10	23 52	I	Sh I
8	23 42	III	Ec D	11	20 59	I	Ec D
9	22 02	I	Oc R	11	23 27	I	Oc R
11	21 10	II	Sh I	12	20 34	I	Sh E
11	22 51	II	Tr I	12	20 47	I	Tr E
11	23 51	II	Sh E	15	20 44	II	Sh I
15	23 42	I	Sh I	15	21 04	II	Tr I
16	23 48	I	Oc R	15	23 25	II	Sh E
17	21 07	I	Tr E	15	23 41	II	Tr E
18	23 44	II	Sh I	16	22 55	III	Oc R
19	20 39	III	Tr I	18	22 53	I	Ec D
19	20 48	III	Sh E	19	20 14	I	Sh I
19	23 23	III	Tr E	19	20 18	I	Tr I

Mar	19	22	28	I	Sh	E	Apr	26	23	37	I	Ec	R
	19	22	30	I	Tr	E		27	20	07	I	Tr	E
	20	19	37	I	Oc	R		27	20	55	I	Sh	E
	22	23	19	II	Tr	I		28	19	00	III	Oc	R
	22	23	20	II	Sh	I		28	19	23	III	Ec	D
	23	23	25	III	Oc	D		28	22	20	III	Ec	R
	24	21	09	II	Ec	R		30	23	54	II	Tr	I
	26	22	01	I	Tr	I	May	2	18	54	II	Oc	D
	26	22	08	I	Sh	I		2	23	19	II	Ec	R
	27	21	30	I	Ec	R		3	22	23	I	Oc	D
	31	20	36	II	Oc	D		4	19	42	I	Tr	I
	31	23	44	II	Ec	R		4	20	37	I	Sh	I
Apr	2	23	45	I	Tr	I		4	21	55	I	Tr	E
	3	20	33	III	Sh	E		4	22	49	I	Sh	E
	3	20	52	I	Oc	D		5	19	34	III	Oc	D
	3	23	24	I	Ec	R		5	20	00	I	Ec	R
	4	20	24	I	Tr	E		5	22	32	III	Oc	R
	4	20	44	I	Sh	E		5	23	23	III	Ec	D
	7	22	51	II	Oc	D		9	21	16	II	Oc	D
	9	19	35	II	Tr	E		11	20	13	II	Sh	E
	9	20	30	II	Sh	E		11	21	31	I	Tr	I
	10	19	43	III	Tr	I		11	22	31	I	Sh	I
	10	21	33	III	Sh	I		11	23	43	I	Tr	E
	10	22	34	III	Tr	E		12	21	55	I	Ec	R
	10	22	37	I	Oc	D		12	23	08	III	Oc	D
	11	19	56	I	Tr	I		13	19	12	I	Sh	E
	11	20	25	I	Sh	I		16	20	20	III	Sh	E
	11	22	09	I	Tr	E		16	23	40	II	Oc	D
	11	22	38	I	Sh	E		18	20	10	II	Sh	I
	12	19	48	I	Ec	R		18	20	36	II	Tr	E
	16	19	44	II	Tr	I		18	22	50	II	Sh	E
	16	20	25	II	Sh	I		18	23	20	I	Tr	I
	16	21	52	II	Tr	E		19	20	28	I	Oc	D
	16	23	06	II	Sh	E		19	23	50	I	Ec	R
	17	23	03	III	Tr	I		20	18	55	I	Sh	I
	18	21	42	I	Tr	I		20	20	01	I	Tr	E
	18	22	19	I	Sh	I		20	21	07	I	Sh	E
	18	23	54	I	Tr	E		23	19	43	III	Tr	E
	19	21	42	I	Ec	R		23	21	26	III	Sh	I
	20	19	01	I	Sh	E		25	20	24	II	Tr	I
	23	21	33	II	Tr	I		25	22	48	II	Sh	I
	23	23	02	II	Sh	I		25	23	05	II	Tr	E
	25	20	44	II	Ec	R		26	22	20	I	Oc	D
	25	23	28	I	Tr	I		27	19	39	I	Tr	I
	26	20	35	I	Oc	D		27	20	20	II	Ec	R

	27	20	49	I	Sh I
	27	21	52	I	Tr E
	27	23	01	I	Sh E
	28	20	14	I	Ec R
	30	20	28	III	Tr I
	30	23	30	III	Tr E
Jun	1	22	56	II	Tr I
	3	19	04	IV	Tr I
	3	20	15	IV	Tr E
	3	21	31	I	Tr I
	3	22	44	I	Sh I
	3	22	54	II	Ec R
	3	23	44	I	Tr E
	4	18	40	I	Oc D
	4	22	09	I	Ec R
	5	19	24	I	Sh E
	10	19	20	III	Ec D
	10	20	20	II	Oc D
	10	22	12	III	Ec R
	10	23	24	I	Tr I
	11	20	34	I	Oc D
	12	19	07	I	Sh I
	12	20	00	II	Sh E
	12	20	05	I	Tr E
	12	21	19	I	Sh E
	17	21	10	III	Oc R
	17	22	54	II	Oc D
	17	23	19	III	Ec D
	18	22	29	I	Oc D
	19	19	49	I	Tr I
	19	20	00	II	Sh I
	19	20	05	II	Tr E
	19	21	02	I	Sh I
	19	21	59	I	Tr E
	19	22	38	II	Sh E
	19	23	13	I	Sh E
	20	20	29	I	Ec R
	24	22	06	III	Oc D
	26	20	02	II	Tr I
	26	21	42	I	Tr I
	26	22	37	II	Sh I
	26	22	44	II	Tr E
	26	22	56	I	Sh I
	27	22	24	I	Ec R
	28	19	36	I	Sh E
	28	19	54	II	Ec R
	28	20	10	III	Sh E
	28	22	34	IV	Oc D
Jul	3	22	43	II	Tr I
	4	20	50	I	Oc D
	5	19	20	I	Sh I
	5	19	20	III	Tr E
	5	20	20	I	Tr E
	5	21	21	III	Sh I
	5	21	31	I	Sh E
	5	22	29	II	Ec R
	6	18	48	I	Ec R
	12	20	04	II	Oc D
	12	20	04	I	Tr I
	12	20	25	III	Tr I
	12	21	14	I	Sh I
	12	22	17	I	Tr E
	13	20	43	I	Ec R
	14	19	49	II	Sh E
	19	22	01	I	Tr I
	20	19	16	I	Oc D
	21	18	44	I	Tr E
	21	19	48	II	Sh I
	21	19	49	I	Sh E
	21	20	12	II	Tr E
	23	19	18	III	Ec D
	27	21	15	I	Oc D
	28	19	32	I	Sh I
	28	20	15	II	Tr I
	28	20	42	I	Tr E
	29	19	02	I	Ec R
	30	18	57	III	Oc D
	30	19	29	II	Ec R
Aug	4	20	28	I	Tr I
	5	20	57	I	Ec R
	10	20	00	III	Sh E
	12	19	45	I	Oc D
	13	19	10	I	Tr E
	13	20	01	I	Sh E
	13	20	16	II	Oc D
	15	19	37	II	Sh E
	20	18	57	I	Tr I
	20	19	44	I	Sh I
	21	19	15	I	Ec R
	22	19	36	II	Sh I

meteor calendar 1969

Date	Shower	Radiant R.A.	Radiant Dec	Maximum Date	Maximum Hourly Rate	Maximum Transit of Radiant
Jan 3	Quadrantids	227°	+ 46°	Jan 3	40	08h 30m
Mar 12 -Apr 25	Hydraids	184	- 27	Mar 25	?	00 00
Mar 1 -May 10	Virginids	200	- 6	Apr 3	?	00 00
Apr 2 -Apr 24	Lyrids	273	+ 35	Apr 21	12	04 00
Apr 29 -May 21	Eta Aquarids	338	- 1	May 3	10	07 36
Apr 20 -Jul 30	Sco - Sgr System	270	- 30	Jun 14	?	00 30
Jul 25 -Aug 10	Delta Aquarids	343	- 17	Jul 28	20	02 00
Jul 18 -Jul 30	Alpha Capricornids	304	- 12	?	?	.....
Jul 20 -Aug 19	Perseids	43	+ 56	Aug 12	50	05 36
Aug 16 -Oct 8	Piscids	0	+ 14	Sep 12	?	00 30
Oct 11 -Oct 30	Orionids	94	+ 16	Oct 21	20	04 24
Sep 24 -Dec 10	Taurids	58	+ 21	Nov 13	6	00 36
Nov 16	Leonids	151	+ 21	Nov 16	6	06 32
Dec 5 -Dec 15	Geminids	113	+ 30	Dec 13	30	02 00
Dec 5 -Jan 7	Velaids	149	- 51	Dec 29	?	03 30

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.

meteor calendar 1969

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

eclipses 1969

During 1969 there will be five eclipses, two of the Sun and three of the Moon.

1. March 18 — Annular eclipse of the Sun - Partial phase visible in Eastern Zululand.
2. April 2 — Penumbral eclipse of the Moon - visible in South Africa.
3. August 27 — Penumbral eclipse of the Moon - not visible in South Africa.
4. September 11 — Annular eclipse of the Sun - not visible in South Africa.
5. September 25/26 — Penumbral eclipse of the Moon - visible in South Africa.

The eclipse of March 18 will end at sunrise along the east coast of Southern Africa from approximate latitude 15° S to 29° S. Partial phases will be seen in Eastern Mozambique.

Penumbral Eclipse of the Moon April 2

Moon enters penumbra	$18^h\ 38^m.3$
Middle of the eclipse	20 32.4
Moon leaves penumbra	22 26.5

Penumbral Eclipse of the Moon September 25/26

Moon enters penumbra	Sep 25	$20^h\ 04^m.9$
Middle of eclipse	Sep 25	22 09.6
Moon leaves penumbra	Sep 26	00 14.2

bright variable stars

Date	Star	Max Mag	Period	R.A.	Dec.
Sep 24	Mira	3.8	332	$02^h\ 17^m$	$-03^\circ\ 07'$
Feb 26	R Hor	6.3	402	02 53	-50 02
?	R Dor	5.3-6.4	338?	04 36	-62 09
?	L_2 Pup	3.4	140?	07 12	-44 35
Aug 11	R Car	4.6	308	09 31	-62 38
Apr 15	S Car	5.8	149	10 08	-61 22
Oct 28	R Hyd	4.3	470	13 28	-23 06
Mar 14	T Cen	6.1	91	13 40	-33 45

astronomical diary 1969

Jan	10^d	10^h	Uranus 1° N of Moon
	10	14	Jupiter 2° N of Moon
	11	20	Spica 0.3° S of Moon
	13	00	Mars 5° N of Moon
	13	17	Mercury greatest elongation 19° E
	14	09	Neptune 6° N of Moon
	15	02	Antares 0.06° N of Moon
	19	10	Mercury 5° N of Moon
	21	05	Jupiter stationary
	21	18	Venus 1° N of Moon
	24	08	Saturn 4° S of Moon
	27	00	Venus greatest elongation 47° E
	29	11	Mercury in inferior conjunction
Feb	6^d	15^h	Uranus 1° N of Moon
	6	19	Jupiter 2° N of Moon
	8	02	Spica 0.1° S of Moon
	10	08	Mars 6° N of Moon
	10	17	Neptune 6° N of Moon
	11	09	Antares 0.3° N of Moon
	14	20	Mercury 6° N of Moon
	20	04	Venus 2° N of Moon
	20	21	Saturn 5° S of Moon
	22	18	Mars 0.5° S of Neptune
	23	13	Mercury greatest elongation 27° W
Mar	3^d	12^h	Venus at greatest brilliancy
	5	19	Uranus 1° N of Moon
	5	21	Jupiter 2° N of Moon
	7	07	Spica 0.03° N of Moon
	9	23	Neptune 6° N of Moon
	10	10	Mars 6° N of Moon
	10	15	Antares 0.4° N of Moon
	14	15	Pluto at Opposition
Mar	16^d	01^h	Jupiter 0.9° N of Uranus
	16	18	Mercury 0.05° S of Moon
	17	09	Venus stationary
	17	23	Mars 6° N of Antares
	18	07	Annular eclipse of the Sun
	20	08	Venus 6° N of Moon
	20	12	Saturn 5° S of Moon
	20	21	Equinox
	22	01	Jupiter at Opposition
	22	21	Uranus at Opposition
Apr	1^d	23^h	Jupiter 2° N of Moon
	2	02	Uranus 1° N of Moon
	2	21	Penumbral eclipse of the Moon
	3	15	Spica 0.02° N of Moon
	6	05	Neptune 6° N of Moon
	6	21	Antares 0.4° N of Moon
	7	06	Mars 6° N of Moon
	8	17	Venus in inferior conjunction
	9	01	Mercury in superior conjunction
	15	18	Venus 5° N of Moon
	18	22	Saturn in conjunction with Sun
	27	05	Mars stationary
	27	09	Venus stationary
	29	03	Jupiter 1° N of Moon
	29	09	Uranus 1° N of Moon
May	1^d	01^h	Spica 0.03° N of Moon
	3	12	Neptune 6° N of Moon
	4	05	Antares 0.3° N of Moon
	4	17	Mars 4° N of Moon
	6	01	Mercury greatest elongation 21° E

May	11d	19h	Mercury 8° N of Aldebaran
	13	03	Venus 1° S of Moon
	14	11	Venus at greatest brilliancy
	14	17	Saturn 5° S of Moon
	17	20	Mercury 4° S of Moon
	18	14	Neptune at Opposition
	24	00	Jupiter stationary
	26	11	Jupiter 1° N of Moon
	26	18	Uranus 1° N of Moon
	28	11	Spica 0.2° N of Moon
	29	12	Mercury in inferior conjunction
	30	21	Neptune 6° N of Moon
	31	14	Antares 0.2° N of Moon
	31	16	Mars 3° N of Moon
	31	18	Mars at Opposition
Jun	3d	19h	Mars 2° N of Antares
	9	06	Mars nearest to Earth
	11	04	Venus 6° S of Moon
	11	04	Saturn 6° S of Moon
	11	16	Venus 0.3° S of Saturn
	13	12	Mercury 9° S of Moon
	17	19	Venus greatest elongation 46° W
	21	16	Solstice
	22	22	Jupiter 2° N of Moon
	23	02	Uranus 1° N of Moon
	23	13	Mercury greatest elongation 23° W
	23	17	Mercury 2° N of Aldebaran
	24	20	Spica 0.4° N of Moon
	27	07	Neptune 6° N of Moon
	27	15	Mars 2° N of Moon
	28	01	Antares 0.3° N of Moon
Jul	8d	12h	Mars stationary
	8	15	Saturn 6° S of Moon
	10	18	Venus 8° S of Moon
	13	16	Mercury 4° S of Moon
	16	03	Venus 3° N of Aldebaran
	18	08	Jupiter 0.6° N of Uranus
	20	10	Uranus 2° N of Moon
	20	10	Jupiter 2° N of Moon
Jul	22d	04h	Spica 0.7° N of Moon
	22	17	Mercury in superior conjunction
	24	15	Neptune 7° N of Moon
	25	02	Mars 2° N of Moon
	25	11	Antares 0.4° N of Moon
Aug	5d	01h	Saturn 7° S of Moon
	6	18	Mercury 0.9° N of Regulus
	9	16	Venus 7° S of Moon
	12	03	Mars 1.3° N of Antares
	15	04	Mercury 0.3° S of Moon
	16	18	Uranus 2° N of Moon
	17	01	Jupiter 3° N of Moon
	18	09	Spica 0.8° N of Moon
	20	22	Neptune 7° N of Moon
	21	18	Antares 0.6° N of Moon
	22	02	Mars 2° N of Moon
	22	03	Saturn stationary
	24	04	Venus 7° S of Pollux
	27	13	Penumbral eclipse of Moon
	30	15	Mercury 3° S of Uranus
Sep	1d	09h	Saturn 7° S of Moon
	3	06	Mercury greatest elongation 27° E
	7	18	Mercury 5° S of Jupiter
	8	21	Venus 3° S of Moon
	11	22	Annular eclipse of Sun
	13	03	Uranus 2° N of Moon
	13	18	Jupiter 3° N of Moon
	13	21	Mercury 2° S of Moon
	14	15	Spica 0.9° N of Moon
	17	04	Neptune 7° N of Moon
	18	00	Antares 0.6° N of Moon
	19	09	Mars 2° N of Moon
	19	22	Mercury 6° S of Jupiter
	22	15	Venus 0.4° N of Regulus
	23	07	Equinox
	25	22	Penumbral eclipse of the Moon
	28	17	Saturn 7° S of Moon
	29	12	Mercury in inferior conj.

Oct	9d	09h	Venus 1° N of Moon
	10	00	Jupiter in conjunction with Sun
	10	04	Mercury 2° N of Moon
	14	11	Neptune 7° N of Moon
	15	00	Mercury greatest elongation 18° W
	15	06	Antares 0.5° N of Moon
	16	14	Mercury 1.3° N of Uranus
	17	21	Mars 2° N of Moon
	22	04	Venus 0.9° N of Uranus
	25	22	Saturn 7° S of Moon
	26	13	Mercury 0.8° N of Jupiter
	27	21	Mercury 4° N of Spica
	29	04	Saturn at Opposition
Nov	4d	02h	Venus 0.5° N of Jupiter
	4	09	Venus 4° N of Spica
	5	17	Jupiter 3° N of Spica
	7	02	Uranus 2° N of Moon
	8	07h	Spica 0.9° N of Moon
	8	08	Jupiter 4° N of Moon
	8	17	Venus 5° N of Moon
	11	13	Antares 0.4° N of Moon
	15	13	Mars 2° N of Moon
	22	02	Saturn 7° S of Moon
Dec	1d	08h	Regulus 1° S of Moon
	4	00	Venus 0.8° S of Neptune
	4	15	Uranus 3° N of Moon
	5	17	Spica 1° N of Moon
	6	04	Jupiter 5° N of Moon
	8	09	Neptune 7° N of Moon
	11	11	Venus 5° N of Antares
	14	08	Mars 0.3° N of Moon
	19	05	Saturn 7° S of Moon
	22	03	Solstice
	27	23	Mercury greatest elongation 20° E
	28	16	Regulus 0.9° S of Moon

society's calendar for 1969

Material and Notes for MNASSA by	15th 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 GILL MEDAL

Medallists

1956	H. Knox Shaw	1960	W. H. van den Bos
1957	W. P. Hirst	1963	A. W. J. Cousins
1958	J. Jackson	1965	R. H. Stoy
		1967	W. S. Finsen

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.

PAST PRESIDENTS

1922 - 23	S. S. Hough	1945 - 46	R. H. Stoy
1923 - 24	R. T. A. Innes	1946 - 47	W. P. Hirst
1924 - 25	J. K. E. Halm	1947 - 48	J. Jackson
1925 - 26	W. Reid	1948 - 49	A. E. H. Bleksley
1926 - 27	H. Spencer Jones	1949 - 50	W. S. Finsen
1927 - 28	A. W. Roberts	1950 - 51	H. E. Krumm
1928 - 29	A. W. Long	1951 - 52	A. D. Thackeray
1929 - 30	H. E. Wood	1952 - 53	J. C. Bentley
1930 - 31	D. Cameron-Swan	1953 - 54	David S. Evans
1931 - 32	H. L. Alden	1954 - 55	P. Kirchhoff
1932 - 33	H. Spencer Jones	1955 - 56	W. H. van den Bos
1933 - 34	D. G. McIntyre	1956 - 57	S. C. Venter
1934 - 35	J. K. E. Halm	1957 - 58	M. W. Feast
1935 - 36	J. Jackson	1958 - 59	H. Haffner
1936 - 37	H. E. Houghton	1959 - 60	P. Smits
1937 - 38	J. S. Paraskevopoulos	1960 - 61	G. G. Cillie
1938 - 39	T. Mackenzie	1961 - 62	M. D. Overbeek
1939 - 40	R. A. Rossiter	1962 - 63	A. J. Wesselink
1940 - 41	E. B. Ford	1963 - 64	A. G. F. Morrisby
1941 - 42	H. Knox Shaw	1964 - 65	H. C. Lagerweij
1942 - 43	A. F. I. Forbes	1965 - 66	A. Menzies
1943 - 44	W. H. van den Bos	1966 - 67	G. R. Atkins
1944 - 45	A. W. J. Cousins	1967 - 68	J. Hers

HONORARY MEMBERS

Prof. Ch. Fehrenbach
Dr. W. S. Finsen
Dr. H. Haffner
Dr. H. Knox Shaw
Dr. J. H. Oort
Dr. R. O. Redman
Dr. J. Schilt
Dr. H. Shapley
Dr. W. H. van den Bos
Dr. A. G. Velghe
Sir Richard Woolley

HONORARY SECRETARIES

1922	H. W. Schonegevel
1922 August	T. MacKenzie
1923	C. L. O'Brien Dutten
1923 October	H. E. Houghton
1930 July	S. Skewes
1931	H. Horrocks
1934 November	H. W. Schonegevel
1935	A. Menzies
1965	T. Russo

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. J. C. Bennett, 90 Malan Street, Riviera, Pretoria

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

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:

CAPE CENTRE

Chairman:	Mr. H. C. Lagerweij
Vice-Chairman:	Mr. I. Weinberg
Hon. Secretary:	Mr. H. B. Molyneux
Hon. Treasurer:	Mr. N. Saville
Hon. Auditor:	Mr. G. Orpen
Members of Committee:	Messrs. G. R. Atkins, W. Grimwood, R. F. Horne, G. H. Larmuth, and N. O. Neale.
Centre Representative on Council:	Mr. J. S. Bondietti

Meetings in winter on 2nd Wednesday of month at the Royal Observatory.
Secretarial Address, c/o The Royal Observatory, Observatory, Cape.

TRANSVAAL CENTRE

Chairman:	Mr. W. Bell
Hon. Secretary:	Mrs. M. M. FitzGerald
Hon. Treasurer:	Mrs. M. M. FitzGerald
Members of Committee:	Messrs. F. D. Bateman, J. H. Botham, C. R. Jacobs, M. D. Overbeek, C. Papadopoulus, C. J. Poole, P. R. Smith, and Dr. M. Coleman.
Republic Observatory Representative:	Mr. J. Hers
Centre Representative on Council:	Mr. W. Bell
Curator of Instruments:	Mr. T. E. Geary
Hon. Librarian:	Mrs. M. M. FitzGerald

Observing and lecture meetings in alternate months.
Secretarial Address, c/o The Planetarium, Milner Park, Johannesburg.

BLOEMFONTEIN CENTRE

Chairman:	Mr. G. J. Muller
Hon. Secretary:	Mr. A. W. E. Schultz
Hon. Treasurer:	Mr. A. W. E. Schultz
Member of Committee:	Mr. G. H. Harrison
Centre Representative on Council:	Mr. G. J. Muller

Secretarial Address, 3 Glennton Court, King Edward Road, Bloemfontein

PRETORIA CENTRE

Chairman:	Mr. J. Wolterbeek
Vice-Chairman:	Mr. H. Kanowitz
Hon. Secretary:	Mrs. J. A. Sterling
Hon. Treasurer:	Mr. H. Kanowitz
Members of Committee:	Messrs. H. Barnard, J. C. Bennett, A. Delen, J. G. Fletcher, J. Grobler and R. Smith.
Centre Representative on Council:	Mr. H. Kanowitz
Director of Observatory:	Mr. K. J. Sterling
Hon. Librarian:	Mr. J. Wolterbeek
Editor of Urania:	Mr. R. Mattheus

Secretarial Address, 5 Hekla Road, Valhalla, Pretoria.

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