astronomical society
of southern africa

handbook
for
1971

astronomical society of southern africa

INFORMATION FOR PROSPECTIVE MEMBERS

The Astronomical Society of Southern Africa is a body consisting of both amateur and professional astronomers. Membership is open to all interested persons, regardless of knowledge or experience. In addition to this handbook, the Society issues twelve numbers of "The Monthly Notes of the Astronomical Society of Southern Africa" (MNASSA) each year. Members also receive copies of "Sky and Telescope", an excellent and very popular monthly magazine published in the United States. It provides up to date information on both professional and amateur activities, together with news of space research and other related subjects. The society's annual subscription is R6.00 and there is an entrance fee of R2.50. Information can be obtained from the Honorary Secretary, Astronomical Society of Southern Africa, c/o The Royal Observatory, Observatory, Cape.

Autonomous local Centres of the Society exist in Cape Town, Bloemfontein, Durban, Johannesburg and Pretoria. These centres hold regular meetings. It is not necessary to hold full membership of the society to join these centres. An Associate Member or Student Member may take part in the activities of a Centre without paying any fees or subscriptions to the Society; although he then loses the right to receive the publications issued and distributed by the Society.

Three Observing Sections exist to coordinate and encourage constructive observing programmes; namely the Comet and Meteor Section, the Occultation Section and the Variable Star Section.

Further information on the Centres and Observing Sections is given on the inside back cover of this handbook.

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Unless stated otherwise, all given times are South African Standard Time.

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P & PD UCT

INTRODUCTION

This brief introduction is directed to Handbook users who do not possess specialised knowledge of astronomy.

It is intended that this booklet should be of some use to all astronomers - whether novice, advanced amateur, or professional. Accordingly explanations have been provided for those tables and diagrams whose functions are not obvious, and which, to a beginner, may appear complicated at first sight. Certain sections of this handbook, in particular that on the stars, are chiefly intended for persons having little astronomical background. On the other hand, sections such as lunar occultations are suited to the more advanced astronomers.

TIME SYSTEMS

The two time systems of importance to astronomers are the local standard time - South African Standard Time for our part of the world - and Sidereal Time. Most observatories arrange clock facilities to keep these two basic times. South African Standard Time (local mean time for meridian 30° east of Greenwich) is the standard time in use throughout South Africa, Rhodesia, Botswana, Lesotho, Swaziland, Malawi and Zambia. Sidereal time, or effectively "star time", is given by the rotation of the earth with respect to the stars - instead of the sun - and can serve to indicate what portion of the heavens is visible at any particular time. In this handbook, both times are given on a 24 hour basis - for example: 2000 hrs SAST is 8 p.m., and 0632 hrs SAST is 6:32 a.m.

Conversion to Local Times

All the times given in this booklet (both SAST and Sidereal Time) are correct for points on the meridian 30° east of Greenwich. In order to calculate local times (described below) and the times of rising and setting of planets (shown in the section on planets) for places not on that meridian, a longitude correction is necessary. This correction (expressed in minutes of time) is given for the chief cities of Southern Africa in the following table.

CORRECTION FOR LONGITUDE

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

To Calculate Local Sidereal Time

The accompanying table gives Sidereal time (for Longitude 30° E) at SAST 0 hrs (midnight) and 2000 hrs (8 p.m.). It is tabulated at 10 day intervals. For intermediate dates, a difference of 4 minutes a day needs to be taken into account (24 hours of sidereal time are 4 minutes shorter than 24 hours of solar time). For places not on the 30° E meridian, the longitude correction (see table above) needs to be included. The sidereal time at times other than 0 hrs and 2000 hrs SAST can be found by adding in the elapsed time, plus an extra minute for each six hour interval.

Example: Find the sidereal time at 10.15 p.m. on January 5 at Bulawayo

	h	m
Sidereal time at 2100 hrs (9 p.m.) on January 1 (from table)	*3*	*43*
Sidereal time at 2100 hrs on January 5 (add 4 × 4 = 16 minutes)	*3*	*59*
Corrected for longitude (Bulawayo −6 minutes)	*3*	*53*
Corrected for elapsed time (add 1 h 15 m)	*5*	*08*

Required sidereal time 5 h 08 m

Date 1971	At 0 hrs SAST	At 21 hrs SAST	Date 1971	At 0 hrs SAST	At 21 hrs SAST	Date 1971	At 0 hrs SAST	At 21 hrs SAST
Jan 1	$6^h\ 40^m$	$3^h\ 43^m$	May 11	$15^h\ 12^m$	$12^h\ 16^m$	Sep 18	$23^h\ 45^m$	$20^h\ 48^m$
11	7 19	4 23	21	15 52	12 55	28	0 24	21 28
21	7 59	5 02	31	16 31	13 35	Oct 8	1 04	22 07
31	8 38	5 41	Jun 10	17 10	14 14	18	1 43	22 46
Feb 10	9 17	6 21	20	17 50	14 53	28	2 22	23 26
20	9 57	7 00	30	18 29	15 33	Nov 7	3 02	0 05
Mar 2	10 36	7 40	Jul 10	19 09	16 12	17	3 41	0 45
12	11 16	8 19	20	19 48	16 52	27	4 21	1 24
22	11 55	8 59	30	20 28	17 31	Dec 7	5 00	2 04
Apr 1	12 34	9 38	Aug 9	21 07	18 10	17	5 40	2 43
11	13 14	10 17	19	21 46	18 50	27	6 19	3 22
21	13 53	10 57	29	22 26	19 29			
May 1	14 33	11 36	Sep 8	23 05	20 08			

Time of Sun's Transit

At transit, the Sun casts a shadow in an exact north-south line (and a sundial reads noon). However, since the Earth does not go round the Sun with uniform circular motion in the plane of the Earth's equator, the time of transit over the 30° E meridian does not necessarily coincide with SAST noon. The difference (known as the Equation of Time) is indicated by the table below. To find the time of the Sun's transit at a place on the 30° meridian, apply the longitude correction, with the sign reversed, to the times given in the table.

TIME OF SUN'S TRANSIT

Date 1971	SAST	Date 1971	SAST	Date 1971	SAST
Jan 1	$12^h\ 03^m\ 22^s$	May 11	$11^h\ 56^m\ 21^s$	Sep 18	$11^h\ 54^m\ 21^s$
11	12 07 46	21	11 56 29	28	11 50 52
21	12 11 13	31	11 57 31	Oct 8	11 47 43
31	12 13 27	Jun 10	11 59 13	18	11 45 18
Feb 10	12 14 18	20	12 01 19	28	11 43 52
20	12 13 52	30	12 03 27	Nov 7	11 43 40
Mar 2	12 12 21	Jul 10	12 05 11	17	11 44 52
12	12 10 00	20	12 06 14	27	11 47 27
22	12 07 08	30	12 06 24	Dec 7	11 51 12
Apr 1	12 04 07	Aug 9	12 05 32	17	11 55 50
11	12 01 15	19	12 03 43	27	12 00 48
21	11 58 50	29	12 01 05		
May 1	11 57 10	Sep 8	11 57 52		

The Julian Day Calendar

This calendar is generally used for recording the time of variable star observations. It 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 1400 hrs (2 p.m.) SAST.

S.A.S.T.	*J.D.*
1971 Jan 1, 1400 hrs	*2,440,953.0*
" Feb 1 "	*2,440,984.0*
" Mar 1 "	*2,441,012.0*
" Apr 1 "	*2,441,073.0*
" May 1 "	*2,441,043.0*
" Jun 1 "	*2,441,104.0*
" Jul 1 "	*2,441,134.0*
" Aug 1 "	*2,441,165.0*
" Sep 1 "	*2,441,196.0*
" Oct 1 "	*2,441,226.0*
" Nov 1 "	*2,441,257.0*
" Dec 1 "	*2,441,287.0*
1972 Jan 1 "	*2,441,318.0*

	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
	h m	h m	h m	h m	m	m	m
Jan 1	05 18	19 04	05 44	18 38	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^{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 1971

The Moon is best positioned for evening viewing from two or three days before First Quarter to shortly after Full Moon. Phases are given in the table below, and times of Moonrise and Moonset for Johannesburg and Cape Town follow on pages 8 to 11. Times of Moonrise and Moonset for other places can be roughly estimated from these tables.

New Moon				First Quarter				Full Moon				Last Quarter			
	d	h	m		d	h	m		d	h	m		d	h	m
Jan	27	00	55	Jan	4	06	55	Jan	11	15	20	Jan	19	20	08
Feb	25	11	49	Feb	2	16	31	Feb	10	09	41	Feb	18	14	14
Mar	26	21	24	Mar	4	04	01	Mar	12	04	34	Mar	20	04	30
Apr	25	06	02	Apr	2	17	46	Apr	10	22	10	Apr	18	14	58
May	24	14	32	May	2	09	34	May	10	13	24	May	17	22	15
Jun	22	23	57	Jun	1	02	42	Jun	9	02	04	Jun	16	03	24
Jul	22	11	15	Jun	30	20	11	Jul	8	12	37	Jul	15	07	47
Aug	21	00	53	Jul	30	13	07	Aug	6	21	42	Aug	13	12	55
Sep	19	16	42	Aug	29	04	56	Sep	5	06	03	Sep	11	20	23
Oct	19	09	59	Sep	27	19	17	Oct	4	14	20	Oct	11	07	29
Nov	18	03	46	Oct	27	07	54	Nov	2	23	20	Nov	9	22	51
Dec	17	21	03	Nov	25	18	37	Dec	2	09	48	Dec	9	18	02
				Dec	25	03	35	Dec	31	22	20				

Dates of Perigee, when the Moon is closest to the Earth, and Apogee, when it reaches its furthest point, are given below.

PERIGEE						APOGEE					
	d	h		d	h		d	h		d	h
Jan	28	12	Aug	9	03	Jan	16	13	Jul	28	05
Feb	25	23	Sep	6	07	Feb	13	03	Aug	24	22
Mar	26	11	Oct	4	17	Mar	12	06	Sep	21	08
Apr	23	20	Nov	2	04	Apr	8	10	Oct	18	10
May	21	19	Nov	30	13	May	5	23	Nov	14	17
Jun	17	12	Dec	28	07	Jun	2	16	Dec	12	09
Jul	12	17				Jul	30	11			

Observers viewing the lunar surface through a telescope may be interested in inspecting the landing sites of the Apollo spacecraft, especially those scheduled for 1971. The approximate positions are indicated on the map. The landing site of Apollo 11 is marked by "A" and that of Apollo 12 by "B". The intended landing site of Apollo 14 (presently scheduled for late January 1971) is shown by "C", while "D" marks that for Apollo 15 (at time of publication scheduled for July 1971).

Terminator and Librations

During the changing phases, the terminator (boundary between night and day) progresses from left to right in the diagram. Since the Moon does not follow a perfectly circular orbit, and its axis is not parallel to the Earth's axis, it is sometimes possible to see a slightly greater proportion of one limb than the opposite one. Maximum exposure (maximum libration) of the southern limb (about 6.7 degrees) occurs on Jan 7, Feb 3, Mar 2, Mar 30, Apr 26, May 23, Jun 19, Jul 16, Aug 13, Sep 9, Oct 6, Nov 2, Nov 30 and Dec 27, and that of the northern limb on Jan 21, Feb 18, Mar 17, Apr 13, May 10, Jun 6, Jul 3, Jul 31, Aug 27, Sep 23, Oct 20, Nov 16 and Dec 13. Maximum exposure of the left hand limb (in diagram) occurs on Jan 9, Feb 4, Mar 4, Apr 1, Apr 29, May 27, Jun 23, Jul 20, Aug 16, Sep 12, Oct 10, Nov 7 and Dec 6, and that of the right hand limb (in diagram) on Jan 22, Feb 19, Mar 20, Apr 17, May 14, Jun 9, Jul 6, Aug 3, Aug 31, Sep 28, Oct 27, Nov 23 and Dec 20. The magnitude of these east-west librations varies between 4.8 and 8.1 degrees.

JOHANNESBURG MOONRISE - 1971

Day	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
1	9h 22m	11h 24m	10h 15m	12h 15m	12h 30m	12h 39m	12h 04m	12h 27m	14h 01m	14h 58m	17h 01m	18h 07m
2	10 26	12 28	11 22	13 08	13 07	13 07	12 36	13 17	15 07	16 03	18 11	19 16
3	11 27	13 32	12 26	13 54	13 40	13 35	13 10	14 13	16 14	17 10	19 23	20 18
4	12 29	14 34	13 27	14 34	14 10	14 05	13 51	15 16	17 21	18 18	20 33	21 13
5	13 32	15 33	14 23	15 08	14 38	14 38	14 37	16 22	18 27	19 27	21 38	22 00
6	14 35	16 26	15 12	15 39	15 06	15 15	15 30	17 29	19 34	20 38	22 36	22 39
7	15 39	17 14	15 55	16 08	15 35	15 58	16 31	18 36	20 41	21 47	23 25	23 15
8	16 40	17 56	16 33	16 36	16 05	16 47	17 34	19 41	21 49	22 53	.....	23 46
9	17 38	18 32	17 06	17 04	16 40	17 43	18 40	20 46	22 57	23 53	0 07	.....
10	18 31	19 04	17 37	17 33	17 18	18 44	19 46	21 51	.....	.....	0 43	0 15
11	19 17	19 34	18 05	18 05	18 03	19 48	20 51	22 56	0 03	0 46	1 16	0 44
12	19 57	20 02	18 33	18 40	18 55	20 53	21 54	.....	1 05	1 31	1 46	1 13
13	20 32	20 30	19 01	19 20	19 51	21 56	22 57	0 01	2 01	2 10	2 15	1 44
14	21 03	20 58	19 31	20 06	20 52	22 59	23 59	1 07	2 49	2 44	2 43	2 18
15	21 32	21 28	20 02	20 58	21 55	.....	.....	2 11	3 32	3 15	3 13	2 57
16	22 00	22 01	20 39	21 56	22 59	0 01	1 04	3 10	4 08	3 43	3 45	3 41
17	22 27	22 39	21 20	22 58	.....	1 03	2 09	4 04	4 42	4 12	4 20	4 30
18	22 56	23 24	22 08	.....	0 02	2 06	3 14	4 51	5 12	4 40	5 01	5 26
19	23 28	.....	23 03	0 03	1 05	3 11	4 17	5 32	5 40	5 11	5 46	6 25
20	.....	0 16	.....	1 07	2 08	4 18	5 16	6 07	6 09	5 44	6 37	7 26
21	0 04	1 15	0 04	2 12	3 12	5 24	6 08	6 39	6 38	6 20	7 33	8 28
22	0 46	2 20	1 09	3 17	4 17	6 27	6 53	7 09	7 09	7 02	8 32	9 29
23	1 35	3 29	2 16	4 22	5 25	7 24	7 32	7 38	7 42	7 49	9 33	10 30
24	2 32	4 39	3 23	5 29	6 34	8 15	8 07	8 06	8 20	8 41	10 34	11 30
25	3 36	5 48	4 31	6 38	7 40	8 58	8 38	8 35	9 02	9 37	11 34	12 31
26	4 45	6 55	5 37	7 46	8 42	9 35	9 07	9 07	9 51	10 37	12 35	13 35
27	5 55	8 02	6 44	8 55	9 36	10 08	9 35	9 42	10 46	11 39	13 38	14 40
28	7 04	9 08	7 53	10 00	10 23	10 38	10 04	10 22	11 45	12 41	14 41	15 48
29	8 12		9 01	10 57	11 03	11 07	10 34	11 08	12 48	13 45	15 48	16 56
30	9 16		10 10	11 48	11 38	11 35	11 07	12 00	13 52	14 48	16 57	18 00
31	10 21		11 15		12 10		11 45	12 58		15 53		18 58

JOHANNESBURG MOONSET - 1971

Day	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
	$22^h\ 19^m$	$22^h\ 42^m$	$21^h\ 19^m$	$22^h\ 39^m$	$23^h\ 25^m$	$h\ m$	$0^h\ 22^m$	$1^h\ 49^m$	$3^h\ 20^m$	$3^h\ 25^m$	$3^h\ 48^m$	$3^h\ 51^m$
1	22 19	22 42	21 19	22 39	23 25	.....	0 22	1 49	3 20	3 25	3 48	3 51
2	22 54	23 24	22 05	23 38	.....	0 48	1 13	2 47	4 08	4 03	4 29	4 46
3	23 29	.....	22 56	.....	0 20	1 39	2 08	3 45	4 53	4 40	5 15	5 47
4	.....	0 09	23 50	0 37	1 13	2 30	3 04	4 41	5 33	5 18	6 07	6 51
5	0 04	1 00	.....	1 33	2 05	3 23	4 02	5 33	6 12	5 58	7 06	7 56
6	0 42	1 55	0 47	2 28	2 55	4 19	5 02	6 19	6 49	6 41	8 08	8 58
7	1 24	2 53	1 46	3 20	3 46	5 16	6 00	7 02	7 22	7 30	9 12	9 58
8	2 12	3 52	2 43	4 10	4 38	6 15	6 54	7 40	8 07	8 23	10 14	10 53
9	3 04	4 48	3 39	5 01	5 32	7 15	7 43	8 17	8 51	9 22	11 13	11 46
10	4 01	5 43	4 32	5 52	6 28	8 11	8 27	8 54	9 39	10 23	12 09	12 37
11	5 00	6 36	5 24	6 44	7 26	9 02	9 07	9 31	10 33	11 24	13 02	13 28
12	5 59	7 28	6 14	7 39	8 25	9 48	9 44	10 11	11 31	12 24	13 53	14 20
13	6 56	8 19	7 05	8 35	9 23	10 29	10 18	10 55	12 31	13 21	14 44	15 13
14	7 51	9 09	7 56	9 33	10 17	11 07	10 54	11 44	13 31	14 15	15 35	16 07
15	8 44	10 01	8 49	10 31	11 06	11 42	11 31	12 38	14 30	15 07	16 26	17 04
16	9 35	10 55	9 44	11 27	11 50	12 17	12 12	13 36	15 25	15 58	17 20	18 00
17	10 25	11 50	10 41	12 20	12 29	12 52	12 56	14 37	16 19	16 48	18 15	18 55
18	11 16	12 49	11 39	13 08	13 06	13 30	13 47	15 37	17 11	17 40	19 12	19 47
19	12 08	13 49	12 37	13 51	13 41	14 13	14 43	16 35	18 02	18 33	20 08	20 35
20	13 03	14 48	13 33	14 31	14 17	15 01	15 44	17 30	18 52	19 26	21 01	21 18
21	14 02	15 44	14 26	15 07	14 54	15 54	16 45	18 24	19 44	20 21	21 51	21 57
22	15 02	16 36	15 13	15 44	15 34	16 54	17 45	19 16	20 37	21 17	22 37	22 33
23	16 04	17 24	15 56	16 21	16 20	17 55	18 43	20 06	21 31	22 12	23 18	23 08
24	17 05	18 06	16 36	17 00	17 11	18 57	19 38	20 57	22 27	23 05	23 56	23 42
25	18 00	18 45	17 14	17 44	18 08	19 57	20 31	21 49	23 23	23 53	.....	.....
26	18 51	19 22	17 51	18 32	19 09	20 54	21 22	22 43	.....	.....	0 32	0 18
27	19 35	19 59	18 29	19 26	20 12	21 48	22 13	23 38	0 18	0 38	1 07	0 57
28	20 15	20 38	19 10	20 25	21 12	22 40	23 04	.....	1 10	1 19	1 42	1 41
29	20 52		19 56	21 26	22 10	23 31	23 57	0 35	1 59	1 57	2 20	2 31
30	21 28		20 46	22 26	23 05	.....	.....	1 32	2 44	2 34	3 03	3 29
31	22 04		21 41		23 57	0 52	2 27			3 10		4 31

CAPE TOWN MOONRISE - 1971

Day	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
1	9h 55m	12h 16m	11h 10m	13h 19m	13h 27m	13h 21m	12h 36m	12h 47m	14h 21m	15h 29m	17h 51m	19h 09m
2	11 03	13 25	12 21	14 10	14 00	13 45	13 03	13 34	15 32	16 40	19 06	20 19
3	12 11	14 33	13 29	14 53	14 29	14 09	13 34	14 30	16 43	17 52	20 22	21 21
4	13 18	15 37	14 31	15 29	14 55	14 35	14 11	15 35	17 55	19 06	21 35	22 13
5	14 25	16 37	15 27	16 00	15 19	15 04	14 55	16 44	19 07	20 21	22 41	22 56
6	15 33	17 30	16 14	16 27	15 42	15 37	15 47	17 56	20 19	21 36	23 38	23 32
7	16 40	18 15	16 54	16 51	16 07	16 18	16 48	19 07	21 31	22 49	.....	.....
8	17 44	18 53	17 28	17 15	16 35	17 05	17 55	20 18	22 44	23 57	0 24	0 02
9	18 42	19 25	17 57	17 40	17 05	18 00	19 05	21 28	23 57	.....	1 03	0 30
10	19 33	19 53	18 23	18 04	17 40	19 03	20 16	22 39	.....	0 57	1 35	0 55
11	20 16	20 19	18 48	18 32	18 22	20 09	21 25	23 49	1 06	1 47	2 03	1 20
12	20 53	20 43	19 11	19 03	19 12	21 18	22 33	.....	2 08	2 28	2 28	1 45
13	21 24	21 06	19 35	19 40	20 08	22 27	23 41	0 59	3 04	3 03	2 53	2 13
14	21 51	21 30	20 01	20 24	21 12	23 34	.....	2 09	3 50	3 33	3 18	2 43
15	22 15	21 57	20 29	21 15	22 18	.....	0 49	3 14	4 29	4 00	3 43	3 19
16	22 39	22 26	21 01	22 13	23 26	0 41	1 58	4 14	5 01	4 25	4 12	4 00
17	23 03	23 01	21 40	23 18	.....	1 48	3 07	5 06	5 30	4 49	4 44	4 48
18	23 27	23 42	22 26	.....	0 34	2 56	4 16	5 50	5 56	5 14	5 21	5 44
19	23 55	.....	23 19	0 26	1 42	4 06	5 21	6 27	6 21	5 41	6 05	6 45
20	.....	0 33	.....	1 35	2 50	5 18	6 19	6 59	6 45	6 10	6 55	7 49
21	0 27	1 31	0 22	2 45	3 59	6 26	7 09	7 27	7 10	6 42	7 51	8 55
22	1 06	2 39	1 29	3 55	5 10	7 31	7 51	7 51	7 37	7 22	8 52	10 01
23	1 52	3 52	2 41	5 06	6 22	8 28	8 26	8 16	8 06	8 07	9 57	11 06
24	2 48	5 07	3 53	6 18	7 34	9 15	8 57	8 41	8 41	8 58	11 02	12 11
25	3 54	6 21	5 06	7 32	8 44	9 55	9 24	9 06	9 22	9 56	12 07	13 17
26	5 06	7 34	6 19	8 46	9 45	10 28	9 49	9 34	10 09	10 58	13 13	14 26
27	6 20	8 46	7 32	9 58	10 38	10 56	10 12	10 05	11 03	12 04	14 20	15 36
28	7 35	9 58	8 45	11 03	11 22	11 22	10 37	10 42	12 05	13 11	15 29	16 48
29	8 48		9 59	12 01	11 58	11 47	11 04	11 25	13 10	14 19	16 41	17 58
30	9 58		11 11	12 48	12 29	12 11	11 33	12 17	14 19	15 28	17 55	19 03
31	11 07		12 19		12 56		12 06	13 15		16 38		20 00

CAPE TOWN MOONSET - 1971

Day	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
1	23h 04m	23h 09m	21h 43m	22h 56m	23h 49m	0h 32m	1h 08m	2h 49m	4h 21m	4h 16m	4h 21m	4h 12m
2	23 34	23 45	22 25	23 57	.....	1 28	2 04	3 50	5 06	4 50	4 57	5 04
3	.....	.....	23 13	.....	0 48	2 22	3 02	4 49	5 46	5 21	5 39	6 04
4	0 03	0 28	.....	0 58	1 46	3 17	4 02	5 44	6 22	5 54	6 27	7 10
5	0 33	1 17	0 06	1 59	2 41	4 15	5 04	6 33	6 55	6 28	7 23	8 17
6	1 07	2 12	1 05	2 57	3 36	5 15	6 05	7 15	7 27	7 07	8 26	9 24
7	1 45	3 11	2 06	3 53	4 31	6 16	7 03	7 53	8 00	7 51	9 31	10 27
8	2 30	4 12	3 06	4 48	5 27	7 18	7 55	8 27	8 35	8 41	10 36	11 26
9	3 22	5 13	4 06	5 43	6 25	8 18	8 41	8 58	9 14	9 39	11 39	12 23
10	4 18	6 11	5 03	6 38	7 26	9 14	9 21	9 29	9 59	10 41	12 39	13 19
11	5 19	7 09	5 59	7 35	8 27	10 02	9 56	10 01	10 50	11 45	13 37	14 14
12	6 21	8 05	6 54	8 34	9 28	10 45	10 27	10 37	11 48	12 48	14 32	15 09
13	7 22	8 59	7 49	9 34	10 27	11 21	10 58	11 16	12 50	13 48	15 27	16 06
14	8 20	9 55	8 44	10 35	11 19	11 54	11 28	12 03	13 52	14 47	16 22	17 05
15	9 18	10 50	9 41	11 35	12 05	12 25	12 00	12 55	14 54	15 43	17 18	18 04
16	10 12	11 48	10 40	12 31	12 45	12 54	12 36	13 54	15 54	16 38	18 15	19 02
17	11 07	12 48	11 41	13 21	13 20	13 25	13 17	14 56	16 52	17 33	19 14	19 58
18	12 02	13 50	12 42	14 06	13 52	13 58	14 05	15 59	17 48	18 28	20 13	20 48
19	13 00	14 52	13 41	14 45	14 22	14 36	15 00	17 01	18 43	19 25	21 10	21 34
20	13 59	15 52	14 37	15 20	14 52	15 20	16 01	18 01	19 38	20 23	22 04	22 13
21	15 01	16 47	15 26	15 52	15 25	16 12	17 05	18 58	20 34	21 21	22 52	22 48
22	16 05	17 36	16 10	16 23	16 01	17 11	18 09	19 55	21 30	22 19	23 34	23 19
23	17 08	18 19	16 48	16 55	16 41	18 14	19 10	20 49	22 29	23 15	.....	23 49
24	18 08	18 56	17 23	17 29	17 29	19 19	20 10	21 44	23 27	.....	0 12	.....
25	19 02	19 29	17 55	18 08	18 25	20 23	21 07	22 41	.....	0 07	0 45	0 19
26	19 48	20 01	18 27	18 52	19 27	21 23	22 03	23 38	0 26	0 54	1 17	0 50
27	20 27	20 33	19 00	19 44	20 32	22 21	22 58	.....	1 21	1 35	1 47	1 25
28	21 02	21 06	19 37	20 42	21 35	23 17	23 53	0 37	2 12	2 12	2 17	2 04
29	21 33		20 17	21 44	22 37	.....	.....	1 37	2 58	2 45	2 50	2 51
30	22 04		21 04	22 47	23 36	0 12	0 50	2 36	3 39	3 17	3 29	3 46
31	22 35		21 57		.....		1 49	3 31		3 48		4 49

LUNAR OCCULTATIONS

An occultation occurs when the disk of the Moon moves in front of a star. Predictions of occultations of all stars brighter than magnitude 7.5, supplied by H.M. Nautical Almanac Office, are given below. The main set of tables gives predictions for three stations, namely,

	Longitude	Latitude
Cape Town	- 18°.475	- 33°.933
Johannesburg	- 28 .075	- 26 .182
Salisbury	- 31 .040	- 17 .788

This does not restrict its use to observers at those centres. 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, in minutes of time, are given in the tables. Alternatively, rough times for intermediate stations can usually be estimated direct from the tables.

Occulted stars have been identified by their Z.C. numbers, that is their numbers in the "Catalogue of 3539 Zodiacal Stars for the Equinox 1950.0" by James Robertson (U.S. Naval Observatory, 1939). An index for stars brighter than magnitude 6.0, giving their more common designations, is also provided.

Timings of occultations, to a precision of one-tenth of a second if possible, are very valuable for studies of the Moon's shape and motion. Since only very modest equipment is required, amateurs can make important contributions in this field. Persons interested in making and reporting occultation observations are urged to contact the Director of the Society's Occultation Section, Mr A.G.F. Morrisby (c/o Dept. of Surveyor General, P.O. Box 8099, Causeway, Salisbury, Rhodesia).

Explanations of Abbreviations used in Tables

Z.C. – *the number of the star in the Zodiacal Catalogue. An "m" following the number indicates the star is not single.*
Sp – *the spectral classification of the star.*
Mag – *the visual magnitude*
Ph – *the Phase D = Disappearance, R = Reappearance*
h.m. – *the time of the occultation is SAST*
a,b – *parameters in minutes for predicting times other than at standard stations (explained above in text)*
P.A. – *the Position Angle on the Moon's limb measured eastward from the north point.*
N – *No occultation*
S – *Sunlight interferes*
A – *Moon at very low altitude*
G – *Grazing occultation*

LUNAR OCCULTATIONS - 1971

Date	Z.C.	Mag	Sp	Ph	Cape Town h. m.	a	b	P.A.	Johannesburg h. m.	a	b	P.A.	Salisbury h. m.	a	b	P.A.
Jan 5	302	6.4	K5	D	S				19 38.0	-	-	114	19 44.4	-3.4	0.0	94
21	2108	6.4	G0	R	N				02 27.9	-2.0	+0.5	239	02 29.1	-1.0	-0.8	273
21	2109	6.1	K2	R	N				03 03.8	-	-	237	03 07.7	-1.4	-0.8	274
24	2545	6.4	A5	R	N				N				04 10.3	-1.8	+2.0	219
24	2554	Var	F8	D	N				S				05 11.6	-0.7	-1.0	103
Feb 1	266	5.7	A0	D	S				S				19 12.0	-2.5	+0.4	93
1	267	7.3	G0	D	S				S				19 19.3	-2.3	+0.8	84
15	1853	4.9	M3	R	00 30.8	-0.5	-2.4	324	00 11.2	+0.4	-3.6	359	N			
20	2470	6.1	B9	R	N				N				01 43.6	-1.8	+1.9	221
21	2650	4.7	K5	R	04 02.4	-0.3	-1.4	283	03 47.1	+0.4	-3.1	326	N			
Mar 2	490	5.7	K0	D	S				19 58.1	-1.4	+0.1	112	20 05.9	-1.5	+0.7	87
4	810	1.8	B8	D	21 17.0	-1.9	+0.5	98	21 43.9	-2.1	+1.6	67	N			
4	810	1.8	B8	R	22 38.0	-1.2	+0.8	278	22 46.9	-0.2	-0.5	314	N			
13	1815	4.8	K0	R	N				22 37.9	-2.0	-1.2	277	22 30.5	-1.5	-1.8	302
16	2045	6.4	G5	R	03 28.3	-0.9	-3.5	343	N				N			
17	2268m	4.8	B3	R	N				23 40.7	-2.0	+0.9	232	23 43.9	-0.9	-0.6	269
18	2273	5.9	B8	R	00 18.2	-1.3	-0.3	243	00 21.4	-0.8	-1.3	282	00 10.3	-0.3	-1.8	309
18	2298	5.1	K0	R	05 55.1	-2.5	0.0	277	S				S			
21	2750	2.1	B3	D	N				02 14.9	-0.1	-1.8	118	02 06.6	-0.6	-0.5	86
21	2750	2.1	B3	R	N				03 14.9	-1.5	+0.2	242	03 16.3	-1.2	-0.8	275
Apr 3	1195	6.7	B8	D	20 34.5	-1.0	-1.7	157	20 40.0	-1.9	-0.6	121	20 45.3	-2.8	+0.3	92
3	1200	6.9	K0	D	23 05.4	-0.1	-1.0	153	23 07.4	-0.8	+0.2	111	23 16.2	-1.5	+1.4	76
5	1322	6.1	A0	D	N				00 32.8	+1.0	-3.0	178	00 17.9	-0.1	-1.0	138
5	1415m	6.2	A0	D	N				N				23 31.5	-0.1	-2.4	165
6	1426	6.6	F2	D	00 36.5	+0.1	-2.0	169	00 31.7	-0.7	-0.4	126	00 35.1	-1.3	+0.6	92
7	1516	7.0	K5	D	N				01 17.8	-	-	190	00 57.1	-0.5	-1.6	147
7	1525	5.9	M0	D	02 37.3	-0.2	-1.0	149	A				A			
14	2366m	1.2	M0,A3	R	N				N				20 46.3	-0.3	+0.1	247
14	2373	6.2	K0	R	N				21 32.7	-	-	213	21 40.7	-0.6	-0.2	258
29	1013m	6.9	G0	D	S				S				18 13.8	-3.4	+2.1	61
30	1155	6.3	F0	D	20 53.8	-0.6	-1.3	134	21 03.7	-1.1	+0.8	94	21 23.5	-	-	47
30	1157	6.0	A0	D	21 31.0	-0.2	-0.4	140	A				A			
May 1	1269	7.0	G5	D	19 00.0	-1.7	-1.0	133	19 16.6	-2.6	+0.2	97	19 39.3	-	-	54
1	1277	5.5	K0	D	22 23.5	-0.3	-0.5	139	22 29.0	-0.7	+0.6	99	A			
3	1476	7.0	A0	D	20 11.2	-2.0	-1.2	122	20 37.4	-	-	76	N			
4	1567	6.3	K0	D	19 25.3	0.0	-3.5	183	19 12.8	-1.6	-2.2	143	19 03.0	-2.6	-1.6	119
4	1573	7.0	A2	D	19 52.7	-1.7	-1.8	135	20 06.2	-3.4	-0.4	96	N			
6	1759m	6.5	A5	D	N				N				23 13.8	-	-	186
7	1853	4.9	M3	D	18 28.0	-0.8	-1.6	104	18 32.9	-2.5	0.0	69	N			
12	2366m	1.2	M0,A3	D	04 12.7	-2.0	-0.4	99	04 35.8	-1.4	+1.2	81	04 52.9	-0.7	+2.2	55
12	2366m	1.2	M0,A3	R	05 32.0	-1.1	+1.4	262	05 49.3	-0.8	+0.7	274	05 53.8	-1.1	-0.4	298
14	2650	4.7	K5	R	N				00 03.9	-2.5	+1.7	226	00 15.5	-2.2	-0.2	263
14	2669	6.2	A5	R	05 52.8	-1.1	+2.5	227	S				S			
14	2676	6.5	A0	R	06 31.7	-0.6	+2.8	219	S				S			
14	2809	4.9	F3	R	N				N				23 03.2	-	-	194
15	2834	5.0	A5	R	04 56.5	-1.5	+2.8	215	05 30.6	-1.4	+2.3	226	S			
19	3367	6.4	G5	R	N				N				01 48.6	-0.3	+4.1	180
20	3512	5.8	K2	R	04 18.1	-0.6	-0.5	252	04 21.1	-1.3	-1.0	272	N			
27	1094	6.9	A0	D	19 00.4	-2.1	+2.3	64	N				N			
28	1222	7.2	G0	D	S				18 25.8	-2.2	+1.0	86	N			
29	1340	6.6	A0	D	18 26.3	-2.1	-0.1	109	G				N			
29	1343	6.6	M3	D	19 09.5	-1.7	0.0	113	19 39.2	-	-	61	N			
31	1549	5.2	K0	D	N				22 51.6	-0.2	-1.2	147	22 46.6	-0.4	-0.3	115
Jun 1	1424	6.8	F2	D	G				19 38.8	-1.3	-2.1	150	19 29.8	-2.4	-1.3	121
1	1635	5.4	K5	D	21 54.5	-1.9	+0.5	102	N				N			
1	1637	6.0	K0	D	23 16.0	-1.0	-0.3	113	23 33.9	-0.9	-2.4	71	N			
3	1809	6.9	A0	D	N				17 58.6	-	-	192	S			
3	1815	4.8	K0	D	18 17.7	-2.4	-1.0	87	N				N			
11	2790	6.2	B9	R	04 46.8	-	-	310	G				N			
12	3058	5.9	K0	R	23 33.6	-1.0	-1.4	209	23 49.2	-1.3	-0.2	244	23 50.2	-1.4	-0.9	276

Jupiter

LUNAR OCCULTATIONS - 1971

Date	Z.C.	Mag	Sp	Ph	Cape Town h. m.	a	b	P.A.	Johannesburg h. m.	a	b	P.A.	Salisbury h. m.	a	b	P.A.
Jun 13	3071	6.5	K0	R		N				G			03 36.3	-1.0	+3.3	198°
13	3196	6.1	A0	R		N				N			23 52.3	-	-	178
25	1287	6.7	A5	D		N			19 01.5	-	-	191°	18 41.6	0.0	-1.2	144
25	1293	6.7	K0	D	19 12.4	-0.7	+0.6	105°		A				N		
25	1294m	6.9	A0	D	19 15.0	-0.8	+0.8	100		N				N		
27	1497	7.6	G5	D		N				N			19 38.4	+0.2	-2.9	173
28	1599	5.0	K0	D	21 19.6	-0.4	-1.2	151	21 20.5	-0.6	0.0	114	21 27.7	-0.8	+1.4	76
30	1778	7.1	K0	D		N				N			20 01.3	-0.5	-1.2	177
Jul 2	1993	6.8	K0	D		G			20 12.3	-2.0	-2.2	140	20 07.1	-3.0	-0.8	108
3	2108	6.4	G0	D	21 31.6	-3.1	+1.6	72		N				N		
3	2109	6.1	K2	D	22 17.8	-2.5	+1.1	83		G				N		
5	2251	7.5	K0	D	01 46.1	-0.7	+1.9	70	02 05.4	+0.1	+2.3	54		N		
5	2366m	1.2	M0,A3	D	18 06.0	-0.7	-3.4	161	17 47.5	-0.5	-1.7	119	17 40.1	-1.2	-0.6	90
5	2366m	1.2	M0,A3	R	18 47.3	-2.2	+0.5	236	19 00.7	-1.6	-1.2	280	18 50.9	-1.0	-2.2	311
5	2373	6.2	K0	D	19 01.0	-0.1	-3.0	149	18 50.9	-1.3	-1.4	108	18 49.9	-2.4	+0.1	76
16	302	6.4	K5	R	03 59.2	+0.4	+2.1	187	04 13.1	0.0	+2.1	193	04 29.8	-0.9	+1.7	212
28	1845m	6.5	K0	D	18 51.3	-1.9	-0.9	125	19 13.7	-2.5	+1.5	82		N		
30	2066m	6.4	A0	D	20 26.5	-1.9	-1.6	135	20 41.5	-2.1	+0.2	102	20 56.6	-1.9	-2.2	68
Aug 1	2312	5.6	M0	D		N				N			19 11.7	-2.2	-3.4	146
2	2468	6.9	G5	D	22 43.4	-1.6	+3.3	43	23 27.6	-	-	13		N		
2	2476	6.9	F0	D	23 59.8	-0.7	+3.5	38	24 30.7	-	-	19		N		
6	3091	6.9	K2	D		N			21 36.1	-2.2	-3.0	118	21 31.6	-2.1	-0.2	83
6	3091	6.9	K2	R		N			22 20.4	-1.0	+4.1	187	22 48.2	-1.8	+2.1	218
8	3269	4.3	K0	D	06 03.3	-	-	344		N				N		
8	3269	4.3	K0	R	06 21.4	-	-	310		N				N		
9	3512	5.8	K2	R		N			22 21.0	+0.1	+3.1	181	22 38.3	-0.5	+1.4	214
12	266	5.7	A0	R	03 19.9	+0.3	+2.4	183	03 38.7	+0.1	+3.0	183	04 02.2	-1.0	+2.4	201
14	529	6.2	A0	R		A			02 16.7	-1.0	-0.9	270	02 10.3	-1.9	-1.9	295
27	2138	7.5	F5	D	20 38.1	-1.7	-0.7	129	20 51.3	-1.2	+0.3	106	21 00.4	-0.8	+1.2	79
28	2268	4.8	B3	D	22 16.9	-1.4	-0.2	123	22 28.4	-0.8	+0.3	108	22 34.8	-0.3	+0.8	85
28	2273	5.9	B8	D	22 45.6	-0.8	+0.8	100	22 57.9	-0.3	-0.9	88	23 07.5	+0.2	+1.4	66
29	2366m	1.2	M0,A3	R		N				N			11 51.4	-0.7	+0.7	235
29	2404	6.9	G0	D	18 51.3	-2.6	0.0	88	19 27.2	-2.6	+2.7	55		N		
29	2409	6.8	A0	D	20 32.8	-	-	33		N				N		
29	2420	7.4	A0	D	22 52.7	-0.8	+1.8	70	23 11.4	-0.1	+1.8	60	23 28.9	+0.7	+2.7	35
30	2558	6.2	B3	D	23 02.2	-1.2	+1.6	73	23 23.2	-0.6	+1.6	66	23 39.2	+0.1	+2.0	46
31	2564	6.8	A3	D	00 04.0	-1.4	+0.2	116	00 17.1	-0.9	+0.3	109	00 23.0	-0.4	-0.6	89
Sep 1	2872m	6.2	A0	D		S			18 33.5	-2.0	+0.5	64	18 53.7	-2.3	+3.2	29
1	2875	6.1	K0	D		S			18 43.1	-2.0	+0.3	68	19 01.3	-2.3	+2.7	34
1	2884	7.4	F2	D	21 26.8	-1.7	+2.1	41	22 01.9	-1.1	+3.1	28	22 37.3	-	-	357
3	3041	6.4	K0	D		N				N			02 00.1	-	-	124
10	490	5.7	K0	R	02 30.8	-2.2	-1.4	285	02 45.0	-3.0	-1.3	287		G		
13	994	6.5	F5	R		A			03 34.5	-0.5	+0.7	225	03 40.9	-1.2	-0.2	247
22	1993	6.8	K0	D	19 26.9	-	-	170	19 22.2	-0.7	-0.9	139	19 20.2	-0.4	-0.1	110
23	2108	6.4	G0	D	21 17.9	-0.2	+0.6	106		A				A		
24	2220m	7.0	A3	D		N				N			19 59.7	-1.5	-1.3	135
25	2366m	1.2	M0,A3	D	21 16.4	-2.1	-2.0	147	21 23.3	-1.2	-0.7	131	21 24.2	-0.6	+0.1	106
25	2366m	1.2	M0,A3	R	21 51.0	+0.9	+4.1	207	22 08.0	+0.7	+2.5	221	22 21.3	+0.5	-1.2	245
28	2823	7.0	K0	D	21 11.4	-2.5	+0.1	101	21 36.3	-2.0	+0.6	95	21 48.6	-1.4	-1.1	77
30	2977	6.9	K0	D	01 30.4	-0.2	+1.6	62	01 42.1	+0.2	+1.4	58		A		
30	3091	6.9	K2	D		N				N			18 32.7	-	-	123
30	3108	5.5	M0	D	22 35.2	-1.7	+1.4	64	23 02.1	-1.5	-1.5	64	23 19.8	-1.0	-1.8	51
Oct 2	3269	4.3	K0	D	02 53.8	0.0	+2.3	23	03 11.1	+0.2	-2.5	14		N		
6	288	5.2	G5	R	01 14.6	-0.4	-2.2	190	01 38.9	-0.7	+2.8	189	00 04.0	-1.6	+2.4	208
9	756	6.5	A2	R	01 18.7	-1.1	-0.8	264	01 26.6	-1.8	-0.7	269	01 25.4	-2.5	-1.2	287
9	771m	6.1	A3	R	04 04.1	-2.5	-0.9	294	04 21.2	-2.7	-1.3	309		N		
22	2332	6.2	B9	D	20 29.2	-0.1	-1.3	82		A				A		
23	2458	6.2	A0	D		S			19 36.8	-0.3	+2.9	38		N		
24	2605	7.1	A0	D		S			19 46.4	-0.3	+2.3	47	20 08.6	-0.7	+3.2	23
24	2623m	7.5	G0	D	22 17.2	-0.2	+1.1	88		A				A		

LUNAR OCCULTATIONS - 1971

Date		Z.C.	Mag	Sp	Ph	Cape Town h. m.	a	b	P.A.	Johannesburg h. m.	a	b	P.A.	Salisbury h. m.	a	b	P.A.
Oct	25	2761	6.6	A0	D	S				18 45.7	-1.5	+2.1	54°	19 09.6	-0.6	+2.9	33°
	25	2767	6.4	K0	D	19 38.5	-3.0	-1.0	121°	20 00.1	-2.4	-0.3	114	20 07.6	-1.6	+0.5	92
	25	2771	5.7	K2	D	N				N				21 20.6	-1.7	-0.8	122
	28	3189	7.0	F8	D	21 24.2	-2.2	-0.9	82	21 51.8	-2.0	+1.0	84	22 06.6	-1.5	+1.3	70
	28	3188	5.4	A0	D	21 49.5	-0.5	+2.8	18	22 14.6	-0.3	+2.7	20	22 39.5	+0.4	+3.4	2
	29	3205	6.8	K0	D	01 19.1	-0.2	+1.5	69	A				A			
	29	3208	6.5	B9	D	01 47.1	+0.1	+1.9	37	A				A			
	29	3328	7.0	M0	D	23 30.0	-	-	123	23 53.0	-	-	122	23 57.9	-1.5	+0.4	97
	30	3462	7.5	K2	D	20 13.5	-2.0	0.0	77	20 36.6	-2.4	-0.5	75	20 51.1	-2.2	+1.3	59
	31	3482	5.6	F5	D	00 23.3	-1.4	+1.5	66	00 46.8	-1.0	+1.5	63	01 03.1	-0.7	+1.8	48
Nov	5	701m	6.5	F0	R	N				N				02 43.0	-2.8	+2.4	221
	9	1298m	6.5	G5	R	03 29.1	-	-	4	N				N			
	9	1299	6.3	A2	R	04 02.2	-1.7	-2.2	324	03 55.9	-	-	354	N			
	21	2719	5.8	B8	D	S				19 03.5	-0.5	+1.6	64	19 18.4	0.0	+1.8	47
	23	3022	6.9	K0	D	22 50.7	+0.3	+1.9	38	A				A			
	24	3142	6.8	B9	D	S				19 19.5	-2.4	+0.7	89	19 34.0	-1.9	+1.2	74
	25	3269	4.3	K0	D	S				S				19 03.8	-	-	351
Dec	4	1099m	6.0	K0	R	23 47.9	-1.3	-1.1	272	23 55.3	-2.0	-1.1	283	23 50.3	-2.3	-1.7	303
	12	1845m	6.5	K0	R	N				N				02 29.5	-	-	235
	22	3233	7.2	F0	D	S				S				19 45.4	-	-	341
	22	3247	7.0	G5	D	21 25.2	-0.5	+1.6	68	21 39.8	-0.1	+1.5	62	A			
	23	3370	6.2	G5	D	20 34.5	-1.7	+1.1	90	20 56.4	-1.1	+1.1	87	21 08.8	-0.8	+1.2	70
	24	3501	5.3	N0	D	S				19 25.8	-3.2	+0.1	101	19 37.9	-2.5	+0.8	84
	24	3511	6.7	A2	D	22 55.4	-0.6	+2.0	42	A				A			
	26	243m	6.9	G5	D	23 45.9	-1.1	+0.8	101	24 02.4	-0.8	+1.1	82	A			
	29	529	6.2	A0	D	01 15.7	-1.3	+1.0	90	A				A			
	29	701m	6.5	F0	D	N				22 28.4	-	-	147	22 21.6	-3.0	-1.1	117

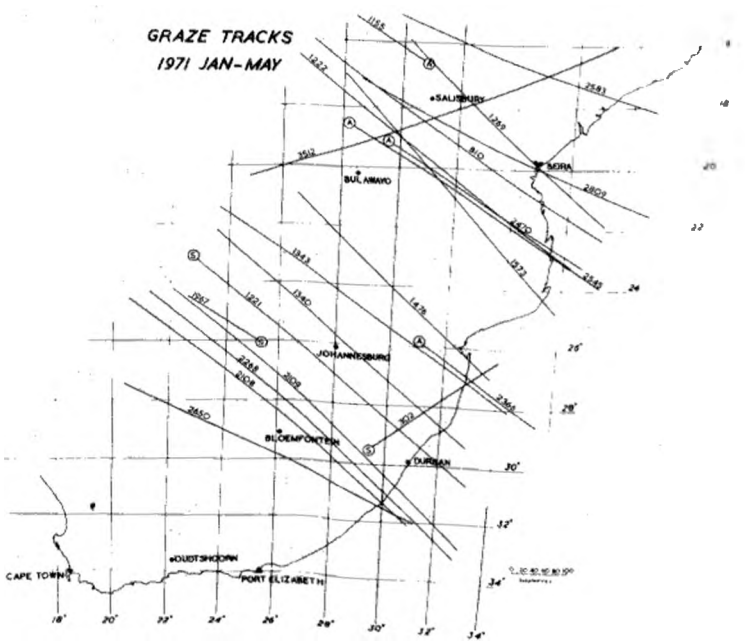
INDEX TO OCCULTED STARS BRIGHTER THAN SIXTH MAGNITUDE

Z.C.			Z.C.			Z.C.		
266	4	ARI	1637	76	LEO	2719	-25°	13394
288	ι	ARI	1815	κ	VIR	2750	σ	SGT
337	θ	ARI	1853	ψ	VIR	2771	-25°	13655
490	64	ARI	1967	83	VIR	2809m	ψ	SGT
810	β	TAU	2268m	2	SCO	2834	κ	SGT
1099m	52	GEM	2273	3	SCO	3058	-18°	5805
1157	+24°	1730	2298	-25°	11295	3108	-15°	5935
1277	η	CAN	2312	-25°	11369	3188	λ	CPR
1525	44	LEO	2366m	α	SCO	3269	θ	AQR
1549	48	LEO	2554	3	SGT	3482	+1°	4744
1599	58	LEO	2583	-28°	13878	3501	19	PISC
1635	75	LEO	2650	-27°	12684	3512	22	PISC

GRAZING OCCULTATIONS

The maps show the tracks of stars brighter than magnitude 7.5 which will graze the limb of the Moon when it is at a favourable elongation from the Sun and at least 10° above the observer's horizon (2° in the case of bright stars). Each track starts in the West at some arbitrary time and ends beyond the area of interest, except where the letters "A" or "S" are given. "A" denotes that the Moon is at a low altitude and "S" that sunlight interferes. The time of occultation for any place on the tracks occurs within about 15 minutes from the time in the West. Observers positioned on, or very near one of these tracks, will probably see the star disappear and reappear at the edges of features on the limb of the Moon.

Observers interested in recording the times of such events should contact the Director of the Society's Occultation Section, Mr A. G. F. Morrisby (address given on page 12).

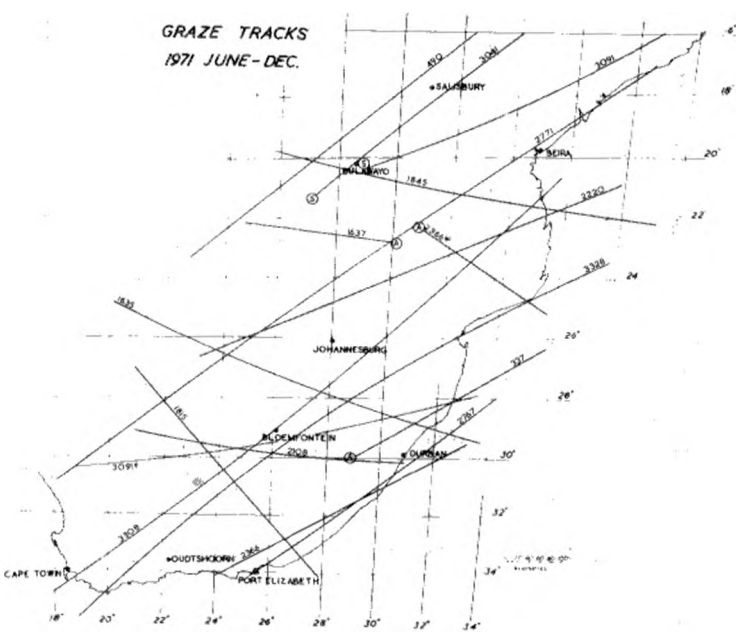


GRAZING OCCULTATIONS - 1971

DATE	Z. C.	Mag	Sp	START h	START m	N or S limit
Jan 5	302	6.4	K5	20	01	S
21	2108	6.4	G0	2	08	S
21	2109	6.1	K2	2	43	S
24	2545	6.4	A5	3	57	S
Feb 16	1967	5.7	F0	5	10	S
20	2470	6.1	B9	1	32	S
Mar 4	810	1.8	B8	22	18	N
17	2268m	4.8	B3	23	22	S
20	2583	5.8	A3	3	34	S
Apr 14	2366m	1.2	M0, A3	20	34	S
30	1155	6.3	F0	21	32	N
May 1	1269	7.0	G5	19	50	N
3	1476	7.0	A0	18	52	N
4	1573	7.0	A2	20	25	N
13	2650	4.7	K5	23	31	S
14	2809m	4.9	F3	22	52	S
20	3512	5.8	K2	3	55	N
28	1221	6.2	M3	18	27	N
28	1222	7.2	G0	18	50	N

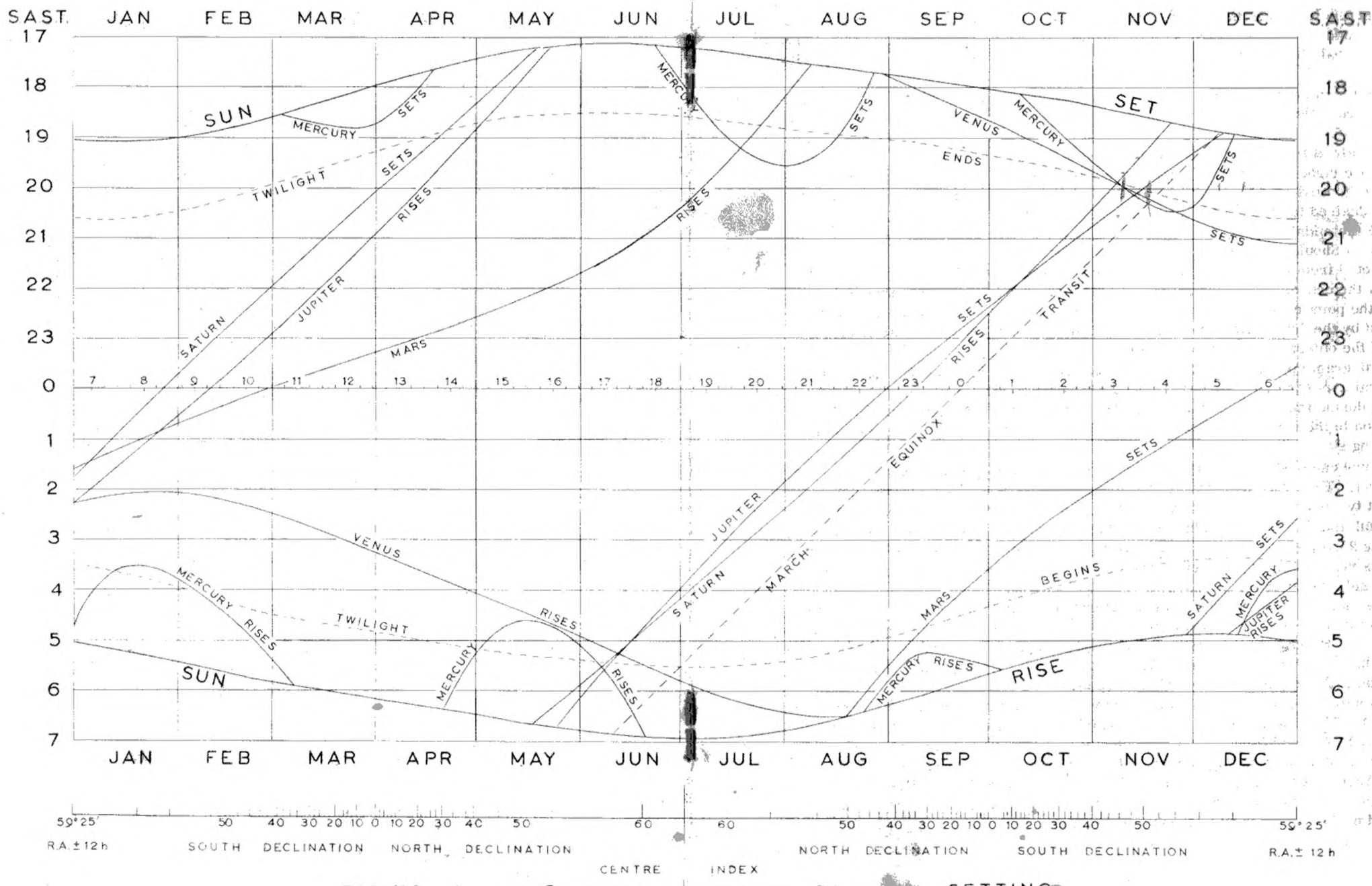
DATE	Z. C.	Mag	Sp	START h	START m	N or S
May 29	1340	6.6	A0	19	05	N
29	1343	6.6	M3	19	48	N
June 1	1635	5.4	K5	22	26	N
1	1637	6.0	K0	23	52	N
3	1815	4.8	K0	18	36	N
July 3	2108	6.4	G0	22	10	N
12	3308	6.2	F8	2	54	N
28	1845m	6.5	K0	19	37	N
*Aug 6	3091	6.9	K2	21	44	S
29	2366m	1.2	M0, A3	11	39	S
Sept 8	337	5.7	A0	23	00	N
10	490	5.7	K0	2	10	N
24	2220m	7.0	A3	20	15	S
25	2366m	1.2	M0, A3	21	36	S
30	3091	6.9	K2	18	45	S
Oct 25	2767	6.4	K0	20	10	S
25	2771	5.7	K2	21	14	S
27	3041	6.4	K0	19	12	S
29	3328	7.0	M0	23	40	S

*Occurs during lunar eclipse



THE PLANETS AS SEEN FROM SOUTH AFRICA 1971

FOR EXPLANATION SEE NOTES ON PLANETS



THE PLANETS - 1971

The Chart (centre pages) shows the SAST 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 on page 1 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). This line will show the time of rising or setting of the object at latitude 30° South.

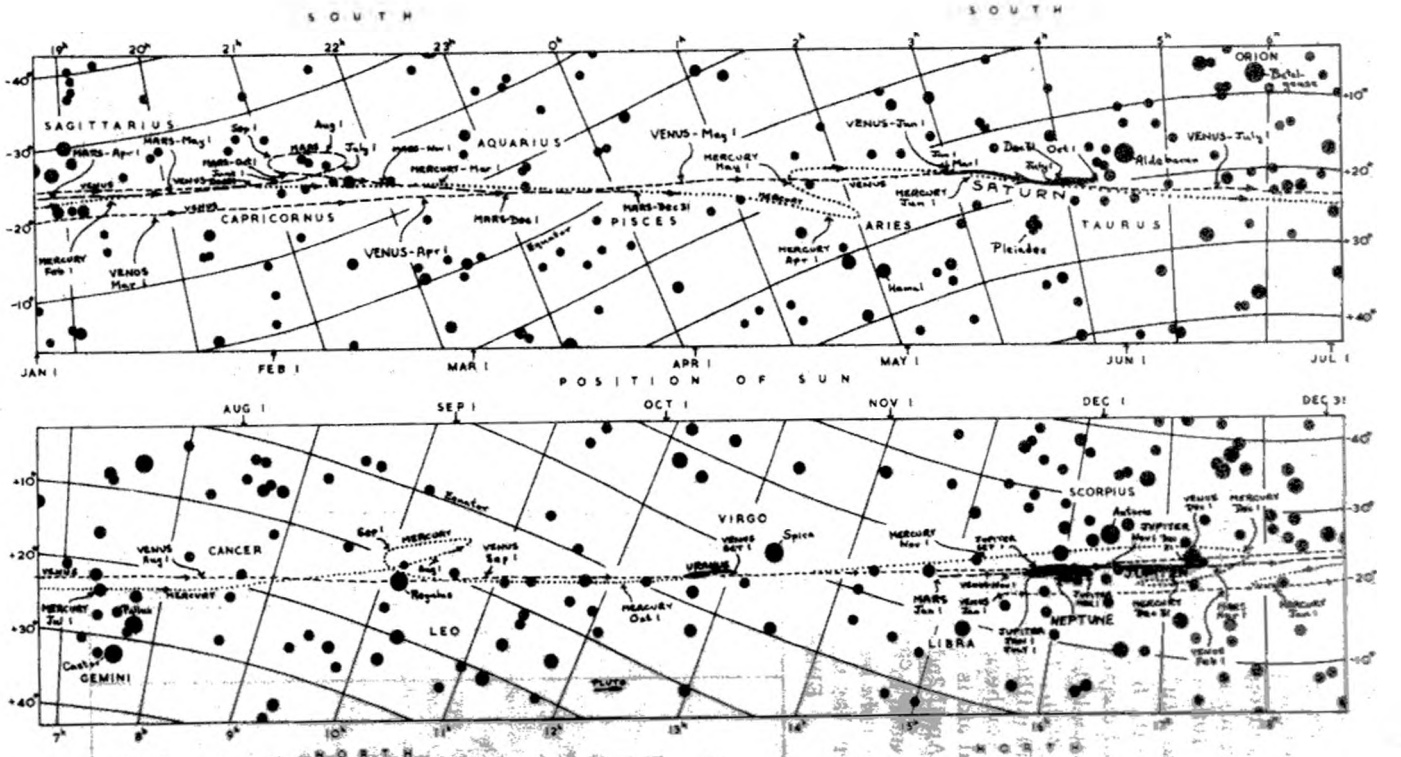
The diagram opposite shows the movement of the planets in the constellations. The central axis of this diagram is the ecliptic, the apparent path of the Sun around the Earth during the course of the year. The dates of the Sun's position are indicated. That region to the right of the Sun would appear in the evening sky, that to the left in the morning sky.

Mercury can best be seen near its greatest elongation (see Astronomical Diary for details). The largest western elongation occurs on May 17th when the planet will rise about two hours before sunrise (mag 0.8). The best evening visibility will occur on July 30th (mag 0.7) setting about two hours after sunset. The planet will be brightest about June 23rd (mag -1.8). A close conjunction with the moon takes place on July 24th.

Venus reaches greatest elongation west on January 20th. Thereafter it moves eastward relative to the sun, reaching superior conjunction on August 27th. After this it appears as an evening object setting progressively later than the sun. For the rest of the year there is little variability in its brightness, maintaining an average magnitude of -3.4. Close conjunctions with the moon take place on March 24th and December 20th and during the first few weeks of November it will be seen in the western sky in conjunction with the planets Mercury and Jupiter.

Mars will be very prominent during the year as opposition occurs on August 10th (mag -2.6). This opposition will be particularly favourable to southern hemisphere observers, because of the planet's large southern declination at the time. The stationary times are July 13th and September 11th. The nearest approach to the Earth takes place on August 12th when the planet will be at a distance of 56.2 million kilometers and the disc will have a diameter of 24.9". After this the planet recedes from the earth; by the end of the year it is setting about midnight.

MOVEMENT OF THE PLANETS - 1971



At the beginning of the year Jupiter rises after midnight and thereafter becomes a brilliant evening object in the eastern sky. The retrograde motion begins on March 23rd and ends on July 25th. Opposition is reached on May 23rd (mag - 2.1) when the planet will be 651.1 million kilometers distant, and the polar disc will subtend an angle of 42". After opposition the planet appears to move closer to the sun and towards the end of November will be lost in the evening twilight. After conjunction with the sun on December 10th it becomes a morning object but will not become clearly visible again until January 1972.

During the first few months of 1971, Saturn is an evening object moving closer to the Sun until conjunction takes place on May 17th. After this it rises before sunrise and increases in brightness, reaching a maximum of -0.2 magnitude at opposition on November 26th. The polar diameter will then subtend an angle of 18" and the planet will be 1210 million kilometers away. The rings appear widest (19.5") in mid-November, their southern surface being observed.

Optical aid is required to observe Uranus and Neptune. The opposition of Uranus occurs on April 2nd (mag 5.5) and the opposition of Neptune occurs on May 23rd (mag 7.7). They can be found fairly easily from the accompanying ephemerides.

EPHEMERIDES FOR URANUS AND NEPTUNE

DATE	URANUS R.A.	URANUS Dec.	NEPTUNE R.A.	NEPTUNE Dec.
	h m		h m	
Jan 1	12 50.5	- 4° 40'	16 01.0	- 18° 58'
21	12 51.0	- 4 22	16 03.3	- 19 04
Feb 10	12 50.2	- 4 36	16 04.8	- 19 07
Mar 2	12 48.1	- 4 23	16 05.5	- 19 08
22	12 45.3	- 4 05	16 05.2	- 19 06
Apr 11	12 42.1	- 3 45	16 04.1	- 19 02
May 1	12 39.2	- 3 26	16 02.3	- 18 57
21	12 37.0	- 3 13	16 00.1	- 18 50
Jun 10	12 35.8	- 3 07	15 57.9	- 18 44
30	12 36.0	- 3 08	15 56.0	- 18 39
Jul 20	12 37.4	- 3 18	15 54.6	- 18 36
Aug 9	12 40.0	- 3 36	15 54.0	- 18 35
29	12 43.5	- 3 59	15 54.3	- 18 37
Sep 18	12 47.8	- 4 26	15 55.5	- 18 42
Oct 8	12 52.4	- 4 55	15 57.4	- 18 48
28	12 57.0	- 5 24	16 00.0	- 18 57
Nov 17	13 01.3	- 5 51	16 02.9	- 19 05
Dec 7	13 04.8	- 6 12	16 06.1	- 19 14
27	13 07.3	- 6 27	16 09.0	- 19 22

THE SATELLITES OF JUPITER

One of the most popular sights for the amateur astronomer with a small telescope is the planet Jupiter. Four of Jupiter's twelve moons are generally clearly visible. The system is seen near edge-on and consequently the moons appear to lie close to a straight line extending from the planet's equator. As they orbit the mother planet, they appear to oscillate from one side to the other, alternately passing in front of, and behind, the planet. This motion is represented on the diagrams overleaf, which cover four of the months when Jupiter is prominent in the evening sky. The horizontal displacements show their relative positions on either side of the planet. The vertical axis is time; the planet's disk is represented by the central column. The horizontal lines are given for 0200 hrs SAST (0 hrs Universal Time) each day. The scales on either side mark the position at approximately 9.30 p.m., a likely time for any evening observation. A ruler placed across the diagram then shows the configuration of the four moons (the points where their paths intersect the ruler's edge).

During the course of the passing of these satellites in front of, and behind, the planet, numerous eclipses, occultations and transits occur. 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 on pages 25 and 26. 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.

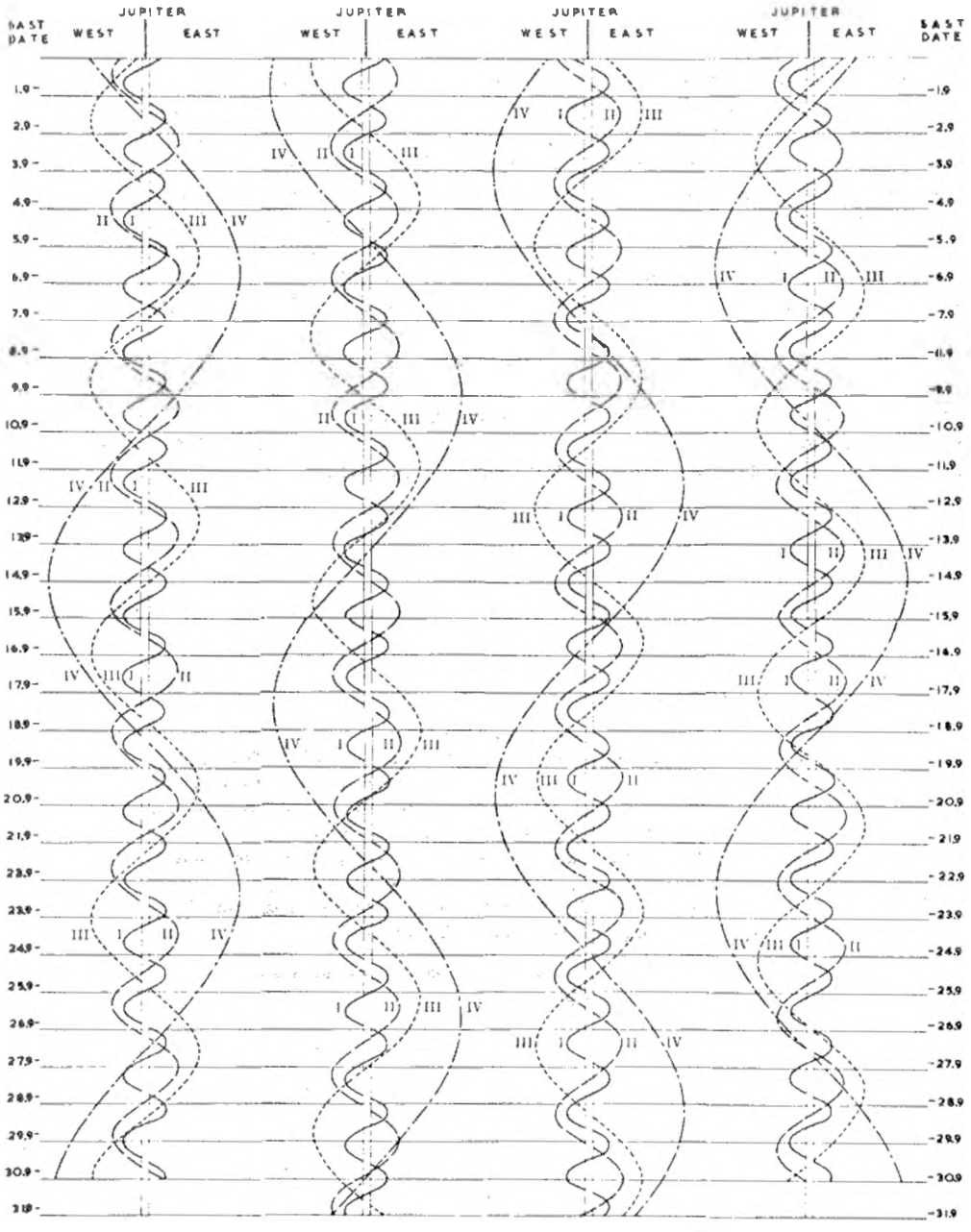
Sh. – Shadow transit: the shadow of the satellite transits the disc.

The second column gives the phase of the phenomenon.

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

CONFIGURATIONS OF JUPITER'S SATELLITES

JUNE JULY AUGUST SEPTEMBER



Date	S.A.S.T.	Sat	Phen
Feb 23	23h 54m	I	Sh I
Mar 1	23 24	II	Ec D
3	23 06	I	Ec D
3	23 23	II	Tr E
4	23 40	I	Tr E
6	23 03	III	Sh I
10	23 23	II	Tr I
10	23 30	II	Sh E
11	22 09	I	Sh I
11	23 22	I	Tr I
12	22 48	I	Oc R
17	21 46	III	Oc D
17	23 32	II	Sh I
17	23 48	III	Oc R
19	22 52	II	Oc R
20	21 50	I	Tr E
24	23 04	III	Ec R
26	23 13	I	Ec D
27	21 30	I	Tr I
27	22 35	I	Sh E
27	23 40	I	Tr E
28	20 54	I	Oc R
Apr 2	23 04	II	Ec D
3	22 18	I	Sh I
3	23 19	I	Tr I
4	20 58	III	Tr E
4	22 21	II	Tr E
4	22 42	I	Oc R
11	21 03	III	Sh E
11	21 27	I	Ec D
11	22 12	II	Tr I
11	22 34	III	Tr I

Date	S.A.S.T.	Sat	Phen
Apr 11	22h 58m	II	Sh E
12	20 51	I	Sh E
12	21 43	I	Tr E
18	22 49	III	Sh I
18	22 59	II	Sh I
18	23 20	I	Ec D
19	21 19	I	Tr I
19	22 45	I	Sh E
19	23 29	I	Tr E
20	20 41	I	Oc R
20	21 41	II	Oc R
26	22 27	I	Sh I
26	23 05	I	Tr I
27	19 42	I	Ec D
27	20 10	II	Ec D
27	22 26	I	Oc R
28	19 41	I	Tr E
29	20 59	III	Oc R
May 4	21 35	I	Ec D
4	22 47	II	Ec D
5	19 16	I	Tr I
5	21 01	I	Sh E
5	21 26	I	Tr E
6	19 55	II	Sh E
6	20 35	III	Ec D
6	20 40	II	Tr E
11	23 29	I	Ec D
12	20 44	I	Sh I
12	21 00	I	Tr I
12	22 56	I	Sh E
12	23 10	I	Tr E
13	19 55	II	Sh I

Date	S.A.S.T.	Sat	Phen
May 13	20h 20m	I	Oc R
13	20 24	II	Tr I
13	22 28	II	Sh E
13	22 54	II	Tr E
19	22 38	I	Sh I
19	22 44	I	Tr I
20	19 51	I	Ec D
20	22 04	I	Oc R
20	22 29	II	Sh I
20	22 37	II	Tr I
21	19 18	I	Sh E
21	19 20	I	Tr E
22	19 57	II	Oc R
24	18 39	III	Tr I
24	18 39	III	Sh I
24	20 38	III	Tr E
24	20 55	III	Sh E
27	21 39	I	Oc D
27	23 54	I	Ec R
28	18 54	I	Tr I
28	19 01	I	Sh I
28	21 04	I	Tr E
28	21 13	I	Sh E
29	19 36	II	Oc D
29	22 33	II	Ec R
31	21 55	III	Tr I
31	22 37	III	Sh I
31	23 56	III	Tr E
Jun 3	23 22	I	Oc D
4	20 38	I	Tr I
4	20 56	I	Sh I
4	22 49	I	Tr E

Date	S.A.S.T.	Sat	Phen
Jun 4	23h 07m	I	Sh E
5	20 17	I	Ec R
5	21 52	II	Oc D
7	18 43	II	Tr E
7	19 27	II	Sh E
11	18 46	III	Ec R
11	22 23	I	Tr I
11	22 51	I	Sh I
12	19 33	I	Oc D
12	22 11	I	Ec R
13	19 00	I	Tr E
13	19 31	I	Sh E
14	19 28	II	Sh I
14	20 58	II	Tr E
14	22 02	II	Sh E
18	20 11	III	Oc R
18	20 25	III	Ec D
18	22 45	III	Ec R
19	21 18	I	Oc D
20	18 35	I	Tr I
20	19 14	I	Sh I
20	20 46	I	Tr E
20	21 25	I	Sh E
21	18 34	I	Ec R
21	20 44	II	Tr I
21	22 02	II	Sh I
21	23 16	II	Tr E
23	19 42	II	Ec R
25	21 25	III	Oc D
25	23 37	III	Oc R
26	23 04	I	Oc D
27	20 22	I	Tr I

Date	S.A.S.T.	Sat	Phen
Jun 27	21h 09m	I	Sh I
27	22 33	I	Tr E
27	23 20	I	Sh E
28	20 29	I	Ec R
28	23 02	II	Tr I
30	22 18	II	Ec R
Jul 4	22 10	I	Tr I
4	23 04	I	Sh I
5	19 18	I	Oc D
5	22 23	I	Ec R
6	18 47	I	Tr E
6	19 43	I	Sh E
6	20 51	III	Sh E
7	20 20	II	Oc D
9	19 04	II	Sh E
11	23 58	I	Tr I
12	21 06	I	Oc D
13	19 28	I	Sh I
13	20 35	III	Tr E
13	20 36	I	Tr E
13	21 38	I	Sh E
13	22 31	III	Sh I
14	18 47	I	Ec R
14	22 45	II	Oc D
16	19 05	II	Sh I
16	19 31	II	Tr E
16	21 40	II	Sh E
19	22 56	I	Oc D
20	20 16	I	Tr I
20	21 23	I	Sh I
20	21 58	III	Tr I
20	22 26	I	Tr E
20	23 33	I	Sh E
21	20 42	I	Ec R
23	19 23	II	Tr I

Date	S.A.S.T.	Sat	Phen
Jul 23	21h 40m	II	Sh I
23	21 57	II	Tr E
25	19 26	II	Ec R
27	22 07	I	Tr I
27	23 18	I	Sh I
28	19 14	I	Oc D
28	22 37	I	Ec R
29	19 57	I	Sh E
30	21 51	II	Tr I
31	20 19	III	Ec D
31	22 43	III	Ec R
Aug 1	22 02	II	Ec R
3	23 59	I	Tr I
4	21 06	I	Oc D
5	19 42	I	Sh I
5	20 38	I	Tr E
5	21 52	I	Sh E
6	19 01	I	Ec R
7	19 11	III	Oc D
7	21 36	III	Oc R
8	19 27	II	Oc D
11	22 59	I	Oc D
12	20 21	I	Tr I
12	21 37	I	Sh I
12	22 31	I	Tr E
12	23 47	I	Sh E
13	20 56	I	Ec R
14	23 04	III	Oc D
15	22 01	II	Oc D
17	21 22	II	Sh E
18	20 50	III	Sh E
19	22 16	I	Tr I
19	23 32	I	Sh I
20	19 22	I	Oc D
20	22 51	I	Ec R

Date	S.A.S.T.	Sat	Phen
Aug 21	20h 11m	I	Sh E
24	21 22	II	Sh I
24	21 25	II	Tr E
24	23 59	II	Sh E
25	19 40	III	Tr E
25	22 27	III	Sh I
26	19 08	II	Ec R
27	21 17	I	Oc D
28	19 56	I	Sh I
28	20 50	I	Tr E
28	22 05	I	Sh E
29	19 15	I	Ec R
31	21 26	II	Tr I
31	23 59	II	Sh I
Sep 1	21 17	III	Tr I
1	23 44	III	Tr E
2	21 44	II	Ec R
3	23 14	I	Oc D
4	20 36	I	Tr I
4	21 51	I	Sh I
4	22 47	I	Tr E
5	21 10	I	Ec R
9	19 14	II	Oc D
11	22 34	I	Tr I
11	23 46	I	Sh I
12	19 41	I	Oc D
12	20 16	III	Ec D
12	22 43	III	Ec R
12	23 06	I	Ec R
13	19 13	I	Tr E
13	20 24	I	Sh E
16	21 56	II	Oc D
18	21 09	II	Sh E
19	19 30	III	Oc D
19	21 39	I	Oc D

Date	S.A.S.T.	Sat	Phen
Sep 19	22h 03m	III	Oc R
20	20 09	I	Sh I
20	21 11	I	Tr E
20	22 19	I	Sh E
21	19 30	I	Ec R
25	21 07	II	Sh I
25	21 33	II	Tr E
27	21 00	I	Tr I
27	22 04	I	Sh I
27	23 10	I	Tr E
28	21 25	I	Ec R
30	20 51	III	Sh E
Oct 2	21 38	II	Tr I
4	21 23	II	Ec R
4	22 59	I	Tr I
5	20 07	I	Oc D
6	19 39	I	Tr E
6	20 38	I	Sh E
7	20 56	III	Tr E
7	22 22	III	Sh I
12	22 07	I	Oc D
13	20 22	I	Sh I
13	21 39	I	Tr E
14	19 44	I	Ec R
20	20 58	II	Sh E
20	21 28	I	Tr I
21	21 39	I	Ec R
25	19 45	III	Oc R
25	20 11	III	Ec D
27	20 54	II	Sh I
28	20 39	I	Oc D
29	20 10	I	Tr E
29	20 50	I	Sh E

ECLIPSES

During 1971 there will be five eclipses, three of the sun and two of the moon.

1. Feb 10 Total eclipse of the Moon - not visible in South Africa.
2. Feb 25 Partial eclipse of the Sun - not visible in South Africa.
3. July 22 Partial eclipse of the Sun - not visible in South Africa.
4. Aug 6 Total eclipse of the Moon - visible in South Africa.
5. Aug 20-21 Partial eclipse of the Sun - not visible in South Africa.

Total eclipse of the Moon, August 6th-7th

Moon enters penumbra	August	6th	18h	58.0m
Moon enters umbra	"	6th	19	55.1
Total eclipse begins	"	6th	20	53.1
Middle of the eclipse	"	6th	21	43.2
Total eclipse ends	"	6th	22	33.2
Moon leaves umbra	"	6th	23	31.3
Moon leaves penumbra	"	7th	00	28.2

Magnitude of the eclipse 1.734

JOVIAN OCCULTATION

On the evening of May 13, 1971, the planet Jupiter will occult the bright star Beta Scorpii. It is intended that further information will be published in MNASSA.

METEOR CALENDAR

Tables of meteor showers are given overleaf. 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.

Date	Shower	Radiant		Maximum		
		R.A.	Dec	Date	Hourly Rate	Transit of Radiant (approx.)
Mar 14 - Mar 18	Corona Australids	245°	- 48°	Mar 16	5	05h 00m
Mar 12 - Apr 25	Hydraids	184	- 27	Mar 25	?	00 00
Apr 2 - Apr 24	April Lyrids	272	+ 32	Apr 21	14	04 30
May 1 - May 8	Eta Aquarids	336	00	May 5	18	07 40
Apr 20 - Jul 30	Sco-Sgr System	270	- 30	Jun 14	?	00 40
Jun 10 - Jun 21	June Lyrids	278	+ 35	Jun 16	9	01 00
Jun 17 - Jun 26	Ophiuchids	260	- 20	Jun 20	15	23 30
Jul 10 - Aug 5	Capricornids	315	- 15	Jul 25	12	01 00
Jul 15 - Aug 15	Delta Aquarids	339 339	- 17 00	Jul 29	35	02 20
Jul 15 - Aug 20	Pisces Australids	340	- 30	Jul 30	15	02 20
Jul 15 - Aug 25	Alpha Capricornids	309	- 10	Aug 1	10	00 00
Jul 15 - Aug 24	Iota Aquarids	338 331	- 15 - 6	Aug 5	12	01 50
Oct 16 - Oct 27	Orionids	96	+ 15	Oct 21	35	04 30
Oct 10 - Dec 5	Taurids	52 54	+ 14 + 21	Nov 1	16	00 00 00 10
Nov 14 - Nov 20	Leonids	152	+ 22	Nov 17	80?	06 30
Dec 5	Phoenicids	15	- 55	Dec 5	?	20 10
Dec 7 - Dec 15	Geminids	112	+ 32	Dec 13	55	02 10
Dec 5 - Jan 7	Velaids	149	- 51	Dec 29	?	03 30

Recommended SAST of watch	Conditions at Maximum	Nature of Current	Appearance
02 - dawn	Unfavourable		
22h - 02h	Favourable		
00h - 02h	Unfavourable	Cometary: Comet 1861 I	Bright and swift, with streaks
03h - dawn	Unfavourable	Cometary: Halley	Very swift - long paths
20h - 24h	Unfavourable	Ecliptical	
22h - 24h	Unfavourable		Blue, with persistent trains
22h - 02h	Favourable		
22h - 02h	Favourable		
00h - 04h	Favourable	Ecliptical	Slow, with long paths
00h - 04h	Favourable		
02h - 04h	Unfavourable		Yellow fireballs
00h - 04h	Unfavourable		
02h - dawn	Favourable	Cometary: Halley	Swift, with streaks
20h - 24h	Favourable	Ecliptical	
02h - dawn	Favourable	Cometary: Comet 1866 I	
20h - 24h	Unfavourable		
23h - 02h	Favourable	Ecliptical	Medium speed, white
23h - 03h30m	Unfavourable		

THE STARS

This section contains a set of simplified star maps, intended for reference and for identifying constellations. Directions for using them follow below. Persons already acquainted with the use of star maps should note that, on the two main maps, south has been placed uppermost and north at the bottom, as is appropriate for southern hemisphere viewing.

Whilst star patterns are not seen to change from year to year, interested observers can follow brightness changes of variable stars. A short list of bright variable stars, with dates of maximum brightness, is provided below. Observers interested in reporting brightness estimates are reminded that there is a variable star section within the society (details inside back cover).

BRIGHT VARIABLE STARS

Date	Star	Max Mag	Period	R.A.	Dec.
Jun 20	Mira	3.5	332	$02^h\ 18^m$	$-03^o\ 07'$
Mar 16	R Hor	6.3	402	02 53	-50 02
Apr 19	R Car	4.6	308	09 31	-62 38
Apr 17	S Car	5.8	149	10 08	-61 22
Dec 19	R Hya	4.3	470	13 28	-23 06
Jan 6 Apr 7 Jun 7 Oct 6	T Cen	6.1	91	13 40	-33 45

Explanation to Star Maps

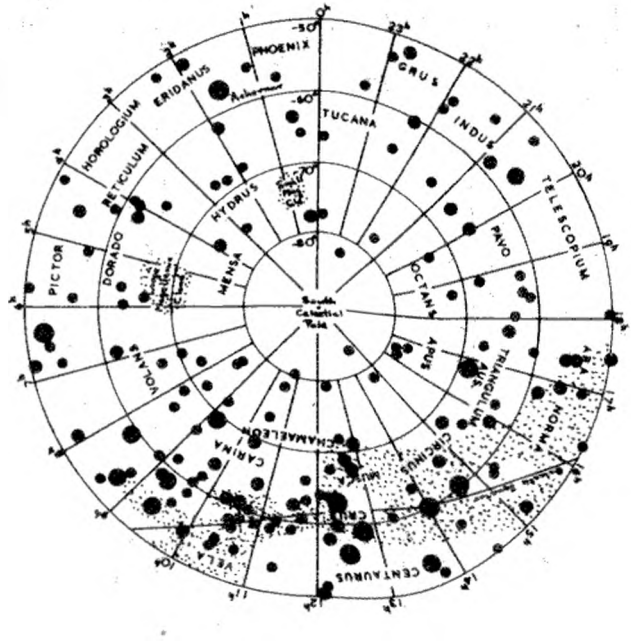
The complete sky can be represented by a sphere (the Celestial Sphere) viewed from the inside, one half of which is visible at any particular time to an observer with a flat horizon. The position of a star on this sphere is given by two coordinates that correspond to latitude and longitude on Earth. That equivalent to latitude is Declination, measured from $+90^o$ (at the North Celestial Pole) through 0^o (the Celestial Equator) to -90^o (at the South Celestial Pole). Right Ascension, corresponding to longitude, is measured eastwards in units of time - 24 hours being equal to 360^o.

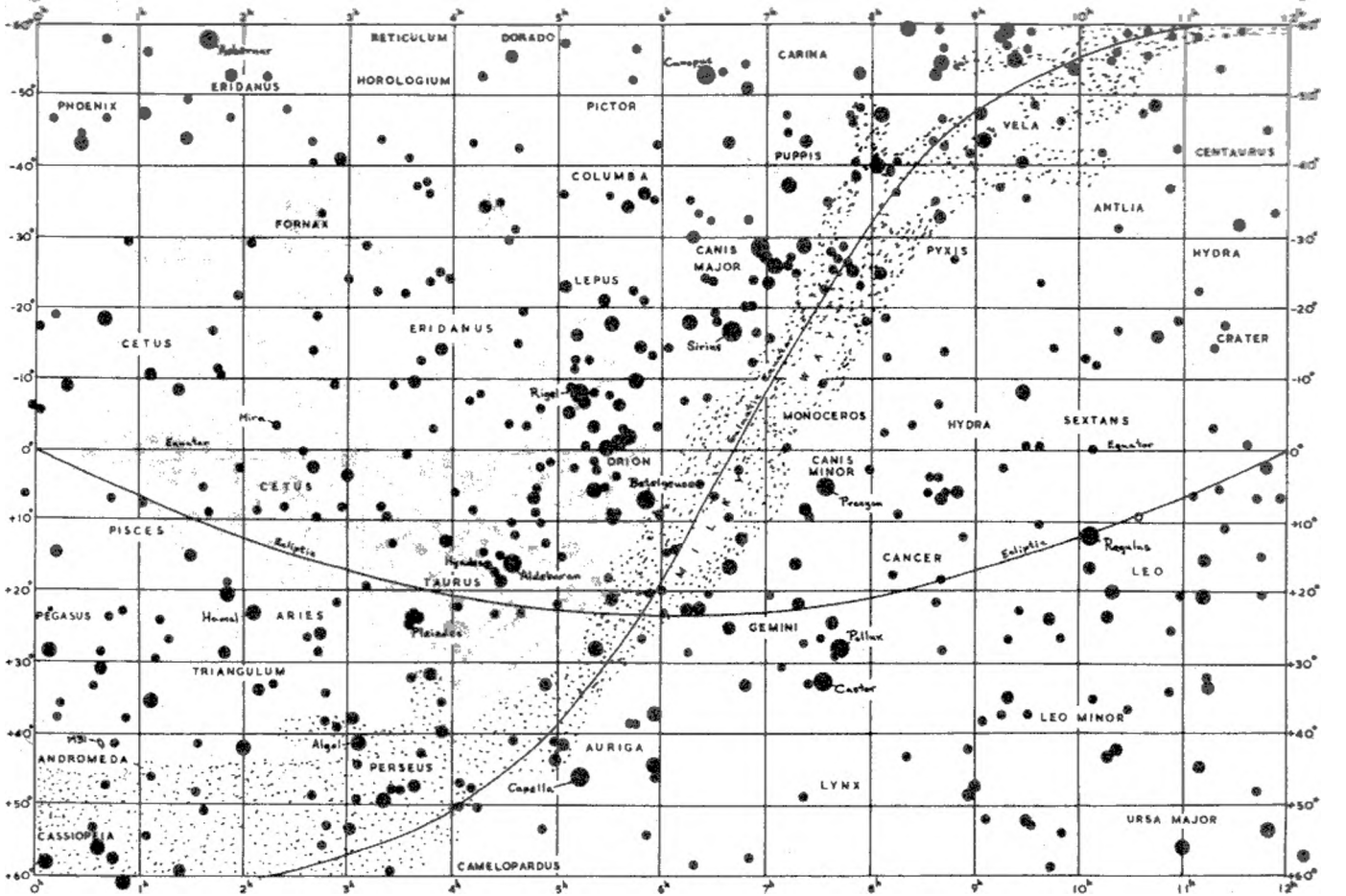
The first of the star maps shows the region of the sky in the vicinity of the South Celestial Pole. The two remaining maps have the Celestial Equator as their central axis and, like maps of the Earth with the equator as their central axis, must unavoidably show some distortion towards the top and bottom edges. The apparent path of the Sun around the Earth, the Ecliptic, is also shown; one of the points where it cuts the Celestial Equator serves as the zero point for the Right Ascension scale. [An earlier map showing the movements of the planets (page 21) represents the Ecliptic as a straight line and the Celestial Equator as a curve.] No map of the region of sky adjacent to the North Celestial Pole is provided as this area is not visible from Southern Africa.

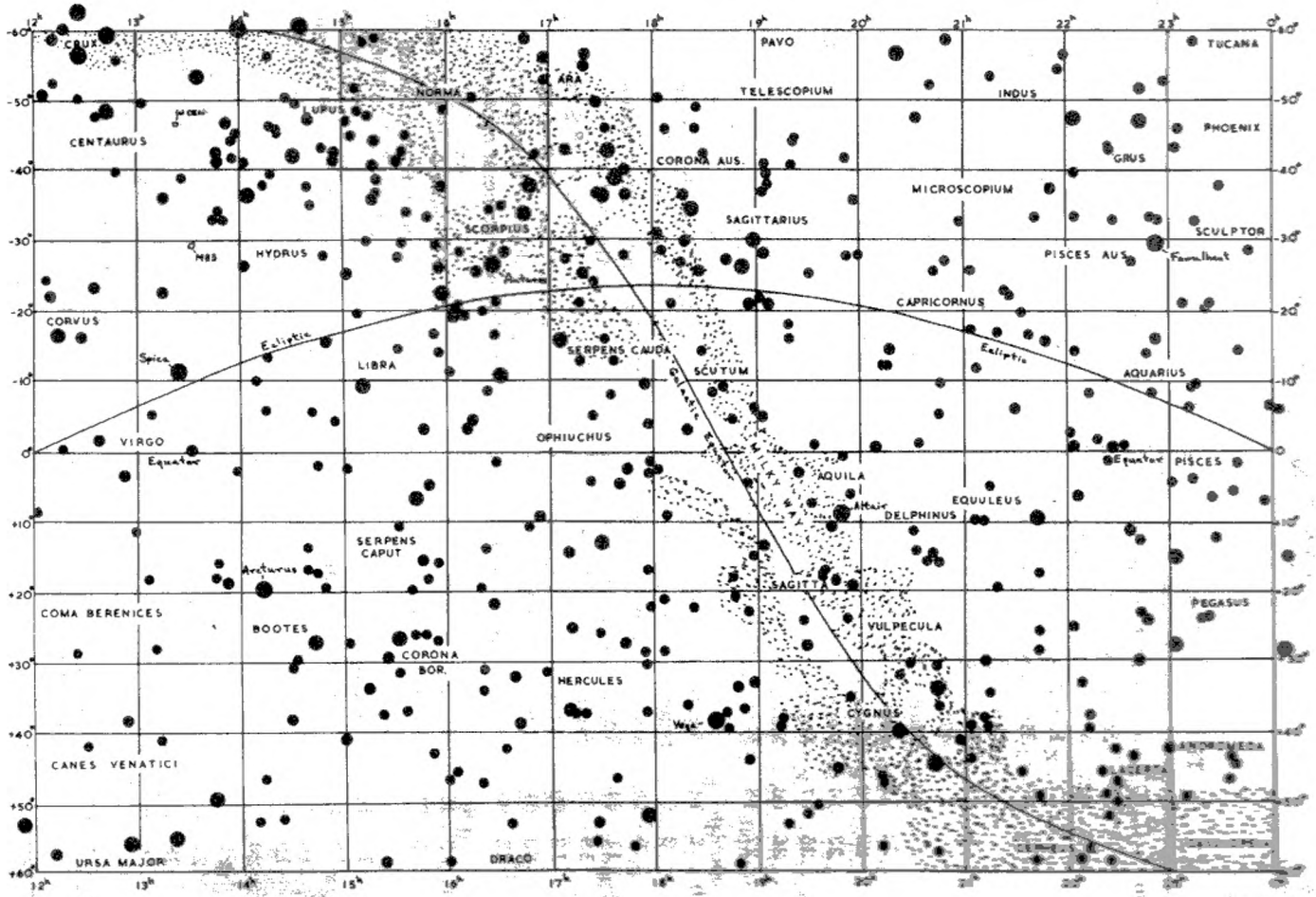
In order to identify constellations, it is best to make a rough estimate of the Local Sidereal Time. The table on page 2 lists the Sidereal Time throughout the year at 9.00 p.m. - a likely time for evening viewing. However, if necessary, an hour can be subtracted for 8.00 p.m. - and so on. The South Celestial Pole will be found elevated above the south point of the horizon by an angle equal to the southern latitude of the observer's site (e.g. 17° for Salisbury, 26° for Johannesburg, and 34° for Cape Town). The circular map should then be held with that line of Right Ascension equal to the Sidereal Time uppermost. As the Earth rotates, so the sky shown on the map will rotate in a clockwise direction; stars sufficiently close to the pole will not set below the horizon.

Stars closer to the Celestial Equator, shown on the rectangular maps, will rise and set. The best way of aligning these maps with the sky is to locate the point directly overhead. The Declination of this point is equal to the observer's latitude (i.e. -17° for Salisbury, -26° for Johannesburg, and -34° for Cape Town) and the Right Ascension roughly equal to the Sidereal Time. The map will be correctly oriented for an observer facing north.

Stars of fifth magnitude and fainter are not included in the maps here. Such fainter stars are better shown in a good star atlas, such as the widely used Norton's Star Atlas (published by Gall and Inglis). Many popular texts explain the movement of the skies more extensively, and provide information on individual constellations - which space does not permit here. Books such as "Our Southern Sky" by Roy Quarmby (published by Purnell) are suggested for interested observers.




RETICULUM
DORADO
HOROLOGIUM
ERIDANUS
Achernar
PHOENIX
PICTOR
Canopus
CARINA
VELA
PUPPIS
CENTAURUS
COLUMBA
FORNAX
ANTLIA
CANIS MAJOR
PYXIS
HYDRA
LEPUS
Sirius
CETUS
ERIDANUS
CRATER
Rigel
Mira
MONOCEROS
HYDRA
SEXTANS
Equator
ORION
Betelgeuse
CANIS MINOR
CETUS
Procyon
PISCES
Ecliptic
Hyades
Aldebaran
CANCER
Regulus
LEO
TAURUS
PEGASUS
Hamal
ARIES
Pleiades
GEMINI
Pollux
TRIANGULUM
Castor
LEO MINOR
Algol
ANDROMEDA
PERSEUS
AURIGA
LYNX
Capella
URSA MAJOR
CASSIOPEIA
CAMELOPARDUS
0h
1h
2h
3h
4h
5h
6h
7h
8h
9h
10h
11h
12h
+60°
+50°
+40°
+30°
+20°
+10°
0°
-10°
-20°
-30°
-40°
-50°
-60°


CRUX
CENTAURUS
LUPUS
NORMA
ARA
PAVO
TELESCOPIUM
INDUS
TUCANA
PHOENIX
GRUS
CORONA AUS.
MICROSCOPIUM
SAGITTARIUS
SCULPTOR
PISCES AUS.
Fomalhaut
SCORPIUS
HYDRUS
CAPRICORNUS
CORVUS
Spica
Ecliptic
LIBRA
SERPENS CAUDA
SCUTUM
AQUARIUS
VIRGO
Equator
OPHIUCHUS
AQUILA
Altair
DELPHINUS
EQUULEUS
PISCES
SERPENS CAPUT
Arcturus
SAGITTA
COMA BERENICES
BOOTES
VULPECULA
PEGASUS
CORONA BOR.
HERCULES
CYGNUS
CANES VENATICI
CASSIOPEIA
URSA MAJOR
DRACO

ASTRONOMICAL DIARY

Times of Conjunctions are for Geocentric Positions

Jan	4^{d}	07^{h}	Venus 3° N of Jupiter
	6	20	Saturn 8° S of Moon
	9	02	Venus 2° N of Neptune
	14	21	Regulus 1° N of Moon
	19	06	Mercury greatest elongation 24° W
	20	18	Venus greatest elongation 47° W
	22	09	Mars 6° N of Moon
	22	12	Jupiter 6° N of Moon
	23	00	Antares 0.5° N of Moon
	23	14	Venus 8° N of Moon
	25	07	Mercury 4° N of Moon
	26	06	Mars 0.3° S of Jupiter
	27	18	Mars 1.1° S of Neptune
Feb	2^{d}	14^{h}	Jupiter 0.8° S of Neptune
	3	01	Saturn 8° S of Moon
	5	19	Mars 5° N of Antares
	11	04	Regulus 1° N of Moon
	19	03	Jupiter 6° N of Moon
	19	09	Antares 0.5° N of Moon
	20	01	Mars 5° N of Moon
	22	05	Venus 5° N of Moon
Mar	2^{d}	11^{h}	Saturn 8° S of Moon
	6	21	Mercury in superior conjunction
	10	10	Regulus 1° N of Moon
	18	13	Jupiter 6° N of Moon
	18	16	Antares 0.4° N of Moon
	19	17	Pluto at opposition
	20	15	Mars 4° N of Moon
	21	09	Equinox
	24	03	Venus 0.3° S of Moon
	28	06	Mercury 3° S of Moon
	30	00	Saturn 7° S of Moon
Apr	1^{d}	07^{h}	Mercury greatest elongation 19° E
Apr	2^{d}	00^{h}	Uranus at opposition
	6	16	Regulus 1° N of Moon
	14	17	Jupiter 6° N of Moon
	14	22	Antares 0.3° N of Moon
	18	03	Mars 2° N of Moon
	20	01	Mercury in inferior conjunction
	23	01	Venus 5° S of Moon
	26	16	Saturn 7° S of Moon
May	11^{d}	18^{h}	Jupiter 6° N of Moon
	12	04	Antares 0.1° N of Moon
			Occultation visible in Southern Africa (See Occultation Notes)
	16	12	Mars 1° S of Moon
	17	14	Saturn in conjunction with Sun
	17	19	Mercury greatest elongation 26° W
	20	20	Jupiter 0.7° S of Neptune
	22	21	Venus 7° S of Moon
	23	11	Jupiter at opposition
	23	14	Neptune at opposition
Jun	6^{d}	14^{h}	Mercury 0.4° N of Saturn
	7	19	Jupiter 6° N of Moon
	7	22	Neptune 7° N of Moon
	8	11	Antares 0.1° N of Moon
	11	19	Venus 0.8° N of Saturn
	12	12	Mercury 5° N of Aldebaran
	13	15	Mars 4° S of Moon
	20	16	Venus 5° N of Aldebaran
	21	12	Mercury in superior conjunction
	21	15	Venus 5° S of Moon
	21	03	Solstice
Jul	3^{d}	02^{h}	Mercury 5° S of Pollux

Jul	5[d]	20[h]	Antares 0.2° N of Moon Occultation visible in Southern Africa (See Occultation Notes)
	24	19	Mercury 1° N of Moon
	26	16	Mercury 1.1° S of Regulus
	30	00	Mercury greatest elongation 27° E
Aug	2[d]	05[h]	Antares 0.2° N of Moon
	6	22	Total eclipse of the Moon Visible in Southern Africa
	7	09	Mars 8° S of Moon
	10	09	Mars at opposition
	12	05	Mars nearest Earth
	14	18	Saturn 7° S of Moon
	24	22	Uranus 6° N of Moon
	26	17	Mercury in inferior conjunction
	27	21	Venus in superior conjunction
	29	13	Antares 0.2° N of Moon
Sep	3[d]	09[h]	Mars 6° S of Moon
	10	21	Mercury 0.5° S of Regulus
	11	02	Saturn 7° S of Moon
	12	07	Mercury greatest elongation 18° W
	18	02	Jupiter 1.0° S of Neptune
	23	19	Equinox
	25	08	Jupiter 6° N of Moon
	25	20	Antares 0.1° N of Moon Occultation visible in Southern Africa (See Occultation Notes)
	30	23	Mars 5° S of Moon
Oct	5[d]	19[h]	Venus 3° N of Spica
Oct	8[d]	17[h]	Mercury in superior conjunction
	20	21	Venus 6° N of Moon
	22	23	Jupiter 5° N of Moon
	23	02	Antares 0.2° S of Moon
	29	02	Mars 4° S of Moon
	30	21	Jupiter 5° N of Antares
Nov	4[d]	17[h]	Saturn 7° S of Moon
	7	03	Venus 2° S of Neptune
	8	09	Mercury 4° S of Neptune
	12	03	Venus 4° N of Antares
	12	18	Mercury 2° N of Antares
	14	15	Venus 1.1° S of Jupiter
	15	03	Mercury 3° S of Jupiter
	19	08	Antares 0.3° S of Moon
	19	16	Jupiter 5° N of Moon
	20	02	Venus 3° N of Moon
	20	02	Mercury 1° N of Moon
	23	20	Mercury greatest elongation 22° E
	26	01	Saturn at opposition
	26	12	Mars 5° S of Moon
Dec	2[d]	01[h]	Saturn 7° S of Moon
	10	06	Jupiter in conjunction with Sun
	12	23	Mercury in inferior conjunction
	16	15	Antares 0.3° S of Moon Occultation visible in Southern Africa (See Occultation Notes)
	20	07	Venus 0.9° S of Moon
	22	14	Solstice
	25	01	Mars 5° S of Moon
	29	07	Saturn 7° S of Moon

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1941-42	H. Knox Shaw	1965-66	A. Menzies
1942-43	A.F.I. Forbes	1966-67	G.R. Atkins
1943-44	W.H. van den Bos	1967-68	J. Hers
1944-45	A.W.J. Cousins	1968-69	J.C. Bennett
1945-46	R.H. Stoy	1969-70	J. Churms

HONORARY SECRETARIES

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

HONORARY MEMBERS

Prof. A.E. Bleksley	Dr R.O. Redman
Mr R.P. de Kock	Dr J. Schilt
Dr D.S. Evans	Dr H. Shapley
Prof. Ch. Fehrenbach	Dr R.H. Stoy
Dr W.S. Finsen	Dr W.S. van den Bos
Dr H. Haffner	Dr A.G. Velghe
Dr J.H. Oort	Sir Richard Woolley

GILL MEDALLISTS

1956	H. Knox Shaw	1963	A.W.J. Cousins
1957	W.P. Hirst	1965	R.H. Stoy
1958	J. Jackson	1967	W.S. Finsen
1960	W.H. van den Bos	1970	J.C. Bennett

INFORMATION FOR PROSPECTIVE MEMBERS
(continued from inside front cover)

Centres of the Society

TRANSVAAL CENTRE (Johannesburg) - Observing and lecture meetings in alternate months. Enquiries: c/o Republic Observatory, Gill Street, Johannesburg.

PRETORIA CENTRE - Secretarial address: 62 Patricia Avenue, Murrayfield, Pretoria.

NATAL CENTRE (Durban) - Meetings and telescope making sessions. Secretarial address: 32 Surrey Mansions, 323 Currie Road, Durban.

BLOEMFONTEIN CENTRE - Meetings, telescope making and observatory building. Secretarial address: 6 Continental Buildings, 2nd Avenue, Bloemfontein.

CAPE CENTRE - Ordinary meetings on 2nd Wednesday in month, March-June and August-November, at the Royal Observatory beginning 8 p.m. Visitors ve welcome. Secretarial address: "Pennington", 34 Balfour Road, Rondebosch.

Observing Sections of the Society

COMETS AND METEORS - Mr J.C. Bennett, 90 Malan Street, Riviera, Pretoria.

VARIABLE STARS - Mr R.P. de Kock, The Royal Observatory, Observatory Cape.

OCCULTATIONS - Mr A.G.F. Morrisby, Dept. of Surveyor General, P.O. Box 8099, Causeway, Salisbury, Rhodesia.