THE OBSERVER'S HANDBOOK FOR 1912

PUBLISHED BY

THE ROYAL ASTRONOMICAL SOCIETY OF CANADA

EDITED BY C. A. CHANT

FOURTH YEAR OF PUBLICATION

TORONTO
198 COLLEGE STREET
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PREFACE

Some changes have been made in the *Handbook* this year which, it is believed, will commend themselves to observers.

In previous issues the times of sunrise and sunset have been given for a small number of selected places in the standard time of each place. On account of the arbitrary correction which must be made to the mean time of any place in order to get its standard time, the tables given for a particualar place are of little use anywhere else. In order to remedy this the times of sunrise and sunset have been calculated for places on five different latitudes covering the populous part of Canada, (pages 10 to 21), while the way to use these tables at a large number of towns and cities is explained on pages 8 and 9.

The other chief change is in the addition of fuller star maps near the end. These are on a large enough scale to locate a star or planet or comet when its right ascension and declination are given.

There are other minor improvements which, it is hoped, will be found generally useful. Suggestions are invited regarding further means of rendering the little book what it is intended to be, *A Handbook for the Amateur*.

The Editor is indebted to Mr. F. L. Blake, of the Toronto Meteorological Observatory; to Mr. R. M. Stewart, of the Dominion Astronomical Observatory, Ottawa; to Mr. A. B. Fennell, Toronto; as well as to others whose names are stated in the course of the book.

THE EDITOR.

TORONTO, December, 1911.

SYMBOLS AND ABBREVIATIONS

SIGNS OF THE ZODIAC

♈ Aries..... 0°	♌ Leo.....120°	♐ Sagittarius...240°
♉ Taurus .....30°	♍ Virgo.....150°	♑ Capricornus..270°
♊ Gemini .....60°	♎ Libra.....180°	♒ Aquarius....300°
♋ Cancer.....90°	♏ Scorpio ....210°	♓ Pisces.....330°

SUN, MOON AND PLANETS

☉ The Sun.	☾ The Moon generally.	♃ Jupiter.
● New Moon.	☿ Mercury.	♄ Saturn.
○ Full Moon.	♀ Venus.	♅ or ♅ Uranus.
☽ First Quarter	⊕ Earth.	♆ Neptune.
☾ Last Quarter.	♂ Mars.	

ASPECTS AND ABBREVIATIONS

☌ Conjunction, or having the same Longitude or Right Ascension.
☍ Opposition, or differing 180° in Longitude or Right Ascension.
□ Quadrature, or differing 90° in Longitude or Right Ascension.
☊ Ascending Node; ☋ Descending Node.
α or A. R., Right Ascension; δ Declination.
h, m, s, Hours, Minutes, Seconds of Time.
° ′ ″, Degrees, Minutes, Seconds of Arc.

THE GREEK ALPHABET

A, α,	Alpha.	I, ι,	Iota.	P, ρ,	Rho.
B, β,	Beta.	K, κ,	Kappa.	Σ, σ, ς,	Sigma.
Γ, γ,	Gamma.	Λ, λ,	Lambda.	T, τ,	Tau.
Δ, δ,	Delta.	M, μ,	Mu.	Υ, υ,	Upsilon.
E, ε,	Epsilon.	N, ν,	Nu.	Φ, ϕ,	Phi.
Z, ζ,	Zeta.	Ξ, ξ,	Xi.	X, χ,	Chi.
H, η,	Eta.	O, o,	Omicron.	Ψ, ψ,	Psi.
Θ, θ, ϑ,	Theta.	Π, π,	Pi.	Ω, ω,	Omega.

SOLAR AND SIDEREAL TIME

In practical astronomy three different kinds of time are used, while in ordinary life we use a fourth.

1. *Apparent Time*—By apparent noon is meant the moment when the sun is on the meridian, and apparent time is measured by the distance in degrees that the sun is east or west of the meridian. Apparent time is given by the sun-dial.

2. *Mean Time*—The interval between apparent noon on two successive days is not constant, and a clock cannot be constructed to keep apparent time. For this reason *mean time* is used. The length of a mean day is the average of all the apparent days throughout the year. The *real sun* moves about the ecliptic in one year; an imaginary *mean sun* is considered as moving uniformly around the celestial equator in one year. The difference between the times that the real sun and the mean sun cross the meridian (*i. e.* between apparent noon and mean noon) is the *equation of time.* (See next page).

3. *Sidereal Time*—This is time as determined from the stars. It is sidereal noon when the Vernal Equinox or First of Aries is on the meridian. In accurate time-keeping the moment when a star is on the meridian is observed and the corresponding mean time is then computed with the assistance of the Nautical Almanac. When a telescope is mounted equatorially the position of a body in the sky is located by means of the sidereal time.

4. *Standard Time*—In everyday life we use still another kind of time. A moment's thought will show that in general two places will not have the same mean time; indeed, difference in longitude between two places is determined from their difference in time. But in travelling it is very inconvenient to have the time varying from station to station. For the purpose of facilitating transportation the system of *Standard Time* was introduced in 1883. Within a certain belt, approximately 15° wide, all the clocks show the same time, and in passing from one belt to the next the hands of the clock are moved forward or backward one hour.

In Canada we have six standard time belts, as follows:—60th meridian or Atlantic Time, 4h. slower than Greenwich; 75th meridian or Eastern Time, 5h.; 90th meridian or Central Time, 6h.; 105th meridian or Mountain Time, 7h.; 120th meridian or Pacific Time, 8h.; and 135th meridian or Yukon Time, 9h. slower than Greenwich.

Notice also that in civil reckoning the day lasts from midnight to midnight, while in astronomical reckoning it begins at noon and lasts until the next noon.

1912, EPHEMERIS OF SUN. AT GREENWICH MEAN NOON.

Date			Right Ascension			Declination			Equation of Time +, add to / −, subt. from Apparent Time			Siderial Time or R.A. of Mean Sun		
			h	m	s	°	′	″		m	s	h	m	s
Mon.	Jan.	1	18	42	21	S. 23	5	44	+	3	13·3	18	39	7·5
Sat.	"	6	19	4	23	22	37	38		5	32·1	18	58	50·3
Thur.	"	11	19	26	15	21	58	23		7	40·2	19	18	33·1
Tue.	"	16	19	47	52	21	8	23		9	34·5	19	38	15·9
Sun.	"	21	20	9	13	20	8	16		11	12·2	19	57	58·7
Fri.	"	26	20	30	14	18	58	42		12	30·9	20	17	41·5
Wed.	"	31	20	50	56	17	40	31		13	29·2	20	37	24·3
Mon.	Feb.	5	21	11	16	16	14	30		14	6·8	20	57	7·1
Sat.	"	10	21	31	17	14	41	29		14	24·4	21	16	49·8
Thur.	"	15	21	50	58	13	2	17		14	22·7	21	36	32·6
Tue.	"	20	22	10	20	11	17	46		14	2·8	21	56	15·4
Sun.	"	25	22	29	26	9	28	53		13	25·8	22	15	58·2
Fri.	Mch.	1	22	48	16	7	36	28		12	33·5	22	35	40·9
Wed.	"	6	23	6	54	5	41	22		11	28·3	22	55	23·7
Mon.	"	11	23	25	21	3	44	19		10	12·9	23	15	6·5
Sat.	"	16	23	43	41	S. 1	46	6		8	50·0	23	34	49·2
Thur.	"	21	0	1	55	N 0	12	29		7	21·8	23	54	32·0
Tue.	"	26	0	20	6	2	10	38		5	50·6	0	14	14·8
Sun.	"	31	0	38	17	4	7	33		4	18·7	0	33	57·6
Fri.	Apl.	5	0	56	30	6	2	34		2	48·9	0	53	40·3
Wed.	"	10	1	14	47	7	55	1		1	23·8	1	13	23·1
Mon.	"	15	1	33	12	9	44	12	+	0	5·8	1	33	5·9
Sat.	"	20	1	51	45	11	29	23	−	1	3·3	1	52	48·6
Thur.	"	25	2	10	29	13	9	48		2	2·1	2	12	31·4
Tue.	"	30	2	29	25	14	44	48		2	49·3	2	32	14·2
Sun	May	5	2	48	33	16	13	42		3	23·4	2	51	57·0
Fri.	"	10	3	7	56	17	35	56		3	43·2	3	11	39·8
Wed.	"	15	3	27	34	18	50	52		3	48·3	3	31	22·5
Mon.	"	20	3	47	26	19	57	50		3	39·1	3	51	5·3
Sat.	"	25	4	7	31	20	56	17		3	16·6	4	10	48·1
Thur.	"	30	4	27	48	21	45	43		2	42·2	4	30	30·9
Tue.	June	4	4	48	16	22	25	44		1	57·0	4	50	13·7
Sun.	"	9	5	8	54	22	55	58		1	2·7	5	9	56·5
Fri.	"	14	5	29	38	23	16	10	−	0	1·7	5	29	39·3
Wed.	"	19	5	50	25	23	26	5	+	1	3·0	5	49	22·1
Mon.	"	24	6	11	13	23	25	40		2	7·9	6	9	4·9
Sat.	"	29	6	31	58	N 23	14	57		3	10·0	6	28	47·7

1912, EPHEMERIS OF SUN. AT GREENWICH MEAN NOON.

Date	Right Ascension	Declination	Equation of Time +, add to) −, subt. from) Apparent Time	Sidereal Time or R.A. of Mean Sun
	h m s	° ′ ″	m s	h m s
Thur. July 4	6 52 38	N 22 54 4	+ 4 7·1	6 48 30·4
Tue. " 9	7 13 11	22 23 14	4 56·7	7 8 13·2
Sun. " 14	7 33 33	21 42 43	5 36·5	7 27 56·0
Fri. " 19	7 53 44	20 52 55	6 4·3	7 47 38·8
Wed. " 24	8 13 41	19 54 20	6 18·0	8 7 21·6
Mon. " 29	8 33 22	18 47 29	6 16·8	8 27 4·4
Sat. Aug. 3	8 52 49	17 32 56	6 0·7	8 46 47·2
Thur. " 8	9 12 1	16 11 13	5 29·8	9 6 30·0
Tue. " 13	9 30 58	14 42 58	4 44·8	9 26 12·7
Sun. " 18	9 49 42	13 8 50	3 46·0	9 45 55·5
Fri. " 23	10 8 13	11 29 32	2 34·3	10 5 38·3
Wed. " 28	10 26 33	9 45 43	+ 1 11·4	10 25 21·1
Mon. Sept. 2	10 44 43	7 58 2	− 0 20·5	10 45 3·8
Sat. " 7	11 2 47	6 7 4	1 59·1	11 4 46·6
Thur. " 12	11 20 47	4 13 32	3 42·1	11 24 39·4
Tue. " 17	11 38 44	2 18 10	5 27·7	11 44 12·2
Sun. " 22	11 56 40	N 0 21 40	7 13·7	12 3 54·9
Fri. " 27	12 14 39	S 1 35 14	8 57·3	12 23 37·7
Wed. Oct. 2	12 32 43	3 31 55	10 35·7	12 43 20·5
Mon. " 7	12 50 55	5 27 39	12 6·0	13 3 3·2
Sat. " 12	13 9 18	7 21 41	13 25·9	13 22 46·0
Thur. " 17	13 27 53	9 13 11	14 33·4	13 42 28·8
Tue. " 22	13 46 43	11 1 20	15 26·4	14 2 11·5
Sun. " 27	14 5 49	12 45 20	16 2·9	14 21 54·3
Fri. Nov. 1	14 25 14	14 24 24	16 20·7	14 41 37·1
Wed. " 6	14 44 59	15 57 43	16 18·2	15 1 19·9
Mon. " 11	15 5 6	17 24 25	15 54·5	15 21 2·6
Sat. " 16	15 25 33	18 43 37	15 9·8	15 40 45·4
Thur. " 21	15 46 21	19 54 27	14 4·6	16 0 28·2
Tue. " 26	16 7 29	20 56 12	12 39·6	16 20 11·0
Sun. Dec. 1	16 28 56	21 48 12	10 55·9	16 39 53·8
Fri. " 6	16 50 39	22 29 46	8 55·7	16 59 36·6
Wed. " 11	17 12 36	23 0 21	6 42·0	17 19 19·4
Mon. " 16	17 34 42	23 19 32	4 19·1	17 39 2·2
Sat. " 21	17 56 54	23 27 3	− 1 51·0	17 58 45·0
Thur. " 26	18 19 6	23 22 49	+ 0 38·3	18 18 27·8
Tue. " 31	18 41 16	23 6 50	+ 3 4·9	18 38 10·6

OCCULTATIONS OF FIXED STARS BY THE MOON, 1912.

PREPARED BY R. M. MOTHERWELL

The following occultations for 1912 are computed for Ottawa, all stars down to magnitude 4·5 being included. These are easily visible in a small telescope if not to the unaided eye.

Star	Mag.	Date	*Immersion		*Emersion		Position Angle	
							Immersion	Emersion
			h	m	h	m	°	°
136 Tauri	4·6	January 30	5	39·3	6	27·3	40	295
σ Scorpii	3·1	February 10			15	51·8		302
α Scorpii	1·2	February 10	20	8·4	21	24·4	130	255
α Scorpii	1·2	April 5			11	28·3		280
η Virginis	4·0	May 25	2	20·0	3	10·5	90	330
α Scorpii	1·2	June 26	11	11·9	12	13·9	69	326
δ Arietis	4·5	July 9			14	13·4		238
σ Leonis	4·1	October 7	18	2·4	18	39·9	175	248

* Eastern Standard Astronomical Time.

TIMES OF SUNRISE AND SUNSET

In the tables on pages 10 to 21 are given the times of sunrise and sunset for places in latitudes 44°, 46°, 48°, 50° and 52°, which cover pretty well the populated part of Canada. The times are given in Mean Solar Time, and in the table on page following are given corrections to adopt these times to the Standard or Railroad times of the cities and towns named or for places near them.

How the Tables are Constructed

The time of sunrise and sunset at a given place, in mean solar time, varies from day to day, and depends principally upon the declination of the sun. Variations in the equation of time, the apparent diameter of the sun and atmospheric refraction at the points of sunrise and sunset also affect the final result. These quantities, as well as the solar declination, do not have precisely the same values on corresponding days from year to year, and so it is impossible to give in any general table the exact time of sunrise and sunset day by day.

With this explanation the following general table has been computed, giving the rising and setting of the upper limb of the sun, corrected for refraction, using the values of the solar declination and equation of time given in the Nautical

Almanac for 1899; these are very close average values and may be accepted as approximately correct for years. It must also be remembered that these times are computed for the sea horizon, which is only approximately realized on land surfaces, and is generally widely departed from in hilly and mountainous localities. The greater or less elevation of the point of view above the ground must also be considered to get exact results.

The Times for Any Station

In order to find the time of sunrise or sunset for any place on any day, first from the list below find the approximate latitude of the place and the correction, in minutes, which follows the name. Then find in the monthly table the time of sunrise or sunset for the proper latitude, on the desired day, and apply the correction.

44°		46°		48°		50°		52°	
	mins.		mins.		mins.		mins.		mins.
Barrie	+ 17	Charlotte-		Port Arthur	+ 57	Brandon	+ 40	Calgary	+ 36
Brantford	+ 21	town	+ 13	Victoria	+ 13	Indian		Edmon-	
Chatham	+ 29	Fredericton	+ 26			Head	- 5	ton	+ 34
Goderich	+ 27	Montreal	- 6			Kamloops	+ 2	Prince	
Guelph	+ 21	Ottawa	+ 3			Kenora	+ 18	Albert	+ 4
Halifax	+ 14	Parry Sound	+ 20			Medicine		Saska-	
Hamilton	+ 20	Quebec	- 15			Hat	+ 22	toon	+ 6
Kingston	+ 6	Sherbrooke	- 12			Moose Jaw	+ 2		
London	+ 25	S. John N.B.	+ 24			Moosomin	+ 46		
Orillia	+ 18	Sydney	+ 1			Nelson	- 11		
Owen Sound	+ 24	Three Rivers	- 10			Portage La			
Peterboro	+ 13					Prairie	+ 33		
Port Hope	+ 14					Regina	- 2		
Stratford	+ 24					Vancouver	+ 12		
Toronto	+ 18					Winnipeg	+ 28		
Windsor	+ 32								
Woodstock	+ 23								
Yarmouth	+ 24								

Example.—Find the time of sunrise at Owen Sound, also at Regina, on February 11.

In the above list Owen Sound is under "44°", and the correction is + 24 min. On page 11 the time of sunrise on February 11 for latitude 44° is 7.05; add 24 min. and we get 7.29 (Eastern Standard Time). Regina is under "50°", and the correction is - 2 min. From the table the time is 7.18, and subtracting 2 min. we get the time of sunrise 7.16 (Central Standard Time).

JANUARY

Day of Month	Latitude 44°		Latitude 46°		Latitude 48°		Latitude 50°		Latitude 52°	
	Sunrise	Sunset	Sunrise	Sunset	Sunrise	Sunset	Sunrise	Sunset	Sunrise	Sunset
	h. m.	h. m.	h. m.	h. m.	h. m.	h. m.	h. m.	h. m.	h. m.	h. m.
1	7 35	4 33	7 42	4 26	7 50	4 18	7 59	4 9	8 9	3 59
2	7 35	4 34	7 42	4 26	7 50	4 19	7 59	4 10	8 8	4 0
3	7 35	4 35	7 42	4 27	7 50	4 20	7 59	4 11	8 8	4 2
4	7 35	4 36	7 42	4 28	7 50	4 21	7 58	4 12	8 7	4 3
5	7 35	4 37	7 42	4 29	7 50	4 22	7 58	4 13	8 7	4 4
6	7 35	4 38	7 42	4 30	7 49	4 23	7 58	4 14	8 6	4 6
7	7 35	4 39	7 42	4 32	7 49	4 24	7 58	4 16	8 6	4 7
8	7 34	4 40	7 41	4 33	7 49	4 25	7 57	4 17	8 5	4 8
9	7 34	4 41	7 41	4 34	7 49	4 26	7 57	4 18	8 5	4 9
10	7 34	4 42	7 41	4 35	7 48	4 27	7 56	4 19	8 4	4 11
11	7 34	4 43	7 40	4 36	7 48	4 29	7 56	4 21	8 4	4 12
12	7 33	4 44	7 40	4 38	7 47	4 30	7 55	4 22	8 3	4 14
13	7 33	4 45	7 39	4 39	7 47	4 31	7 55	4 23	8 2	4 15
14	7 32	4 46	7 39	4 40	7 46	4 33	7 54	4 25	8 1	4 17
15	7 32	4 48	7 38	4 41	7 45	4 34	7 53	4 26	8 0	4 19
16	7 31	4 49	7 38	4 42	7 45	4 36	7 52	4 28	8 0	4 21
17	7 30	4 50	7 37	4 44	7 44	4 37	7 52	4 29	7 59	4 22
18	7 30	4 52	7 36	4 45	7 43	4 38	7 51	4 31	7 58	4 24
19	7 29	4 53	7 35	4 47	7 42	4 40	7 50	4 32	7 57	4 26
20	7 28	4 54	7 34	4 48	7 41	4 41	7 49	4 34	7 56	4 27
21	7 28	4 55	7 34	4 49	7 40	4 43	7 48	4 36	7 55	4 29
22	7 27	4 57	7 33	4 51	7 40	4 44	7 46	4 37	7 54	4 31
23	7 26	4 58	7 32	4 52	7 39	4 46	7 45	4 39	7 52	4 32
24	7 25	4 59	7 31	4 54	7 38	4 47	7 44	4 41	7 51	4 34
25	7 25	5 1	7 30	4 55	7 36	4 49	7 43	4 42	7 50	4 36
26	7 24	5 2	7 29	4 56	7 35	4 50	7 42	4 44	7 49	4 38
27	7 23	5 3	7 28	4 58	7 34	4 52	7 40	4 46	7 47	4 39
28	7 22	5 5	7 27	4 59	7 33	4 54	7 39	4 47	7 46	4 41
29	7 21	5 6	7 26	5 1	7 32	4 55	7 38	4 49	7 45	4 43
30	7 20	5 8	7 25	5 3	7 30	4 57	7 36	4 51	7 43	4 44
31	7 18	5 9	7 23	5 4	7 29	4 58	7 35	4 52	7 42	4 46

For an explanation of this table and its use at various places, see pages 8 and 9

FEBRURAY

Day of Month	Latitude 44°		Latitude 46°		Latitude 48°		Latitude 50°		Latitude 52°	
	Sunrise	Sunset	Sunrise	Sunset	Sunrise	Sunset	Sunrise	Sunset	Sunrise	Sunset
	h. m.	h. m.	h. m.	h. m.	h. m.	h. m.	h. m.	h. m.	h. m.	h. m.
1	7 17	5 10	7 22	5 5	7 28	5 0	7 33	4 54	7 40	4 48
2	7 16	5 12	7 21	5 7	7 26	5 1	7 32	4 56	6 38	4 50
3	7 15	5 13	7 20	5 8	7 25	5 3	7 30	4 58	7 36	4 52
4	7 14	5 14	7 19	5 10	7 24	5 5	7 29	4 59	7 34	4 54
5	7 13	5 15	7 18	5 11	7 22	5 6	7 27	5 1	7 33	4 56
6	7 12	5 17	7 17	5 12	7 21	5 8	7 26	5 3	7 31	4 57
7	7 10	5 18	7 15	5 14	7 19	5 9	7 24	5 5	7 29	4 59
8	7 9	5 20	7 13	5 15	7 18	5 11	7 23	5 6	7 27	5 1
9	7 8	5 21	7 12	5 17	7 16	5 13	7 21	5 8	7 25	5 3
10	7 6	5 23	7 11	5 18	7 15	5 14	7 19	5 10	7 23	5 5
11	7 5	5 24	7 10	5 19	7 13	5 16	7 18	5 11	7 21	5 7
12	7 3	5 25	7 8	5 21	7 12	5 17	7 16	5 13	7 19	5 9
13	7 2	5 27	7 6	5 23	8 10	5 19	7 14	5 15	7 18	5 10
14	7 1	5 28	7 4	5 24	7 8	5 21	7 12	5 17	7 16	5 12
15	6 59	5 29	7 3	5 26	7 6	5 22	7 10	5 18	7 14	5 14
16	6 58	5 31	7 1	5 27	7 5	5 24	7 9	5 20	7 12	5 16
17	6 56	5 32	7 0	5 29	7 3	5 26	7 7	5 22	7 10	5 18
18	6 55	5 34	6 58	5 30	7 1	5 27	7 5	5 23	7 9	5 19
19	6 53	5 35	6 56	5 32	6 59	5 29	7 3	5 25	7 7	5 21
20	6 52	5 36	6 54	5 33	6 58	5 30	7 1	5 27	7 5	5 23
21	6 50	5 38	6 53	5 35	6 56	5 32	6 59	5 29	7 3	5 25
22	6 48	5 39	6 51	5 36	6 54	5 33	6 57	5 30	7 0	5 27
23	6 47	5 40	6 49	5 38	6 52	5 35	6 55	5 32	6 58	5 29
24	6 45	5 42	6 47	5 39	6 50	5 36	6 53	5 34	6 56	5 31
25	6 44	5 43	6 46	5 41	6 49	5 38	6 51	5 35	6 54	5 33
26	6 42	5 44	6 44	5 42	6 47	5 39	6 49	5 37	6 51	5 34
27	6 40	5 45	6 42	5 43	6 45	5 41	6 48	5 38	6 49	5 36
28	6 38	5 47	6 41	5 45	6 43	5 42	6 45	5 40	6 47	5 38
29	6 37	5 48	6 39	5 46	6 41	5 44	6 43	5 42	6 44	5 40

For an explanation of this table and its use at individual places, see pages 8,9

MARCH

Day of Month	Latitude 44°		Latitude 46°		Latitude 48°		Latitude 50°		Latitude 52°	
	Sunrise	Sunset	Sunrise	Sunset	Sunrise	Sunset	Sunrise	Sunset	Sunrise	Sunset
	h m	h m	h m	h m	h m	h m	h m	h m	h m	h m
1	6 37	5 48	6 39	5 46	6 41	5 44	6 43	5 42	6 43	5 41
2	6 35	5 49	6 37	5 47	6 39	5 45	6 41	5 44	6 42	5 42
3	6 34	5 50	6 35	5 49	6 37	5 47	6 39	5 45	6 40	5 44
4	6 32	5 52	6 33	5 50	6 35	5 48	6 37	5 47	6 38	5 45
5	6 30	5 53	6 31	5 52	6 33	5 50	6 35	5 48	6 36	5 47
6	6 28	5 55	6 30	5 53	6 31	5 51	6 33	5 50	6 34	5 49
7	6 26	5 56	6 28	5 54	6 29	5 53	6 31	5 52	6 32	5 51
8	6 25	5 57	6 26	5 56	6 27	5 54	6 28	5 53	6 29	5 52
9	6 23	5 58	6 24	5 57	6 25	5 56	6 26	5 55	6 27	5 54
10	6 21	6 0	6 22	5 59	6 23	5 57	6 24	5 56	6 25	5 56
11	6 19	6 1	6 20	6 0	6 21	5 59	6 22	5 58	6 23	5 57
12	6 18	6 2	6 18	6 1	6 19	6 0	6 20	6 0	6 21	5 59
13	6 16	6 4	6 16	6 3	6 17	6 2	6 18	6 2	6 19	6 1
14	6 14	6 5	6 15	6 4	6 15	6 3	6 15	6 3	6 16	6 3
15	6 12	6 6	6 13	6 5	6 13	6 5	6 13	6 5	6 14	6 4
16	6 10	6 7	6 11	6 7	6 11	6 6	6 11	6 6	6 11	6 6
17	6 8	6 8	6 9	6 8	6 9	6 8	6 9	6 8	6 9	6 8
18	6 7	6 10	6 7	6 9	6 7	6 9	6 7	6 9	6 7	6 10
19	6 5	6 11	6 5	6 11	6 5	6 11	6 5	6 11	6 4	6 12
20	6 3	9 12	6 3	6 12	6 3	6 12	6 3	6 13	6 2	6 13
21	6 1	6 13	6 1	6 14	6 1	6 14	6 0	6 14	5 59	6 15
22	5 59	6 14	5 59	6 15	5 59	6 15	5 58	6 16	5 57	6 17
23	5 58	6 16	5 57	6 16	5 56	6 17	5 56	6 17	5 55	6 19
24	5 56	6 17	5 55	6 17	5 54	6 18	5 54	6 19	5 52	6 20
25	5 54	6 18	5 53	6 19	5 52	6 20	5 52	6 20	5 50	6 22
26	5 52	6 19	5 51	6 20	5 50	6 21	5 50	6 22	5 48	6 24
27	5 50	6 21	5 49	6 22	5 48	6 23	5 47	6 24	5 46	6 26
28	5 48	6 22	5 47	6 23	5 46	6 24	5 45	6 25	5 43	6 27
29	5 47	6 23	5 46	6 24	5 44	6 26	5 43	6 27	5 41	6 29
30	5 45	6 24	5 44	6 25	5 42	6 27	5 41	6 28	5 39	6 31
31	5 43	6 25	5 42	6 27	5 40	6 28	5 38	6 30	5 36	6 32

For an explanation of this table and its use at various places, see page 8 and 9

APRIL

Day of Month	Latitude 44°		Latitude 46°		Latitude 48°		Latitude 50°		Latitude 52°	
	Sunrise	Sunset	Sunrise	Sunset	Sunrise	Sunset	Sunrise	Sunset	Sunrise	Sunset
	h. m.	h. m.	h. m.	h. m.	h. m.	h. m.	h. m.	h. m.	h. m.	h. m.
1	5 41	6 27	5 40	6 28	5 38	6 30	5 36	6 31	5 34	6 34
2	5 39	6 28	5 38	6 30	3 36	6 31	5 34	6 33	5 32	6 36
3	5 38	6 29	5 36	6 31	5 34	6 33	5 32	6 35	5 30	6 37
4	5 36	6 30	5 34	6 32	5 32	6 34	5 30	6 36	5 27	6 39
5	5 34	6 32	5 32	6 33	5 30	6 36	5 28	6 38	5 25	6 41
6	5 32	6 33	5 30	6 34	5 28	6 37	5 26	6 39	5 23	6 43
7	5 30	6 34	5 28	6 36	5 26	6 38	5 24	6 41	5 21	6 44
8	5 29	6 35	5 26	6 37	5 24	6 40	5 21	6 42	5 19	6 46
9	5 27	6 36	5 24	6 39	5 22	6 41	5 19	6 44	5 16	6 48
10	5 25	6 37	5 23	6 40	5 20	6 43	5 17	6 46	5 14	6 49
11	5 24	6 38	5 21	6 41	5 18	6 44	5 15	6 47	5 11	6 51
12	5 22	6 40	5 19	6 43	5 16	6 45	5 13	6 49	5 9	6 53
13	5 20	6 41	5 17	6 44	5 14	6 47	5 11	6 50	5 7	6 54
14	5 18	6 42	5 15	6 45	5 12	6 48	5 9	6 52	5 5	6 56
15	5 17	6 43	5 14	6 46	5 10	6 50	5 7	6 53	5 3	6 58
16	5 15	6 45	5 12	6 48	5 8	6 51	5 5	6 55	5 1	7 0
17	5 13	6 46	5 10	6 49	5 6	6 53	5 2	6 56	4 58	7 1
18	5 11	6 47	5 8	6 50	5 5	6 54	5 1	6 58	4 56	7 3
19	5 10	6 48	5 6	6 52	5 3	6 55	4 59	6 59	4 54	7 5
20	5 8	6 49	5 5	6 53	5 1	6 57	4 57	7 1	4 52	7 6
21	5 7	6 50	5 3	6 54	4 59	6 58	4 55	7 2	4 50	7 8
22	5 5	6 52	5 1	6 56	4 57	7 0	4 53	7 4	4 48	7 10
23	5 3	6 53	4 59	6 57	4 55	7 1	4 50	7 6	4 46	7 11
24	5 2	6 54	4 58	6 58	4 54	7 3	4 49	7 7	4 44	7 13
25	5 0	6 56	4 56	7 0	4 52	7 4	4 47	7 9	4 42	7 14
26	4 59	6 57	4 54	7 1	4 50	7 5	4 45	7 10	4 40	7 16
27	4 57	6 58	4 53	7 2	4 48	7 7	4 43	7 12	4 38	7 18
28	4 56	6 59	4 51	7 3	4 47	7 8	4 41	7 13	4 36	7 19
29	4 54	7 0	4 50	7 5	4 45	7 10	4 39	7 15	4 34	7 21
30	4 53	7 1	4 48	7 6	4 43	7 12	4 38	7 16	4 32	7 22

For an explanation of this table and its use at various places, see pages 8 and 9

MAY

Day of Month	Latitude 44°		Latitude 46°		Latitude 48°		Latitude 50°		Latitude 52°	
	Sunrise	Sunset	Sunrise	Sunset	Sunrise	Sunset	Sunrise	Sunset	Sunrise	Sunset
	h. m.	h. m.	h. m.	h. m.	h. m.	h. m.	h. m.	h. m.	h. m.	h. m.
1	4 51	7 3	4 47	7 7	4 42	7 12	4 36	7 18	4 30	7 24
2	4 50	7 4	4 45	7 9	4 40	7 14	4 34	7 20	4 28	7 26
3	4 48	7 5	4 43	7 10	4 38	7 15	4 32	7 21	4 26	7 27
4	4 47	7 6	4 42	7 11	4 37	7 17	4 31	7 23	4 24	7 29
5	4 46	7 8	4 41	7 13	4 35	7 18	4 29	7 24	4 22	7 31
6	4 44	7 9	4 39	7 14	4 34	7 19	4 27	7 26	4 21	7 33
7	4 43	7 10	4 38	7 15	4 32	7 21	4 26	7 27	4 19	7 34
8	4 42	7 11	4 36	7 16	4 31	7 22	4 24	7 29	4 17	7 36
9	4 40	7 12	4 35	7 17	4 29	7 23	4 22	7 30	4 15	7 38
10	4 39	7 13	4 34	7 19	4 28	7 25	4 21	7 32	4 13	7 39
11	4 38	7 14	4 32	7 20	4 26	7 26	4 20	7 33	4 11	7 41
12	4 37	7 16	4 31	7 21	4 25	7 28	4 18	7 34	4 10	7 42
13	4 36	7 17	4 30	7 23	4 24	7 29	4 16	7 36	4 8	7 44
14	4 35	7 18	4 49	7 24	4 22	7 30	4 15	7 37	4 7	7 45
15	4 34	7 19	4 28	7 25	4 21	7 31	4 14	7 39	4 5	7 47
16	4 32	7 20	4 26	7 26	4 20	7 33	4 12	7 40	4 4	7 48
17	4 31	7 21	4 25	7 27	4 18	7 34	4 11	7 42	4 3	7 50
18	4 30	7 22	4 24	7 28	4 17	7 35	4 10	7 43	4 1	7 51
19	4 30	7 23	4 23	7 30	4 16	7 36	4 8	7 44	4 0	7 52
20	4 29	7 24	4 22	7 31	4 15	7 38	4 7	7 46	3 58	7 54
21	4 28	7 25	4 21	7 32	4 14	7 39	4 6	7 47	3 57	7 55
22	4 27	7 26	4 20	7 33	4 13	7 40	4 5	7 48	3 56	7 56
23	4 26	7 27	4 19	7 34	4 12	7 41	4 4	7 49	3 55	7 58
24	4 25	7 28	4 18	7 35	4 11	7 43	4 3	7 51	3 53	7 59
25	4 24	7 29	4 17	7 36	4 10	7 44	4 2	7 52	3 52	8 1
26	4 24	7 30	4 16	7 37	4 9	7 45	4 0	7 53	3 51	8 2
27	4 23	7 31	4 16	7 38	4 8	7 46	3 59	7 54	3 50	8 3
28	4 22	7 32	4 15	7 39	4 7	7 47	3 58	7 56	3 49	8 5
29	4 22	7 33	4 14	7 40	4 6	7 48	3 58	7 57	3 47	8 6
30	4 21	7 34	4 14	7 41	4 5	7 49	3 57	7 58	3 46	8 8
31	4 21	7 34	4 13	7 42	4 5	7 50	3 56	7 59	3 45	8 9

For an explanation of this table and its use at individual places, see pages 8,9

JUNE

Day of Month	Latitude 44°		Latitude 46°		Latitude 48°		Latitude 50°		Latitude 52°	
	Sunrise	Sunset	Sunrise	Sunset	Sunrise	Sunset	Sunrise	Sunset	Sunrise	Sunset
	h. m.	h. m.	h. m.	h. m.	h. m.	h. m.	h. m.	h. m.	h. m.	h. m.
1	4 20	7 35	4 12	7 43	4 4	7 51	3 56	8 0	3 45	8 10
2	4 19	7 36	4 12	7 44	4 4	7 52	3 55	8 1	3 44	8 11
3	4 19	7 37	4 11	7 44	4 3	7 52	3 54	8 2	3 44	8 11
4	4 18	7 38	4 11	7 45	4 3	7 53	3 54	8 3	3 43	8 12
5	4 18	7 39	4 10	7 46	4 2	7 54	3 53	8 4	3 43	8 13
6	4 17	7 39	4 10	7 47	4 2	7 55	3 52	8 4	3 43	8 14
7	4 17	7 40	4 10	7 48	4 1	7 56	3 52	8 5	3 42	8 15
8	4 17	7 41	4 9	7 48	4 1	7 57	3 52	8 6	3 42	8 15
9	4 17	7 41	4 9	7 49	4 1	7 57	3 51	8 7	3 41	8 16
10	4 16	7 42	4 9	7 49	4 0	7 58	3 51	8 8	3 41	8 17
11	4 16	7 42	4 9	7 50	4 0	7 59	3 50	8 8	3 41	8 18
12	4 16	7 43	4 9	7 51	4 0	7 59	3 50	8 9	3 41	8 18
13	4 16	7 43	4 8	7 51	4 0	8 0	3 50	8 10	3 40	8 19
14	4 16	7 44	4 8	7 52	4 0	8 0	3 50	8 10	3 40	8 19
15	4 16	7 44	4 8	7 52	4 0	8 1	3 50	8 11	3 40	8 20
16	4 16	7 45	4 8	7 53	4 0	8 1	3 50	8 11	3 40	8 21
17	4 17	7 45	4 8	7 53	4 0	8 2	3 50	8 12	3 40	8 21
18	4 17	7 45	4 8	7 54	4 0	8 2	3 50	8 12	3 39	8 22
19	4 17	7 46	4 8	7 54	4 0	8 2	3 50	8 12	3 39	8 23
20	4 17	7 46	4 8	7 54	4 0	8 3	3 50	8 13	3 39	8 23
21	4 17	7 46	4 8	7 54	4 0	8 3	3 50	8 13	3 39	8 23
22	4 18	7 46	4 9	7 55	4 0	8 3	3 50	8 13	3 39	8 23
23	4 18	7 46	4 9	7 55	4 1	8 3	3 51	8 13	3 40	8 23
24	4 18	7 47	4 10	7 55	4 1	8 3	3 51	8 13	3 40	8 23
25	4 18	7 47	4 10	7 55	4 1	8 3	3 51	8 13	3 40	8 23
26	4 19	7 47	4 10	7 55	4 2	8 3	3 52	8 13	3 41	8 23
27	4 19	7 47	4 11	7 55	4 2	8 3	3 52	8 13	3 41	8 23
28	4 19	7 47	4 11	7 55	4 3	8 3	3 53	8 13	3 42	8 23
29	4 20	7 47	4 12	7 55	4 3	8 3	3 53	8 13	3 42	8 23
30	4 20	7 47	4 12	7 54	4 4	8 3	3 54	8 13	3 43	8 23

For an explanation of this table and its use at various places, see pages 8 and 9

JULY

Day of Month	Latitude 44°		Latitude 46°		Latitude 48°		Latitude 50°		Latitude 52°	
	Sunrise	Sunset	Sunrise	Sunset	Sunrise	Sunset	Sunrise	Sunset	Sunrise	Sunset
	h. m.	h. m.	h. m.	h. m.	h. m.	h. m.	h. m.	h. m.	h. m.	h. m.
1	4 21	7 47	4 13	7 54	4 4	8 3	3 55	8 12	3 44	8 23
2	4 21	7 46	4 14	7 54	4 5	8 2	3 56	8 12	3 45	8 22
3	4 22	7 46	4 14	7 54	4 6	8 2	3 56	8 12	3 46	8 22
4	4 22	7 46	4 15	7 54	4 6	8 2	3 57	8 11	3 47	8 21
5	4 23	7 46	4 15	7 53	4 7	8 2	3 58	8 11	3 48	8 21
6	4 24	7 45	4 16	7 53	4 8	8 1	3 59	8 10	3 48	8 20
7	4 24	7 45	4 17	7 53	4 9	8 1	4 0	8 10	3 49	8 20
8	4 25	7 45	4 18	7 52	4 10	8 0	4 0	8 9	3 50	8 19
9	4 26	7 44	4 18	7 52	4 10	8 0	4 1	8 9	3 51	8 19
10	4 27	7 43	4 19	7 51	4 11	7 59	4 2	8 8	3 52	8 18
11	4 28	7 43	4 20	7 50	4 12	7 59	4 3	8 7	3 53	8 17
12	4 29	7 42	4 21	7 50	4 13	7 58	4 4	8 7	3 54	8 16
13	4 29	7 42	4 22	7 49	4 14	7 57	4 5	8 6	3 56	8 15
14	4 30	7 41	4 23	7 48	4 15	7 56	4 6	8 5	3 57	8 14
15	4 31	7 40	4 24	7 48	4 16	7 56	4 7	8 4	3 58	8 13
16	4 32	7 40	4 25	7 47	4 17	7 55	4 8	8 3	3 59	8 12
17	4 33	7 39	4 26	7 46	4 18	7 54	4 10	8 2	4 0	8 11
18	4 34	7 38	4 27	7 45	4 19	7 53	4 11	8 1	4 2	8 10
19	4 34	7 38	4 28	7 44	4 20	7 52	4 12	8 0	4 3	8 9
20	4 36	7 37	4 29	7 43	4 21	7 51	4 13	7 59	4 4	8 8
21	4 37	7 36	4 30	7 42	4 23	7 50	4 15	7 58	4 5	8 7
22	4 38	7 35	4 31	7 41	4 24	7 49	4 16	7 57	4 7	8 5
23	4 39	7 34	4 32	7 40	4 25	7 48	4 17	7 56	4 8	8 4
24	4 40	7 33	4 33	7 39	4 26	7 47	4 18	7 54	4 10	8 2
25	4 40	7 32	4 34	7 38	4 27	7 46	4 20	7 53	4 11	8 1
26	4 41	7 31	4 35	7 37	4 28	7 44	4 21	7 52	4 12	8 0
27	4 42	7 30	4 36	7 36	4 30	7 43	4 22	7 50	4 14	7 58
28	4 44	7 29	4 38	7 35	4 31	7 42	4 24	7 49	4 15	7 57
29	4 45	7 28	4 39	7 34	4 32	7 40	4 25	7 47	4 17	7 55
30	4 46	7 27	4 40	7 33	4 33	7 39	4 26	7 46	4 18	7 54
31	4 47	7 26	4 41	7 32	4 35	7 38	4 28	7 44	4 20	7 52

For an explanation of this table and its use at various places, see pages 8 and 9

AUGUST

Day of Month	Latitude 44°		Latitude 46°		Latitude 48°		Latitude 50°		Latitude 52°	
	Sunrise	Sunset	Sunrise	Sunset	Sunrise	Sunset	Sunrise	Sunset	Sunrise	Sunset
	h m	h m	h m	h m	h m	h m	h m	h m	h m	h m
1	4 48	7 24	4 42	7 30	4 36	7 36	4 29	7 43	4 21	7 50
2	4 49	7 23	4 44	7 29	4 37	7 35	4 31	7 41	4 23	7 49
3	4 50	7 22	4 45	7 27	4 39	7 33	4 32	7 40	4 24	7 47
4	4 51	7 21	4 46	7 26	4 40	7 32	4 33	7 38	4 26	7 45
5	4 52	7 19	4 47	7 24	4 41	7 30	4 35	7 37	4 28	7 43
6	4 53	7 18	4 48	7 23	4 43	7 29	4 36	7 35	4 29	7 41
7	4 54	7 17	4 49	7 22	4 44	7 27	4 38	7 33	4 31	7 40
8	4 56	7 15	4 51	7 20	4 45	7 26	4 39	7 32	4 32	7 38
9	4 57	7 14	4 52	7 19	4 46	7 24	4 40	7 30	4 34	7 36
10	4 58	7 12	4 53	7 17	4 48	7 22	4 42	7 28	4 36	7 34
11	4 59	7 11	4 54	7 16	4 49	7 21	4 44	7 26	4 37	7 32
12	5 0	7 9	4 56	7 14	4 51	7 19	4 45	7 25	4 39	7 30
13	5 2	7 8	4 57	7 12	4 52	7 17	4 47	7 23	4 40	7 28
14	5 3	7 6	4 58	7 11	4 53	7 16	4 48	7 21	4 42	7 26
15	5 4	7 5	4 59	7 9	4 55	7 14	4 50	7 19	4 44	7 24
16	5 5	7 3	5 1	7 8	4 56	7 12	4 51	7 17	4 45	7 22
17	5 6	7 2	5 2	7 6	4 57	7 10	4 53	7 15	4 47	7 20
18	5 7	7 0	5 3	7 4	4 59	7 9	4 54	7 13	4 48	7 18
19	5 8	6 59	5 4	7 3	5 0	7 7	4 55	7 12	4 50	7 16
20	5 10	6 57	5 6	7 1	5 2	7 5	4 57	7 9	4 52	7 14
21	5 11	6 55	5 7	6 59	5 3	7 3	4 59	7 7	4 53	7 12
22	5 12	6 54	5 8	6 57	5 4	7 1	5 0	7 5	4 55	7 10
23	5 13	6 52	5 9	6 56	5 6	6 59	5 2	7 3	4 56	7 8
24	5 14	6 50	5 11	6 54	5 7	6 57	5 3	7 1	4 58	7 6
25	5 15	6 49	5 12	6 52	5 8	6 56	5 4	7 0	5 0	7 4
26	5 16	6 47	5 13	6 50	5 10	6 54	5 6	6 57	5 1	7 2
27	5 18	6 45	5 14	6 48	5 11	6 52	5 8	6 55	5 3	7 0
28	5 19	6 44	5 16	6 46	5 12	6 50	5 9	6 53	5 4	6 58
29	5 20	6 42	5 17	6 45	5 14	6 48	5 10	6 51	5 6	6 56
30	5 21	6 40	5 18	6 43	5 15	6 46	5 12	6 49	5 8	6 54
31	5 22	6 38	5 19	6 41	5 17	6 44	5 14	6 47	5 10	6 51

For an explanation of this table and its use at various places, see pages 8 and 9

SEPTEMBER

Day of Month	Latitude 44°		Latitude 46°		Latitude 48°		Latitude 50°		Latitude 52°	
	Sunrise	Sunset	Sunrise	Sunset	Sunrise	Sunset	Sunrise	Sunset	Sunrise	Sunset
	h. m.	h. m.	h. m.	h. m.	h. m.	h. m.	h. m.	h. m.	h. m.	h. m.
1	5 23	6 36	5 20	6 39	5 18	6 42	5 15	6 45	5 11	6 49
2	5 24	6 35	5 22	6 37	5 19	6 40	5 16	6 43	5 13	6 46
3	5 25	6 33	5 23	6 35	5 21	6 38	5 18	6 40	5 15	6 44
4	5 27	6 31	5 24	6 33	5 22	6 36	5 20	6 38	5 17	6 42
5	5 28	6 29	5 26	6 31	5 23	6 34	5 21	6 36	5 19	6 39
6	5 29	6 28	5 27	6 29	5 25	6 32	5 23	6 34	5 20	6 37
7	5 30	6 26	5 28	6 27	5 26	6 30	5 24	6 32	5 22	6 34
8	5 31	6 24	5 30	6 26	5 27	6 28	5 25	6 30	5 24	6 32
9	5 32	6 22	5 31	6 24	5 29	6 26	5 27	6 28	5 26	6 30
10	5 33	6 20	5 32	6 22	5 30	6 24	5 28	6 25	5 27	6 27
11	5 34	6 19	5 33	6 20	5 31	6 22	5 30	6 23	5 29	6 25
12	5 36	6 17	5 34	6 18	5 33	6 20	5 31	6 21	5 30	6 23
13	5 37	6 15	5 36	6 16	5 34	6 17	5 33	6 19	5 32	6 21
14	5 38	6 13	5 37	6 14	5 36	6 15	5 34	6 17	5 33	6 18
15	5 39	6 11	5 38	6 12	5 37	6 13	5 36	6 14	5 35	6 16
16	5 40	6 9	5 39	6 10	5 38	6 11	5 38	6 12	5 36	6 14
17	5 41	6 8	5 41	6 8	5 40	6 9	5 39	6 10	5 38	6 11
18	5 42	6 6	5 42	6 6	5 41	6 7	5 41	6 8	5 39	6 9
19	5 44	6 4	5 44	6 4	5 42	6 5	5 42	6 5	5 41	6 7
20	5 45	6 2	5 45	6 2	5 44	6 3	5 43	6 3	5 42	6 4
21	5 46	6 0	5 46	6 0	5 45	6 1	5 45	6 1	5 44	6 2
22	5 47	5 58	5 47	5 58	5 47	5 59	5 46	5 59	5 46	6 0
23	5 48	5 56	5 48	5 56	5 48	5 56	5 48	5 56	5 48	5 58
24	5 49	5 55	5 50	5 54	5 50	5 54	5 50	5 54	5 49	5 55
25	5 50	5 53	5 51	5 52	5 51	5 52	5 51	5 52	5 51	5 53
26	5 52	5 51	5 52	5 50	5 52	5 50	5 52	5 50	5 53	5 51
27	5 53	5 49	5 54	5 48	5 54	5 48	5 54	5 48	5 54	5 48
28	5 54	5 47	5 55	5 46	5 55	5 46	5 55	5 46	5 56	3 46
29	5 55	5 45	5 56	5 44	5 57	5 44	5 57	5 44	5 58	5 44
30	5 56	5 43	5 57	5 43	5 58	5 42	5 58	5 41	5 59	5 41

For an explanation of this table and its use at various places, see pages 8 and 9

OCTOBER

Day of Month	Latitude 44°		Latitude 46°		Latitude 48°		Latitude 50°		Latitude 52°	
	Sunrise	Sunset	Sunrise	Sunset	Sunrise	Sunset	Sunrise	Sunset	Sunrise	Sunset
	h m	h m	h m	h m	h m	h m	h m	h m	h m	h m
1	5 58	5 41	5 58	5 41	5 59	5 40	6 0	5 39	6 1	5 39
2	5 59	5 40	6 0	5 39	6 1	5 38	6 2	5 37	6 3	5 37
3	6 0	5 38	6 1	5 37	6 2	5 36	6 3	5 35	6 5	5 35
4	6 1	5 36	6 2	5 35	6 4	5 34	6 5	5 33	6 6	5 32
5	6 2	5 34	6 4	5 33	6 5	5 32	6 6	5 31	6 8	5 30
6	6 4	5 32	6 5	5 31	6 7	5 30	6 8	5 28	6 10	5 28
7	6 5	5 31	6 6	5 30	6 8	5 28	6 10	5 26	6 11	5 25
8	6 6	5 29	6 8	5 28	6 9	5 26	6 11	5 24	6 13	5 23
9	6 8	5 27	6 9	5 26	6 11	5 24	6 12	5 22	6 15	5 21
10	6 9	5 25	6 10	5 24	6 12	5 22	6 14	5 20	6 16	5 19
11	6 10	5 24	6 12	5 22	6 14	5 20	6 16	5 18	6 18	5 17
12	6 11	5 22	6 13	5 20	6 15	5 18	6 17	5 16	6 19	5 15
13	6 12	5 20	6 14	5 18	6 17	5 16	6 19	5 14	6 21	5 13
14	6 13	5 19	6 16	5 16	6 18	5 14	6 21	5 12	6 23	5 10
15	6 15	5 17	6 17	5 14	6 20	5 12	6 22	5 10	6 24	5 8
16	6 16	5 15	6 18	5 13	6 21	5 10	6 24	5 7	6 26	5 6
17	6 17	5 13	6 20	5 11	6 22	5 8	6 26	5 5	6 27	5 4
18	6 19	5 12	6 21	5 9	6 24	5 6	6 27	5 3	9 29	5 1
19	6 20	5 10	6 22	5 8	6 25	5 5	6 28	5 2	6 31	4 59
20	6 21	5 9	6 24	5 6	6 27	5 3	6 30	5 0	6 33	4 57
21	6 22	5 7	6 25	5 4	6 28	5 1	6 32	4 57	6 35	4 55
22	6 24	5 6	6 27	5 2	6 30	4 59	6 34	4 56	6 37	4 53
23	6 25	5 4	6 28	5 1	6 31	4 58	6 35	4 54	6 39	4 51
24	6 26	5 2	6 30	4 59	6 33	4 56	6 37	4 52	6 40	4 48
25	6 28	5 1	6 31	4 57	6 34	4 54	6 38	4 50	6 42	4 46
26	6 29	4 59	6 32	4 56	6 36	4 52	6 40	4 48	6 44	4 44
27	6 30	4 57	6 34	4 54	6 38	4 50	6 42	4 46	6 46	4 42
28	6 32	4 56	6 35	4 52	6 39	4 48	6 43	4 44	6 48	4 40
29	6 33	4 55	6 37	4 51	6 41	4 47	6 45	4 42	6 50	4 38
30	6 34	4 54	6 38	4 49	6 42	4 45	6 47	4 41	6 52	4 36
31	6 35	4 52	6 40	4 48	6 44	4 44	6 48	4 39	6 53	4 35

For an explanation of this table and its use at various places, see pages 8 and 9

NOVEMBER

Day of Month	Latitude 44°		Latitude 46°		Latitude 48°		Latitude 50°		Latitude 52°	
	Sunrise	Sunset	Sunrise	Sunset	Sunrise	Sunset	Sunrise	Sunset	Sunrise	Sunset
	h. m.	h. m.	h. m.	h. m.	h. m.	h. m.	h. m.	h. m.	h. m.	h. m.
1	6 37	4 51	6 41	4 46	6 45	4 42	6 50	4 37	6 55	4 33
2	6 38	4 49	6 42	4 45	6 47	4 41	6 52	4 36	6 57	4 31
3	6 40	4 48	6 44	4 44	6 48	4 39	6 53	4 34	6 59	4 29
4	6 41	4 47	6 45	4 42	6 50	4 38	6 55	4 32	7 1	4 27
5	6 42	4 45	6 47	4 41	6 51	4 36	6 57	4 31	7 2	4 26
6	6 43	4 44	6 48	4 39	6 53	4 35	6 58	4 29	7 4	4 24
7	6 44	4 43	6 49	4 38	6 54	4 33	7 0	4 28	7 6	4 22
8	6 46	4 42	6 51	4 37	6 56	4 32	7 2	4 26	7 8	4 21
9	6 47	4 41	6 52	4 36	6 58	4 30	7 3	4 25	7 9	4 19
10	6 49	4 40	6 54	4 35	6 59	4 29	7 5	4 23	7 11	4 18
11	6 50	4 38	6 55	4 33	7 1	4 28	7 7	4 22	7 13	4 16
12	6 51	4 37	6 56	4 32	7 2	4 26	7 8	4 20	7 15	4 15
13	6 53	4 36	6 58	4 31	7 4	4 25	7 10	4 19	7 16	4 13
14	6 54	4 35	6 59	4 30	7 5	4 24	7 11	4 18	7 18	4 12
15	6 55	4 34	7 1	4 29	7 7	4 23	7 13	4 16	7 20	4 10
16	6 57	4 33	7 2	4 28	7 8	4 21	7 15	4 15	7 21	4 9
17	6 58	4 32	7 4	4 27	7 10	4 20	7 16	4 14	7 23	4 7
18	6 59	4 32	7 5	4 26	7 12	4 19	7 18	4 13	7 25	4 6
19	7 0	4 31	7 6	4 25	7 13	4 18	7 20	4 11	7 26	4 5
20	7 2	4 30	7 8	4 24	7 14	4 17	7 21	4 10	7 28	4 4
21	7 3	4 29	7 9	4 23	7 15	4 17	7 23	4 9	7 30	4 3
22	7 4	4 28	7 10	4 22	7 17	4 16	7 24	4 8	7 32	4 2
23	7 6	4 28	7 12	4 22	7 19	4 15	7 26	4 7	7 33	4 0
24	7 7	4 27	7 13	4 21	7 20	4 14	7 28	4 6	7 35	3 59
25	7 8	4 26	7 14	4 20	7 21	4 13	7 29	4 5	7 37	3 58
26	7 9	4 26	7 16	4 19	7 23	4 12	7 31	4 4	7 38	3 57
27	7 10	4 25	7 17	4 19	7 24	4 12	7 32	4 4	7 40	3 56
28	7 12	4 25	7 18	4 18	7 25	4 11	7 33	4 3	7 41	3 55
29	7 13	4 24	7 19	4 18	7 27	4 10	7 35	4 2	7 43	3 55
30	7 14	4 24	7 21	4 17	7 28	4 10	7 36	4 2	7 44	3 54

For an explanation of this table and its use at various places, see pages 8 and 9

DECEMBER

Day of Month	Latitude 44°		Latitude 46°		Latitude 48°		Latitude 50°		Latitude 52°	
	Sunrise	Sunset	Sunrise	Sunset	Sunrise	Sunset	Sunrise	Sunset	Sunrise	Sunset
	h m	h m	h m	h m	h m	h m	h m	h m	h m	h m
1	7 15	4 23	7 22	4 16	7 29	4 9	7 37	4 1	7 46	3 54
2	7 16	4 23	7 23	4 16	7 31	4 9	7 39	4 1	7 47	3 53
3	7 17	4 23	7 24	4 16	7 32	4 8	7 40	4 0	7 48	3 52
4	7 18	4 23	7 25	4 16	7 33	4 8	7 41	4 0	7 50	3 52
5	7 19	4 22	7 26	4 15	7 34	4 8	7 42	3 59	7 51	3 51
6	7 20	4 22	7 27	4 15	7 35	4 8	7 43	3 59	7 53	3 51
7	7 21	4 22	7 29	4 15	7 36	4 7	7 45	3 59	7 54	3 50
8	7 22	4 22	7 30	4 15	7 37	4 7	7 46	3 59	7 55	3 50
9	7 23	4 22	7 30	4 15	7 37	4 7	7 47	3 58	7 56	3 50
10	7 24	4 22	7 31	4 15	7 38	4 7	7 48	3 58	7 57	3 50
11	7 25	4 22	7 32	4 15	7 40	4 7	7 49	3 58	7 58	3 50
12	7 26	4 22	7 33	4 15	7 41	4 7	7 50	3 58	7 59	3 50
13	7 26	4 22	7 34	4 15	7 42	4 7	7 51	3 58	7 59	3 49
14	7 27	4 22	7 35	4 15	7 43	4 7	7 52	3 58	8 0	3 49
15	7 28	4 23	7 36	4 15	7 44	4 7	7 53	3 58	8 1	3 49
16	7 29	4 23	7 36	4 15	7 44	4 7	7 53	3 58	8 2	3 49
17	7 30	4 23	7 37	4 16	7 45	4 8	7 54	3 59	8 3	3 49
18	7 30	4 24	7 38	4 16	7 46	4 8	7 55	3 59	8 4	3 50
19	7 31	4 24	7 38	4 16	7 46	4 8	7 55	3 59	8 4	3 50
20	7 31	4 24	7 39	4 17	7 47	4 9	7 56	4 0	8 5	3 51
21	7 32	4 25	7 39	4 17	7 47	4 9	7 56	4 0	8 5	3 51
22	7 32	4 25	7 40	4 18	7 48	4 10	7 57	4 1	8 6	3 52
23	7 33	4 26	7 40	4 18	7 48	4 10	7 57	4 1	8 6	3 52
24	7 33	4 27	7 41	4 19	7 49	4 11	7 58	4 2	8 7	3 53
25	7 34	4 27	7 41	4 20	7 49	4 12	7 58	4 3	8 7	3 53
26	7 34	4 28	7 42	4 20	7 50	4 12	7 58	4 3	8 8	3 54
27	7 34	4 28	7 42	4 21	7 50	4 13	7 59	4 4	8 8	3 54
28	7 34	4 29	7 42	4 22	7 50	4 14	7 59	4 5	8 8	3 55
29	7 35	4 30	7 42	4 22	7 50	4 15	7 59	4 6	8 8	3 56
30	7 35	4 31	7 42	4 23	7 50	4 16	7 59	4 7	8 8	3 57
31	7 35	4 32	7 42	4 24	7 50	4 17	7 59	4 8	8 8	3 58

For an explanation of this table and its use at various places, see pages 8 and 9

THE SKY FOR JANUARY

The Sun. — During January the Sun's R.A. increases from 18h 42m, to 20h 51m, and its Decl. changes from 23° 6′ S, to 17° 41′ S. The equation of time increases from 3m 14s to 13m 29s , and to this rapid rise in value the time of mean noon appears to remain, for the first ten days at the same distance from the time of sunrise, i. e. the forenoons as indicated by our clocks are of the same length. The sun is nearest the earth on January 3.

The Moon. — For its phases and conjunctions with the planets, see opposite page. On the 30th the moon occults 136 Tauri, mag. 4·6 (see page 8).

Mercury on January 1 crosses the meridian at 11 a.m. (M.T.); at 10.26 on the 14th; it reaches greatest elongation W. 23° 51′ on the 15th, and then approaches the sun, crossing the meridian on the 31st at 10.51. Its low declination, 18° S., prevents it from being well seen.

Venus on January 15 is in R.A. 16h 52m, Decl. 20° 24′ S. It crosses the meridian then at 9.12 (M.T.), and hence is a morning star. It is a very prominent object in the eastern sky. It was at greatest elongation west of the sun on November 26, and so is receding from the earth. It will reach superior conjunction with the sun on July 5. On the 9th is a conjunction between Venus and Jupiter.

Mars on January 15 R. A. 3h 33m, Decl. 21° 30′ N., about 2° S. of the Pleiades. Its distance from the earth then is 75 millions of miles. On January 1 its stella magnitude is −0·7 being brighter than any fixed star but Sirius. It is well placed for evening observations.

Jupiter on January 15 is in R. A. 16h 23m, Decl. 20° 48′ S., and crosses the meridian at 8.49 a.m. (M. T.) It is then 5½° N. of Antares.

Saturn on January 15 is in R.A. 2h 46m, Decl. 13° 37′ N., and crosses the meridian at 7.10 p.m. It is in Aries, and is well placed for evening observations. The rings continue to widen out, the southern side being visible. It is stationary on the 16th, after which its motion is direct.

Uranus on January 15 is in R.A. 20h 5m, Decl. 20° 52′ S. It is in Sagittarius, near its western boundary, and crosses the meridian at 0.31 p.m.

Neptune on January 15 is in R.A. 7h 36m, Decl. 21° 2′ N., about 7° south from Pollux. Its stellar magnitude is 7·6 and so cannot be seen with the unaided eye.

For the minima of Algol and the configurations of Jupiter's satellites see opposite page.

JANUARY

ASTRONOMICAL PHENOMENA

(75th Meridian Time, Hours Numbering from Midnight)

		Minima of Algol	Configuration of Jupiter's Satellites at 5h 30m.
		h m	
1	3h 10m ☌ ♂, ☾, ♂ 0° 1′ S.; 12h ♀ Greatest Hel. Lat. N.	1 25	42○13
2	1h ☿ greatest Hel. Lat. N.		43○12
3	6h ⊕ in Perihelion.	22 14	43○12
☺ 4	8h 29m·5 Full Moon; 8h·6 Moon in Perigee; 22h 20m☌ ♆		4321○
5	[☾, ♆ 5° 39′ S; 23h ☿ Stationary.		432○1
6		19 03	4○32●
7			2 4 1○3
8			2○413
9	16h ☌ ♀ 2 4, ♀ 1° 38′ N.	15 52	2 4 1○24
10			3○124
☾ 11	2h 42m·8 Moon's Last Quarter.		321○4
12		12 41	32○14
13	17h ☍ ♆ ☉.		1○324
14			2 4 ○234
15	0h 57m ☌ 2 4 ☾, 2 4 4° 6′ N.; 12h 26m ☌ ♀ ☾, ♀ 5° 51′	9 30	2○143
16	12h ♄ Stationary. [N.; 17h ☿ great. Elong. W. 23° 51′		1○324
17	1h 22m ☌ ☿ ☾, ☿ 5° 48′ N.; 20h·9 ☾ in Apogee.		34○12
18		6 19	4312○
● 19	6h 9m·9 New Moon; 6h 51m ☌ ♅ ☾, ♅ 4° 33′ N.		432○1
20	14h ☌ ♅ ☉.		41○32
21		3 08	4○123
22			42○3●
23		23 57	41○3●
24			34○12
25	12h ☿ in ♉		312○4
26		20 46	32○14
☽ 27	3h 51m·2 Moon's First Quarter; 19h 10m ☌ ♄ ☾, ♄ 4° 9′ S.		1○324
28	20h 58m ☌ ♂ ☾, ♂ 0° 37′ S.		○1234
29		17 35	2○34●
30			2 4 ○34●
31			3○124

Key to Symbols.—☌ Conjunction; ☍ Opposition; □ Quadrature; ☊ Ascending Node; ☋ Descending Node; ☉ Sun; ☿ Mercury; ♀ Venus; ⊕ Earth; ♂ Mars; 2 4 Jupiter; ♄ Saturn; ♅ Uranus; ♆ Neptune. For Jupiter's satellites the circle ○ represents the disc of the planet; 2 4 signifies that the satellite is on the disc; ● signifies that the satellite is behind the disc or in the shadow. Configurations are for an inverting telescope.

THE SKY FOR FEBRUARY

The Sun. — During February the sun's R. A. increases from 20h 55m to 22h 45m, and its Decl. changes from 17° 24′ S. to 7° 59′ S. The equation of time reaches its maximum value, 14m 26s on the 12th. On the 29th it is 12m 45s

The Moon. — For its phases and conjunctions with the planets, see opposite page. On the 10th the moon occults σ Scorpii, mag. 3·1, and also α Scorpii, mag. 1·2 (see page 8.)

Mercury during the month is approaching the sun, and is not well placed for observation.

Venus on the 15th is in R. A. 19h 26m, Decl. 21° 21′ N., and crosses the meridian at 9.51 a.m. (M.T.). It is still a prominent morning star, About 8/10 of the disc is illuminated, and its stellar magnitude is − 3·5. On the 14th it is in conjunction with the moon, and on the 24th with Uranus.(See opp. page)

Mars on the 15th is in R. A. 4h 14m, Decl. 22° 25′ N., and crosses the meridian at 6.36 p.m. (M.T.). Its distance from the earth then is 102 millions of miles, and its stellar magnitude is 0·5, approximately that of Procyon. The planet is still in Taurus, rapidly moving eastward. In conjunction with the moon on the 25th (see opp. page.)

Jupiter on February 15th is in R.A. 16h 44m, Decl. 21° 31′ S., and crosses the meridian at 7.08 p.m. (M.T.) It is about 7° north-east of Antares.

Saturn on February 15th is in R.A. 2h 50m, Decl. 14° 1′ N., and crosses the meridian at 5.12 p.m. (M.T.). It is still in the constellation Aries. In conjunction with the moon on the 24th (see opp. page.)

Uranus on February 15th is in R.A. 20h 13m, Decl. 20° 28′ S., and crosses the meridian at 10.44 a.m. (M.T.).

Neptune on February 15th is in R. A. 7h 32m, Decl. 21° 10′ N., and crosses the meridian at 9.54 p.m. (M.T.).

For the minima of Algol and the configurations of Jupiter's satellites, see opposite page.

FEBRUARY

ASTRONOMICAL PHENOMENA

(75th Meridian Time, Hours Numbering from Midnight)

			Minima of Algol	Configuration of Jupiter's Satellites at 4h 30m.
			h m	
	1	8h 36m ☌ ♆ ☾, ♆ 5° 39′ S.; 21h·1 ☾ in Perigee.	14 23	♃31○4
☽	2	18h′58m·0 Full Moon.		32○41
	3	15h □ ♄ Ⓢ.		413○2
	4	18h ☿ in Aphelion.	11 12	4○123
	5			421○3
	6			42○13
	7	1h ☌ ☿ ♁, ☿ 0° 55′ S.	8 01	43○2●
	8			431○2
☾	9	19h 50m·8 Moon's Last Quarter.		432○1
	10		4 50	143○2
	11	16h 20m ☌ ♃ ☾, ♃ 4° 37′ N.		○4123
	12			21○43
	13		1 39	2○134
	14	6h·1 ☾ in Apogee; 17h 30m ☌ ♀ ☾, ♀ 5° 44′ N.		3○24●
	15	16h 21m ☌ ♅ ☾, ♅ 4° 36′ N.	22 28	31○24
	16	22h 54m ☌ ☿ ☾, ☿ 2° 48′ N.		32○14
	17			31○4●
●	18	0h 44m·2 New Moon.	19 17	○1342
	19			214○3
	20			42○13
	21		16 06	41○32
	22			♃43○2
	23			432○1
	24	3h 27m ☌ ♄ ☾, ♄ 4° 23′ S.; 16h ☌ ♀ ♁, ♀ 0° 39′ N.	12 55	431○●
☽	25	3h ☿ greatest Hel. Lat. S.; 14h 26m·8 Moon's First Quarter;		4○312
	26	14h ♀ in ♉. [22h 32m ☌ ♂ ☾, ♂ 1° 43′ S.		412○3
	27		9 44	24○13
	28	17h 5m ☌ ♆ ☾, ♆ 5° 46′ S.		1○324
	29			3○124

Key to Symbols.—☌ Conjunction; ☍ Opposition; □ Quadrature; ☊ Ascending Node; ☋ Descending Node; Ⓢ Sun; ☿ Mercury; ♀ Venus; ⊕ Earth; ♂ Mars; ♃ Jupiter; ♄ Saturn; ♅ Uranus; ♆ Neptune. For Jupiter's satellites the circle ○ represents the disc of the planet; ♃ signifies that the satellite is on the disc; ● signifies that the satellite is behind the disc or in the shadow. Configurations are for an inverting telescope.

MARCH

The Sun. — On March 1 the sun's R. A. is 22m 48s and its Decl. is 7° 36′ S. It reaches the equator on the 20th (see opp. page) and on the 31st the R.A. is 0h 38m, Decl. 4° 8′ N. During the month the equation of time decreases from 12m 33s to 4m 19s .

The Moon. — For its phases and conjunctions with the planets, see opposite page.

Mercury is in superior conjunction with the sun on the 2nd, and on the 27th reaches greatest elongation east. This is a good time of the year to see Mercury when it is at greatest eastern elongation, but its angular distance from the sun on this occasion is only 18° 51′ while at some times it can be 28°. It should be looked for immediately after sunset just above the sunset point. Use an opera glass if convenient.

Venus on the 15th is in R. A. 21h 53m, Decl. 13° 45′ S., and crosses the meridian at 10.22 a.m. (M.T.). It is slowly decreasing in brightness. In conjunction with the moon on the 16th, (see opp. page).

Mars on the 15th is in R. A. 5h 12m, Decl. 25° 0′ N., and crosses the meridian at 5.40 p.m. (M.T.). It is 129 millions of miles from the earth. The planet is then of the same apparent magnitude as Aldebaran and about 13° north-east from it.

Jupiter on the 15th is in R. A. 16h 55m, Decl. 21° 49′ S., and crosses the meridian at 5.24 a.m. (M.T.). It is about 10° north-east of Antares.

Saturn on the 15th is in R. A. 2h 58m, Decl. 14° 47′ N., and crosses the meridian at 3.27 p.m. (M.T.). It is thus an evening star, visible for about 4 hours after sunset.

Uranus on the 15th is in R. A. 20h 19m, Decl. 20° 11′ S., and crosses the meridian at 8.48 a.m. (M.T.).

Neptune on the 15th is in R. A. 7h 31m, Decl. 21° 15′ N., and crosses the meridian at 7.59 p.m. (M.T.).

For the minima of Algol and the configurations of Jupiter's satellites, see opposite page.

MARCH

ASTRONOMICAL PHENOMENA

(75th Meridian Time, Hours Numbering from Midnight)

		Minima of Algol (h m)	Configuration of Jupiter's Satellites at 3h 30m.
1	4h·1 ☾ in Perigee.	6 33	32○4●
2	9h ☌ ☿ ☉ Superior.		321○4
♋ 3	5h 41m·9 Full Moon.		○3124
4	12h □ ♂ ♉; 23h □ ♃ ♉.	3 22	♃1○34
5			2○134
6			1○234
7		0 11	34○12
8			3421○
9		21 00	♃432○
☾ 10	5h 36m ☌ ♃ ☾, ♃ 5° 0′ N.; 14h 55m·5 Moon's Last		4○12●
11	[Quarter.		41○23
12	23h·9 ☾ in Apogee.	17 49	42○13
13			41○23
14	2h 12m ☌ ♅ ☾, ♅ 4° 43′ N.		43○21
15	3h ☿ in ♌.	14 38	3214○
16	2h 5m ☌ ♀ ☾, ♀ 3° 43′ N.		32○14
17			○24●●
♏ 18	17h 8m·8 New Moon.	11 27	1○234
19	17h ☿ in Perihelion; 23h 45m ☌ ☿ ☾, ☿ 1° 47′ N.		2○134
20	18h 29m ☉ enters Aries. Spring begins.		1○34●
21		8 16	3○124
22	13h 14m ☌ ♄ ☾, ♄ 4° 36′ S.		321○4
23			32○14
24	[Quarter.	5 05	43○2●
☽ 25	3h 30m ☌ ♂ ☾, ♂ 2° 44′ S.; 22h 1m·9 Moon's First		41○23
26	23h 19m ☌ ♆ ☾, ♆ 5° 53′ S.		42○13
27	20h ☿ Greatest Elongation E. 18° 51′.	1 54	41○3●
28	15h·9 ☾ in Perigee.		43○12
29		22 43	4312○
30	1h ☿ greatest Hel. Lat. N.		432○1
31			431○2

Key to Symbols.—☌ Conjunction; ☍ Opposition; □ Quadrature; ☊ Ascending Node; ☋ Descending Node; ☉ Sun; ☿ Mercury; ♀ Venus; ⊕ Earth; ♂ Mars; ♃ Jupiter; ♄ Saturn; ♅ Uranus; ♆ Neptune. For Jupiter's satellites the circle ○ represents the disc of the planet; ♃ signifies that the satellite is on the disc; ● signifies that the satellite is behind the disc or in the shadow. Configurations are for an inverting telescope.

THE SKY FOR APRIL

The Sun—During April the sun continues its rapid rise above the equator and the days rapidly increase in length. On the 1st its R.A. is 0h 42m, Decl. 4° 31′ N.: on the 30th the R.A. is 2h 29m, Decl. 14° 45′ N. On the 16th there is a central eclipse of the sun. For full particulars see page 48

The Moon—For its phases and conjunctions with the planets, see opposite page. There is an eclipse of the moon on the 1st, but it is invisible in North America (see page 48) On the 5th the Moon occults α Scorpii, mag. 1·2 (see page 8.)

Mercury is in inferior conjunction with the sun on the 15th, after which it is a morning star. On the 27th there is an interesting conjunction of Venus and Mercury (see opp. page.)

Venus on the 15th is in R.A. 0h 16m, Decl. 0° 4′ N., that is, it is very near the vernal equinox. It crosses the meridian then at 10.45 a.m. (M.T.) In conjunction with the moon on the 15th, and with Venus on the 27th, (see opp. page.)

Mars on the 15th is in R.A. 6h 24m, Decl. 25° 7′ N., and crosses the meridian at 4.51 p.m. (M.T.) It is about 3° west of ε Geminorum, and about midway between Castor and Pollux in brightness. It is 157 millions of miles from the earth then.

Jupiter on the 15th is in R.A. 16h 55m, Decl. 21° 48′ N., and crosses the meridian at 3.23 a.m. (M.T.) It rises about 11.30 p.m.

Saturn on the 15th is in R.A. 3h 12m, Decl. 15° 48′ N., and crosses the meridian at 1.39 p.m. (M.T.) It is seen for a short time after sunset.

Uranus on the 15th is in R.A. 20h 23m, Decl. 19° 59′ S., and crosses the meridian at 6.35 a.m. (M.T.) It is in quadrature with the sun, being 90° west, on the 23rd (see opp. page.)

Neptune on the 15th is in R.A. 7h 3rm, Decl. 21° 16′ N., and crosses the meridian at 5.57 p.m. (M.T.) It is in quadrature (90° east) with the sun on the 11th.

For the minima of Algol and the configurations of Jupiter's satellites see opposite page.

APRIL

ASTRONOMICAL PHENONENA

(75th Meridian Time, Hours Numbering from Midnight)

			Minima of Algol	Configuration of Jupiter's Satellites at 2h.
			h m	
☉	1	0h ☿ in Aphelion; 7h ♆ Stationary; 8h ♃ Stationary; 17h	19 32	○1423
	2	[4m·6 Full Moon; Partial Eclipse of the Moon; invisible		2○143
	3	[in Canada.		21○34
	4		16 20	○3124
	5	3h ☿ Stationary		♃31○4
	6	15h 32m ☌ ♃ ☾, ♃ 5° 8′ N.		32○14
	7		13 09	31○24
	8			○1324
☾	9	10h 23m·8 Moon's Last Quarter; 19h·8 ☾ in Apogee		2○43●
	10	11h 54m ☌ ♅ ☾, ♅ 4° 46′ N.	9 58	421○3
	11	2h □ ♆ ☉		4○312
	12			431○2
	13		6 47	432○1
	14			431○2
	15	7h ☌ ☿ ☉ Inferior; 12h 17m ☌ ♀ ☾, ♀ 0° 5′ N.		4○312
	16		3 36	421○3
♋	17	0h 4m ☌ ☿ ☾, ☿ 1° 27′ N.; 6h 40m·2 New Moon; Central		♃24○3
	18	[Eclipse of the Sun; visible in Eastern Canada as a partial		○1432
	19	1h 31m ☌ ♄ ☾, ♄ 4° 47′ S. [Eclipse	0 25	31○24
	20			32○14
	21	[gee.	21 14	31○4●
	22	10h 22m ☌ ♂ ☾, ♂ 3° 25′S.; 12h ☿ in ♉; 17h·3 ☾ in Peri-		○124●
	23	4h 53m ☌ ♆ ☾, ♆ 5° 53′ S.; 10h ♀ greatest Hel. Lat. S.;		21○34
☽	24	3h 47m·3 Moon's First Quarter. [17h □ ♅ ☉	18 03	♃2○34
	25			○1234
	26			314○2
	27	16h ☿ Stationary; 19h ☌ ☿ ♀, ☿ 0° 10′ N.	14 52	342○1
	28			431○●
	29			4○12●
	30		11 41	412○3

Key to Symbols.—☌ Conjunction; ☍ Opposition; □ Quadrature; ☊ Ascending Node; ☋ Descending Node; ☉ Sun; ☿ Mercury; ♀ Venus; ⊕ Earth; ♂ Mars; ♃ Jupiter; ♄ Saturn; ♅ Uranus; ♆ Neptune. For Jupiter's satellites the circle ○ represents the disc of the planet; ♃ signifies that the satellite is on the disc; ● signifies that the satellite is behind the disc or in the shadow. Configurations are for an inverting telescope.

THE SKY FOR MAY

The Sun. —On the 1st the Sun's R. A. is 2h 33m, Decl. 15° 3′ N., on the 31st the R.A is 4h 32m, Decl. 21° 54′ N. The equation of time, 2m 57s on the 1st, rises to 3m 48s on the 14th (a maximum) and then falls to 2m 34s on the 31st.

The Moon. —For its phases and conjunctions with the planets, see opposite page. On the 25th the Moon occults η Virginis. mag. 4·0. (See p. 8).

Mercury on the 13th reaches its greatest elongation west, being then 26° 3′ from the sun (see opp. page). Mercury is best seen at western elongations which occur near the autumn equinox (Sept. 21), but as the planet is nearly 8° above the equator, one should be able to see it by looking just before sunrise. (See note on Mercury for March.)

Venus—On the 15th is in R. A. 2h 33m, Decl. 13° 46′ N., and crosses the meridian at 11.02 a.m. (M. T.) In conjunction with the Moon on the 15th, and with Saturn on the 27th (see opposite page.)

Mars—On the 15th is in R. A. 7h 38m, Decl. 23° 7′ N., and crosses the meridian at 4.07 p.m. (M. T.) At that time it is 182 millions of miles from the earth. It is about 5° south of Pollux, and is of apparent magnitude 1·8, being slightly brighter than Castor.

Jupiter—On the 15th is in R. A. 16h 45m Decl. 21° 31′ S., and crosses the meridian at 1.15 a.m. (M.T.) It is now a conspicuous evening star, of apparent magnitude – 2·1, 7° north-east of Antares. In conjunction with the moon on the 3rd and the 30th (See opp. page).

Saturn—On the 15th is in R.A. 3h 27m, Decl. 16° 49′ N., and crosses the meridian at 11.56 a.m. (M.T.) It is in conjunction with the Sun on the 14th. The Sun now appears east of the planet which thus becomes a morning star.

Uranus—On the 15th is in R.A. 20h 24m, Decl. 19° 58′ S., and crosses the meridian at 4.41 a.m. (M.T.) It is stationary on the 8th and then begins to retrograde, or move westward amongst the stars, and this continues until October 9.

Neptune—on the 15th is in R.A. 7h 33m, Decl. 21° 13′ N., and crosses the meridian at 4.01 p.m. (M.T.)

For the minima of Algol and the configurations of Jupiter's satellites see opposite page.

MAY

ASTRONOMICAL PHENOMENA

(75th Meridian Time, Hours Numbering from Midnight)

			Minima of Algol	Configuration of Jupiter's Satellites at 0h 35m.
			h m	
♉	1	5h 19m·4 Full Moon.		42○13
	2	17h ☿ in Aphelion.		4○23●
	3	21h 9m ☌ ♃ ☾, ♃ 5° 2′ N.	8 30	431○2
	4	10h ♂ greatest Hel. Lat. N.		324○1
	5			312○4
	6		5 19	3○124
	7	15h ·0 ☾ in Apogee; 20h 36m ☌ ♅ ☾, ♅ 4° 41′ N.		♃1○34
	8	6h ♅ Stationary		2○134
☾	9	4h 56m·1 Moon's Last Quarter.	2 08	1○234
	10			♃3○24
	11		22 57	32○14
	12	22h ☌ ♂ ♆, ♂ 2° 9′ N.		321○4
	13	3h ☿ greatest Elong. W. 26° 3′.		34○12
	14	12h ☌ ♄ (☉); 20h 20m ☌ ☿ ☾, ☿ 4° 18′ S.	19 46	41○23
	15	17h 45m ☌ ♀ ☾, ♀ 3° 11′ S.		42○13
♌	16	16h 11m ☌ ♄ ☾, ♄ 4° 58′ S.; 17h 13m·6 New Moon.		41○23
	17		16 35	4○312
	18			432○●
	19	11h ·6 ☾ in Perigee.		4321○
	20	12h 1m ☌ ♆ ☾. ♆ 5° 46′ S.; 19h 3m ☌ ♂ ☾, ♂ 3° 41′ S	13 24	43○12
	21			1○423
	22			2○143
☽	23	2h ☿ greatest Hel. Lat. S.; 9h 11m·3 Moon's First Quarter.	10. 13	1○34●
	24			○3124
	25			321○4
	26		7 02	32:○4
	27	16h ☌ ♀ ♄, ♀ 1° 7′ N.		3○124
	28			1○324
	29		3 51	2○413
♉	30	18h 29m·6 Full Moon; 22h 49m ☌ ♃ ☾, ♃ 4° 48′ N.		412○3
	31			4○312

Key to Symbols.—☌ Conjunction; ☍ Opposition; □ Quadrature; ☊ Ascending Node; ☋ Descending Node; (☉) Sun; ☿ Mercury; ♀ Venus; ⊕ Earth; ♂ Mars; ♃ Jupiter; ♄ Saturn; ♅ Uranus; ♆ Neptune. For Jupiter's satellites the circle ○ represents the disc of the planet; ♃ signifies that the satellite is on the disc; ● signifies that the satellite is behind the disc or in the shadow. Configurations are for an inverting telescope.

THE SKY FOR JUNE

The Sun. — The sun's R. A. on the 1st is $4^h\ 36^m$, and on the 30th it is $6^h\ 36^m$. During the month the declination slowly rises from 22° 3′ N., to 23° 27′ on the 21st, which is the summer solstice (see opp. page), at which time our days are longest. It then falls to 23° 12′ on the 30th. The equation of time is zero on the 14th; it then rises to $3^m\ 22^s$ on the 30th. It is this increase in the equation of time, taken with the decreasing length of the day which causes the time of sunset to appear constant for several days at the end of June and the beginning of July.

The Moon. — For its phases and conjunctions with the planets, see opposite page. On the 26th the moon occults α Scorpii, mag. 1·2, (see page 8).

Mercury comes to superior conjunction with the sun on the 17th, after which it becomes an evening star.

Venus on the 15th is in R. A. $5^h\ 9^m$, Decl. 22° 48′ N., and crosses the meridian at 11.36 a.m. (M.T.). It is thus too close to the sun for ordinary observations.

Mars on the 15th is in R. A. $8^h\ 54^m$, Decl. 18° 50′ N., and crosses the meridian at 3.21 p.m. (M.T.). At that time it is 203 millions of miles from the earth, and of apparent magnitude 2·0. It is in the constellation Cancer.

Jupiter on the 15th is in R. A. $16^h\ 29^m$, Decl. 21° 2′ S., and crosses the meridian at 10.52 p.m. (M.T.) It is a conspicuous evening star, about $5\frac{1}{2}°$ north of Antares. The planet is in opposition to the sun on June 1, and in conjunction with the moon on the 26th. (See opp. page).

Saturn on the 15th is in R. A. $3^h\ 43^m$, Decl. 17° 45′ N., and crosses the meridian at 10.09 a.m. (M.T.). It is about 6° south of the Pleiades. In conjunction with the moon on the 13th. (See opp. page).

Uranus on the 15th is in the R. A. $20^h\ 21^m$, Decl. 20° 6′ S., and crosses the meridian at 2.45 a.m. (M.T.). It is still retrograding.

Neptune on the 15th is in R. A. $7^h\ 36^m$, Decl. 21° 4′ N., and crosses the meridian at 2.03 p.m. (M.T.).

For the minima of Algol and the configurations of Jupiter's satellites, see opposite page.

JUNE

ASTRONOMICAL PHENOMENA

(75th Meridian Time, Hours Numbering from Midnight)

		Minima of Algol	Configuration of Jupiter's Satellites at 23h 30m.
		h m	
1		0 40	432○1
2	23h ☌ ☿ ♄, ☿ 0° 29′ N.		43○12
3		21 29	41○2●
4	3h 36m ☌ ♅ ☾, ♅ 4° 31′ N.; 7h ·9 ☾ in Apogee.		42○13
5			142○3
6		18 17	○4132
☾ 7	21h 35m ·6 Moon's Last Quarter.		2431○4
8			32○14
9	2h ♂ in Aphelion.	15 06	3○24●
10			13○24
11	2h ☿ in ♌		2○134
12	0h ☌ ☿ ♀, ☿ 0° 26′ N.	11 55	12○34
13	8h 1m ☌ ♄ ☾, ♄ 5° 15′ S.		○1432
14	16h 4m ☌ ♀ ☾, ♀ 4° 29′ S.; 20h 40m ☌ ☿ ☾, ☿ 3° 48′ S.		134○2
☉ 15	1h 23m ·6 New Moon; 17h ☿ in Perihelion.	8 44	342○1
16	11h ·5 ☾ in Perigee, 21h 44m ☌ ♆ ☾, ♆ 5° 38′ S.		431○2
17	7h ☌ ☿ ☉ Superior.		2143○2
18	5h 53m ☌ ♂ ☾, ♂ 3° 29′ S.; 17h ♀ in ♌.	5 33	42○13
19			421○3
20			4○123
☽ 21	14h 17m ☉ enters Cancer, Summer begins; 15h 38m·9.	2 22	413○2
22	[Moon's First Quarter.		324○1
23		23 11	31○4●
24			243○24
25			2○134
26	0h ☿ greatest Hel. Lat. N.; 22h 58m ☌♃ ☾, ♃ 4° 37′ N.	20 00	21○34
27			○1234
28			13○24
☺ 29	8h 33m ·8 Full Moon.	16 49	32○14
30	2h ☌ ☿ ♆, ☿ 2° 27′ N.		31○4●

Key to Symbols.—☌ Conjunction; ☍ Opposition; □ Quadrature; ☊ Ascending Node; ☋ Descending Node; ☉ Sun; ☿ Mercury; ♀ Venus; ⊕ Earth; ♂ Mars; ♃ Jupiter; ♄ Saturn; ♅ Uranus; ♆ Neptune. For Jupiter's satellites the circle ○ represents the disc of the planet; ♃ signifies that the satellite is on the disc; ● signifies that the satellite is behind the disc or in the shadow. Configurations are for an inverting telescope.

THE SKY FOR JULY

The Sun. — During the month the Sun's R. A. changes from 6h 40m to 8h 41m and the declination from 23° 8′ to 18° 19′ N. The earth is farthest from the sun on July 4. (See opp. page.)

The Moon. — For its phases and conjunctions with the planets, see opposite page. On the 9th the moon occults δ Arietis, mag. 4·5, (See p. 8).

Mercury — attains its greatest elongation east on the 25th, being then 27° 6′ from the sun. By looking in the west (with an opera glass, preferably) immediately after sunset the planet can be detected. Its apparent magnitude is 0·2, equal to Capella or Rigel. Having located it with an opera glass it is easy to see it with the unaided eye.

Venus — On the 15th is in R. A. 7h 49m, Decl. 22° 3′ N., and it crosses the meridian at 0.17 p.m. (M. T.) On the 5th it is in superior conjunction with the sun, after which it becomes an evening star.

Mars — On the 15th is in R. A. 10h 6m, Decl. 12° 52′ N., and crosses the meridian at 2.34 p.m. (M. T.) It is then 220 millions of miles from the earth. At 11.24 p.m. (E. S. T.)on July 13th the planet is in conjunction (i.e. in the same R. A.) with α Leonis (Regulus), and is but 42′ north of it. In conjunction with the moon on the 16th, (see opp. page.)

Jupiter — On the 15th is in R. A. 16 17m Decl. 20° 41′ S., and crosses the meridian ot 8.43 p.m. (M.T.) It is about 5½° north, slightly west, of Antares, and is a fine object for evening observations. In conjunction with the moon on the moon on the 24th (see opp. page.)

Saturn — On the 15th is in R.A. 3h 56m, Decl. 18° 25′ N., and crosses the meridian at 8.25 a.m. It is about 6 1-2° south-east of the Pleiades and 8 1-2° north-west of Aldebaran. In conjunction with the moon on the 10th (See opp. page.

Uranus — On the 15th is in R.A. 20h 17m, Decl. 20° 21′ S., and crosses the meridian at 0.42 a.m. (M.T.) It is in opposition to the sun on the 24th, i.e. at midnight it is then on the meridian.

Neptune — on the 15th is in R.A. 7h 41m, Decl. 20° 54′ N., and crosses the meridian at 0.08 p.m. (M.T.) In conjunction with the sun on the 16th.

For the minima of Algol and the configurations of Jupiter's satellites see opposite page.

JULY

ASTRONOMICAL PHENOMENA

(75th Meridian Time, Hours Numbering from Midnight)

		Minima of Algol	Configuration of Jupiter's Satellites at 22h 30m.
		h m	
1	8h 45m ☌ ♅ ☾, ♅ 4° 22′ N.; 19h·6 ☾ in Apogee.		34○12
2		13 38	42○3●
3			421○3
4	18h ⊕ in Aphelion.		4○123
5	21h ☌ ☿ ☉ Superior.	10 27	41○32
6			432○1
☾ 7	11h 46m·9 Moon's Last Quarter.		4312○
8		7 16	34○12
9			♃1○43
10	23h 13m ☌ ♄ ☾, ♄ 5° 36′ S.		♃2○43
11		4 05	○1234
12			1○324
13	15h ☌ ☿ ♆, ☿ 1° 27′ N.		32○14
14	8h 13m·2 New Moon; 9h 29m ☌ ♆ ☾, ♆ 5° 34′ S.; 10h 58m	0 54	312○4
15	[☌ ☿ ☾, ☿ 4° 6′ S.; 19h·0 ☾ in Perigee.		3○124
16	0h 24m ☌ ☿ ☾, ☿ 3° 56′ S.; 6h ☌ ♆ ☉; 19h 8m ☌ ♂ ☾,	21 43	1○24●
17	[♂ 2° 46′ S.		2○413
18			4○23●
19	11h ☿ in ♉.	18 32	41○32
20			432○1
☽ 21	0h 18m·4 Moon's First Quarter.		4312○
22	8h ☿ in Perihelion.	15 21	43○12
23			41○2●
24	1h 12m ☌ ♃ ☾, ♃ 4° 36′ N.; 14h ☍ ♅ ☉.		42○13
25	10h ☿ Greatest Elong. E. 27° 6′.	12 10	4○3●●
26			1○432
27			32○14
☽ 28	12h 45m ☌ ♅ ☾, ♅ 4° 21′ N.; 23h 28m·2 Full Moon;	8 59	321○4
29	16h ☿ in Aphelion. [23h·8 ☾ in Apogee.		3○124
30			13○24
31		5 48	2○134

Key to Symbols.—☌ Conjunction; ☍ Opposition; □ Quadrature; ☊ Ascending Node; ☋ Descending Node; ☉ Sun; ☿ Mercury; ♀ Venus; ⊕ Earth; ♂ Mars; ♃ Jupiter; ♄ Saturn; ♅ Uranus; ♆ Neptune. For Jupiter's satellites the circle ○ represents the disc of the planet; ♃ signifies that the satellite is on the disc; ● signifies that the satellite is behind the disc or in the shadow. Configurations are for an inverting telescope.

THE SKY FOR AUGUST

The Sun. — During August the sun's R. A. increases from 8h 45m to 10h 37m and the Decl. changes from 18° 4′ to 8° 42′ N. The equation of time falls from 6m 9s on the 1st to zero on the 31st.

The Moon. — For its phases and conjunctions with the planets, see opposite page.

Mercury is in inferior conjunction with the sun on the 22nd, and then becomes a morning star.

Venus on the 15th is in R. A. 10h 23m, Decl. 11° 37′ N., and crosses the meridian at 0·49 p.m. (M.T.). Still close to the sun. In conjunction with the moon on the 13th, and with Mercury on the 14th (see opp. page).

Mars on the 15th is in R. A. 11h 19m, Decl. 5° 24′ N., and crosses the meridian at 1.44 p.m. (M.T.). It is then 231 millions of miles away from the earth. The planet is still in Leo. In conjunction with the moon on the 14th (see opp. page).

Jupiter on the 15th is in R. A. 16h 16m, Decl. 20° 45′ S., and crosses the meridian at 6.41 p.m. (M.T.). It is in quadrature (90° E.) with the sun on the 30th. Still conveniently placed for observation.

Saturn on the 15th is in R. A. 4h 6m, Decl. 18° 49′, and crosses the meridian at 6.33 a.m. (M.T.). In quadrature (90° W.) with the sun on the 27th. In conjunction with the moon on the 7th (see opp. page).

Uranus on the 15th is in R. A. 20h 12m, Decl. 20° 37′ S., and crosses the meridian at 10.36 p.m. (M.T.).

Neptune on the 15th is in R. A. 7h 46m, Decl. 20° 43′ N., and crosses the meridian at 10.12 a.m. (M.T.).

For the minima of Algol and the configurations of Jupiter's satellites, see opposite page.

AUGUST

ASTRONOMICAL PHENONENA

(75th Meridian Time, Hours Numbering from Midnight)

		Minima of Algol	Configuration of Jupiter's Satellites at 21h.
		h m	
1			12○34
2	15h ♃ Stationary.		○1432
3		2 37	324○●
4			3421○
☾ 5	23h 17m·6 Moon's Last Quarter.	23 26	43○12
6			413○2
7	11h 57m ☌ ♄ ☾, ♄ 6° 0′ S.; 12h ☿ Stationary.		42○13
8		20 14	412○3
9			4○123
10	21h 39m ☌ ♆ ☾, ♆ 5° 37′ S.		♃43○●
11		17 03	3214○
12	4h·6 ☾ in Perigee; 14h 57m·6 New Moon. [☌ ☿ ☾, ☿ 8° 31′ S.		3○124
13	6h ♀ Great'st Hel. Lat. N.; 7h 31m ☌ ♀ ☾, ♀ 2° 13′ S.; 10h 54m		31○24
14	10h 50m ☌ ♂ ☾, ♂ 1° 32′ S.; 13h ☌ ☿ ♀, ☿ 6° 33′ S.	13 52	2○134
15			12○34
16			○1234
17		10 41	1○234
18			♃32○4
☽ 19	1h ☿ Greatest Hel. Lat. S.; 11h 56m·6 Moon's First Quarter.		3○14●
20	8h 10m ☌ ♃ ☾, ♃ 4° 44′ N.	7 30	341○2
21			42○31
22	4h ☌ ☿ ☉ Inferior.		421○3
23		4 19	4○123
24	16h 49m ☌ ♅ ☾, ♅ 4° 26′ N.		41○32
25	3h·6 ☾ in Apogee.		423○1
26		1 08	43○●●
☾ 27	5h □ ♄ ☉; 14h 58m.9 Full Moon.		341○2
28		21 57	2○431
29			21○43
30	7h □ ♃ ☉.		○1234
31	2h ☿ Stationary.	18 46	1○234

Key to Symbols.—☌ Conjunction; ☍ Opposition; □ Quadrature; ☊ Ascending Node; ☋ Descending Node; ☉ Sun; ☿ Mercury; ♀ Venus; ⊕ Earth; ♂ Mars; ♃ Jupiter; ♄ Saturn; ♅ Uranus; ♆ Neptune. For Jupiter's satellites the circle ○ represents the disc of the planet; ♃ signifies that the satellite is on the disc; ● signifies that the satellite is behind the disc or in the shadow. Configurations are for an inverting telescope.

THE SKY FOR SEPTEMBER

The Sun. — The sun's R. A. increases during the month from 10h 41m to 12h 25m. On the 1st the declination is 8° 20′ N., the sun reaches the equator on the 23rd and on the 30th it is 2° 45′ south.

The Moon. — For its phases and conjunctions with the planets, see opposite page. An eclipse of the moon on the 25th (see page 48).

Mercury reaches greatest elongation west on the 7th. This is a good time of the year to see the planet when at western elongation, but on this occasion the angular separation from the sun is not very great. It should be looked for just before sunrise and just above the sunrise point. (Consult note on Mercury for March).

Venus on the 15th is in R. A. 12h 44m, Decl. 3° 46′ S., and crosses the meridian at 1.08 p.m. (M.T.). It is increasing in brightness and can easily be seen as an evening star. There is an interesting conjunction of Venus and Mars on the 9th and a conjunction with the moon on the 12th (see opp. page).

Mars on the 15th is in R. A. 12h 31m, Decl. 2° 45′ S., and crosses the meridian at 0.55 p.m. (M.T.). At that time the planet is 238 millions of miles from earth, and has an apparent magnitude 2.0. In conjunction with the moon on the the 12th (see opp. page).

Jupiter—On the 15th is in R.A. 16h 27m, Decl. 21° 16′ S., and crosses the meridian at 4.50 p.m. (M.T.) Still well seen as an evening star. In conjunction with the moon on the 16th (See opp. page.)

Saturn on the 15th is in R. A. 4h 10m, Decl. 18° 54′ N., and crosses the meridian at 4.31 a.m. (M.T.). It it now almost on a line between Aldebaran and the Pleiades. In conjunction with the moon on the 3rd.

Uranus on the 15th is in the R. A. 20h 8m, Decl. 20° 48′ S., and crosses the meridian at 8.26 p.m. (M.T.).

Neptune on the 15th is in R. A. 7h 49m, Decl. 20° 33′ N., and crosses the meridian at 8.10 a.m. (M.T.)

For the minima of Algol and the configurations of Jupiter's satellites, see opposite page.

SEPTEMBER

ASTRONOMICAL PHENOMENA

(75th Meridian Time, Hours Numbering from Midnight)

		Minima of Algol	Configuration of Jupiter's Satellites at 20h.
		h m	
1			23○14
2			321○4
3	20h 57m ☌ ♄ ☾, ♄ 6° 20′ S.	15 35	31○24
☾ 4	8h 23m·1 Moon's Last Quarter.		23○14
5			21○43
6		12 24	4○213
7	2h ☿ in ☊; 8h 22m ☌ ♆ ☾, ♆ 5° 43′ S.; 22h ☿ greatest		41○23
8	[Elong. W. 17° 59′.		423○1
9	4h ☌ ♀ ♂, ♀ 0° 30′ N.; 13h ·3 ☾ in Perigee; 14h 14m ☌	9 13	4321○
● 10	22h 48m·5 New Moon [☿ ☾, ♀ 3° 18′ S.		2143○2
11	16h ☿ in Perihelion.		2143○●
12	4h 43m ☌ ♂ ☾, ♂ 0° 4′ N.; 8h 1m ☌ ♀ ☾, ♀ 0° 4′ N.	6 02	421○3
13			4○213
14			1○423
15		2 51	23○14
16	11h ♄ Stationary; 20h 33m ☌ ♃ ☾, ♃ 4° 54′ N.		321○4
17		23 40	3○124
☽ 18	2h 54m·7 Moon's First Quarter.		3○24●
19			21○34
20	22h 13m ☌ ♅ ☽, ♅ 4° 34′ N.	20 29	○134●
21	15h ·3 ☾ in Apogee; 23h ☿ greatest Hel. Lat. N.		1○243
22			2○241
23	5h ☍ enters Libra, Autumn begins.	17 18	3421○
24			43○12
25			431○2
☍ 26	6h 34m Full Moon; Partial Eclipse of the Moon, visible in	14 07	2○423
27	[Central and Western Canada.		4○13●
28			41○23
29		10 56	42○31
30			3214○

Key to Symbols.—☌ Conjunction; ☍ Opposition; □ Quadrature; ☊ Ascending Node; ☋ Descending Node; ☉ Sun; ☿ Mercury; ♀ Venus; ⊕ Earth; ♂ Mars; ♃ Jupiter; ♄ Saturn; ♅ Uranus; ♆ Neptune. For Jupiter's satellites the circle ○ represents the disc of the planet; ♃ signifies that the satellite is on the disc; ● signifies that the satellite is behind the disc or in the shadow. Configurations are for an inverting telescope.

OCTOBER

The Sun—During October the sun's R.A. increases from 12h 29m to 14h 21m and the declination changes from 3° 9′ to 14° 5′ S. The equation of time rises from 10m 17s on the 1st to 16m 19s on the 31st, to be subtracted from apparent time. On the 9th is a total eclipse of the sun, for full particulars of which see page 49.

The Moon—For its phases and conjunctions with the planets, see opposite page. On the 7th the moon occults σ Leonis, mag. 4·1. (See p. 8).

Mercury—On the 4th is in superior conjunction with the sun, after which it becomes an evening star. In conjunction with the moon on the 10th and with Mars on the 14th (see opp. page.)

Venus—On the 15th is in R.A. 15h 6m Decl. 17° 48′ S., and it crosses the meridian at 1.30 p.m. (M.T.) It is becoming better placed for observation as an evening star, having an apparent magnitude of −3·3. In conjunction with the moon on the 12th (see next page.)

Mars—On the 15th is in R.A. 13h 45m, Decl. 10° 33′ S., and it crosses the meridian at 11.32 a.m. (M.T.) It is then 239 millions of miles from the earth. Its greatest distance, however, is on the 8th, when it is 130,000 miles farther off.

Jupiter—On the 15th is in R.A. 16h 46m, Decl. 22° 0′ S., and crosses the meridian at 3.11 p.m. (M.T.) Still an evening star, but its low declination makes it not so convenient for observatiou. In conjunction with the moon on the 14th (see opp. page.)

Saturn—On the 15th is in R.A. 4h 7m, Decl. 18° 41′ N., and crosses the meridian at 2.34 a.m. (M.T.) It now rises at about 5.15 p.m., and so can be seen all evening. It is still retrograding. The southern face of the ring is visible to us, and the axis of the ellipse which the rings present to us are in the ratio of 2·36 to 1. In conjunction with the moon on the 28th (see opp. page.)

Uranus—On the 15th is in R.A. 20h 7m, Decl. 20° 50′ S., and crosses the meridian at 6.32 p.m. (M.T.)

Neptune—On the 15th is in R.A. 7h 5rm, Decl. 20° 28′ N., and crosses the meridian at 6.18 a.m. (M.T.)

For the minima of Algol and the configurations of Jupiter's satellites see opposite page.

OCTOBER

ASTRONOMICAL PHENONENA

(75th Meridian Time, Hours Numbering from Midnight)

		Minima of Algol	Configuration of Jupiter's Satellites at 18h 30m.
		h m	
1	2h 22m ☌ ♄ ☾, ♄ 6° 29′ S.		3○421
2		7 45	31○24
☾ 3	15h 48m·1 Moon's Last Quarter.		2○14●
4	1h ☌ ☿ ☉ Superior; 16h 25m ☌ ♆ ☾, ♆ 5° 46′ S.		2○34●
5		4 34	1○234
6			24○134
7	13h·8 ☾ in Perigee.		231○4
8	7h ♀ in ♍.	1 23	3○214
9	10h ♁ Stationary. [Canada; 18h 35m ☌ ☿ ☾, ☿ 1° 35′ N.		314○2
🌑 10	8h 40m·6 New Moon; Total Eclipse of the Sun, invisible in	22 12	42○1●
11	0h 9m ☌ ♂ ☾, ♂ 1° 44′ N.		421○3
12	11h 5m ☌ ♀ ☾, ♀ 2° 52′ N.		24○23
13		19 00	4○213
14	0h ☌ ☿ ♂, ☿ 0° 11′ S.; 13h 15m ☌ 24 ☾, 24 5° 2′ N.		4231○
15	10h ☿ in ♍.		43○1●
16		15 49	431○2
☽ 17	21h 6m·2 Moon's First Quarter.		243○1
18	5h 39m ☌ ♁ ☾, ♁ 4° 35′ N.		21○43
19	9h·0 ☾ in Apogee; 13h □ ♆ ☉.	12 38	○1234
20			○234●
21			213○4
22		9 27	3○14●
23	4h □ ♁ ☉.		31○24
24			32○14
🌕 25	16h ☿ in Aphelion; 21h 30m·5 Full Moon.	6 16	21○43
26			4○123
27			4○23●
28	6h 9m ☌ ♄ ☾, ♄ 6° 26′ S.	3 05	4213○
29	9h ♆ Stationary.		432○1
30		23 54	431○2
31	22h 12m ☌ ♆ ☾, ♆ 5° 43′ S.		432○1

Key to Symbols.—☌ Conjunction; ☍ Opposition; □ Quadrature; ☊ Ascending Node; ☋ Descending Node; ☉ Sun; ☿ Mercury; ♀ Venus; ⊕ Earth; ♂ Mars; 24 Jupiter; ♄ Saturn; ♁ Uranus; ♆ Neptune. For Jupiter's satellites the circle ○ represents the disc of the planet; 24 signifies that the satellite is on the disc; ● signifies that the satellite is behind the disc or in the shadow. Configurations are for an inverting telescope.

THE SKY FOR NOVEMBER

The Sun. — The Sun's R. A. during the month increases from $14^h\ 25^m$ to $16^h\ 25^m$ and the declination changes from $14°\ 24'$ to $21°\ 39'$ S. The equation of time rises to a maximum value on the 3rd, at which time it is $16^m\ 22^s$. The true sun crosses the meridian this much earlier than the mean sun.

The Moon. — For its phases and conjunctions with the planets, see opposite page.

Mercury on the 19th reaches its greatest elongation east at which time it is $22°\ 15'$ from the sun. Its declination, however, is $25°\ 32'$ S., and so it is not well placed for observation.

Venus — On the 15th is in R. A. $17^h\ 45^m$, Decl. $25°\ 4'$ S., and crosses the meridian at 2.09 p.m. (M. T.) Easily seen as an evening star, though having a great declination south. In conjunction with Jupiter on the 7th, and with the moon on the 11th. Stationary on the 28th. (See opp. page.)

Mars — On the 15th is in R. A. $15^h\ 8^m$, Decl. $17°\ 36'$ S., and crosses the meridian at 11.32 a.m. (M. T.) It is in conjunction with the sun on the 4th, and so is too near to the sun to be seen during the month. Its distance from the earth on the 15th is 236 millions of miles.

Jupiter — On the 15th is in R. A. $17^h\ 13^m$ Decl. $22°\ 42'$ S., and crosses the meridian ot 1.36 p.m. (M.T.) Still an evening star but not well placed for observation. In conjunction with Venus on the 7th, with the moon on the 11th and with Mercury on the 21st. (See opp. page).

Saturn — On the 15th is in R.A. $3^h\ 58^m$, Decl. $18°\ 15'$ N., and crosses the meridian at 0.23 a.m. It is in opposition to the sun on the 23rd, and so is visible all night long. In conjunction with the moon on the 24th. (See next page).

Uranus — On the 15th is in R.A. $20^h\ 10^m$, Decl. $20°\ 42'$ S., and crosses the meridian at 4.32 p.m. (M.T.)

Neptune — on the 15th is in R.A. $7^h\ 51^m$, Decl. $20°\ 28'$ N., and crosses the meridian at 4.28 a.m. (M.T.)

For the minima of Algol and the configurations of Jupiter's satellites see opposite page.

NOVEMBER

ASTRONOMICAL PHENOMENA

(75th Meridian Time, Hours Numbering from Midnight)

			Minima of Algol	Configuration of Jupiter's Satellites at 17h 30m.
			h m	
☾	1	22h 37m·6 Moon's Last Quarter.		421○3
	2		20 43	4○123
	3	5h ·9 ☾ in Perigee.		14○23
	4	22h ☌ ♂ (☉).		2○234
	5		17 32	32○14
	6			31○24
	7	23h ☌ ♀ ♃, ♀ 1° 43′ S.		3○14
♋	8	20h 28m ☌ ♂ ☾, ♂ 3° 7′ N.; 21 4m·8 New Moon.	14 21	21○34
	9			○2134
	10	13h50m ☌ ☿ ☾, ☿ 1° 53′ N.		1○234
	11	8h 21m ☌ ♃ ☾, ♃ 5° 5′ N.; 15h 21m ☌ ♀ ☾, ♀ 3° 21′	11 10	2○134
	12	[N.; 17h ♀ in Aphelion.		324○●
	13			341○2
	14	14h 59m ☌ ♁ ☾, ♁ 4° 27′ N.	7 59	43○21
	15	0h ☿ Greatest Hel. Lat. S.		421○●
☽	16	5h·5 ☾ in Apogee; 17h 43m·3 Moon's First Quarter.		4○13●
	17		4 48	41○23
	18	1h ☌ in ♍		42○13
	19	9h ☿ Greatest Elongation E. 22° 15′.		4231○
	20		1 37	2○34○2
	21	0h ☌ ☿ ♃, ☿ 2° 47′ S.		
	22		22 26	
	23	1h ☍ ♄ (☉).		
♌	24	10h 47m ☌ ♄ ☾, ♄ 6° 17′ S.; 11h 12m·2 Full Moon.		
	25		19 15	
	26			
	27			
	28	3h 49m ☌ ♆ ☾, ♆ 5° 33′ S.; 5h·7 ☾ in Perigee; 22h ☿	16 04	
	29	[Stationary.		
	30			

Invisible on account of proximity to Sun.

Key to Symbols.—☌ Conjunction; ☍ Opposition; □ Quadrature; ☊ Ascending Node; ☋ Descending Node; (☉) Sun; ☿ Mercury; ♀ Venus; ⊕ Earth; ♂ Mars; ♃ Jupiter; ♄ Saturn; ♁ Uranus; ♆ Neptune. For Jupiter's satellites the circle ○ represents the disc of the planet; ♃ signifies that the satellite is on the disc; ● signifies that the satellite is behind the disc or in the shadow. Configurations are for an inverting telescope.

THE SKY FOR DECEMBER

The Sun. — During December the sun's R. A. increases from 16h 29m to 18h 41m. On the 1st the declination is 21° 48′ S.; this slowly changes until it becomes 23° 27′ on the 22nd; and by the 31st it has come back to 23° 7′. The winter solstice is at 11.45 p.m. (E.S.T.) on the 21st. On the 31st at 8 p.m. the Earth is nearest the sun. (See opp. page.)

The Moon. — For its phases and conjunctions with the planets, see opposite page.

Mercury on the 8th is in inferior conjunction with the sun, after which it becomes a morning star. On the 3rd it is in conjunction with Jupiter, on the 8th with the Moon and on the 14th with Mars (See opp. page.)

Venus on the 15th is in R. A. 20h 24m, Decl. 31° 32′ S., and crosses the meridian at 2.49 p.m. (M.T.). It is seperating from the sun and is becoming more easily seen as an evening star. It is in conjunction with the moon on the 11th and with Uranus on the 13th (see opp. page.)

Mars on the 15th is in R. A. 16h 37m, Decl. 22° 22′ S., and crosses the meridian at 11.02 p.m. (M.T.) .On that date it is 229 millions of miles from the earth, and is slowly increasing in brightness.

Jupiter on the 15th is in R. A. 17h 42m, Decl. 23° 8′ S., and crosses the meridian at 0.07 p.m. (M.T.). It is in conjunction with the sun on the 18th, and cannot be seen during the month.

Saturn on the 15th is in R. A. 3h 49m Decl. 17° 48′ N., and crosses the meridian at 10.12 p.m. (M.T.). It is in Taurus, about 5½° south and slightly east of the Pleiades, and continues retrograding during the month. Well placed for observation. In conjunction with the moon on the 21st (see next page.)

Uranus on the 15th is in R. A. 20h 15m, Decl. 20° 26′ S., and crosses the meridian at 2.39 a.m. (M.T.).

Neptune on the 15th is in R. A. 7h 49m, Decl. 20° 33′ N., and crosses the meridian at 2.16 a.m. (M.T.).

For the minima of Algol and the configurations of Jupiter's satellites, see opposite page.

DECEMBER

ASTRONOMICAL PHENONENA

(75th Meridian Time, Hours Numbering from Midnight)

			Minima of Algol h m
☾	1	6h 4m·8 Moon's Last Quarter.	12 53
	2		
	3	2h ☌ ☿ ♃, ☿ 0° 35′ S.	
	4	1h ☿ in ♌; 3h ♀ Greatest Hel. Lat. S.	9 42
	5		
	6		
	7	17h 11m ☌ ♂ ☾, ♂ 4° 2′ N.	6 31
♑	8	12h 6m·7 New Moon; 14h 7m ☌ ☿ ☾, ☿ 6° 11′ N.; 15h ☿ in	
	9	3h 55m ☌ ♃ ☾, ♃ 5° 7′ N. [Perihelion; 18h ☌ ☿ ☉	
	10	[Inferior.	3 20
	11	21h 45m ☌ ♀ ☾, ♀ 2° 42′ N.	
	12	1h 16m ☌ ♅ ☾, ♅ 4° 15′ N.	
	13	10h ☌ ♀ ♅, ♀ 1° 36′ S.	0 09
	14	2h·2 ☾ in Apogee; 12h ☌ ☿ ♂, ☿ 3° 4′ N.	
	15		20 57
☽	16	15h 6m·5 Moon's First Quarter.	
	17		
	18	15h ☌ ♃ ☉; 16h ☿ Stationary; 22h ☿ Greatest Hel. Lat. N.	17 46
	19		
	20		
	21	17h 29m ☌ ♄ ☾, ♄ 6° 12′ S.; 23h 45m ☉ enters Capri-	14 35
	22	[cornus. Winter begins.	
♋	23	23h 30m·1 Full Moon.	
	24		11 24
	25	11h 24m ☌ ♆ ☾, ♆ 5° 25′ S.; 21h·8 ☾ in Perigee.	
	26		
	27		8 13
	28	4h ☿ Greatest Elongation W. 22° 23′.	
	29		
☾	30	15h 11m·9 Moon's Last Quarter.	5 02
	31	20h ⊕ in Perihelion	

Key to Symbols.—☌ Conjunction; ☍ Opposition; □ Quadrature; ☊ Ascending Node; ☋ Descending Node; ☉ Sun; ☿ Mercury; ♀ Venus; ⊕ Earth; ♂ Mars; ♃ Jupiter; ♄ Saturn; ♅ Uranus; ♆ Neptune. For Jupiter's satellites the circle ○ represents the disc of the planet; ♃ signifies that the satellite is on the disc; ● signifies that the satellite is behind the disc or in the shadow. Configurations are for an inverting telescope.

EPHEMERIS FOR PHYSICAL OBSERVATIONS OF THE SUN

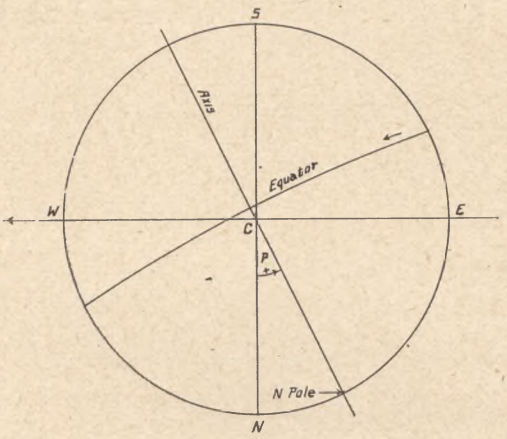
By R. E. De Lury

In the table *P* is the position angle of the *N* end of the sun's axis measured *E* from the *N* point of the disc, *i. e.*, in direction *N E S W* around the edge of the disc. *P* will therefore be positive when the *N* point of the sun's axis is *E* of the *N* point of the disc and negative when it is *W* of this point.

"*Lat.*" is the heliographical latitude of the centre of the sun's disc, *i. e.*, the angle measured on the surface of the sun in a direction *N* of the sun's equator. "*Lat.*" will therefore be positive when the centre of the sun's disc is *N* of the sun's equator and negative when the centre of the disc is *S* of it.

"*Long.*" is the heliographical longitude of the centre of the sun's disc referred to the meridian which passed through the ascending node on January 1, 1854, Greenwich mean noon, as zero meridian.

In preparing this Table it has been assumed that the inclination of the sun's axis to the ecliptic is 82°·75, the longitude of the ascending node for 1912·0 is 74°·53 and the period of the sun's sidereal rotation is 25·38 days. (according to Carrington.)



The accompanying Figure shows the relative positions of various points for a selected time, October 9, 12·00 noon, "Eastern" Time, *i.e.*, 5·00 Greenwich Mean Time, when *P* = + 26°·41, "*Lat.*" = +6°·18, and "*Long.*" = 30°·63. In the Figure *N*, *E*, *S* and *W* are the North, East, South and West points on the disc of the sun. These are determined on an image of the sun by allowing it to drift from East to West tangentially to a line which will thefore give the direction of the "*East and West*" line thus fixing the diameter, *E W*, which is parallel to it and *NS*, which is perpendicular to it. The axis is shown making an angle of 26°·41 with *NS*, and having the *North Pole* on the positive side of it, *i. e.*, eastward from *N* or in direction, *N E S W*; and the equator is shown intersecting the edge of the disc at points the same angle from *E* and *W*, and passing South of the centre of the disc, *C*, which is at "*Lat.*", + 6°·18 and "*Long.*" 30°·63.

If the Tables are to be used frequently it will be found very convenient to have them plotted on a large scale on section-paper so that the angles for any particular hour may be read off directly.

EPHEMERIS FOR PHYSICAL OBSERVATIONS OF THE SUN

Greenwich Mean Noon		P	Lat.	Long.	Greenwich Mean Noon		P	Lat.	Long.
		°	°	°			°	°	°
Jan.	1	+ 2·37	− 3·08	156·94	July	4	− 1·24	+ 3·35	235·18
	6	− 0·07	3·65	91·09		9	+ 1·04	3·87	169·00
	11	2·49	4·19	25·24		14	3·29	4·37	102·83
	16	4·87	4·70	319·40		19	5·51	4·83	36·68
	21	7·19	5·17	253·57		24	7·67	5·26	330·53
	26	9·43	5·60	187·74		29	9·76	5·66	264·39
	31	− 11·57	− 5·99	121·91	Aug.	3	+ 11·76	+ 6·02	198·26
Feb.	5	13·60	6·33	56·08		8	13·67	6·34	132·15
	10	15·51	6·61	350·24		13	15·48	6·61	66·05
	15	17·29	6·85	284·40		18	17·17	6·84	359·96
	20	18·92	7·03	218·56		23	18·74	7·01	293·88
	25	20·41	7·16	152·71		28	20·19	7·14	227·82
Mar.	1	− 21·74	− 7·23	86·85	Sept.	2	+ 21·50	+ 7·22	161·77
	6	22·92	7·25	20·97		7	22·67	7·25	95·74
	11	23·93	7·21	315·08		12	23·70	7·23	29·72
	16	24·78	7·12	249·18		17	24·57	7·15	323·71
	21	25·46	6·97	183·27		22	25·28	7·02	257·71
	26	25·96	6·77	117·34		27	25·83	6·83	191·73
	31	− 26·28	− 6·52	51·38	Oct.	2	+ 26·20	+ 6·60	125·75
Apr.	5	26·43	6·22	345·40		7	26·40	6·32	59·78
	10	26·39	5·88	279·40		12	26·42	5·99	353·82
	15	26·17	5·50	213·39		17	26·25	5·61	287·87
	20	25·77	5·08	147·36		22	25·89	5·19	221·92
	25	25·18	4·62	81·31		27	25·34	4·73	155·98
	30	− 24·41	− 4·13	15·23	Nov.	1	+ 24·59	+ 4·24	90·05
May	5	23·45	3·61	309·13		6	23·64	3·71	24·13
	10	22·31	3·07	243·02		11	22·50	3·15	318·21
	15	21·01	2·51	176·90		16	21·16	2·56	252·30
	20	19·56	1·93	110·76		21	19·64	1·96	186·39
	25	17·94	1·34	44·60		26	17·94	1·34	120·49
	30	− 16·18	− 0·74	338·44	Dec.	1	+ 16·07	+ 0·70	54·60
June	4	14·28	0·14	272·27		6	14·06	+ 0·06	348·71
	9	12·28	+ 0·46	206·09		11	11·91	− 0·58	282·83
	14	10·18	1·06	139·01		16	9·66	1·21	216·95
	19	8·01	1·66	73·73		21	7·32	1·83	151·08
	24	5·78	2·24	7·54		26	4·93	2·45	85·22
	29	− 3·52	+ 2·80	301·36		31	+ 2·50	− 3·05	19·36

ECLIPSES IN 1912

There will be four eclipses in 1912, two of the Sun, and two of the Moon, but they are not of much interest in Canada as two are entirely invisible to us and the others are only partially visible.

I. A Partial Eclipse of the Moon, April 1, 1912, invisible in North America. The Moon being south of the Equator at this time and the Sun north, it follows that the Moon does not rise until sometime after the Sun sets, although the Moon is full on April $1^d\ 5^h\ 4^m{\cdot}6$. Consequently as the eclipse ends just about sunset the Moon has left the Earth's shadow before it rises in eastern Canada.

	d	h	m
Moon enters shadow	April 1	4	25·8
Middle of the eclipse	" 1	5	14·0
Moon leaves shadow	" 1	6	2·3

Magnitude of the eclipse = 0·187 (Moon's diameter = 1·0.)

II. A Central Eclipse of the Sun, April 16–17, visible in Canada from Lake Superior eastward as a partial eclipse, beginning at sunrise in eastern Ontario and ending at sunrise near Winnipeg. The central eclipse will be total for about 32 seconds at the middle of its duration and annular for the rest of its duration. The path of totality will extend across the northwest corner of Spain, the path of the central eclipse extending from the north coast of South America across the Atlantic Ocean to Spain, thence across the Bay of Biscay, France, Germany and Russia to a point in central Siberia.

III. A Partial Eclipse of the Moon, September 25–26, beginning visible in North America, excepting the eastern coast; the ending visible in western North America, the Pacific Ocean, Australia, eastern and central Asia.

		d	h	m
Moon enters shadow	September	25	18	3·1
Middle of the eclipse	"	25	18	44·7
Moon leaves shadow	"	25	19	26·3

Magnitude of the eclipse = 0·122 (Moon's diameter = 1·0.)

IV. A Total Eclipse of the Sun, October 9–10, invisible in North America, except as a partial eclipse in the southeastern part. It is visible also in Central America and eastern Mexico as a partial eclipse. The path of totality begins about 4° north of the Equator, southwest of Central America, extending across South America and ending in the Indian Ocean southeast of the southern extremity of South Africa..

(All times given are Eastern Standard Astronomical Time.)

COMETS OF 1912

By R. M. Motherwell

The year 1911 has been remarkable for the number of comets discovered, eight in all being observed, some for the first time others well-known periodic comets. At the beginning of the year Halley's and Faye's comets were still visible. Faye's was observed as late as March 19, 1911, by Prof. Barnard when it was of magnitude 14·5. Halley's was observed by Prof. Barnard with the 40-inch telescope until near the end of April and it was photographed by Prof. Curtis as late as May 27, 1911.

Comet *a* 1911

The first comet to be observed was Wolf's periodic comet which was discovered photographically by Prof. Wolf at Königsthul on June 16, 1911. Its magnitude was then 15·0. Prof. Wolf also observed it visually at Heidelberg on June 19. This comet was first discovered in 1884 by Prof. Wolf at Heidelberg and was observed on its return in 1891 and in 1898, its period being 6·76 years. Owing to its unfavorable position it was not observed in 1905.

Comet *b* 1911

The second comet of the year was discovered by Mr. C. C. Kiess at the Lick Observatory on a photograph taken on the morning of July 6, 1911. Its magnitude then wasabout 7. Its rapid motion southward soon carried it beyond the reach of the northern observatories but up to December it was still visible to southern observers, although becoming much fainter. Its spectrum as photographed by Prof. Parkhurst at the Yerkes Observatory on July 9 was characteristic, resembling that of Halley before and after perihelion. The third carbon band and the cyanogen band were equally strong but on July 19 the carbon band was much stronger than the cyanogen and another band near $H\delta$ was visible.

Comet *c* 1911

The third comet was discovered by Prof. Brooks at Smith Observatory on July 20.6. It was then about the eleventh magnitude and was in the constellation Pegasus. It rapidly increased in brightness and many splendid photographs were obtained at the various observatories. These photographs showed a large extent of tail but no marked activity. In September and October it was visible to the naked eye, its brightness on October 20 being of the second magnitude and the tail 20° in length. It was visible to southern observers in November but was much fainter, being barely visible to the naked eye.

Comet *d* 1911, (Encke's)

Director Gonnessiat of the Algiers Observatory discovered Encke's comet on its return, on the morning of July 31. It was very near the horizon and so unfavorably situated for observing. This comet was first discovered by Méchain at Paris on January 17. 1786, but it was not then recognized as periodic. It was also observed in 1795 and 1805. At the latter appearance Encke computed a period of 12·12 years but it was not until 1818 that he noted the resemblance to the comets of 1786, 1795 and 1805. He obtained a period of 3·315 years and predicted its return in 1822. So accurately were his predictions fulfilled that scientists gave the comet the name Encke.

Comet *e* 1911, (Borrelly's)

The fifth comet of the year was the periodic Borrelly, 1905 II, Knoxham observing it close to the predicted place on September 19·5, 1911. This comet was first discovered by Borrelly in December, 1904, and its period is 7·20 years. On its present return it was brightest in November, but was not visible to the unaided eye at any time.

Comet *f* 1911

The honor of discovering the sixth comet of 1911 fell to Prof. Quenisset at Juvisy on the evening of September 25, 1911. It was then visible in an opera glass and moving southward from Ursa Minor. At the time of its discovery it was in the most favorable position for observation and has since been moving away from us.

Comet *g* 1911

The seventh comet of 1911 was discovered by Beljawsky in Russia on the morning of September 28, 1911. It was visible to the unaided eye but moving towards the sun, so observations were difficult. Spectra were obtained at the Yerkes Observatory on September 30, showing bright bands in the green and yellow, with continuous spectrum from the head. Later spectra showed six bands, the carbon at λ474 being strongest and the cyanogen at λ3883 next. Its brightness on September 30 was of the first magnitude and on October 17 of the second magnitude.

Comet *h* 1911

This comet was discovered by Schaumasse on November 30.7 in the constellation Virgo. It will be nearest the earth about January 28, and will reach perihelion February 5, 1912. Visible in a small telescope.

METEORS AND SHOOTING STARS

On almost any clear night any one observing the sky for a few minutes will see one or more shooting stars. They are particularly numerous during the autumn months, and on account of the rotation of the earth are better seen during the early morning hours than in the evening.

At certain times there are striking displays, located in particular portions of the sky. These are considered to be due to *meteor swarms*. The principal ones are given in the following table:

Name of Shower	Duration	Greatest Display	Radiant Point R.A.		Decl.
			h	m	°
Quadrantids	Dec. 28-Jan. 4	Jan. 2	15	20	+ 52
Lyrids	April 16-22	April 20	18	0	+ 32
η Aquarids	April 30-May 6	May 6	22	31	− 2
δ Aquarids	July 23-Aug. 25	July 28	22	38	− 12
Perseids	July 8-Aug. 22	Aug. 10	3	4	+ 57
Orionids	Oct. 9-29	Oct. 18	6	8	+ 16
Leonids	Nov. 9-17	Nov. 13	10	0	+ 23
Andromedes	Nov. 25-30	Nov. 27	1	41	+ 44
Geminids	Dec. 1-14	Dec. 10	7	12	+ 33

Of these the chief ones are the Perseids, the Leonids and the Andromedes.

The Perseids furnish an annal display of considerable strength, and are perhaps the best known of all. The swarm appears to have an orbit identical with that of the great Comet 1862 III, the period of which is 120 years.

The Leonids follow in the orbit of Temple's Comet of 1866, of period 33 years.

The Andromedes are thought to be remnants of Biela's Comet. They were especially numerous in 1872, 1885, 1898, but in recent years have not been so prominent.

For interesting information regarding this subject (and almost any other subject in which the amateur is interested) reference may be made to *Telescopic Work for Starlight Evenings* by W. F. Denning.

PRINCIPAL ELEMENTS OF THE SOLAR SYSTEM

Name	Mean Distance from Sun		Sidereal Period		Mean Diam't'r Miles	Mass	Density	Volume	Axial Rotation
	⊕ = 1	Millions of Miles	Mean Solar Days	Years		⊕ = 1	Water = 1	⊕ = 1	
☿ Mercury...	0.387	36.0	87.97	0.24	3030	0.476	4.7(?)	0.056	88^d
♀ Venus.....	0.723	67.2	224.70	0.62	7700	0.82	4.94	0.92	225^d
⊕ Earth.....	1.000	92.9	365.26	1.00	7917.6	1.00	5.55	1.00	$23^h\ 56^m\ 4^s$
♂ Mars.....	1.524	141.5	686.95	1.88	4230	0.108	3.92	0.152	$24^h\ 37^m\ 23^s$
♃ Jupiter....	5.203	483.3	4332.58	11.86	86500	317.7	1.32	1309	$9^h\ 55^m \pm$
♄ Saturn.....	9.539	886.0	10759.2	29.46	73000	94.8	0.72	760	$10^h\ 14^m \pm$
♅ Uranus....	19.183	1781.9	30686.8	84.02	31900	14.6	1.22	65	?
♆ Neptune...	30.055	2971.6	60181.1	164.78	34800	17.0	1.11	85	?
☉ Sun.....	....	....	....	....	866400	332000	1.39	1300000	$25^d\ 7^h\ 48^m \pm$
☾ Moon.....	From ⊕ 238,840 mls		27.32	0.75	2163	1/81.5	3.39	0.020	$27^d\ 7^h\ 43^m$

SATELLITES OF THE SOLAR SYSTEM

Name	Stellar Magnitude.	Mean Distance in Miles	Sidereal Period d. h. m. s.	Discoverer	Date
THE EARTH					
The Moon..	..	238,840	27 7 43 11		
MARS					
1. Phobos....	14	5,850	7 39 15	Asaph Hall....	Aug. 17, 1877
2. Deimos....	13	14,650	1 6 17 54	Asaph Hall....	Aug. 11, 1877
JUPITER					
5. (Nameless).	13	112,500	11 57 23	Barnard.....	Sept. 9, 1892
1. Io.....	6½	261,000	1 18 27 33	Galileo.....	Jan. 7, 1610
2. Europa....	6½	415,000	3 13 13 42	Galileo.....	Jan. 8, 1610
3. Ganymede .	6	664,000	7 3 42 33	Galileo.....	Jan. 7, 1610
4. Callisto....	7	1,167,000	16 16 32 11	Galileo.....	Jan. 7, 1610
6. (Nameless).	14	7,000,000	250 d.	Perrine.....	Dec. 1904
7. (Nameless).	16	7,300,000	265 d.	Perrine.....	Jan. 1905
8. (Nameless).	17	15,600,000	789 d.	Melotte.....	Jan. 1908
SATURN					
1. Mimas.....	15	117,000	22 37 6	W. Herschel...	July 18, 1789
2. Enceladus..	14	157,000	1 8 53 7	W. Herschel...	Aug. 29, 1789
3. Tethys.....	11	186,000	1 21 18 26	J. D. Cassini...	Mar. 21, 1684
4. Dione.....	11	238,000	2 17 41 9	J. D. Cassini...	Mar. 21, 1684
5. Rhea.....	10	332,000	4 12 25 12	J. D. Cassini...	Dec. 23, 1672
6. Titan.....	9	771,000	15 22 41 23	Huygens.....	Mar. 25, 1655
7. Hyperion...	16	934,000	21 6 39 27	G. P. Bond....	Sept. 16, 1848
8. Iapetus....	11	2,225,000	79 7 54 17	J. D. Cassini...	Oct. 25, 1671
9. Phoebe.....	17	8,000,000	546.5 d.	W.H.Pickering	1898
10. Themis.....	17	906,000	20 20 24 0	W.H.Pickering	1905
URANUS					
1. Ariel.....	15	120,000	2 12 29 21	Lassell.....	Oct. 24, 1851
2. Umbriel....	16	167,000	4 3 27 37	Lassell.....	Oct 24, 1851
3. Titania.....	13	273,000	8 16 56 29	W. Herschel...	Jan. 11, 1787
4. Oberon.....	14	365,000	13 11 7 6	W. Herschel...	Jan. 11, 1787
NEPTUNE					
1. (Nameless).	13	221,500	5 21 2 44	Lassell.....	Oct. 10, 1846

THE CONSTELLATIONS

Constellations on the Meridian in January

Camelopardalis (The Giraffe) is a large polar constellation situated between Cassiopeia and the Great Bear. Whatever the origin of the name, the constellation includes a long narrow lane extending down to the east of Polaris, which might be likened to the neck of a giraffe. The outlines of many of the constellations are so extremely irregular and arbitary that it is difficult to see how they could have originated. Camelopardalis contains no bright stars, there being only one of the fourth magnitude and a number of the fifth and sixth.

Auriga (The Charioteer) may readily be recognized by Capella, its brightest star, which crosses the meridian very slightly north of the zenith at 9 p.m. on January 24. It is the most northerly of the first magnitude stars, and is surpassed by only a few in brilliance. It is followed 43 minutes later by β, of the second magnitude; the specific name of this star is Menkalinan, but is now practically never used. The south-western half of the constellation, which is traversed by the Milky Way, contains many fine star clusters.

Taurus (The Bull), situated directly south-west of Auriga, is the second sign and the third constellation of the zodiac, and is occupied by the sun from May 13 till June 18. It is most easily recognized by the Pleiades or Seven Stars, which cross the meridian about nine o'clock on January 1; this group is well worth examination with an opera glass or *small* telescope. About 15° to the south-east is the red first magnitude star Aldebaran, the brightest in the constellation; it is at one end of a group of five stars forming the shape of a V, well known as the Hyades; this is another small group which will well repay examination with an opera glass. The only other conspicuous star is β, or Nath, to the north-east of Aldebaran and almost south of Capella; it is of the second magnitude.

Orion, which is named from a giant of mythological history, is the only constellation which really suggests the figure of the object it is supposed to represent. It is also the most beautiful and brilliant constellation of all, being studded with stars of the first, second and third magnitudes. The three stars of second

magnitude in a close row form the belt ; the upper one of these is on the equator. From these depend three others, known as the Sword of Orion ; the centre one, θ, appears slightly hazy to a good eye ; when examined with a telescope it is seen to be quadruple, and to be surrounded by a nebula, the Great Nebula of Orion. The left knee of the giant is marked by Rigel, of the first magnitude, the right knee by κ, of the second ; the two shoulders by Betelgeuse and Bellatrix, of the first and second magnitudes respectively ; the head is a small triangle formed by one star of the fourth and two of the fifth magnitude.

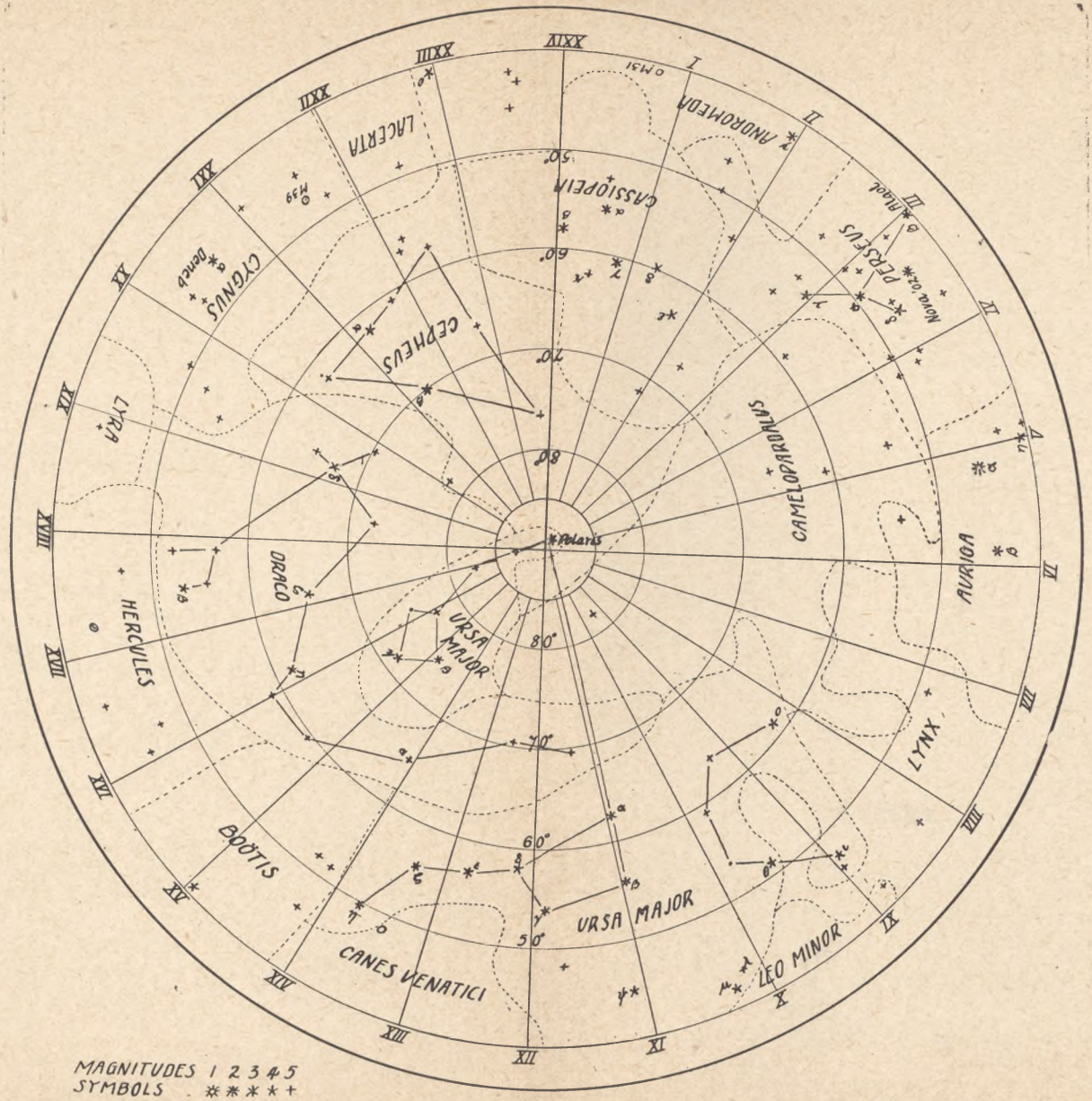
Constellations in February

Canis Major (The Great Dog), lies to the south-east of Orion. It is marked by Sirius, the Dog Star, which is by far the brightest of the fixed stars, forming a magnitude by itself. It is at a distance of about nine light-years ; hence it must be of stupendous magnitude and brilliancy. From irregularites in its proper motion it was shown that it must have a dark companion revolving about it. This was confirmed by Alvan Clark's discovery in 1862 of a companion of the tenth magnitude. The period of revolution is about fifty years, the companion having about one-half the mass of Sirius, and about equal to that of our sun. About five or six degrees west of Sirius is β, of the second magnitude ; further to the south are δ and ϵ, of the second magnitude, and two other stars of the third, all in the same constellation.

Canis Minor (The Lesser Dog) is to the east of Orion and slightly higher. The name of its brightest star, Procyon, signifies "Before the Dog," being given to it because it rises shortly before Sirius ; it forms an equilateral triangle with Sirius and Betelgeuse. From the proper motion of Procyon it was shown theoretically by Bessel that it must, like Sirius, have a companion revolving around it. This companion was discovered at the Lick Observatory by Professor Schaeberle in 1896, very nearly in the predicted position.

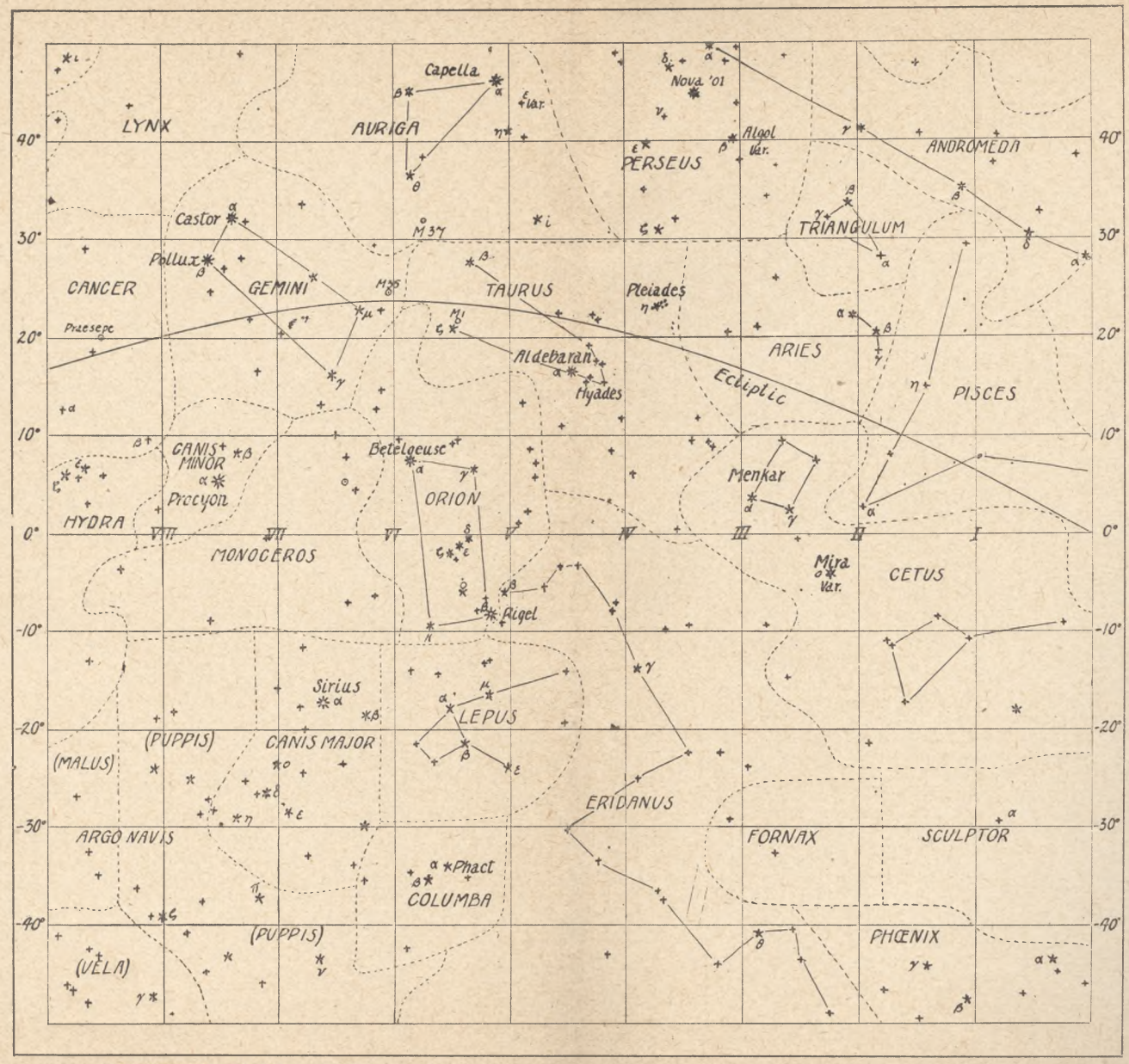
Gemini (The Twins) is the third sign and the fourth constellation of the zodiac. It derives its name from the Twin Stars, Castor and Pollux, of the first magnitude ; they are separated by about four and a half degrees, and lie to the south-east of Capella, and some distance directly to the north of Procyon. Castor is a double star, the components revolving about one another in about 1000 years. Some distance to the south-west is γ, of the second

NORTH POLAR CONSTELLATIONS

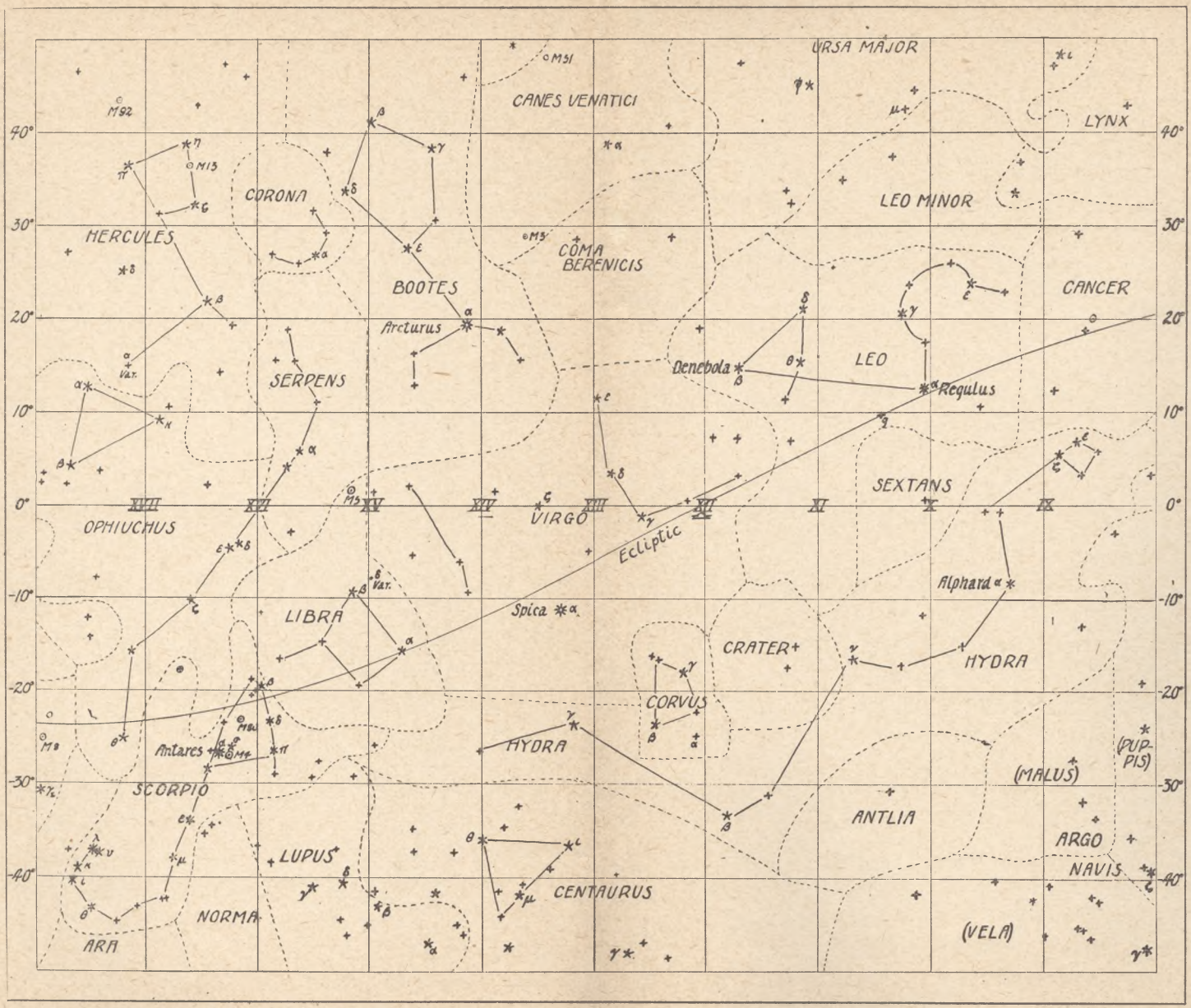


MAGNITUDES 1 2 3 4 5
SYMBOLS . * * * * +

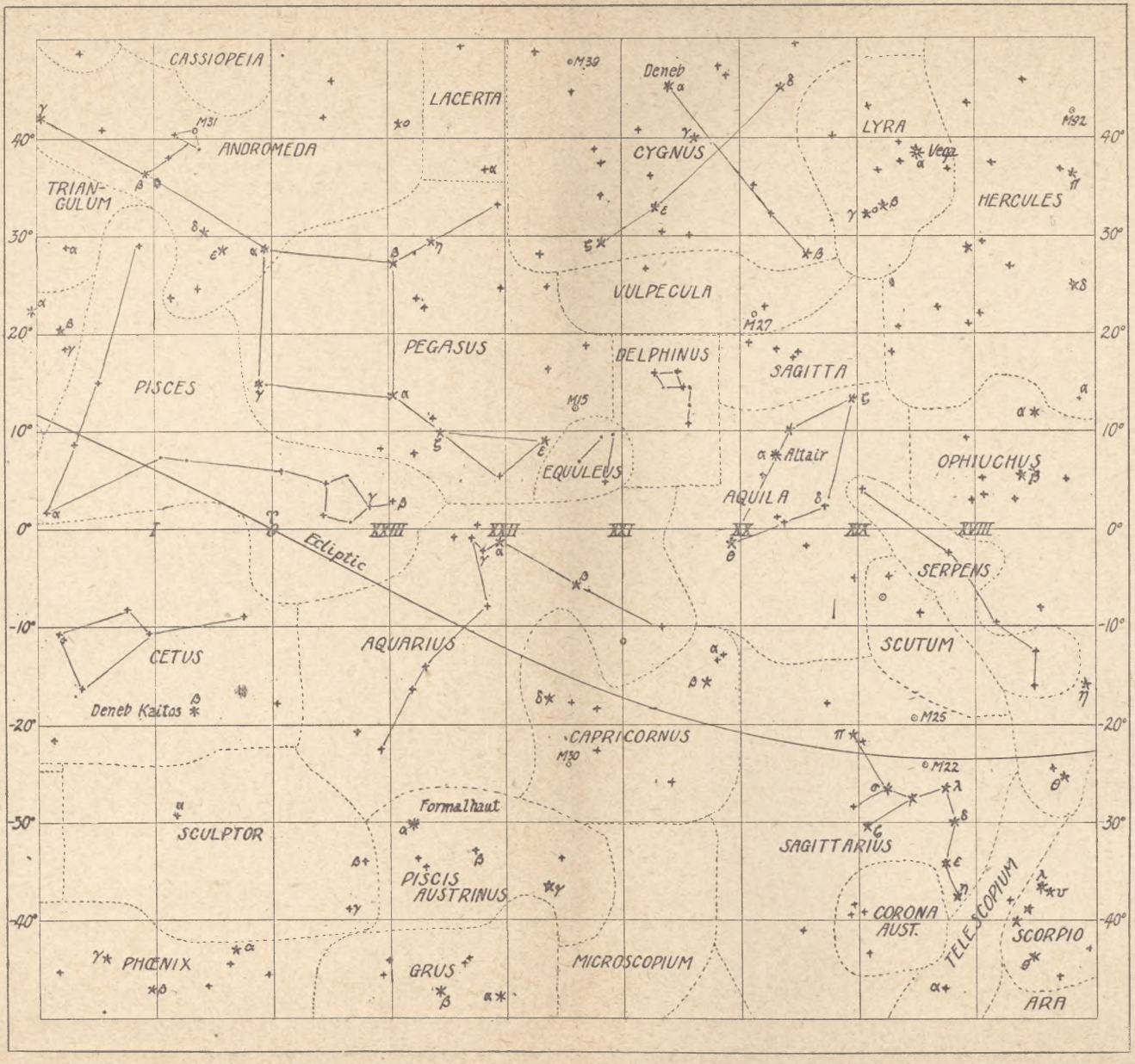
CONSTELLATIONS, 0h to 9h



MAGNITUDES 0 1 2 3 4 Nebula Cluster
SYMBOLS ✲ ✲ ✲ × + ○ ⊙



MAGNITUDES 0 1 2 3 4 Nebula Cluster
SYMBOLS ✲ ✲ ✲ ✲ + ○ ⊙



MAGNITUDES 0 1 2 3 4 Nebula Cluster
SYMBOLS ✲ ✲ ✲ ✲ + ○ ⊙

magnitude ; the constellation also includes several third and fourth magnitude stars. It is occupied by the sun from June 18 to July 18.

The Constellations in March

The brilliant constellations of the winter months are now sinking towards the west, and soon we will have in their place the somewhat less resplendent, though equally interesting, summer skies. Orion and Sirius are already low in the south-west ; above Sirius, nearly half-way from the horizon to the zenith is Procyon ; still higher and almost directly above Orion, are the twin stars Castor and Pollux. Somewhat to the north of west, half-way up to the zenith, is Capella, the most northerly of the first magnitude stars, which in latitude 45 never sets, but at its lowest merely grazes the northern horizon. Beneath it are the Pleiades, while a little to the west of the northern horizon is the familiar wide W of Cassiopeia, the Lady in her Chair. About half-way between the Pleiades and Orion is the first magnitude star Aldebaran. About one-third of the way from the Pleiades towards Cassiopeia is Algol, "The Demon of the slowly winking Eye," and near is a fourth magnitude star which affords a good comparison for its variations in brightness.

The Constellations in April

Just east of the meridian, and somewhat to the south of the zenith, is the zodiac constellation Leo, marked by a group of six stars arranged in the form of a sickle ; the brightest star in the constellation, Regulus, is at the extremity of the handle. The ancients divided the zodiac into twelve signs or constellations, one corresponding to each month of the year ; it is supposed that the beginning of spring, that is, the vernal equinox, was marked by the entrance of the sun into the first sign Aries ; in course of time, however, through the precession of the earth's axis, the vernal equinox, or the first point of Aries, as it still continues to be called, has retrograded through nearly a whole constellation, so that the *sign* Aries now practically coincides with the *constellation* Pisces. Hence it is, for example, that Leo, which is the fifth in order of the zodiacal signs, is yet the sixth constellation occupied by the sun since the vernal equinox.

Turning again to the north, Polaris is now, as always, half-way from the horizon to the zenith ; Ursa Minor, more familiarly

known as the Little Dipper, extends in a curve to the eastward, while higher up, and somewhat to the east of the meridian, is Ursa Major, the Great Bear, whose more conspicuous stars form the group known as the Great Dipper. The two most westerly stars of the Dipper, known as the Pointers, furnish the simplest method of at any time locating the meridian by finding the pole star, as the line joining them, when produced, passes very nearly through the latter. To astronomers the Dipper is of peculiar interest in that five of the seven principal stars composing it have been demonstrated to be moving parallel to each other with practically the same velocity, and hence, though separated from each other by almost inconceivable distances, are probably members of one physical family travelling in company. Within only the last few months it has been shown to be possible, if not probable, that a number of stars in different parts of the heavens, Sirius among the number, are also members of this vast family of suns.

The Constellations in May

Since the last view of the evening sky the constellations have moved westward one-sixth of the circuit of the heavens. Those which were near the western horizon have been overtaken by the sun in his eastward march, and are now hidden in his rays, while others have arisen in the east, and taken their place. Some little distance to the southeast is Spica, the brightest star in Virgo; in the opposite direction at a little greater distance is the second magnitude star Denebola, in the constellation Leo; a little further yet is the well known form of the Sickle, with Regulus, or Cor Leonis, at the extremity of the handle. Almost directly below is the small constellation Corvus (The Crow), marked by two stars of the second magnitude, two of the third, and one of the fourth. The last (α Corvi) affords an example of the changes in brightness which some of the stars undergo even in limited periods of time; in Bayer's time, only three hundred years ago, this was probably the brightest star in the constellation. Such considerations as these may possibly afford some explanation of the fact that so few of the constellations now have the slightest resemblance in form to the objects whose names they were given in antiquity.

The Constellations in June

Much higher than Spica, and very slightly to the east of the meridian, is Arcturus, which is second in brightness only to

Sirius and, perhaps, Vega. It forms a nearly equilateral triangle with Spica and Denebola, and may also be easily recognized by prolonging the sweep of the handle of the Dipper. A little further to the east, and at about the same altitude as Arcturus, is the pretty little half-circle of stars known as Corona Borealis, the Northern Crown; it contains only one star as bright as the second magnitude.

Somewhat to the north of east, and already well up towards the zenith, is Vega, one of the chief ornaments of our midsummer sky, flanked at nearly an equal distance on the remote side of the pole in the far northwest, by Capella. Southward from the latter, and approaching the northwestern horizon, are the twin stars Castor and Pollux. Low down in the north is Cassiopeia, and above it Ursa Minor and Ursa Major, the latter almost overhead. Polaris, which describes a diurnal circle of an apparent diameter only four or five times that of the moon, is now almost directly below the pole. The exact position of the meridian can easily be observed by remembering that when Polaris and ζ Ursæ Majoris (the star next to the end of the handle of the Dipper) are in the same vertical plane, Polaris in the meridian.

The Constellations in July

Scorpio, the eighth sign and ninth constellation of the zodiac, is of irregular shape. It is only by virtue of two long projections to the north that it is ranked as a zodiac constellation at all, as nearly all the stars belonging to it are some distance south of the ecliptic. The sun spends only nine days out of twenty-five in Scorpio, the other sixteen being occupied in passing through Ophiuchus, which, however, is not counted among the zodiac constellations. Scorpio's principal star is Antares, of the first magnitude, color a decided red. Viewed through the telescope Antares' color appears interspersed with intermittent flashes of green, which is explained by the presence of a close green companion. Under ordinary atmospheric conditions this companion can not be separated from the rays of Antares itself. At its greatest altitude this star is only about 20° above the southern horizon; passing the meridian at 9 p.m., local time, on July 13.

Ophiuchus (The Serpent-Bearer) is situated almost directly above Scorpio; though occupying a considerable space in the sky, is not a very conspicuous constellation. The highest part

of this constellation is marked by the star α, of the second magnitude, about half-way between Antares and Vega.

Serpens (The Serpent) is a divided constellation, the principal part being to the north-west of Ophiuchus ; with one corner to the sout-east of the latter. The ancients probably considered it to consist of a trail of stars stretching across, or perhaps coiled around, Ophiuchus, whence arose the name of the latter. It contains no stars brighter than the third magnitude.

Hercules, a large constellation, is bounded on the north and south by Draco and Ophiuchus, and extends east and west nearly from Arcturus to Vega. It has no very conspicuous stars, but contains many good telescopic objects. It is interesting as marking that part of the heavens towards which the solar system is at present travelling. An interesting cluster of 25,000 stars exist in this constellation, known as the Hercules Cluster.

Constellations in August

Lyra though a small constellation, contains several fairly bright stars. The principal of these is Vega, which ranks second or third in the heavens in brightness. Vega is of a brilliant bluish-white color and cannot fail to be easily identified. It crosses the meridian at 9 p.m. on August 15, when it is only a few degrees south of the zenith. This star is always visible in our latitudes at some hour of the night throughout the year. Twelve thousand years from now it will be the pole star, though not so near the pole as Polaris now is. The other most interesting objects in the constellation are the doubles β and ϵ, the former being also variable, and the annular nebula near β.

Sagittarius (The Archer), the ninth sign and tenth constellation of the zodiac, passes low in the south when Vega is on the meridian. It contains a group of seven fairly bright stars, about 30° to the east of Antares and at about the same altitude. The sun passes through Sagittarius in December and January. The most southerly point of the ecliptic passes through this constellation.

Draco (The Dragon), a very large and winding constellation, is in the neighborhood of the pole, almost completely surrounding Ursa Minor, whose principal object is Polaris. Draco contains several second magnitude stars between Vega and the pole, and extends westward in a wide curve around Ursa Minor.

Cygnus (The Swan) is marked by five stars forming a conspicuous cross in the heavens, which may, without unduly stretching the imagination, be likened to the outline of a flying swan. It is in the Milky Way, which here begins to separate into two streams, and contains telescopic fields of great magnificence. Its brightest star α, sometimes known as Arided or Deneb, crosses the meridian two hours and five minutes after Vega and a few degrees higher, almost exactly in the zenith ; it is between the first and second magnitudes, but has no appreciable parallax or proper motion, being, therefore, at an immense distance, and possibly surpassing Vega or even Sirius in size ; it is approaching us at the rate of about forty miles per second. About 15° east of α there suddenly appeared, in 1876, a Nova of the 3rd magnitude, which later faded irregularly to the 14th magnitude.

Vulpecula (The Fox) and *Sagitta* (The Arrow) are two small constellations immediately south of Cygnus, between it and Aquila. Neither of them contains any bright stars, but as both are traversed by the Galaxy the telescopic fields are good. Vulpecula, in particular, contains one of the prettiest of telescopic objects, the well-known Dumb-Bell Nebula. Sagitta is one of the ancient constellations, but Vulpecula is comparatively modern, having been named by Hevelius about the end of the seventeenth century.

Delphinus (The Dolphin), otherwise known as Job's Coffin, is another small constellation to the immediate north-east of Aquila, containing a little group of five stars of the third magnitude. Two of these bear the not too euphonious names of Sualocin and Rotanev ; it has been conjectured that they were derived by reversing the letters in the name (Nicolaus Venator) of an assistant at the Palermo Observatory, in the catalogue emanating from which these stars are so dominated.

Aquila (The Eagle) is on the meridian about nine o'clock at the beginning of September, being then about half-way from the horizon to the zenith. It is conspicuously marked by Altair, a fine star of the first magnitude, which crosses the meridian seventy minutes after Vega. Though Aquila is a large constellation it contains only three other moderately bright stars, all of the third magnitude.

The Constellations in October

Aquarius (The Waterman), a large and irregularly shaped constellation, lies to the east and north of Capricornus. It is the eleventh sign and twelfth constellation of the zodiac, and is occupied by the sun from the middle of February till the middle of March; it contains seven third magnitude and eight fourth magnitude stars. It is not conspicuous, but if attentively examined the stars in the south-eastern part of it will be found to have a trend downwards, which, doubtless, gave occasion to the idea of water flowing from a jar.

Piscis Australis (The Southern Fish), which is not to be confounded with the zodiac constellation of Pisces, lies to the south of Aquarius and Capricornus. Its brightest star, Fomalhaut, is the most southerly of the first magnitude stars visible in these latitudes; it is on the meridian at nine o'clock on the 20th of October, when it is only about 15° above the southern horizon.

Cepheus, one of the polar constellations, extends northward to the pole between Draco and Cassiopeia, and southward as far as Cygnus. Though a large constellation, it contains only three stars of the third magnitude and four of the fourth; however, it atones for this by the comparatively large number of interesting double and variable stars, several of the latter being of quite short period.

Capricornus (The Goat), the tenth sign and eleventh constellation of the zodiac, contains four stars of the third magnitude and four of the fourth. It may be readily recognized by two stars pointing directly to Altair, which pass the meridian twenty-seven minutes after it, about 20° lower; just below them in the same line is a fourth magnitude star; four other stars, the first two of the fourth, the others of the third magnitude, extend in a line almost at right angles to the former towards the east.

The Constellations in November

Cassiopeia, one of the two bright circumpolar constellations, is named from a queen of Grecian mythology; also sometimes known by the name of *The Lady in her Chair*. During November it is on the meridian, directly above the pole and opposite the Dipper, about nine o'clock. The constellation is very easily recognized by five bright stars arranged in a zigzag figure like a

wide inverted W, which in certain positions is said to resemble the outline of a chair. Lying as it does, in the galaxy, it contains many fine telescopic fields.

Andromeda is directly to the south of Cassiopeia, and passes the meridian slightly south of the zenith. Its brightest star Alpherat, passes the meridian at the same time as the most westerly of the five bright stars in Cassiopeia. β, once known by the name, (now entirely out of use). of Mirach Mizar, passes the meridian an hour after Alpherat, and about 7° nearer to the zenith. One of the most interesting features of this constellation is the Great Nebula, the only one visible to the unaided eye, which may be located by prolonging the line joining β and μ to its own length beyond μ.

Pegasus, the winged horse of Grecian mythology, lies immediately to the south-west of Andromeda ; three bright stars in it form with Alpherat, in Andromeda, a large and conspicuous figure known as the Square of Pegasus, each side of the square being about 14° in length. The boundaries of the constellation extend a considerable distance to the west and south-west, taking in the bright star ϵ, which lies west and a little south of the star in the right hand lower corner of the square.

Pisces (The Fishes), is to the southeast and east of Pegasus and south of Andromeda. It is the twelfth sign and the first constellation of the zodiac ; although containing quite a large number of stars, none of them are brighter than the fourth magnitude, and it is a quite inconspicuous constellation. It is occupied by the sun from March 15 to April 16.

Cetus, (The Whale), is a fairly large constellation lying to the southeast of Pisces. It contains two stars, α and β, of the second magnitude, and eight of the third. β may be identified by prolonging the eastern side of the Square of Pegasus about two and a half times its own length to the south : α lies about 40° towards the northeast. About one-third of the way from α to β, in a direct line between them, lies Mira (The Wonderful), a variable star, having a period of about eleven months ; at its maximum brilliancy this star is somewhat brighter than the second magnitude, though it does not attain this degree of brightness in every period ; its minimum is about the ninth magnitude.

The Constellations in December

Aries, (The Ram), the first sign and second constellation of

the zodiac, lies immediately to the north-east of Pisces. Its brightest star α, otherwise known as Hamal, is of the second magnitude; it is situated directly east from the centre of the Square of Pegasus, at a distance of about double the diameter of the latter; near it to the south-west, is β, of the third magnitude; the constellation contains no other stars brighter than the fifth magnitude.

Triangulum (The Triangle), is a small constellation marked by a right-angled triangle of three stars of the third magnitude. The centre of the triangle lies about ten degrees directly north of Hamal.

Perseus, named after a hero of Grecian mythology, lies to the east of Andromeda and north-east of Aries. Its brightest star, α, is known by the name of Mirfak: it is of the second magnitude, and crosses the meridian slightly north of the zenith at nine o'clock (local time) on December 26. About ten degrees a little west of south from it is Algol (The Demon), the best known variable star in the heavens. Ordinarily of the second magnitude, but once in every period of two days and nearly twenty-one hours it is partially eclipsed by a companion which revolves around it; the eclipse occupies eight or ten hours, during about half an hour of which it is only of the fourth magnitude. It is easily located by noting that it is a little less than half way from the Pleiades to Cassiopeia, Another interesting feature of this constellation is the double cluster, lying about half way between Mirfak and Cassiopeia.

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