THE OBSERVER'S HANDBOOK FOR 1924

PUBLISHED BY

The Royal Astronomical Society of Canada

EDITED BY C. A. CHANT.

SIXTEENTH YEAR OF PUBLICATION

TORONTO
198 COLLEGE STREET
PRINTED FOR THE SOCIETY
1924

1924 CALENDAR 1924

JANUARY						
Sun.	.	6	13	20	28	
Mon.	.	7	14	21	27	
Tues.	1	8	15	22	29	
Wed.	2	9	16	23	30	
Thur.	3	10	17	24	31	
Fri.	4	11	18	25	..	
Sat.	5	12	19	26	..	

FEBRUARY						
Sun.	.	3	10	17	24	
Mon.	.	4	11	18	25	
Tues.	.	5	12	19	26	
Wed.	.	6	13	20	27	
Thur.	.	7	14	21	28	
Fri.	1	8	15	22	29	
Sat.	2	9	16	23	..	

MARCH						
Sun.	2	9	16	23	30	
Mon.	3	10	17	24	31	
Tues.	4	11	18	25	..	
Wed.	5	12	19	26	..	
Thur.	6	13	20	27	..	
Fri.	7	14	21	28	..	
Sat.	1	8	15	22	29	..

APRIL						
Sun.	.	6	13	20	27	
Mon.	.	7	14	21	28	
Tues.	1	8	15	22	29	
Wed.	2	9	16	23	30	
Thur.	3	10	17	24	..	
Fri.	4	11	18	25	..	
Sat.	5	12	19	26	..	

MAY						
Sun.	.	4	11	18	25	
Mon.	.	5	12	19	26	
Tues.	.	6	13	20	27	
Wed.	.	7	14	21	28	
Thur.	1	8	15	22	29	
Fri.	2	9	16	23	30	
Sat.	3	10	17	24	31	

JUNE						
Sun.	1	8	15	22	29	
Mon.	2	9	16	23	30	
Tues.	3	10	17	24	..	
Wed.	4	11	18	25	..	
Thur.	5	12	19	26	.	
Fri.	6	13	20	27	..	
Sat.	7	14	21	28	..	

JULY						
Sun.	.	6	13	20	27	
Mon.	.	7	14	21	28	
Tues.	1	8	15	22	29	
Wed.	2	9	16	23	30	
Thur.	3	10	17	24	31	
Fri.	4	11	18	25	..	
Sat.	5	12	19	26	..	

AUGUST						
Sun.	3	10	17	24	31	
Mon.	4	11	18	25	..	
Tues.	5	12	19	26	..	
Wed.	6	13	20	27	..	
Thur.	7	14	21	28	..	
Fri.	1	8	15	22	29	..
Sat.	2	9	16	23	30	..

SEPTEMBER						
Sun.	.	7	14	21	28	
Mon.	1	8	15	22	29	
Tues.	2	9	16	23	30	
Wed.	3	10	17	24	..	
Thur.	4	11	18	25	..	
Fri.	5	12	19	26	..	
Sat.	6	13	20	27	..	

OCTOBER						
Sun.	.	5	12	19	26	
Mon.	.	6	13	20	27	
Tues.	.	7	14	21	28	
Wed.	1	8	15	22	29	
Thur.	2	9	16	23	30	
Fri.	3	10	17	24	31	
Sat.	4	11	18	25	..	

NOVEMBER						
Sun.	2	9	16	23	30	
Mon	3	10	17	24	..	
Tues.	4	11	18	25	..	
Wed.	5	12	19	26	..	
Thur.	6	13	20	27	..	
Fri.	7	14	21	28	..	
Sat.	1	8	15	22	29	..

DECEMBER						
Sun.	.	7	14	21	28	
Mon.	1	8	15	22	29	
Tues.	2	9	16	23	30	
Wed.	3	10	17	24	31	
Thur.	4	11	18	25	..	
Fri.	5	12	19	26	..	
Sat.	6	13	20	27	..	

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CONTENTS

PREFACE

The HANDBOOK for 1924 follows the same lines as that for 1923, but corrections to some of the tables have been made in order to bring them up to date. The general sketch of the planets will be found useful in giving a view of their phenomena during the entire year, while under the heading "The Sky for the Month" are given further details.

Descriptions of the constellations and also star maps are not included, since fuller information is available in a better form and at a reasonable price in many publications, such as: Young's *Uranography* (72 c.), Norton's *Star Atlas and Telescopic Handbook* (10*s* 6*d*.), or Olcott's *A Field-book of the Stars* ($1.50).

In the preparation of this HANDBOOK the Editor has been assisted by Mr. J. A. Pearce, M.A., of the Lick Observatory; Mr. R. M. Motherwell, M.A., and Dr. R. J. McDiarmid, of the Dominion Observatory, Ottawa; and Messrs. J. H. Horning, M.A., H. F. Balmer, B.A., H. J. Stowe, B.A., and J. P. Dandy, B.A., of Toronto.

THE EDITOR.

TORONTO, December, 1923.

ANNIVERSARIES AND FESTIVALS, 1924

New Year's Day	Tues, Jan. 1	Pentecost (Whit Sunday)	June 8
Epiphany	Sun., Jan. 6	Trinity Sunday	June 15
Septuagesima Sunday	Feb. 17	Corpus Christi	Thur., June 19
St. David	Sat., Mar. 1	St. John Baptist	Tues., June 24
Quinquagesima (Shrove Sunday)	Mar. 2	Dominion Day	Tues., July 1
Ash Wednesday	Mar. 5	Labor Day	Mon., Sept. 1
St. Patrick	Mon., Mar. 17	St. Michael (Michaelmas Day)	Mon., Sept. 29
Palm Sunday	Apr. 13	All Saints Day	Sat., Nov. 1
Good Friday	Apr. 18	Saint Andrew	Sun., Nov. 30
Easter Sunday	Apr. 20	First Sunday in Advent	Nov. 30
St. George	Wed., Apr. 23	Conception Day	Mon., Dec. 8
Victoria Day	Sat., May 24	St. Thomas	Sun., Dec. 21
Rogation Sunday	May 25	Christmas Day	Thur. Dec. 25
Ascension Day	Thur., May 29		

King George V., born June 3 1865; began to reign May 6, 1910.
Queen Mary, born May 26, 1867.
Prince of Wales, born June 23, 1894.

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.

In the Configurations of Jupiter's Satellites (pages 29, 31, etc.), O represents the disc of the planet, d 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.

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.

1924, EPHEMERIS OF SUN AT GREENWICH MEAN NOON

Date	R.A.	Equation of Time	Declination	Date	R.A.	Equation of Time	Declination
	h m s	m s	° ′ ″		h m s	m s	° ′ ″
Jan. 1	18 42 42	− 3 12.5	−23 5 1	Apr. 3	0 49 32	− 3 22.8	+ 5 18 50
" 4	18 55 57	− 4 37.2	−22 49 25	" 6	1 0 29	− 2 30.3	+ 6 27 18
" 7	19 9 8	− 5 58.6	−22 29 44	" 9	1 11 28	− 1 39.7	+ 7 34 47
" 10	19 22 15	− 7 15.8	−22 6 4	" 12	1 22 29	− 0 51.2	+ 8 41 7
" 13	19 35 16	− 8 27.9	−21 38 32	" 15	1 33 33	− 0 5.3	+ 9 46 7
" 16	19 48 12	− 9 34.3	−21 7 11	" 18	1 44 40	+ 0 37.6	+10 49 40
" 19	20 1 2	−10 34.4	−20 32 13	" 21	1 55 50	+ 1 17.0	+11 51 36
" 22	20 13 45	−11 28.0	−19 53 46	" 24	2 7 5	+ 1 52.3	+12 51 47
" 25	20 26 22	−12 14.7	−19 11 59	" 27	2 18 23	+ 2 23.3	+13 50 4
" 28	20 38 51	−12 54.4	−18 27 1	" 30	2 29 47	+ 2 49.5	+14 46 20
" 31	20 51 13	−13 27.0	−17 39 2				
Feb. 3	21 3 28	−13 52.4	−16 48 14	May 3	2 41 15	+ 3 10.9	+15 40 25
" 6	21 15 36	−14 10.5	−15 54 47	" 6	2 52 48	+ 3 27.3	+16 32 10
" 9	21 27 37	−14 21.2	−14 58 53	" 9	3 4 26	+ 3 38.7	+17 21 27
" 12	21 39 30	−14 24.7	−14 0 43	" 12	3 16 10	+ 3 45.1	+18 8 6
" 15	21 51 16	−14 21.1	−13 0 29	" 15	3 27 58	+ 3 46.5	+18 52 1
" 18	22 2 55	−14 10.8	−11 58 21	" 18	3 39 51	+ 3 43.0	+19 33 3
" 21	22 14 28	−13 54.0	−10 54 31	" 21	3 51 49	+ 3 34.4	+20 11 6
" 24	22 25 55	−13 31.4	− 9 49 10	" 24	4 3 53	+ 3 21.0	+20 46 4
" 27	22 37 17	−13 3.4	− 8 42 28	" 27	4 16 0	+ 3 2.8	+21 17 49
				" 30	4 28 13	+ 2 40.2	+21 46 16
Mar. 1	22 48 34	−12 30.6	− 7 34 36	June 2	4 40 29	+ 2 13.6	+22 11 19
" 4	22 59 46	−11 53.3	− 6 25 44	" 5	4 52 49	+ 1 43.5	+22 32 54
" 7	23 10 54	−11 11.9	− 5 16 4	" 8	5 5 11	+ 1 10.6	+22 50 56
" 10	23 21 59	−10 27.0	− 4 5 47	" 11	5 17 36	+ 0 35.4	+23 5 21
" 13	23 33 1	− 9 38.9	− 2 55 3	" 14	5 30 3	− 0 1.4	+23 16 6
" 16	23 43 59	− 8 48.2	− 1 44 2	" 17	5 42 30	− 0 39.4	+23 23 10
" 19	23 54 56	− 7 55.4	− 0 32 55	" 20	5 54 59	− 1 18.1	+23 26 31
" 22	0 5 52	− 7 1.2	+ 0 38 9	" 23	6 7 27	− 1 56.9	+23 26 9
" 25	0 16 46	− 6 6.2	+ 1 49 1	" 26	6 19 55	− 2 35.2	+23 22 4
" 28	0 27 41	− 5 11.1	+ 2 59 31	" 29	6 32 22	− 3 12.4	+23 14 17
" 31	0 38 36	− 4 16.5	+ 4 9 31				

1924, EPHEMERIS OF SUN AT GREENWICH MEAN NOON

Date	R.A.	Equation of Time	Declination	Date	R.A.	Equation of Time	Declination
	h m s	m s	° ′ ″		h m s	m s	° ′ ″
July 2	6 44 47	− 3 47.8	+23 2 51	Oct. 3	12 36 43	+10 55.5	− 3 57 29
" 5	6 57 10	− 4 20.7	+22 47 48	" 6	12 47 39	+11 49.8	− 5 6 55
" 8	7 9 29	− 4 50.5	+22 29 10	" 9	12 58 37	+12 40.6	− 6 15 45
" 11	7 21 45	− 5 16.6	+22 7 3	" 12	13 9 40	+13 27.6	− 7 23 49
" 14	7 33 56	− 5 38.6	+21 41 31	" 15	13 20 47	+14 10.0	− 8 30 59
" 17	7 46 4	− 5 56.1	+21 12 39	" 18	13 32 0	+14 47.3	− 9 37 5
" 20	7 58 6	− 6 8.9	+20 40 33	" 21	13 43 18	+15 19.0	−10 41 56
" 23	8 10 4	− 6 16.8	+20 5 19	" 24	13 54 42	+15 44.6	−11 45 21
" 26	8 21 56	− 6 19.8	+19 27 3	" 27	14 6 12	+16 3.7	−12 47 11
" 29	8 33 44	− 6 17.5	+18 45 54	" 30	14 17 50	+16 16.1	−13 47 14
Aug. 1	8 45 26	− 6 9.9	+18 1 57	Nov. 2	14 29 34	+16 21.6	−14 45 18
" 4	8 57 2	− 5 56.8	+17 15 21	" 5	14 41 25	+16 20.0	−15 41 12
" 7	9 8 33	− 5 38.2	+16 26 14	" 8	14 53 24	+16 11.1	−16 34 45
" 10	9 19 59	− 5 14.1	+15 34 45	" 11	15 5 30	+15 54.6	−17 25 47
" 13	9 31 19	− 4 44.7	+14 41 2	" 14	15 17 43	+15 30.6	−18 14 6
" 16	9 42 34	− 4 10.3	+13 45 12	" 17	15 30 5	+14 58.8	−18 59 33
" 19	9 53 45	− 3 31.3	+12 47 24	" 20	15 42 34	+14 19.4	−19 41 58
" 22	10 4 52	− 2 48.0	+11 47 46	" 23	15 55 10	+13 32.6	−20 21 10
" 25	10 15 54	− 2 0.9	+10 46 27	" 26	16 7 54	+12 38.5	−20 56 59
" 28	10 26 53	− 1 10.2	+ 9 43 35	" 29	16 20 44	+11 37.9	−21 29 17
" 31	10 37 49	− 0 16.3	+ 8 39 19				
Sept. 3	10 48 42	+ 0 40.4	+ 7 33 48	Dec. 2	16 33 41	+10 31.2	−21 57 54
" 6	10 59 32	+ 1 39.7	+ 6 27 11	" 5	16 46 43	+ 9 19.0	−22 22 42
" 9	11 10 20	+ 2 41.0	+ 5 19 38	" 8	16 59 49	+ 8 2.1	−22 43 35
" 12	11 21 7	+ 3 43.8	+ 4 11 16	" 11	17 13 0	+ 6 41.1	−23 0 27
" 15	11 31 53	+ 4 47.5	+ 3 2 15	" 14	17 26 14	+ 5 16.6	−23 13 13
" 18	11 42 39	+ 5 51.5	+ 1 52 43	" 17	17 39 31	+ 3 49.5	−23 21 49
" 21	11 53 25	+ 6 55.1	+ 0 42 49	" 20	17 52 50	+ 2 20.5	−23 26 12
" 24	12 4 12	+ 7 57.8	− 0 27 19	" 23	18 6 9	+ 0 50.5	−23 26 22
" 27	12 15 0	+ 8 59.1	− 1 37 31	" 26	18 19 29	− 0 39.5	−23 22 17
" 30	12 25 51	+ 9 58.5	− 2 47 38	" 29	18 32 47	− 2 8.4	−23 13 59
				" 31	18 41 39	− 3 6.5	−23 6 7

To obtain the Sidereal Time or R.A. of Mean Sun, subtract the Equation of Time from the Right Ascension.

In the Equation of Time the Sign + means the watch is faster than the Sun, −that it is slower. To obtain the Local Mean Time, in the former case add the Equation of Time to, and in the latter case subtract it from, apparent or sun-dial time.

OCCULTATIONS OF STARS BY THE MOON, 1924

Eastern Standard Time, the hours numbering from noon

Date	Star	Mag.	Immersion	Emersion	Position Angle	
					Immer.	Emer.
1924			h m	h m	°	°
Jan. 29	γ Librae	4.0	14 17.6	14 55.9	161	238
Feb. 11	μ Ceti	4.4	1 50.1	3 06.1	66	247
Feb. 12	f Tauri	4.3	1 04.1	2 10.9	80	241
Feb. 13	γ Tauri	3.9	1 52.1	2 34.9	23	303
Feb. 13	θ^1Tauri	4.2	7 16.0	8 39.4	95	241
Feb. 13	θ^2Tauri	3.6	7 23.0	8 16.5	112	195
Feb. 25	γLibrae	4.0	21 33.7	.....	95	...
Apr. 7	θ^1Tauri	4.2	21 36.4	22 38.0	51	259
Apr. 7	θ^2Tauri	3.6	21 37.2	22 36.5	94	237
Apr. 8	αTauri	1.1	2 05.6	3 31.6	61	268
Apr. 20	γLibrae	4.0	11 18.0	12 20.5	83	317
June 11	γVirginis	2.9	6 26.5	7 41.0	132	281
June 14	γLibrae	4.0	8 49.7	9 52.0	78	321
June 28	θ^1Tauri	4.2	16 16.0	17 14.5	97	234
June 28	θ^2Tauri	3.6	16 24.1	17 04.6	125	205
June 28	αTauri	1.1	20 44.3	22 07.8	90	238
July 23	μCeti	4.4	20 36.8	21 56.6	88	246
July 24	f Tauri	4.3	19 38.7	20 15.2	133	182
July 25	γTauri	3.9	19 56.5	20 58.5	118	208
July 26	θ^1Tauri	4.2	1 40.5	.....	127	...
Aug. 2	Mercury	0.2	5 00.9	5 55.6	156	247
Aug. 2	ρLeonis	3.8	6 24.7	7 03.2	162	240
Sept. 16	μCeti	4.4	11 50.1	12 41.6	18	292
Sept. 17	f Tauri	4.3	10 09.9	11 12.1	69	250
Sept. 18	γTauri	3.9	.....	11 23.5	...	264
Sept. 18	αTauri	1.1	20 42.5	21 50.5	92	257
Oct. 22	αLeonis	1.3	17 57.6	18 57.7	69	331
Dec. 7	μCeti	4.4	9 50.3	11 08.1	80	232
Dec. 22	γLibrae	4.0	17 44.1	18 47.6	121	284
Dec. 27	θCapricorni	4.2	23 42.9	0 26.8	27	311
Dec. 29	ιAquarii	4.4	0 20.2	1 30.5	64	263

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 parts of Canada. The times are given in Mean Solar Time, and in the table on page following this, are given corrections to change 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 realised 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 and 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 and 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			Moosejaw	+ 2		
London	+ 25	St. John,				Moosomin	+ 40		
Orillia	+ 18	N.B.	+ 24			Nelson	- 11		
Owen Sound	+ 24	Sydney	+ 1			Portage La			
Peterboro	+ 13	Three Rivers	- 10			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	7 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	7 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

For an explanation of this table and its use at various places, see pages 8 and 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	6 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 pages 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	5 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 various places, see pages 8 and 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	5 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	6 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 PLANETS DURING 1924

In the following notes on the planets a general account of the phenomena in connection with their motions is given. Fuller details will be found on the pages headed *The Sky for the Month* (pages 28, 30, ...).

MERCURY

Mercury's apparent separation from the sun is never very great, and consequently the planet is comparatively seldom seen with the naked eye; but when near its greatest elongation, or angular distance from the sun, it is easily visible as a star of the first magnitude. It can often be seen for about a fortnight at such a time, but some of these occasions are much more favourable than others. For instance on April 16, the planet is 20° east of the sun, while on August 15 and December 9, Mercury is 27° and 21° east and can be seen as an evening star, but April 16 is the best time on account of its northerly declination. Mercury is at westerly elongation February 5, 25° W., June 3, 24° W. and September 27, 18° W. The June elongation is the best for morning observation. In general the planet can best be seen at an eastern elongation (that is as an evening star) in the spring. By reference to pages 29, 37, 47 it will be seen that maximum eastern elongations occur on April 16 and August 24, near which dates the planet should be well seen as an evening star. Mercury transits the sun on May 7. This is a most interesting phenomenon to observe, and it is partly visible in Canada. Fuller information is given on page 27.

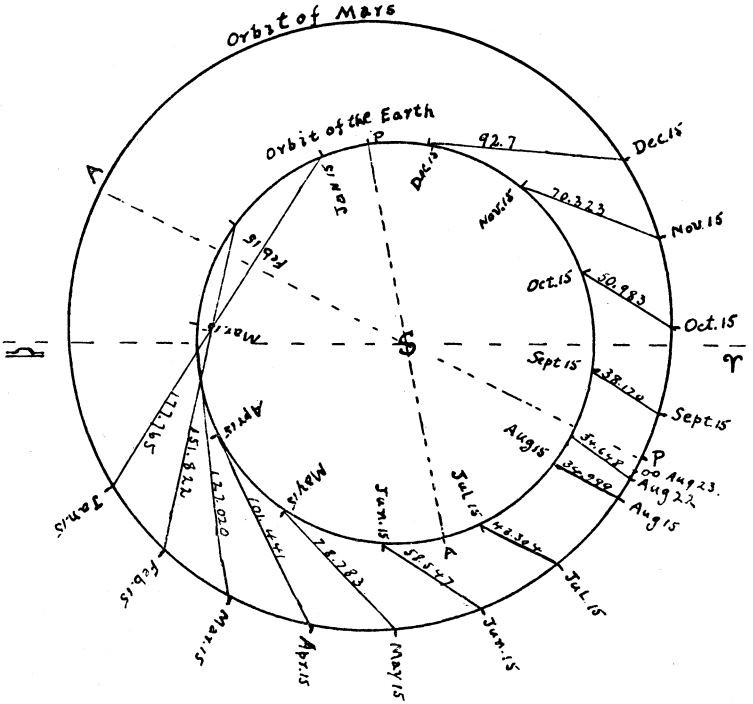
VENUS

Venus is an evening star at the beginning of the year; the planet attains its greatest elongation (45° 40′) east of sun on April 1. It continues to be an evening star till the latter part of June, when it is lost in the sun's rays, coming in conjunction (inferior conjunction) with the sun on July 1. After a short period it appears as a morning star and continues such for the remainder of the year. On September 9 Venus has its greatest elongation west (46° 0′) of the sun, and will be almost at its best for morning observing. The planet has its greatest brilliancy as an evening star May 24, when its stellar magnitude is −4.2, and as a morning star on August 7 when it again is of magnitude −4.2, passing a minimum at inferior conjunction July 1.

MARS

At the beginning of the year, Mars is a morning star in the constellation Libra; the planet is nearly midway between Spica and Antares. The separation between Mars and the sun gradually increases till July 25, when the planet is stationary, rising soon after the sun sets. On August 23 the sun and Mars are in opposition and the planet is then visible all night. During the year Mars changes by 4.4 magnitudes. On January 1 it is +1.7 magnitude and it reaches its greatest brightness August 22, − 2.7 magnitude, when it is nearest the earth. Mars is in perihelion August 30. The diagram on the third page of the cover

gives the path of Mars amongst the stars. It is in the constellation Aquarius from middle of June till end of November. The other diagram shows the orbits of the earth and Mars.

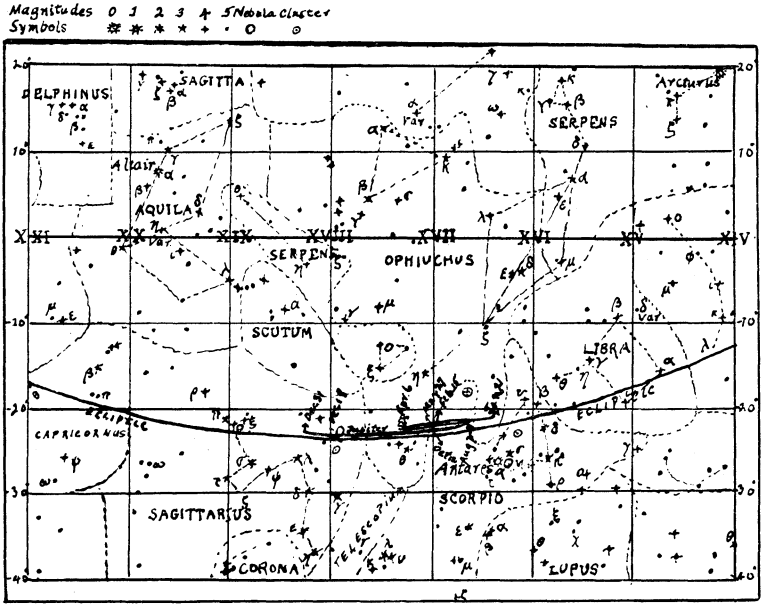


Orbit of the Earth and Mars, 1924.

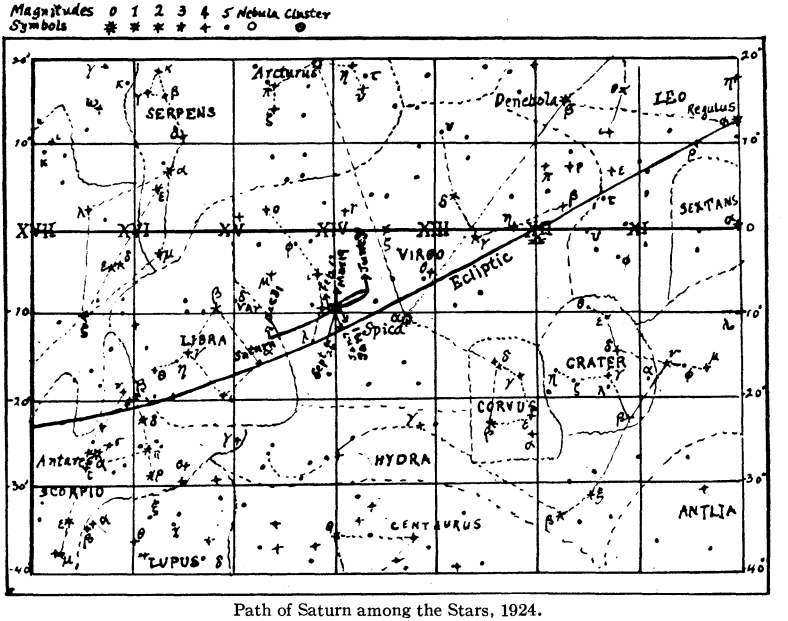
JUPITER

Jupiter is the greatest of all planets. Its brightness exceeds that of any of the fixed stars and though at times Mars rivals it, Venus only distinctly outshines it. Jupiter is a morning star at the beginning of the year; it is then about five degrees north of Antares. The sun moves gradually to the east among the stars, leaving Jupiter behind, so that on June 5 Jupiter and the sun are in opposition and the planet is then visible all night. After that it apparently drifts steadily to the western sky and it is a brilliant evening star until it becomes lost in the sun's rays. It reaches conjunction with the sun on December 2 and early in 1925 it will appear as a bright morning star.

Jupiter is a fine object for a small telescope. Even a field glass will reveal its disc and also its four large moons. These were discovered by Galileo in 1610, but since then five more have been discovered—all very faint objects (see page 65). The path of Jupiter amongst the stars is given in the accompanying diagram for 1924.



Path of Jupiter among the Stars, 1924.



Path of Saturn among the Stars, 1924.

Saturn

At the beginning of the year Saturn is a morning star, moving slowly eastward and it becomes stationary on Februaty 11. It then retrogrades until June 29. Saturn is in opposition with the sun April 19 and it is then visible all night. Saturn is in the constellation Virgo all year, a few degrees east of Spica. On October 28 Saturn is in conjunction with the sun, after which it becomes a morning star.

By many observers Saturn, with its unique ring system and its numerous satellites, is considered the finest object in the sky. During some months in 1921 the rings were invisible (as explained in the Hand Book for 1921) and we now see their north face. In the year 1924 Saturn is in a good position to see the ring formation. For about 7 years the rings will appear to open out and then they will close in again. The accompanying diagram shows the path of Saturn amongst the stars for 1924.

Uranus

This planet was discovered by Sir William Herschel in 1781 and it appears to the naked eye on a dark night as a small star of the sixth magnitude. It is in the constellation Pisces. On January 1 it is about 4° east and a little north of Lamda Aquarii. It moves eastward until June 26, when it begins to retrograde and continues to do so until November 27. On September 12 Uranus is in opposition with the sun when it will be visible all night. It is then 6° south of Theta Piscium. For some weeks before and after this date, the planet can best be observed, and its position and motion can be followed with a field glass.

Neptune

The planet Neptune is the most distant member of the solar system, being 2,800 millions of miles from the sun and requiring 165 years to complete a revolution. During the year it moves in the constellation Leo about 30m R.A. west of Regulus, and is in opposition to the sun on February 8 (see page 31). It appears as a star of the eighth magnitude and so cannot be seen with the naked eye.

ECLIPSES IN 1924

In 1924 there will be five eclipses, three of the sun and two of the moon, but all of them will be invisible to Canadian observers.

1. A total eclipse of the moon, February 20, 1924. The beginning will be visible generally in the extreme northwestern part of North America, the Pacific Ocean, Australia, Asia and the Indian Ocean; the ending will be visible generally in the western part of the Pacific Ocean, Asia, Australia, the Indian Ocean, Europe, and Africa except the extreme northwestern part.

Total eclipse begins	February	20	3h	19.6m	G.M.T.
Middle of the eclipse	"	20	4	8.5	"
Total eclipse ends	"	20	4	57.4	"

Magnitude of the eclipse = 1.605 (moon's diameter = 1.0).

2. A partial eclipse of the sun, March 5, 1924. This eclipse is visible generally at the South Pole. The sun will set partially eclipsed to observers situated at the southern end of the continent of Africa.

		G.M.T.	Longitude	Latitude
Eclipse begins	March 5	1h 55.4m	+131° 14′	−68° 14′
Greatest eclipse	" 5	3 43.9	− 55 47	−72 2
Eclipse ends	" 5	5 32.8	− 13 50	−34 36

Magnitude of the greatest eclipse = 0.582 (sun's diameter = 1.0).

3. A partial eclipse of the sun, July 31, 1924. This small partial is visible only in the South Pacific Ocean.

		G.M.T.	Longitude	Latitude
Eclipse begins	July 31	6h 51.7m	163° 53′	−54°32′
Greatest eclipse	" 31	7 57.9	145 53	−69 35
Eclipse ends	" 31	9 3.7	100 4	−68 18

Magnitude of the greatest eclipse = 0.191 (sun's diameter = 1.0).

4. A total eclipse of the moon, August 14, 1924. The beginning will be visible generally in the western part of the Pacific Ocean, Australia, Asia, the Indian Ocean, eastern and central Europe and Africa except the northwestern part; the ending will be visible generally in central and western Asia, western Australia, the Indian Ocean, Europe, Africa, the Atlantic Ocean and eastern and central South America.

Total eclipse begins	August	14	7h	30.6m	G.M.T.
Middle of the eclipse	"	14	8	20.1	"
Total eclipse ends	"	14	9	9.4	"

Magnitude of the eclipse = 1.659 (moon's diameter = 1.0).

5. A partial eclipse of the sun, August 29, 1924. This eclipse will be visible generally at the North Pole, Greenland, Finland, northeastern Asia except the extreme part; the southern limit of the eclipse crossing Iceland, Finland, Russia, Mongolia and encircles Korea and Japan.

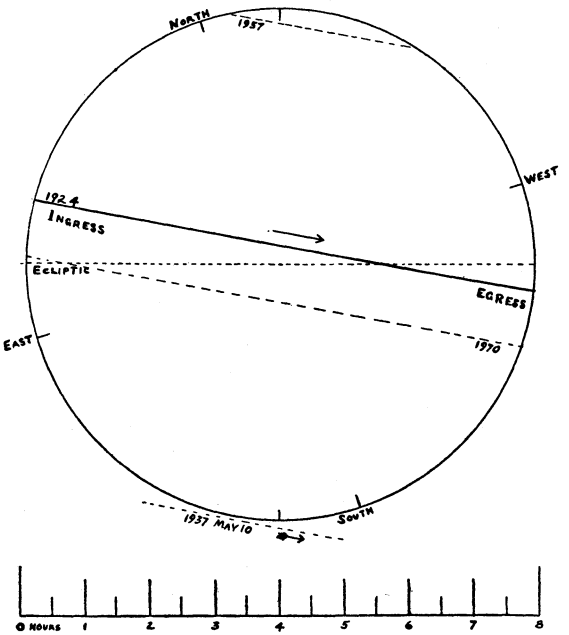
		G.M.T.	Longitude	Lattude
Eclipse begins	August 29	18h 50.4m	41° 35′	71° 49′
Greatest eclipse	" 29	20 22.5	173 5	71 32
Eclipse ends	" 29	21 55.0	129 23	41 5

Magnitude of the greatest eclipse = 0.426 (sun's diameter = 1.0).

The above-mentioned longitudes are measured from Greenwich.

TRANSIT OF MERCURY, 1924

A transit of Mercury over the sun's disk will take place on May 7, 1924. It will be partially visible for stations throughout Canada, the sun setting with the planet on its disk. The ingress will be visible generally in the western part of the Atlantic Ocean, North America, the northern and western parts of South America, the Pacific Ocean, eastern Asia, and eastern Australia; the egress will be visible generally in the extreme northwestern part of North America, the central and western parts of the Pacific Ocean, Asia, Australia, the Indian Ocean, Europe, and Africa except the extreme northwestern part.



Path of Mercury in the May Transit over the Sun, 1900-2000.

During the present century there will be 12 transits and 2 appulses, the 4 which occur in the month of May are shown in the above drawing. The duration of the 1924 transit will be 7h 50m, the longest of the series of 12; and as Mercury passes nearly centrally over the sun's disk it is little short of the maximum duration. That of 1970 is also noteworthy, being 7h 45m long. On May 10, 1937, the planet will pass so close to the sun at inferior conjunction that it will almost be seen projected upon the chromosphere; the nearest approach to the limb will be a little more than one minute of arc.

[*Continued on page 64.*]

THE SKY FOR JANUARY, 1924

The Sun.—During January the sun's R.A. increases from 18h 43m to 20h 51m and its Decl. from 23° 5′ S to 17° 39′ S. The equation of time (see page 6) increases from 3m 13s to 13m 27s. On account of this rapid rise in value the time of mean noon appears to remain, for the first ten days of the month, at the same distance from the time of sunrise, that is the forenoons as indicated by our clocks are of the same length. On the 19th the sun enters the sign of Aquarius, the second of the winter signs of the zodiac. On January 2 the sun is in Perihelion at a distance of 91,342,000 miles.

The Moon.—For its phases and conjunctions with the planets see opposite page. On January 29 the moon occults a star in Libra (see page 8).

Mercury on the 15th is in R.A. 19h 19m, Decl. 18° 50′ S, and transits at 11.45 (L.M.T.) On the 12th the planet is at inferior conjunction. Mercury is too near the sun for observation, rising as a morning star less than half an hour before the sun.

Venus on the 15th is in R.A. 21h 51m, Decl. 14° 46′ S, and transits at 14.17 L.M.T. The planet appears as an evening star setting about 2 hours after the sun. At sunset it is about 25° above the horizon. Its stellar magnitude is −3.4.

Mars on the 15th is in R.A. 15h 40m, Decl. 18° 58′ S, and transits at 8.06 (L.M.T.). The planet is a morning star of stellar magnitude +1.6.

Jupiter on the 15th is in R.A. 16h 38′, Decl. 21° 25′ S, and transits at 9.00 (L.M.T.). The planet is a fair morning star rising 3 hours before the sun. On the 15th its stellar magnitude is −1.4. For its path among the stars see page 23. For the configuration of its satellites see next page, and for their eclipses, etc., see page 52.

Saturn on the 15th is in R.A. 14h 2m, Decl. 9° 46′ S, and transits at 6.28 (L.M.T.). It is a good morning star of stellar magnitude +0.8 and its position for observation improves during the month.

Uranus on the 15th is in R.A. 23h 5m, Decl. 6° 41′ S, and transits at 15.30 (L.M.T.).

Neptune on the 15th is in R.A. 9h 29m, Decl. 15° 9′ N and transits at 1.48 (L.M.T.).

For information regarding *Uranus* and *Neptune* see page 25.

JANUARY

ASTRONOMICAL PHENOMENA

(75th Meridian Time, Hours Numbering from Midnight)

			Minima of Algol		Configurations of Jupiter's Satellites at 6h 0m
			h	m	
Tues.	1	5h 47m ☌ ♄ ☾, ♄ 1° 59′ S.; 22h ⊕ in Perihelion, 91,341,500 miles distant			1O24*
Wed.	2	10h 53m ☌ ♂ ☾, ♂ 4° 22′ S.; 15h ☿ in ♌	1	50	O1234
Thur.	3	14h ☿ Stationary; 19h 49m ☌ ♃ ☾, ♃ 4° 28′ S.			12O34
Fri.	4	5h ☾ in Perigee	22	30	2O134
Sat.	5				31O24
● Sun.	6	7h 48m N.M.			34O12
Mon.	7	5h 51m ☌ ☿ ☾, ☿ 1° 33′ S.; 6h ☿ in Perihelion	19	20	342O*
Tues.	8	15h 22m ☌ ♀ ☾, ♀ 3° 14′ S.			413O*
Wed.	9				4O123
Thur.	10	15h 49m ☌ ♁ ☾, ♁ 0° 18′ N.	16	10	412O3
Fri.	11				42O13
Sat.	12	23h ☌ ☿ ☉ Inferior			413O2
◑ Sun.	13	17h 44m Moon F.Q.	13	00	34O12
Mon.	14				324O*
Tues.	15				31O4*
Wed.	16	0h ☾ in Apogee	9	50	O1324
Thur.	17	12h ☿ Greatest Hel. Lat. N.			12O34
Fri.	18				2O134
Sat.	19		6	40	13O24
Sun.	20				3O124
♋ Mon.	21	19h 57m F.M.			321O4
Tues.	22		3	30	d32O4
Wed.	23	2h □ ♄ ☉; 7h 28m ☌ Ψ ☾, Ψ 1° 27′ N.			4O132
Thur.	24	4h ☿ Stationary			d41O3
Fri.	25		0	20	42O13
Sat.	26				41O32
Sun.	27		21	10	43O12
Mon.	28	13h 38m ☌ ♄ ☾, ♄ 2° 6′ S.			4321O
☾ Tues.	29	0h 53m Moon L.Q.			432O1
Wed.	30		18	00	4O32*
Thur.	31	0h 50m ☌ ♂ ☾, ♂ 4° 52′ S.; 12h 15m ☌ ♃ ☾, ♃ 4° 30′ S.; 16h ☾ in Perigee; 21h ☌ ♀ ♁, ♀ 0° 33′ S.			14O23

Explanation of symbols and abbreviations on page 4.

THE SKY FOR FEBRUARY, 1924

The Sun.—During February the sun's R.A. increases from 20h 55m to 22h 45m, and its Decl. decreases from 17° 22′ S to 7° 57′ S. The equation of time reaches a maximum value of 14m 25s on the 12th (see page 6). For change in the length of day, see page 11. On the 18th the sun enters the third winter sign Pisces.

The Moon.—For its phases and conjunctions with the planets see opposite page. On February 11, the moon occults a star in Cetus, on February 12 a star in Taurus, on February 13 three stars in Taurus, on February 25 a star in Libra (see page 8).

Mercury on the 15th is in R.A. 20h 17m, Decl. 20° 30′ S, and transits at 10.42 (L.M.T.). On the 5th the planet has its greatest elongation west 25° 30′. It is then a morning star, at sunrise being 13° above the horizon and 23° south of the sun. Its stellar magnitude then is 0.2.

Venus on the 15th is in R.A. 0h 11m, Decl. 0° 33′ N and transits at 14.34 (L.M.T.). The planet is in a better position than a month ago. Its stellar magnitude is increasing and on the 15th is −3.5, and the planet doesn't set till 3 hours after sunset.

Mars on the 15th is in R.A. 17h 4m, Decl. 22° 35′ S and transits at 7.27 (L.M.T.). On the 15th its stellar magnitude is +1.3. The planet rises 4 hours before sunrise.

Jupiter on the 15th is in R.A. 17h 0m, Decl. 22° 3′ S, and transits at 7.21 (L.M.T.). On the 15th its stellar magnitude is −1.5. For its position among the stars see page 23. For the configuration of its satellites see next page; and for their eclipses, etc., see page 52.

Saturn on the 15th is in R.A. 14h 4m, Decl. 9° 51′ S, and transits at 4.29 (L.M.T.). On the 11th the planet reaches a stationary position and then begins to retrograde. It is in a fine position for observation and is of stellar magnitude +0.7 slightly brighter than during the previous month.

Uranus on the 15th is in R.A. 23h 11m Decl. 6° 4′ S and transits at 13.26 (L.M.T.).

Neptune on the 15th is in R.A. 9h 25m, Decl. 15° 26′ N, and transits at 23.38 (L.M.T.).

For information regarding *Uranus* and *Neptune*, see page 25.

FEBRUARY

ASTRONOMICAL PHENOMENA

(75th Meridian Time, Hours Numbering from Midnight)

			Minima of Algol		Configurations of Jupiter's Satellites at 5h 0m
			h	m	
Fri.	1				20143
Sat.	2	22h 22m ☌ ☿ ☾, ☿ 2° 31′ S.	14	40	10234
Sun.	3				30124
● Mon.	4	20h 38m N.M.			31204
Tues.	5	7h ☿ Greatest Elong. W. 25° 30′	11	30	32014
Wed.	6				10324
Thur.	7	3h 40m ☌ ♁ ☾, ♁ 0° 32′ N.; 17h 56m ☌ ♀ ☾, ♀ 1° 1′ N.			d0234
Fri.	8	19h ☍ ♆ ☉	8	20	20143
Sat.	9	23h ☿ in ♉			41O3*
Sun.	10				43012
Mon.	11	17h ♄ Stationary	5	10	43120
☽ Tues.	12	15h 9m Moon F.Q.; 21h ☾ in Apogee			43201
Wed.	13	12h ☌ ☌ ♃, ☌ 0° 25′ S.			41302
Thur.	14		2	00	40123
Fri.	15				42O3*
Sat.	16		22	50	41O3*
Sun.	17				30412
Mon.	18				31204
Tues.	19	14h 24m ☌ ♆ ☾, ♆ 1° 32′ N.	19	40	32014
♒ Wed.	20	5h ☿ in Aphelion; 11h 7m F.M.; Total Eclipse invisible at Toronto (see page 27)			13024
Thur.	21				01234
Fri.	22		16	30	20341*
Sat.	23				21034
Sun.	24	19h 15m ☌ ♄ ☾, ♄ 2° 2′ S.			30124
Mon.	25	11h ☾ in Perigee	13	20	d3104
Tues.	26	0h ♀ in ♌			32401
☾ Wed.	27	8h 15m Moon L.Q.			43102
Thur.	28	0h 38m ☌ ♃ ☾, ♃ 4° 26′ S.; 14h 22m ☌ ☌ ☾, ☌ 4° 49′ S.	10	00	40132
Fri.	29				42103

Explanation of symbols and abbreviations on page 4.

THE SKY FOR MARCH, 1924

The Sun.—During March the sun's R.A. increases from 22h 49m to 0h 39m, and its Decl. changes from 7° 35′ S to 4° 10′ N. The equation of time decreases from 12m 31s to 4m 16s (see page 6). For changes in the length of day see page 12. On the 21st the sun enters the first sign of spring, Aries (see opp. page).

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

Mercury on the 15th is in R.A. 23h 19m, Decl. 6° 29′ S, and transits at 11.48 (L.M.T.). On the 21st the planet is in superior conjunction, and consequently is not well situated for observation. On the 15th it rises just before sunrise.

Venus on the 15th is in R.A. 2h 17m, Decl. 14° 58′ N, and transits at 14.46 (L.M.T.). Venus is steadily improving in position, it being 4 hours after sunset before the planet sets. Its stellar magnitude on the 15th is −3.7.

Mars on the 15th is in R.A. 18h 24m, Decl. 23° 35′ S, and transits at 6.53 (L.M.T.). Mars is rising earlier every night and its stellar magnitude is steadily increasing. On the 15th it is +0.9.

Jupiter on the 15th is in R.A. 17h 13m, Decl. 22° 18′ S, and transits at 5.39 (L.M.T.). The planet is steadily improving its position for observation, and on the 15th its stellar magnitude is is −1.8. For its position among the stars, see page 23. For the configurations of its satellites see next page; and for their eclipses, etc., see page 52.

Saturn on the 15th is in R.A. 14h 1m, Decl. 9° 26′ S, and transits at 2.31 (L.M.T.). The planet is still retrograding and is improving in position for observation. Its stellar magnitude is +0.6.

Uranus on the 15th is in R.A. 23h 17m, Decl. 5° 27′ S, and transits at 11.57 (L.M.T.).

Neptune on the 15th is in R.A. 9h 23m, Decl. 15° 40′ N, and transits at 21.50 (L.M.T.).

For information regarding *Uranus* and *Neptune*, see page 35.

MARCH

ASTRONOMICAL PHENOMENA

(75th Meridian Time, Hours Numbering from Midnight)

			Minima of Algol	Configurations of Jupiter's Satellites at 3h 45m
			h m	
Sat.	1	19h ☌ in ♉		d42O3
Sun.	2		6 50	4O32*
Mon.	3			43lO2
Tues.	4	7h 7m ☌ ☿ ☾, ☿ 2° 33′ S.		324O1
● Wed.	5	10h 58m N.W.; Partial Eclipse of Sun invisible in Canada (see page 27); 15h 11m ☌ ♁ ☾, ♁ 0° 41′ N.	3 40	31O4*
Thur.	6			O3124
Fri.	7			12O34
Sat.	8	3h 20m ☌ ♁ ☉; 20h 48m ☌ ♀ ☾, ♀ 5° 27′ N.	0 30	2O134
Sun.	9	9h □ ♃ ☉		O324*
Mon.	10		21 20	31O24
Tues.	11	14h ☿ Greatest Hel. Lat. S.; 17h ☾ in Apogee		32O14
Wed.	12			31O4*
◑ Thur.	13	11h 50m Moon F.Q.	18 10	O4312
Fri.	14	21h ☌ ☿ ♁, ☿ 1° 21′ S.		412O3
Sat.	15			42O13
Sun.	16		15 00	41O32
Mon.	17	22h 52m ☌ ♆ ☾, ♆ 1° 34′ N.		d43O2
Tues.	18			432O1
Wed.	19		11 50	4312O
♈ Thur.	20	16h 20m ☉ enters ♈, Spring commences; 23h 30m F.M.		4O12*
Fri.	21			d14O3
Sat.	22	5h ☌ ☿ ☉ Superior	8 40	2O143
Sun.	23	0h 59m ☌ ♄ ☾, ♄ 1° 49′ S.; 12h ☾ in Perigee		1O234
Mon.	24			3O124
Tues.	25		5 20	32O4*
Wed.	26	9h 42m ☌ ♃ ☾, ♃ 4° 16′ S.		321O4
☾ Thur.	27	15h 24m Moon L.Q.		O124*
Fri.	28	3h 34m ☌ ☌ ☾, ☌ 4° 24′ S.	2 10	1O234
Sat.	29			2O143
Sun.	30	12h ♀ in Perihelion; 14h ☿ in ♌	23 00	14O23
Mon.	31			43O12

Explanation of symbols and abbreviations on page 4.

THE SKY FOR APRIL, 1924

The Sun.—During April the sun's R.A. increases from 0h 42m to 2h 30m, and its Decl. increases from 4° 32′ N to 14° 46′ N. The equation of time changes from +4m 58s to −2m 50s (see page 6). For the length of the day in various latitudes consult page 13. On the 22nd the sun enters the second spring sign, Taurus.

The Moon.—For its phases and conjunctions with the planets see opposite page. On April 7, the moon occults two stars in Taurus, on April 8 a star in Taurus, and on April 20 a star in Libra (see page 8).

Mercury on the 15th is in R.A. 2h 46m, Decl. 18° 48′ N, and transits at 13.13 (L.M.T.). On the 16th the planet reaches greatest elongation east 19° 53′. Mercury now appears as an evening star and can be picked up in the west at sunset 15° above the horizon. It is in an excellent position for observation.

Venus on the 15th is in R.A. 4h 34m, Decl. 25° 10′ N, and transits at 15.01 (L.M.T.). On the 21st the planet reaches its greatest elongation east 45° 40′. Its stellar magnitude on the 15th is −3.9. The planet is a very bright evening star and is in an excellent position for observation.

Mars on the 15th is in R.A. 19h 47m, Decl. 22° 12′ S, and transits at 6.14 (L.M.T.). On the 15th the planet's stellar magnitude is +0.4. The planet is in the constellation Sagittarius.

Jupiter on the 15th is in R.A. 17h 16m, Decl. 22° 20′ S, and transits at 3.40 (L.M.T.). The planet is visible most of the night rising 4½ hours after sunset. On the 5th the planet is stationary and then commences to retrograde. Its stellar magnitude on the 15th is −1.9. For its position among the stars, see page 23. For the configuration of its satellites, see next page, and for their eclipse, etc., see page 52.

Saturn on the 15th is in R.A. 13h 53m Decl. 8° 39′ S, and transits at 0.22 (L.M.T.). On the 18th the planet is in opposition with the sun, and is visible all night. Its stellar magnitude is +0.4 considerably brighter than a month ago. For its position among the stars, see page 24.

Uranus on the 15th is in R.A. 23h 23m, Decl. 4° 46′ S, and transits at 9.34 (L.M.T.).

Neptune on the 15th in in R.A. 9h 21m, Decl. 15° 48′ N, and transits at 19.38 (L.M.T.).

For information regarding *Uranus* and *Neptune*, see page 25.

APRIL

ASTRONOMICAL PHENOMENA

(75th Meridian Time, Hours Numbering from Midnight)

			Minima of Algol		Configurations of Jupiter's Satellites at 2h 15m
			h	m	
Tues.	1				4302*
Wed.	2	0h 59m ☌ ♁ ☾, ♁ 0° 50′ N.	19	50	d4320
Thur.	3				43012
● Fri.	4	2h 17m N.M.; 5h ☿ in Perihelion			41023
Sat.	5	4h 5m ☌ ☿ ☾, ☿ 5° 41′ N.; 21h ♃ Stationary	16	40	42013
Sun.	6				4103*
Mon.	7				d4012
Tues.	8	0h 22m ☌ ♀ ☾, ♀ 8° 2′ N.; 10h ☾ in Apogee	13	30	31204
Wed.	9				32014
Thur.	10				30124
Fri.	11		10	20	10234
◑ Sat.	12	6h 12m Moon F.Q.			20134
Sun.	13	11h □ ☌ ☉			1034*
Mon.	14	7h 34m ☌ ♆ ☾, ♆ 1° 28′ N.; 11h ☿ Greatest Hel. Lat. N.	7	10	03124
Tues.	15				31204
Wed.	16	22h ☿ Greatest Elong. E. 19° 53′			32401
Thur.	17		4	00	4302*
Fri.	18				41032
♋ Sat.	19	3h ☍ ♄ ☉; 7h 53m ☌ ♄ ☾, ♄ 1° 39′ S.; 9h 11m F.M.			42013
Sun.	20	15h ☾ in Perigee	0	50	41203
Mon.	21	12h ♀ Greatest Hel. Lat. N.; 22h ♀ Greatest Elong. E. 45° 40′			40312
Tues.	22	16h 47m ☌ ♃ ☾, ♃ 4° 5′ S.	21	30	d4310
Wed.	23				34201
Thur.	24				31042
☾ Fri.	25	16h 13m ☌ ☌ ☾, ☌ 3° 50′ S.; 23h 28m Moon L.Q.	18	20	d0324
Sat.	26				20134
Sun.	27	10h ☿ Stationary			21034
Mon.	28	9h ♆ Stationary	15	10	03124
Tues.	29	9h 0m ☌ ♁ ☾, ♁ 1° 4′ N.			31024
Wed.	30				32014

Explanation of symbols and abbreviations on page 4.

THE SKY FOR MAY, 1924

The Sun.—During May the sun's R.A. increases from 2h 34m to 4h 32m, and its Decl. from 15° 5′ N to 21° 55′ N. The equation of time increases from 2m 57s to a maximum of 3m 47s on the 14th, and then falls to 2m 32s on the 31st (see page 6). For changes in the length of day see page 14. On the 21st the sun enters Gemini the third sign of the zodiac.

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

Mercury on the 15th is in R.A. 2h 45m, Decl. 13° 52′ N, and transits at 11.14 (L.M.T.). On the 7th the planet is at inferior conjunction and crosses the face of the sun (See opposite page). This is an interesting observation, to be made with a small telescope.

Venus on the 15th is in R.A. 6h 33m, Decl. 26° 52′ N, and transits at 15.01 (L.M.T.). On the 15th its stellar magnitude is −4.2. The planet is a very bright evening star and is still in a very good position for observation.

Mars on the 15th is in R.A. 20h 59m, Decl. 19° 13′ S, and transits at 5.28 (L.M.T.). Its stellar magnitude is still increasing and is −0.2 on the 15th.

Jupiter on the 15th is in R.A. 17h 6m, Decl. 22° 10′ S, and transits at 1.32. Its stellar magnitude is −2.1. For the configuration of its satellites, see next page, and for their eclipses, etc., see page 52. The planet is visible practically all night.

Saturn on the 15th is in R.A. 13h 45m, Decl. 7° 55′ S, and transits at 22.11 (L.M.T.). It is in an excellent position for observation and its stellar magnitude is +0.5. For its position among the stars, see page 24.

Uranus on the 15th is in R.A. 23h 27m, Decl. 4° 22′ S, and transits at 8.00 (L.M.T.).

Neptune on the 15th is in R.A. 9h 21m, Decl. 15° 48′ N, and transits at 17.56 (L.M.T.).

For information regarding *Uranus* and *Neptune*, see page 25.

MAY

ASTRONOMICAL PHENOMENA

(75th Meridian Time, Hours Numbering from Midnight)

			Minima of Algol	Configurations of Jupiter's Satellites at 1h 0m
			h m	
	Thur.	1	12 00	31O24
	Fri.	2		O142*
♍	Sat.	3 18h 0m N.M.		42O3*
	Sun.	4 2h 54m ☌ ☿ ☾, ☿ 6° 12′ N.	8 50	421O3
	Mon.	5 21h ☾ in Apogee		4O132
	Tues.	6		413O2
	Wed.	7 −−☿ Transit, partly visible in Canada (see page 27); 20h 1m ☌ ♀ ☾, ♀ 7° 56′ N.; 21h ☌ ☿ ☉ Inferior; 22h ☿ in ♉	5 40	432O1
	Thur.	8 7h □ ♆ ☉		431O*
	Fri.	9		43O12
	Sat.	10	2 30	42O3*
♎	Sun.	11 15h 25m ☌ ♆ ☾, ♆ 1° 13′ N.; 21h 14m Moon F.Q.		21O43
	Mon.	12	23 20	O1234
	Tues.	13		13O24
	Wed.	14		32O14
	Thur.	15	20 00	31O4*
	Fri.	16 15h 28m ☌ ♄ ☾, ♄ 1° 40′ S.		3O124
	Sat.	17		12O34
♏	Sun.	18 5h ☿ in Aphelion; 16h 52m F.M.	16 50	d2O43
	Mon.	19 0h ☾ in Perigee; 22h 46m ☌ ♃ ☾, ♃ 4° 3′ S.		4O123
	Tues.	20 3h ☿ Stationary		413O2
	Wed.	21	13 40	432O1
	Thur.	22		4312O
	Fri.	23		43O12
	Sat.	24 3h 19m ☌ ♂ ☾, ♂ 3° 25′ S.	10 30	d41O3
☾	Sun.	25 0h ♀ Greatest brilliancy; 9h 16m Moon L.Q.		42O13
	Mon.	26 16h 13m ☌ ♁ ☾, ♁ 1° 22′ N.		4O23*
	Tues.	27	7 20	d14O2
	Wed.	28		32O14
	Thur.	29		312O4
	Fri.	30	4 10	3O124
	Sat.	31 4h 52m ☌ ☿ ☾, ☿ 1° 15′ N.		1O234

Explanation of symbols and abbreviations on page 4.

THE SKY FOR JUNE, 1924

The Sun.—During June the sun's R.A. increases from 4h 36m to 6h 37m, and its Decl. to the maximum 23° 27′ on the 21st. On that date the sun enters the first summer sign, Cancer, and our days are longest (see page 15). The Decl. falls to 23° 11′ on the 30th (see page 6). The increase in the equation of time taken with the decreasing length of day causes local mean 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 June 11 the moon occults a star in Virgo, on June 14 a star in Libra, and on June 28 three stars in Taurus (see page 8).

Mercury on the 15th is in R.A. 4h 8m, Decl. 18° 48′ N, and transits at 10.34 (L.M.T.). On the 3rd the planet reaches its greatest elongation west 24° 15′. Although at a considerable distance from the sun, its altitude at sunrise is only about 10°. It might be located with a field glass. Look 10° N. of the E. point.

Venus on the 15th is in R.A. 7h 14m, Decl. 22° 38′ N, and transits at 13.40 (L.T.M.). Its stellar magnitude has decreased to −3.9 on the 15th, and the planet is not in nearly as good a position for observation as a month ago. It is gradually overtaking the sun. It can still be seen as an evening star for an hour after sunset.

Mars on the 15th is in R.A. 22h 0m, Decl. 15° 59′ S, and transits at 4.27 (L.M.T.). The planet is now coming into the constellation of Aquarius. Its stellar magnitude on the 15th is −1.0.

Jupiter on the 15th is in R.A. 16h 50m, Decl. 21° 49′ S, and transits at 23.19 (L.M.T.). On the 5th the planet was in opposition with the sun and was consequently in the very best position for observation, being visible all night. Its stellar magnitude on the 15th is −2.1. For the configurations of its satellites, see next page, and for their eclipses, etc. see page 52.

Saturn on the 15th is in R.A. 13h 39m, Decl. 7° 31′ S, and transits at 20.04 (L.M.T.). On the 29th the planet is stationary and it begins to move eastward again; at that time it is in R.A. 13h 39′, Decl. 7° 31′ S, about 18m E and 3° 14′ N of Spica. It is still a good evening star of stellar magnitude +0.7 which is fainter than a month ago. For its position among the stars see page 24.

Uranus on the 15th is in R.A. 23h 30m, Decl. 4° 6′ S, and transits at 5.49 (L.M.T.).

Neptune on the 15th is in R.A. 9h 23m, Decl. 15° 38′ N, and transits at 15.48 (L.M.T.).

For information regarding *Uranus* and *Neptune*, see page 25.

JUNE

ASTRONOMICAL PHENOMENA

(75th Meridian Time, Hours Numbering from Midnight)

			Minima of Algol		Configurations of Jupiter's Satellites at 0h 0m
			h	m	
	Sun.	1			20134
●	Mon.	2 0h ☾ in Apogee; 9h 34m N.M.	1	00	10234
	Tues.	3 16h ☿ Greatest Elong. W. 24° 15′			d0324
	Wed.	4	21	50	32014
	Thur.	5 10h 22m ☌ ♀ ☾, ♀ 5° 6′ N.; 19h ☍ ♃ ☉			32140
	Fri.	6			43012
	Sat.	7 13h ☿ Greatest Hel. Lat. S.; 22h 20m ☌ ♆ ☾, ♆ 0° 56′ N.	18	40	41032
	Sun.	8			42013
	Mon.	9 6h ♀ Stationary			4103*
◑	Tues.	10 8h 37m Moon F.Q.	15	30	40132
	Wed.	11			43201
	Thur.	12h □ ♁ ☉; 22h 53m ☌ ♄ ☾, ♄ 1° 54′ S.			34210
	Fri.	13	12	10	30412
	Sat.	14			10324
	Sun.	15			20134
♋	Mon.	16 4h 6m ☌ ♃ ☾, ♃ 4° 11′ S.; 10h ☾ in Perigee; 13h ♀ in ♉; 23h 41m F.M.	9	00	1034*
	Tues.	17			01324
	Wed.	18			3204*
	Thur.	19	5	50	32104
	Fri.	20			30124
	Sat.	21 10h 16m ☌ ♂ ☾, ♂ 3° 37′ S.; 12h 0m ☉ enters ♋, Summer commences.			1042*
	Sun.	22 23h 44m ☌ ♁ ☾, ♁ 1° 38′ N.	2	40	24013
☾	Mon.	23 21h 16m Moon L.Q.			41203
	Tues.	24	23	30	40132
	Wed.	25			43120
	Thur.	26 13h ☿ in ♌; 15h ♁ Stationary			d4320
	Fri.	27	20	20	43012
	Sat.	28			41302
	Sun.	29 6h ☾ in Apogee; 21h ♄ Stationary			24013
	Mon.	30	17	10	12043

Explanation of symbols and abbreviations on page 4.

THE SKY FOR JULY, 1924

The Sun.—During July the sun's R.A. increases from 6h 41m to 8h 42m, and its Decl. decreases from 23° 7′ N to 18° 17′ N. The equation of time increases from 3m 36s on the 1st to 6m 20s on the 26th, and then falls to 6m 13s on the 31st (see page 7). On the 20th the sun enters Leo, the second summer sign of the zodiac. For changes in the length of the day, see page 16. The earth is in aphelion on July 3rd, 94,459,700 miles distant.

The Moon.—For its phases and conjunctions with the planets see opposite page. On July 23 the moon occults a star in Cetus, on July 24 a star in Taurus, on July a star in Taurus, and on July 26 a star in Taurus (see page 8).

Mercury on the 15th is in R.A. 8h 26m, Decl. 21° 6′ N, and transits at 12.54 (L.M.T.). On the 5th the planet is in superior conjunction and during the month it is too close to the sun for observation.

Venus on the 15th is in R.A. 6h 9m, Decl. 17° 53′ N, and transits at 10.37 (L.M.T.). On the 1st the planet was at inferior conjunction with the sun and consequently it is now a morning star. At sunrise it is 12° above the horizon, and rises an hour before the sun. Its stellar magnitude is −3.7.

Mars on the 15th is in R.A. 22h 35m, Decl. 14° 47′ S, and transits at 3.04 (L.M.T.). On the 28th the planet reaches its stationary position and begins to retrograde. On the 15th its stellar magnitude is −1.8.

Jupiter on the 15th is in R.A. 16h 37m, Decl. 21° 31′ S, and transits at 21.04. On the 15th its stellar magnitude is −2.0. For the configuration of its satellites, see next page, and for their eclipses, etc. see page 52.

Saturn on the 15th is in R.A. 13h 39m, Decl. 7° 40′ S, and transits at 18.06 (L.M.T.). The planet is still a prominent evening star of stellar magnitude +0.9 which is fainter than a month ago. For its position among the stars, see page 24.

Uranus on the 15th is in R.A. 23h 30m, Decl. 4° 9′ S, and transits at 3.54 (L.M.T.).

Neptune on the 15th is in R.A. 9h 26m, Decl. 15° 24′ N, and transits at 13.54 (L.M.T.).

For information regarding *Uranus* and *Neptune*, see page 25.

JULY

ASTRONOMICAL PHENOMENA

(75th Meridian Time, Hours Numbering from Midnight)

			Minima of Algol h m	Configurations of Jupiter's Satellites at 22h 45m
	Tues.	1 4h ☿ in Perihelion; 8h ☌ ♀ ⊙ Inferior; 14h 33m ☌ ☿ ☾, ☿ 4° 43′ N.; 22h 27m ☌ ♀ ☾, ♀ 0° 6′ N.		13O24
●	Wed.	2 0h 35m N.M.		32O14
	Thur.	3 1h ☌ ♀ ☿, ☿ 4° 49′ N.; 9h ⊕ in Aphelion, 94,458,800 miles distant	14 00	3O24*
	Fri.	4		31O24
	Sat.	5 5h 9m ☌ ♆ ☾, ♆ 0° 43′ N.; 13h ☌ ☿ ⊙ Superior.		2O134
	Sun.	6	10 50	21O43
	Mon.	7		4O123
	Tues.	8		413O2
◗	Wed.	9 16h 46m Moon F.Q.	7 30	432O1
	Thur.	10 5h 54m ☌ ♄ ☾, ♄ 2° 13′ S.		431O*
	Fri.	11 11h ☿ Greatest Hel. Lat. N.		431O2
	Sat.	12	4 20	42O13
	Sun.	13 9h 17m ☌ ♃ ☾, ♃ 4° 27′ S.		421O3
	Mon.	14 17h ☾ in Perigee		4O123
	Tues.	15	1 10	14O32
○	Wed.	16 6h 49m F.M.		32O14
	Thur.	17	22 00	31O4*
	Fri.	18 17h □ ♄ ⊙		d3O24
	Sat.	19 7h 34m ☌ ♂ ☾, ♂ 4° 44′ S.		2O134
	Sun.	20 7h 57m ☌ ♁ ☾, ♁ 1° 46′ N.	18 50	21O34
	Mon.	21 1h ♀ in Aphelion		O1234
	Tues.	22 23h ♀ Stationary		1O324
☾	Wed.	23 11h 36m Moon L.Q.; 16h ☌ ☿ ♆, ☿ 1° 10′ N.	15 40	32O41
	Thur.	24		3412O
	Fri.	25 23h ♂ Stationary		43O12
	Sat.	26 20h ☾ in Apogee	12 30	42O**
	Sun.	27		421O3
	Mon.	28 14h 29m ☌ ♀ ☾, ♀ 1° 45′ S.		4O213
	Tues.	29	9 20	41O32
	Wed.	30		4321O
●	Thur.	31 14h 42m N.M.; Partial Elipse of Sun invisible in Canada (see page 27)		3412O

Explanation of symbols and abbreviations on page 4.

THE SKY FOR AUGUST, 1924

The Sun.—During August the sun's R.A. increases from 8h 45m to 10h 38m, and its Decl. decreases from 18° 2′ N to 8° 39′ N. The equation of time falls from 6m 10s to 0m 16s (see page 7), and for changes in the length of day see page 17. On the 21st the sun enters the third summer sign, Virgo.

The Moon.—For its phases and conjunctions with the planets see opposite page. On August 2 the moon occults the planet Mercury, and also a star in Leo (see page 8).

Mercury on the 15th is in R.A. 11h 19m, Decl. 2° 19′ N, and transits at 13.45 (L.M.T.). On the 14th the planet reaches its greatest elongation east 27° 26′. The planet at sunset is 8° above the horizon and sets an hour and a quarter after the sun.

Venus on the 15th is in R.A. 6h 41m, Decl. 18° 16′ N and transits at 9.06 (L.M.T.). Its stellar magnitude has increased to −4.2 and it is a very good morning star. It rises 3½ hours before the sun, and reaches a height of over 30° above the horizon.

Mars on the 15th is in R.A. 22h 27m, Decl. 16° 57′ S, and transits at 0.55. Its stellar magnitude is −2.6. On the 23rd the planet is in opposition with the sun and consequently can be observed to advantage.

Jupiter on the 15th is in R.A. 16h 34m, Decl. 21° 31′ S, and transits at 18.59. Its stellar magnitude is −1.9. On the 6th the planet is stationary and then begins to advance. Jupiter will be seen in the west as an evening star. For configuration of its satellites, see next page, for their eclipses, etc., see page 52.

Saturn on the 15th is in R.A. 13h 45m, Decl. 8° 21′ S and transits at 16.14 (L.M.T.). The sun is creeping in on the planet and the planet sets about 2 hours after it. It is of stellar magnitude +1.0 which is its minimum value. For its position among the stars, see page 24.

Uranus on the 15th is in R.A. 23h 27m, Decl. 4° 28′ S, and transits at 1.50 (L.M.T.).

Neptune on the 15th is in R.A. 9h 31m, Decl. 15° 1′ N and transits at 11.56 (L.M.T.).

For information regarding *Uranus* and *Neptune*, see page 25.

AUGUST

ASTRONOMICAL PHENOMENA

(75th Meridian Time, Hours Numbering from Midnight)

			Minima of Algol		Configurations of Jupiter's Satellites at 21h 30m
			h	m	
Fri.	1	12h 57m ☌ ♆ ☾, ♆ 0° 35′ N.	6	10	3O412
Sat.	2	16h 9m ☌ ☿ ☾, ☿ 0° 55′ S.			1O24*
Sun.	3	22h ☿ in ♉			d2O34
Mon.	4		3	00	O2134
Tues.	5	16h ♂ Greatest Hel. Lat. S.			1O324
Wed.	6	13h 19m ☌ ♄ ☾, ♄ 2° 29′ S.	23	40	23O14
☽ Thur.	7	1h ♃ Stationary; 5h ♀ Greatest brilliancy; 22h 41m Moon F.Q.			321O4
Fri.	8				3O124
Sat.	9	15h 13m ☌ ♃ ☾, ♃ 4° 38′ S.	20	30	13O42
Sun.	10				24O13
Mon.	11	15h ☾ in Perigee			4O3**
Tues.	12	10h ♀ Greatest Hel. Lat. S.; 23h ☌ ♆ ☉	17	20	41O23
Wed.	13				423O1
♋ Thur.	14	4h ☿ in Aphelion; 15h 19m F.M.; Total Eclipse invisible in Canada (see page 27)			4321O
Fri.	15	4h ☿ Greatest Elong. E. 27° 26′; 13h 20m ☌ ♂ ☾, ♂ 6° 8′ S.	14	10	43O12
Sat.	16	16h 16m ☌ ♁ ☾, ♁ 1° 44′ N.			413O2
Sun.	17				24O13
Mon.	18		11	00	O43**
Tues.	19				1O234
Wed.	20				23O14
Thur.	21		7	50	321O4
☾ Fri.	22	4h 10m Moon L.Q.; 19h ♂ nearest ⊕, 34,637,400 miles distant (see page 22)			3O214
Sat.	23	12h ☍ ♂ ☉; 13h ☾ in Apogee			31O24
Sun.	24		4	40	2O134
Mon.	25				21O43
Tues.	26	6h 28m ☌ ♀ ☾, ♀ 0° 50′ S.			d4O23
Wed.	27		1	30	42O31
Thur.	28	8h ☿ Stationary; 22h 15m ☌ ♆ ☾, ♆ 0° 30′ N.			4321O
Fri.	29		22	20	43O21
♍ Sat.	30	3h 37m N.M.; Partial Eclipse of Sun, invisible in Canada (see page 27); 11h ♂ in Perihelion			431O2
Sun.		10h 13m ☌ ☿ ☾, ☿ 7° 35′ S.			42O31

Explanation of symbols and abbreviations on page 4.

THE SKY FOR SEPTEMBER, 1924

The Sun.—During September the sun's R.A. increases from 10h 42m to 12h 26m, and its Decl. changes from 8° 39′ N to 2° 48′ S. The equation of time becomes zero on the 2nd and then increases to 9m 59s. For change in the length of day see page 18. On the 23rd the sun crosses the equator and enters Libra, the first autumn sign of the zodiac.

The Moon.—For its phases and conjunctions with the planets see opposite page. On September 16 the moon occults a star in Cetus, on September 17 a star in Taurus, and on September 18 two stars in Taurus, one being Aldebaran (see page 8).

Mercury on the 15th is in R.A. 11h 1m, Decl. 3° 50′ N, and transits at 11.18 (L.M.T.). On the 11th the planet is at inferior conjunction, and on the 26th it reaches its greatest elongation west 17° 52′. The planet is a morning star now and is in a fine position for observation; it rises 1½ hours before the sun and at sunrise has an altitude of 17°. Its stellar magnitude is −0.1 on the 26th.

Venus on the 15th is in R.A. 8h 33m, Decl. 16° 47′ N, and transits at 8.57 (L.M.T.) On the 9th the planet reaches its greatest elongation W. of 46° 0′. This is the best position of the planet as a morning star. On the 15th its stellar magnitude is −4.0.

Mars on the 15th is in R.A. 22h 0m, Decl. 18° 16′ S, and transits at 22.21 (L.M.T.). Its stellar magnitude on the 15th being −2.2. On the 24th the planet is stationary and then begins to advance.

Jupiter on the 15th is in R.A. 16h 43m, Decl. 21° 55′ S and transits at 17.06 (L.M.T.). Its stellar magnitude is decreasing being −1.7 on the 15th. The planet is an evening star and sets 3½ hours after the sun. For the configuration of its satellites see next page, and for their eclipses, etc. see page 52.

Saturn on the 15th is in R.A. 13h 56m, Decl. 9° 25′ S and transits at 14.22 (L.M.T.). The planet is approaching conjunction and sets 1½ hours after sunset. Its stellar magnitude is +0.9.

Uranus on the 15th is in R.A. 23h 22m, Decl. 4° 56′ S, and transits at 23.44 (L.M.T.).

Neptune on the 15th is in R.A. 9h 35m, Decl. 14° 40′ N, and transits at 9.55 (L.M.T.).

For information regarding *Uranus* and *Neptune*, see page 25.

SEPTEMBER

ASTRONOMICAL PHENOMENA

(75th Meridian Time, Hours Numbering from Midnight)

			Minima of Algol	Configurations of Jupiter's Satellites at 20h 0m
			h m	
Mon.	1		19 00	42103
Tues.	2	22h 29m ♂ ♄ ☾, ♄ 2° 38′ S.		40123
Wed.	3	13h ☿ Greatest Hel. Lat. S.; 21h □ ♃ ☉		4023*
Thur.	4		15 50	23104
Fri.	5	23h 13m ♂ ♃ ☾, ♃ 4° 39′ S.		3014*
● Sat.	6	3h 46m Moon F.Q.		31024
Sun.	7	2h ☾ in Perigee	12 40	20314
Mon.	8			21034
Tues.	9			01234
Wed.	10	1h ♀ Greatest Elong. W. 46° 0′	9 30	10234
Thur.	11	8h ♂ ☿ ☉ Inferior; 10h 56m ♂ ♂ ☾, ♂ 5° 46′ S.		d2304
Fri.	12	9h ♂ ♁ ☉; 23h 38m ♂ ♁ ☾, ♁ 1° 37′ N.		3401*
○ Sat.	13	2h 0m F.M.	6 20	34102
Sun.	14			4201*
Mon.	15			42103
Tues.	16		3 10	40123
Wed.	17			41023
Thur.	18			42301
Fri.	19	19h ☿ Stationary	0 00	3420*
☾ Sat.	20	8h ☾ in Apogee; 22h 35m Moon L.Q.		31402
Sun.	21		20 50	32014
Mon.	22	13h ☿ in ♌		21034
Tues.	23	2h 59m ☉ enters ♎ Autumn commences		02134
Wed.	24	8h ♂ Stationary; 22h 23m ♂ ♀ ☾, ♀ 0° 31′ S.	17 40	10234
Thur.	25	8h 41m ♂ ♆ ☾, ♆ 0° 22′ N.		23014
Fri.	26			3204*
Sat.	27	3h ☿ in Perihelion, 4h ☿ Greatest Elong. W, 17° 52′; 4h 46m ♂ ☿ ☾, ☿ 1° 2′ S.	14 20	31024
● Sun.	28	15h 16m N.M.		d3014
Mon.	29			21403
Tues.	30	4h ♂ ♀ ♆ ♀ 0° 56′ S.; 10h 28m ♂ ♄ ☾, ♄ 2° 43′ S.	11 10	40213

Explanation of symbols and abbreviations on page 4.

THE SKY FOR OCTOBER, 1924

The Sun.—During October the sun's R.A. increases from 12h 29m to 14h 22m, and its Decl. increases from 3° 11′ S to 14° 7′ S. On the 25th the sun enters the second autumnal sign, Scorpio. The equation of time rises from 10m 18s to 16m 19s to be subtracted from the apparent time (see page 7). For change in the length of the day, see page 19.

The Moon.—For its phases and conjunctions with the planets, see opposite page. On October 22 the moon occults a star in Leo, Regulus (see page 8).

Mercury on the 15th is in R.A. 13h 1m, Decl. 4° 12′ S, and transits at 11.20 (L.M.T.). On the 25th the planet reaches superior conjunction. The planet is still a morning star but is rapidly approaching the sun, and therefore is not well situated for observation.

Venus on the 15th is in R.A. 10h 43m, Decl. 8° 44′ N, and transits at 9.08 (L.M.T.). Its stellar magnitude is decreasing and on the 15th is −3.7. It is still, however, a fine morning star and rises 3½ hours before sunrise.

Mars on the 15th is in R.A. 22h 8m, Decl. 15° 4′ S, and transits at 20.32 (L.M.T.). The stellar magnitude is decidedly less than last month being −1.3 on the 15th. The planet will be seen as an evening star.

Jupiter on the 15th is in R.A. 17h 2m, Decl. 22° 29′ S, and transits at 15.27 (L.M.T.). Its stellar magnitude is −1.5 on the 15th. Jupiter is still an evening star. Its height at sunset being 18° above the horizon. It sets 2½ hours after the sun. Its stellar magnitude is −1.5.

Saturn on the 15th is in R.A. 14h 8m, Decl. 10° 37′ S, and transits at 12.33 (L.M.T.). On the 28th the planet is in conjunction with the sun and consequently its position is not suitable for observation.

Uranus on the 15th is in R.A. 23h 18m, Decl. 5° 22′ S, and transits at 21.42 (L.M.T.).

Neptune on the 15th is in R.A. 9h 38m, Decl. 14° 24′ N, and transits at 8.00 (L.M.T.).

For information regarding *Uranus* and *Neptune*, see page 25.

OCTOBER

ASTRONOMICAL PHENOMENA

(75th Meridian Time, Hours Numbering from Midnight)

			Minima of Algol	Configurations of Jupiter's Satellites at 19h 0m
			h m	
	Wed.	1		41023
	Thur.	2 9h ☾ in Perigee		d4201
	Fri.	3 10h 36m ☌ ♃ ☾, ♃ 4° 27′ S.	8 00	43210
	Sat.	4		d4302
☽	Sun.	5 9h 30m Moon F.Q.		4302*
	Mon.	6	4 50	24103
	Tues.	7 10h ☿ Greatest Hel. Lat. N.; 17h ♀ in ♌		0413*
	Wed.	8 18h 7m ☌ ♂ ☾, ♂ 3° 28′ S.		10243
	Thur.	9	1 40	20314
	Fri.	10 5h 17m ☌ ♁ ☾, ♁ 1° 34′ N.		32104
	Sat.	11	22 30	30124
☺	Sun.	12 15h 21m F.M.		3024*
	Mon.	13		2104*
	Tues.	14	19 20	0143*
	Wed.	15		10423
	Thur.	16		42031
	Fri.	17	16 10	42310
	Sat.	18 3h ☾ in Apogee		43012
	Sun.	19		43102
☾	Mon.	20 17h 54m Moon L.Q.	13 00	d420*
	Tues.	21		42013
	Wed.	22 19h 1m ☌ ♆ ☾, ♆ 0° 8′ N.		41023
	Thur.	23	9 50	42013
	Fri.	24 21h 6m ☌ ♀ ☾, ♀ 1° 28′ S.		21304
	Sat.	25 22h ☌ ☿ ☉ Superior		30214
	Sun.	26	6 30	31024
	Mon.	27 22h ☌ ☿ ♄, ♄ 1° 59′ S.		23014
♏	Tues.	28 1h 15m ☌ ♄ ☾, ♄ 2° 47′ S.; 1h 36m ☌ ☿ ☾, ☿ 4° 47′ S.; 1h 57m N.M.; 16h ☌ ♄ ☉		2034*
	Wed.	29	3 20	10234
	Thur.	30 0h ☾ in Perigee; 21h ☿ in ♉		d0134
	Fri.	31 2h 9m ☌ ♃ ☾, ♃ 4° 7′ S.		21304

Explanation of symbols and abbreviations on page 4.

THE SKY FOR NOVEMBER, 1924

The Sun.—During November the sun's R.A. increases from 14h 26m to 16h 25m, and its Decl. changes from 14° 26′ S to 21° 39′ S. On the 24th the sun enters Sagittarius the third Autumn sign of the zodiac. The equation of time rises to a maximum of 16m 22s on the 3rd (see page 7). For changes in the length of the day, see page 20.

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

Mercury on the 15th is in R.A. 16h 9m, Decl. 22° 38′ S, and transits at 12.32 (L.M.T.). Mercury is now an evening star, but it is too close to the horizon to be suitable for observation, it being practically on the horizon at sunset.

Venus on the 15th is in R.A. 13h 0m, Decl. 4° 23′ S, and transits at 9.22 (L.M.T.). At sunrise the planet is 33° above the S.E. point of the horizon.

Mars on the 15th is in R.A. 22h 53m, Decl. 8° 49′ S, and transits at 19.15 (L.M.T.). Its stellar magnitude is −0.5 or 1.8 magnitudes brighter than Fomalhaut which is 21° south of Mars.

Jupiter on the 15th is in R.A. 17h 28m, Decl. 23° 1′ S, and transits at 13.51 and has a stellar magnitude of −1.4, and at sunset is 11° above the horizon. It sets an hour and a half after sunset.

Saturn on the 15th is in R.A. 14h 23m, Decl. 11° 49′ S, and transits at 10.42 (L.M.T.). It is now a morning star rising about 2 hours before the sun on the 15th. Stellar magnitude +0.8.

Uranus on the 15th is in R.A. 23° 16′, Decl. 5° 36′ S, and transits at 19.37 (L.M.T.).

Neptune on the 15th is in R.A. 9h 40m, Decl. 14° 17′ N, and transits at 6.00 (L.M.T.).

For information regarding *Uranus* and *Neptune*, see page 25.

NOVEMBER

ASTRONOMICAL PHENOMENA

(75th Meridian Time, Hours Numbering from Midnight)

			Minima of Algol	Configuration of Jupiter's Satellites at 17h 45m
			h m	
	Sat.	1	0 10	3O41*
	Sun.	2		341O2
☽	Mon.	3 17h 18m Moon F.Q.	21 00	423O1
	Tues.	4		421O3
	Wed.	5 14h 51m ☌ ♂, ☾, ♂ 0° 33′ S.		d4O23
	Thur.	6 9h 43m ☌ ♁, ☾, ♁ 1° 42′ N.	17 50	4O123
	Fri.	7		d421O
	Sat.	8		43O1*
	Sun.	9	14 40	341O2
	Mon.	10 3h ☿ in Aphelion; 10h ♀ in Perihelion		32O41
♋	Tues.	11 7h 31m F.M.		21O34
	Wed.	12	11 30	dO234
	Thur.	13		O1234
	Fri.	14 20h ☾ in Apogee		21O34
	Sat.	15 0h □ ♆ ☉	8 20	32O14
	Sun.	16		31O24
	Mon.	17		32O14
	Tues.	18	5 10	21O43
☾	Wed.	19 3h 42m ☌ ♆ ☾, ♆ 0° 10′ S.; 12h 38m Moon L.Q.		4O123
	Thur.	20		4O23*
	Fri.	21	1 50	421O3
	Sat.	22		432O1
	Sun.	23 20h 34m ☌ ♀ ☾, ♀ 2° 56′ S.	22 40	431O2
	Mon.	24 17h 29m ☌ ♄ ☾, ♄ 2° 53′ S.		d43O1
	Tues.	25 3h ♆ Stationary		421O*
♍	Wed.	26 12h 16m N.M.	19 30	4O213
	Thur.	27 8h ☾ in Perigee; 8h ♁ Stationary; 11h ☌ ♂, ♂ 0° 16′ S.; 17h 19m ☌ ☿ ☾, ☿ 6° 26′ S.; 21h 32m ☌ ♃ ☾, ♃ 3° 43′ S.		1O423
	Fri.	28		d2O34
	Sat.	29 20h ☌ ☿ ♃, ☿ 2° 36′ S.	16 20	
	Sun.	30 11h ☿ Greatest Hel. Lat. S.		

Explanation of symbols and abbreviations on page 4.

THE SKY FOR DECEMBER, 1924

The Sun.—During December the sun's R.A. increases from 16h 29m, to 18h 46m, and its Decl. reaches a maximum value of 23° 26′ S on the 22nd. On that date the sun enters the first zodiacal sign of winter, Capricornus; and it is vertical to points on the tropic of Capricorn on the earth. From this time it slowly moves northward. The equation of time changes from 10m 54s, watch slow, to 3m 35s, watch fast (see page 7). For changes in the length of day, see page 21.

The Moon—For its phases and conjunctions with the planets see opposite page. On December 7, the moon occults a star in Cetus, on December 22 a star in Libra, on December 27 a star in Capricornus and on December 29 a star in Aquarius (see page 8).

Mercury on the 15th is in R.A. 18h 55m, Decl. 23° 57′ S, and transits at 13.19 (L.M.T.). On the 9th the planet reaches its greatest elongation east 20° 49′, and on the 26th is in inferior conjunction. The planet on the 9th is in a fair position to be seen as an evening star, being about 15° above the horizon at sunset. Its stellar magnitude is +0.2 on the 15th.

Venus on the 15th is in R.A. 15h 21m, Decl. 16° 41′ S and transits at 9.45 (L.M.T.). The planet is steadily approaching the sun, it now rising only 2 hours before the sun.

Mars on the 15th is in R.A. 23h 52m, Decl. 1° 19′ S, and transits at 18.16 (L.M.T.). Its stellar magnitude is now down to +0.2. At sunset the planet's height is 35° above the horizon and it is seen 35° E of south.

Jupiter on the 15th is in R.A. 17h 57m, Decl. 23° 16′ S, and transits at 12.22. On the 22nd the planet is in conjunction with the sun and consequently is not suitably placed for observation. Its stellar magnitude is −1.4. For the configuration of its satellites, see next page, and for their eclipses, etc., see page 52.

Saturn on the 15th is in R.A. 14h 35m, Decl. 12° 51 S, and transits at 8.57 (L.M.T.). The planet is now a very good morning star. Stellar magnitude +0.8. It rises 3½ hours before sunrise and attains a height of 25°. At sunrise it is 23° E of south.

Uranus on the 15th is in R.A. 23h 16m, Decl. 5° 32′ S and transits at 17.40 (L.M.T.).

Neptune on the 15th is in R.A. 9h 40m, Decl. 14° 19′ N, and transits at 4.02 (L.M.T.).

For information regarding *Uranus* and *Neptune*, see page 25.

DECEMBER

ASTRONOMICAL PHENOMENA

(75th Meridian Time, Hours Numbering from Midnight)

			Minima of Algol h m
	Mon.	1	
	Tues.	2 5h ♀ Greatest Hel. Lat. N.	13 10
☽	Wed.	3 4h 10m Moon F.Q.; 14h 51m ☌ ♁ ☾, ♁ 1° 59′ N.; 20m 57m ☌ ♂ ☾, ♂ 2° 14′ N.	
	Thur.	4	
	Fri.	5 3h ☌ ♀ ♄, ♀ 0° 23′ S.	10 00
	Sat.	6	
	Sun..	7	
	Mon.	8	6 50
	Tues	9 16h ☿ Greatest Elong. E. 20° 49′; 19h □ ♁ ☉	
	Wed.	10	
♋	Thur.	11 2h 3m F.M	3 40
	Fri.	12 4h ☾ in Apogee	
	Sat.	13	
	Sun.	14	0 30
	Mon.	15	
	Tues.	16 10h 0m ☌ Ψ ☾ Ψ 0° 23′ S.	21 10
	Wed.	17 17h ☿ Stationary	
	Thur.	18	
☾	Fri.	19 5h 11m Moon L.Q. 12h ☿ in ♌	18 0
	Sat.	20	
	Sun.	21 21h 46m ☉ enter ♑, Winter commences.	
	Mon.	22 8h 48m ☌ ♄ ☾, ♄ 3° 1′ S.	14 50
	Tues.	23 0h ☌ ♃ ☉; 20h 14m ☌ ♀ ☾, ♀ 3° 33′ S.	
	Wed.	24 3h ☿ in Perihelion.	
♍	Thur.	25 18h □ ♂ ☉; 19h 10m ☌ ♃ ☾, ♃ 3° 20′ S.; 20h ☾ in Perigee; 22h 46m N.M.	11 40
	Fri.	26 3h 3m ☌ ☿ ☾, ☿ 1° 2′ S.	
	Sat.	27 4h ☌ ☿ ☉ Inferior.	
	Sun.	28	8 30
	Mon.	29 5h ☌ ☿ ♃, ☿ 2° 41′ N.	
	Tues.	30 22h 55m ☌ ♁ ☾, ♁ 2° 16′ N.	
	Wed.	31 0h ♂ in ♌	5 20

By reason of the proximity of Jupiter to the sun the phenomena of Jupiter's satellites are not given from November 29 to December 31.

Explanation of symbols and abbreviations on page 4.

PHENOMENA OF JUPITER'S SATELLITES, 1924

E—Eclipse, O—occultation, T—transit, S—shadow, D—disappearance, R—reappearance, I—ingress, e—egress. The Roman numerals denote the satellites.
Eastern Standard Time, hours numbering from Midnight.

JANUARY

d	h	m	Sat.	Phen.	d	h	m	Sat.	Phen.
6	6	35	I	SI	22	5	45	I	TI
7	6	46	I	OR	23	5	15	I	OR
8	6	11	III	ED	24	4	30	II	TI
	6	25	II	OR		4	53	II	Se
14	5	44	I	ED		6	51	II	Te
15	5	6	I	Se	26	6	1	III	Se
	5	8	II	ED	29	6	43	I	SI
	5	57	I	Te	31	4	22	I	Te
19	5	46	III	Te		5	9	II	SI
22	4	50	I	SI					

FEBRUARY

6	4	40	III	OR	18	4	22	II	Te
	5	54	I	ED	20	5	56	III	ED
7	4	10	I	TI	22	4	9	I	ED
	5	14	I	Se	23	3	29	I	Se
	6	20	I	Te		4	41	I	Te
13	4	7	III	ER	24	2	53	III	Te
14	4	58	I	SI	25	4	33	II	Se
	6	6	I	TI		4	41	II	TI
15	5	38	I	OR	29	6	2	I	ED
16	4	37	II	ED					

MARCH

1	3	12	I	SI	18	2	12	I	OR
	4	26	I	TI	19	4	7	II	ED
	5	22	I	Se	20	2	48	III	OD
2	3	57	I	OR		5	5	III	OR
	4	42	III	TI	21	1	36	II	Se
3	4	48	II	SI		1	46	II	TI
5	3	53	II	OR		4	6	II	Te
8	5	5	I	SI	24	3	20	I	SI
9	2	24	I	ED		4	33	I	TI
	3	40	III	SI		5	29	I	Se
	5	50	III	Se	25	4	4	I	OR
	5	51	I	OR	26	1	10	I	Te
10	2	58	I	Te	27	1	43	III	ED
12	3	55	II	ER		3	57	III	ER
	4	5	II	OD	28	1	50	II	SI
16	4	17	I	ED		4	11	II	Se
17	2	41	I	TI		4	16	II	TI
	3	36	I	Se	30	0	45	II	OR
	4	51	I	Te	31	5	13	I	SI

APRIL

1	2	32	I	ED	15	0	41	II	Te
2	0	51	I	TI	16	3	27	I	SI
	1	51	I	Se		4	29	I	TI
	3	1	I	Te	17	0	48	I	ED
4	4	24	II	SI	17	4	0	I	OR
6	3	12	II	OR	18	0	6	I	Se
7	2	17	III	Te		1	6	I	Te
8	4	26	I	ED	20	3	41	II	ED
9	1	34	I	SI	21	3	23	III	SI
	2	40	I	TI	22	0	44	II	TI
	3	44	I	Se		1	12	II	Se
	4	50	I	Te		3	4	II	Te
10	2	11	I	OR	24	2	41	I	ED
13	1	6	II	ED		23	30	III	OR
14	1	41	III	Se		23	49	I	SI
	3	41	III	TI	25	0	43	I	TI

APRIL—*Continued*

d	h	m	Sat.	Phen.	d	h	m	Sat.	Phen.
25	2	0	I	Se	29	3	4	II	TI
	2	53	I	Te		3	46	II	Se
26	0	13	I	OR	30	23	33	II	OR
29	1	24	II	SI					

MAY

d	h	m	Sat.	Phen.	d	h	m	Sat.	Phen.
1	4	34	I	ED	16	23	7	II	Te
	23	51	III	ER	17	2	50	I	ED
2	0	42	III	OD		23	58	I	SI
	1	43	I	SI	18	0	25	I	TI
	2	29	I	TI		2	10	I	Se
	2	57	III	OR		2	36	I	Te
	3	54	I	Se		21	18	I	ED
	4	40	I	Te		23	55	I	OR
	23	3	I	ED	19	21	36	III	Se
3	1	59	I	OR		23	10	III	Te
	22	22	I	Se	22	3	20	II	ED
	23	6	I	Te	23	22	23	II	SI
6	3	58	II	SI		23	1	II	TI
7	2	9	II	ED	24	0	47	II	Se
8	1	52	II	OR		1	22	II	Te
9	1	28	III	ED	25	1	52	I	SI
	3	36	I	SI		2	10	I	TI
	3	49	III	ER		4	4	I	Se
	4	6	III	OD		23	12	I	ED
	4	15	I	TI	26	1	39	I	OR
10	0	56	I	ED		22	33	I	Se
	3	44	I	OR		22	47	I	Te
	22	5	I	SI		23	11	III	SI
	22	41	I	TI	27	0	14	III	TI
11	0	16	I	Se		1	35	III	Se
	0	51	I	Te		2	28	III	Te
	22	11	I	OR	31	0	57	II	SI
15	0	44	II	ED		1	15	II	TI
	4	9	II	OR		3	21	II	Se
16	22	12	II	Se		3	36	II	Te

JUNE

1	3	47	I	SI	13	23	45	III	ER
	3	54	I	TI	15	23	58	II	OD
	21	49	II	OR	16	2	52	II	ER
2	1	6	I	ED	17	1	48	I	TI
	3	22	I	OR	17	2	4	I	SI
	22	15	I	SI		21	11	II	Te
	22	20	I	TI		21	47	II	Se
3	0	27	I	Se		23	5	I	OD
	0	31	I	Te	18	1	34	I	ER
	3	9	III	SI		20	14	I	TI
	3	30	III	TI		20	33	I	SI
	21	48	I	OR		22	25	I	Te
7	3	29	II	TI		22	45	I	Se
	3	31	II	SI	20	23	53	III	OD
8	21	42	II	OD	23	2	14	II	OD
9	0	15	II	ER	24	21	5	II	TI
	2	55	I	OD		21	57	II	SI
10	0	4	I	TI		3	26	II	Te
	0	10	I	SI	25	0	21	II	Se
	2	15	I	Te		0	50	I	OD
	2	22	I	Se		21	59	I	TI
	21	21	I	OD		22	27	I	SI
	23	40	I	ER	26	0	10	I	Te
11	20	41	I	Te		0	39	I	Se
	20	50	I	Se		21	57	I	ER
13	20	36	III	OD					

JULY

d	h	m	Sat.	Phen.	d	h	m	Sat.	Phen.
1	21	34	III	Se	11	22	58	I	Se
	23	21	II	TI	12	20	14	I	ER
2	0	31	II	SI	15	23	34	III	TI
	1	42	II	Te	17	22	23	II	OD
	23	45	I	TI	18	0	34	I	OD
3	0	22	I	SI		21	46	I	TI
	1	56	I	Te		22	41	I	SI
	21	1	I	OD		23	57	I	Te
	21	26	II	ER	19	0	53	I	Se
	23	51	I	ER		21	22	II	Se
4	20	23	I	Te		22	9	I	ER
	21	3	I	Se	25	0	47	II	OD
8	20	7	III	TI		23	35	I	TI
	22	26	III	Te	26	0	36	I	SI
	23	3	III	SI		20	49	I	OD
9	1	33	III	Se		21	10	III	ED
	1	38	II	TI		21	32	II	SI
10	1	31	I	TI		21	53	II	Te
	22	47	I	OD		23	44	III	ER
11	0	4	II	ER		23	57	II	Se
	1	45	I	ER	27	0	3	I	ER
	20	46	I	SI		20	13	I	Te
	22	9	I	Te		21	17	I	Se

AUGUST

2	20	38	III	OD	4	21	16	II	ER
	21	55	II	TI	10	21	44	I	TI
	22	39	I	OD		22	56	I	SI
	23	4	III	OR	11	21	24	II	OR
3	0	7	II	SI		21	26	II	ED
	19	53	I	TI		22	21	I	ER
	21	0	I	SI	13	21	35	III	Se
	22	4	I	Te	18	20	49	I	OD
	23	12	I	Se		21	29	II	OD
4	20	26	I	ER	19	20	16	I	Te

AUGUST—*Continued*

d	h	m	Sat.	Phen.	d	h	m	Sat.	Phen.
19	21	32	I	Se	26	22	10	I	Te
20	20	25	III	Te	27	20	40	I	ER
	20	59	II	Se		21	2	II	Te
	23	0	III	SI		21	8	II	SI
26	19	59	I	TI		21	50	III	TI
	21	16	I	SI	31	19	44	III	ER

SEPTEMBER

2	21	54	I	TI	12	21	16	II	ED
3	21	11	II	TI	14	19	56	III	OD
4	19	52	I	Se	18	20	16	I	TI
5	21	8	II	ER	19	20	53	I	ER
7	21	4	III	ED	21	20	38	II	Se
10	21	1	I	OD	25	18	57	III	SI
11	19	35	I	SI	26	19	23	I	OD
	20	30	I	Te	27	18	55	I	Te
12	18	58	I	ER		20	7	I	Se
	21	8	II	OR					

OCTOBER

4	18	42	I	TI	20	18	9	I	SI
	19	50	I	SI		19	23	I	Te
5	19	12	I	ER	23	17	50	II	SI
13	18	26	I	Se		18	26	II	Te
	19	46	III	ER	30	18	44	II	TI
14	18	55	II	OD					

NOVEMBER

1	18	7	II	ER	13	17	44	I	ER
4	18	20	I	OD	17	17	27	II	Se
5	17	54	I	Te	24	17	31	II	SI
12	17	43	I	TI					

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. 9	Jan. 3	15	20	+	53
Aurigids	Feb. 7-23	Feb. 10	5	0	+	41
Lyrids	April 16-22	April 21	18	4	+	33
η Aquarids	April 29-May 8	May 4-6	22	32	-	2
Herculids	May 13-29	May 24	16	36	+	30
Scorpiids	May-June-July	June 4	16	48	-	21
Sagittids	June-July	July 28	20	12	+	24
Capricornids	July-Aug.	July 22	20	20	-	12
δ Aquarids	July 18-Aug. 12	July 28-31	22	36	-	11
$\alpha\ \beta$ Perseids	July-Aug.-Sept.	Aug. 16	3	12	+	43
Perseids	July 8-Aug. 25	Aug. 11-12	3	4	+	57
Draconis	Aug. 18-25	Aug. 23	19	24	+	61
ϵ Perseids	Aug.-Sept.	Sept. 15	4	8	+	35
Arietids	Aug.-Sept.-Oct.	Sept. 21	2	4	+	19
	Sept.-Oct.	Oct. 15	2	4	+	9
Orionids	Oct. 9-29	Oct. 19	6	8	+	15
μ Ursids Maj.	Oct.-Nov.-Dec.	Nov. 16-25	10	16	+	41
Taurids	November	Nov. 21	4	12	+	23
Leonids	Nov. 9-20	Nov. 14-15	10	0	+	23
Andromedes	Nov. 20-30	Nov. 20-23	1	40	+	43
Geminids	Dec. 1-14	Dec. 11	7	12	+	33

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

The Perseids furnish an annual 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 Tempel'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.

The above table was prepared for the HANDBOOK by Mr. W. F. Denning, F.R.A.S., of Bristol, England; and for further interesting information regarding this subject (and almost any other subject in which the amateur is interested) reference may be made to his *Telescopic Work for Starlight Evenings.*

PRINCIPAL ELEMENTS OF THE SOLAR SYSTEM

Name	Mean Distance from Sun		Sidereal Period		Mean Diameter 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	3009	0.0556	4.7(?)	0.055	88d
♀ Venus	0.723	67.2	224.70	0.62	7575	0.817	4.94	0.88	225d
⊕ Earth	1.000	92.9	365.26	1.00	7917.8	1.000	5.55	1.000	23h 56m 4s
♂ Mars	1.524	141.5	686.97	1.88	4216	0.108	3.92	0.151	24h 37m 23s
♃ Jupiter	5.203	483.3	4332.58	11.86	86728	318.4	1.32	1314	9h 55m ±
♄ Saturn	9.539	886.1	10759.2	29.46	72430	95.2	0.72	765	10h 14m ±
♅ Uranus	19.191	1782.8	30685.9	84.02	30878	14.6	1.22	59	10h 45m ±
♆ Neptune	30.071	2973.4	60187.6	164.79	32932	16.9	1.11	72	?
☉ Sun	....	....	....	....	864392	333400	1.39	1301100	25d 7h 48m±
☾ Moon	From ⊕238,857 mls.		27.32	0.075	2160	0.0123	3.39	0.020	27d 7h 43m 11.5s

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	7,372,000	266 00 d.	Perrine	Dec. 1904
7. (Nameless).	16	7,567,900	276·67 d.	Perrine	Jan. 1905
8. (Nameless).	17	15,600,000	789 d.	Melotte.....	Jan. 1908
9. (Nameless).	19	18,900,000	3 years	Nicholson....	July 1914
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

DOUBLE STARS

Close scrutiny of the sky reveals the fact that many of the stars are composed of two or more components, that is, they are *double* or *multiple* stars. Over 15,000 such objects have been discovered.

A star may appear double in two ways. First, one may just happen to be nearly in line with the other as seen from the earth. Second, the two bodies may be physically connected, each revolving about their common centre of gravity. The former are called *optical doubles*, the latter *binary stars*. In the course of time the binaries exhibit a change in the distance between the components and also in the direction of the line joining them, that is, in the position angle.

While the close pairs require a large instrument for their detection, there are many within the range of small instruments. Such observations also allow one to determine the quality of the instrument employed. It has been found that a telescope having an objective 1 inch in diameter should be able to distinguish two stars 4″.56 apart, and the resolving power is inversely proportional to the diameter of the objective. Thus a telescope of 3-inch aperture should separate stars 1/3 of 4″.56, or 1″.52 apart; for one of aperture 10 inches, stars 1/10 of 4″.56, or 0″.45 apart should be seen separate; and so on. With the Yerkes refractor, of aperture 40 inches, a double star with distance 0″.11 can be detected.

In choosing a double star for testing a telescope care should be taken not to select a binary, with varying distance between its components.

The stars in the following short lists can be identified from almost any star atlas, and observation of them will prove of great interest to the amateur.

I. THE MOST LUMINOUS PAIRS

Star	Mags.	Dist. ″	Star	Mags.	Dist. ″
Mizar....	2.4, 4.0	14.5	γ Leonis....	2.5, 4.0	3.0
Castor...	2.5, 3.0	5.6	β Scorpii...	2.5, 5.5	13.0
γ Virginis .	3.0, 3.2	5.0	θ Serpentis.	4.4, 6.0	21.0
γ Arietis...	4.2, 4.5	8.9	44i Boötis....	5.0, 6.0	4.8
ζ Aquarii..	3.5, 4.4	3.5	π Boötis....	4.3, 6.0	6.0

II. THE FINEST COLORED PAIRS

Star	Magnitudes	Distance ″	Colors
γ Andromedæ..	2.2, 5.5	10	Orange, Green.
α CanumVenat.	3.2, 5.7	20	Golden, Lilac.
β Cygni.....	3.3, 5.5	34	Golden, Sapphire.
ε Boötis.....	2.4, 6.5	2.9	Golden, Sapphire.
95 Herculis.....	5.5, 5.8	6	Golden, Azure.
α Herculis.....	4, 5.5	4.7	Ruby, Emerald.
γ Delphini.....	3.4, 5	11	Golden, Bluish Green.
32 Eridani.....	4.7, 7	6.7	Topaz, Bright Green.
ε Hydræ.....	3.5, 7.5	3.5	Yellow, Blue.
ζ Lyræ.....	4.5, 5.5	44	Yellow, Green.
ι Cancri.....	4.5, 5	30	Pale Orange, Blue.
ο Cygni.....	4.3, 7.5, 5.5	337.8, 106.8	Yellow, Blue.
24 Coma Beren..	5.6, 7	21	Orange, Lilac.
ο Cephei.....	5.4, 8	2.5	Golden, Azure.
94 Aquarii.....	5.5, 7.5	11	Rose, Greenish.
39 Ophiuchi.....	5.7, 7.5	12	Yellow, Blue.
41 Aquarii.....	5.8, 8.5	4.8	Yellow Topaz, Blue.
2 Canum Venat	6, 9	11	Golden, Azure
52 Cygni.....	4.6, 9	7	Orange, Blue.
55 Piscium.....	6, 9	6	Orange, Blue.
κ Geminorum..	3.8, 9	9	Orange, Blue.
ρ Orionis.....	5.1, 9	6.8	Orange, Blue.
54 Hydræ.....	5.2, 8	9	Yellow, Violet.
η Persei.....	4.2, 8.5	28	Yellow, Blue.
φ Draconis.....	4.8, 6	31	Yellow, Lilac.
ο Draconis.....	4.7, 8.5	32	Golden, Lilac.
η Cassiopeiæ...	4.7, 7	5.7	Golden, Purple.
23 Orionis.....	5.4, 7	32	White, Blue.
δ Herculis.....	3.6, 8	18	White, Violet.
ο Capricorni...	6.3, 7	22	Bluish.
17 Virginis.....	6.5, 7	20	Rose.
ξ Boötis.....	4.5, 6.5	4.2	Reddish Yellow.

The colors given above are according to Flammarion. For slight variations and also for a much longer list consult Webb's "Celestial Objects."

VARIABLE STARS

The study of variable stars is especially suited to amateur observers. In it they can make observations of permanent scientific value, since all the brighter and more interesting objects are within the range of modest instruments. An ordinary field glass or a small telescope is all that is required.

In recent years there has been organized the American Association of Variable Star Observers, with a working membership of about 70, and reports of observations are published monthly in *Popular Astronomy*. The recording secretary is Howard O. Eaton, 428 Lake St., Madison, Wis., and additional observers are desired.

The *novae* or "new" stars comprise one class of variables, and all the recent brighter objects of this sort have been discovered by amateurs. The long-period variable Omicron Ceti, or *Mira*, was discovered by Fabricius in 1596, while Algol, the best-known variable of short-period, was discovered by Goodricke, a deaf mute, in 1783.

Several attempts have been made to classify the variable stars; but a scientific system of classification, in harmony with the chief deductions of theory as well as the facts of observation, is still wanting. The best known system is that formulated by Professor E. C. Pickering in 1880, and reproduced (with slight additions) in his "Provisional Catalogue of Variable Stars" (1903). This includes five classes, two of which are subdivided, as follows:—

	EXAMPLES
I. New or temporary stars	Nova, 1572
II. Variables of long period:	
a. Ordinary stars of this class, *o*	Ceti
b. Stars subject to "occasional sudden and irregular outbursts of light which gradually diminishes"	U Geminorum
III. "Variables of small range or irregular variation, according to laws as yet unknown", *a*	Orionis
IV. Variables of short period:	
a. "Ordinary" cases, δ	Cephei
b. Stars with "minima successively bright and faint", β	Lyræ
V. Stars of the Algol type, β	Persei

Name	Limiting Mags.	Period	Class	Discoverer
		d. h. m.		
U Cephei	7.0– 9.2	2 11 49.6	V.	W. Ceraski....1880
o Ceti	1.7– 9.5	331.7	II.	Fabricius.....1596
ρ Persei	3.4– 4.2	Irr.	III.	Schmidt.....1854
6.1904 Cephei	8.6– 9.1	32.3	V.	Blajko.....1904
β Persei (Algol)	2.1– 3.2	2 20 48.9	V.	Montanari.....1669
λ Tauri	3.3– 4.2	3 22 52.2	V.	Baxendell.....1848
W Eridani	8.1–<12.5	369	II.	Fleming.....1898
RW Tauri	8–11	2 18 27.2	V.	Fleming.....1905
R Leporis	6–8 ?	436.1	II.	Schmidt.....1855
a Orionis	1– 1.4	Irr.	III.	J. Herschel.....1840
U Orionis	5.8–12.3	375	II.	Gore.....1885
η Geminorum	3.2– 4.2	231.4	III.	Schmidt.....1865
T Monocerotis	5.7– 6.8	27.0	IV.	Gould.....1871
ζ Geminorum	3.8– 4.3	10 3 41.5	IV.	Schmidt.....1847
R Geminorum	6.6–13.3	370.2	II.	Hind.....1848
R Canis Maj	5.7– 6.3	1 3 15.8	V.	Sawyer.....1887
S Cancri	8.0–10.2	9 11 37.8	V.	Hind.....1848
S Antliæ	6.3– 6.8	0 7 46.8	IV.	Paul.....1888
W Ursæ Maj	7.9– 8.6	0 4 0.2	V.?	Müller & Kempf..1903
R Leonis	4.6–10.5	312.8	II.	Koch.....1782
R Hydræ	3.5– 9.7	425.1	II.	Montanari.....1670
δ Libræ	5.0– 6.2	2 7 51.4	V.	Schmidt.....1859
a Herculis	3.1– 3.9	Irr.	III.	W. Herschel.....1795
U Ophiuchi	6.0– 6.7	0 20 7.7	V.	Gould.....1871
X Sagittarii	4.4– 5.4	7 0 17.1	IV.	Schmidt.....1866
R Scuti	4.8– 7.8	Irr.	III.	Pigott.....1795
β Lyræ	3.4– 4.1	12 21 59.2	IV.	Goodricke.....1784
χ Cygni	4.5–13.5	406.0	II.	Kirch.....1686
η Aquilæ	3.7– 4.5	7 4 14.0	IV.	Pigott.....1784
S Sagittæ	5.5– 6.1	8 9 11.8	IV.	Gore.....1885
14.1904 Cygni	10.7–11.6	0 3 14.2	IV.	Ceraski.....1904
Y Cygni	7.1– 7.9	1 11 57.5	V.	Chandler.....1886
δ Cephei	3.7– 4.6	5 8 47.7	IV.	Goodricke.....1784
U Pegasi	9.3– 9.9	0 8 59.7	IV.	Chandler.....1894

THE DISTANCES OF THE STARS

The measurement of the distances of the stars is one of the most important problems in astronomy. Without such information it is impossible to form any idea as to the magnitude of our universe or the distribution of the various bodies in it.

The parallax of a star is the apparent change of position in the sky which the star would exhibit as one would pass from the sun to the earth at a time when the line joining earth to sun is at right angles to the line drawn to the star; or, more accurately, it is the angle subtended by the semi-major axis of the earth's orbit when viewed perpendicularly from the star. Knowing the parallax, the distance can be deduced at once.

For many years attempts were made to measure stellar parallaxes, but without success. The angle to be measured is so exceedingly small that it was lost in the unavoidable instrumental and other errors of observation. The first satisfactory results were obtained by Bessel, who in 1838, by means of a heliometer, succeeded in determining the parallax of 61 Cygni, a 6th magnitude star with a proper motion of 5″ a year. On account of this large motion the star was thought to be comparatively near to us, and such proved to be the case. At about the same time Henderson, at the Cape of Good Hope, from meridian-circle observations, deduced the parallax of Alpha Centauri to be 0″.75. For a long time this was considered to be the nearest of all the stars in the sky, but in 1913 Innes, director of the Union Observatory, Johannesburg, South Africa, discovered a small 11th mag. star, 2° 13′ from Alpha Centauri, with a large proper motion, and which proved to have a parallax of 0″.78. Its brightness is only 1/20,000 that of Alpha Centauri and the mass of the body is the least known. In 1916 Barnard discovered an 11th mag. star in Ophiuchus with a proper motion of 10″ per year, the greatest on record, and its parallax is about 0″.6. It is believed to be next to Alpha Centauri in distance from us.

The distances of the stars are so enormous that a very large unit has to be chosen to express them. The one generally used is the light-year, that is, the distance travelled by light in a year, or 186,000x60x60x24x365¼ miles. A star whose parallax is 1″ is distant 3.26 light years; if the parallax is 0″.1, the distance is 32.6 l.-y.; if the parallax is 0″.27 the distance is 3.26÷.27 = 12 l.-y. In other words, the distance is inversely proportional to the parallax. In recent years the word *parsec* has been introduced to express the distances of the stars. A star whose distance is 1 parsec is such that its *par*-allax is 1 *sec*-ond. Thus 1 parsec is equivalent to 3.26 l.-y., 10 parsecs = 32.6 l.-y., etc.

In later times much attention has been given to the determination of parallaxes, chiefly by means of photography, and now several hundred are known with tolerable accuracy.

The following list, prepared by Mr. J. A. Pearce, gives some of the latest values obtained.

Name	R.A. (1900)		Decl. (1900)		Vis. Mag. Harvard	Parallax	Distance Light Years
	h	m	′	″		″	
Prox. Cen	14	22.9	−62	15	10.5	0.802	4.06
* αCentauri	14	32.8	−60	25	0.33	.759	4.30
Barnard	17	52.9	+ 4	28	9.67	.533	6.12
Lal. 21185	10	57.9	+36	38	7.60	.403	8.09
* αCan. Maj	6	40.7	−16	35	−1.58	.376	8.67
Innes	11	12.0	−57	2	(12)	.339	9.62
C.Z. 5h 243	5	7.7	−44	59	8.3	.319	10.22
τCeti	1	39.4	−16	28	3.65	.318	10.25
* αCan. Min	7	34.1	+ 5	29	0.48	.312	10.45
ϵErid	3	28.2	− 9	48	3.81	.311	10.48
*61 Cygni	21	2.4	+38	15	5.57	.306	10.65
Lac. 9352	22	59.4	−36	26	7.44	.292	11.16
* Σ2398	18	41.8	+59	29	9.33	.287	11.36
ϵInd i	21	55.7	−57	12	4.74	.284	11.48
* Groom. 34	0	12.5	+43	27	7.98	.281	11.60
* Krüger 60	22	24.5	+57	12	9.64	.262	12.44
Lac. 8760	21	11.4	−39	15	6.65	.251	12.99
Oe. Arg. 17415-6	17	37.0	+68	26	9.2	.247	13.20
Van Maanen	0	43.9	+ .4	55	12.3	.246	13.25
Gould 32416	23	59.5	−37	51	8.5	.203	15.87
αAquilae	19	45.9	+ 8	36	0.89	.200	16.30
O² Erid	4	10.7	− 7	49	4.48	.198	16.5
*70 Oph	18	10.4	+ 2	31	4.28	.192	17.0
Cordoba 32416	23	59.5	−37	51	8.3	.191	17.1
+HR 7703	20	4.6	−36	21	5.34	.190	17.2
* ηCassiop	0	43.0	+57	17	3.64	.184	17.7
Alb. 8164	23	44.0	+ 1	52	8.7	.183	17.8
σDrac	19	32.6	+69	29	4.78	.182	17.9
HR 8832	23	8.5	+56	37	5.65	.177	18.4
* HR 6416	17	11.5	−46	32	5.58	.175	18.6
* A Oph	17	9.2	−26	27	5.29	.174	18.7
* HR 6426	17	12.1	−34	53	5.89	.170	19.2
εErid	3	15.9	−43	27	4.30	.152	21.5
* ξUrs. Maj	11	12.9	+32	6	4.41	.150	21.7
δErid	3	38.5	−10	6	3.72	.142	23.0
* αLyrae	18	33.6	+38	41	0.14	.134	24.3
βHydri	0	20.5	−77	49	2.90	.133	24.5
αPis. Aus	22	52.1	−30	9	1.29	.128	25.5
χDrac	18	22.9	+72	41	3.69	.127	25.7
* ζHerc	16	37.5	+31	47	3.00	.116	28.1
* μHerc	17	42.5	+27	47	3.48	.116	28.1
βLeonis	11	44.0	+15	8	2.23	.109	29.9
αBootis	14	11.1	+19	42	0.24	.105	31.1
βVirg	11	45.5	+ 2	20	3.80	.105	31.1
βCan. Ven	12	29.0	+41	54	4.32	.104	31.4
* 85 Peg	23	56.8	+26	34	5.85	.101	32.3
βGemin	7	39.2	+28	16	1.21	.095	34.3
αTauri	4	30.2	+16	18	1.06	.064	50.9
* αAurigae	5	9.3	+45	54	0.21	.063	51.8
αLeonis	10	3.0	+12	27	1.34	.045	72.5
αErid	1	34.0	−57	45	0.60	.041	79.5
* Urs. Min	1	22.6	+88	46	2.12	.041	79.5
αCentauri	13	56.8	−59	53	0.86	.027	120.7
αOrionis	5	49.8	+ 7	23	0.92	.022	148.2
αScorp	16	23.3	−26	13	1.22	.019	171.6
αCygni	20	38.0	+44	35	1.33	.012	271.7
αCarinae	6	21.7	−52	38	−0.86	.007	465.7

*Double or multiple star; magnitude of brighter component given.

GEOGRAPHICAL POSITIONS OF SOME POINTS IN CANADA

Name	Latitude N.	Longitude W.	Feet above Sea Level
	° ′ ″	° ′ ″	
Banff, Alta	51 10	115 35	4542
Barrie, Ont	44 23	79 41	839
Battleford, Sask	52 41	108 20	1620
Brandon, Man	49 51	99 57	1176
Calgary, Alta	51 02 39.21	7 36 15.1	3428
Charlottetown, P.E.I	46 14	63 10	38
Collingwood, Ont	44 30	80 15	595
Edmonton, Alta	53 31 58.81	113 30 27.0	2188
Father Point, Que	48 31	68 19	20
Fort Churchill	58 51	94 11	....
Fort Simpson	61 52	121 43	....
Fredericton, N.B	45 57	66 36	164
Golden, B.C	51 16	116 55	2550
Gravenhurst, Ont	44 54	79 20	770
Guelph, Ont	43 32 43.7	80 15 09.0	1063
Halifax, N.S	44 39	63 36	97
Hamilton, Ont	43 16	79 54	303
Herschel Is	69 30	139 15	....
Kingston, Ont	44 13	76 29	285
London, Ont	42 59	81 13	808
Medicine Hat	50 1	110 37	2161
Moncton, N.B	46 9	64 45	50
Montreal, Que	45 30 17.0	73 34 39.45	187
New Westminster, B.C	49 13	122 54	330
No. West River, Ungava	53 31 31.45	60 10 17.85	....
Ottawa, Ont	45 23 38	75 42 58.20	273.4
Owen Sound, Ont	44 33 56.42	80 56 40.5	585
Peterborough, Ont	44 17	78 19	722
Portage la Prairie, Man	49 58	98 17	830
Port Simpson, B.C	54 34	130 26	26
Prince Albert, Sask	53 10	106 0	1432
Quebec, Que	46 48	71 13	296
Regina, Sask	50 27	104 37	1885
Revelstoke, B.C	51 00 11.25	7 52 49.8	1503
Rose Point, Ont	45 19 00.73	80 02 28.5	602
St. Catharines, Ont	43 10	79 17	347
St. John, N.B	45 17	66 4	70
St. Johns, Nfd	47 34	52 42	125
Stratford, Ont	43 23	81 00	1191
Toronto, Ont	43 39 35.9	79 23 39.75	350
Vancouver, B.C	49 17 48.0	123 07 05.52	11
Victoria, B.C	48 25 31.38	123 21 42.0	55
Windsor, Ont	42 20	83 4	625
Winnipeg, Man	49 53 51.53	97 08 28.53	751
York Factory	57 00	92 28	55

In above table the longitudes of Calgary and Revelstoke are in h. m. s. In arc the values are 105° 12′ 46″.5 and 105° 25′ 27″ respectively.

The times of the first and second contacts for stations across Canada are tabulated below:

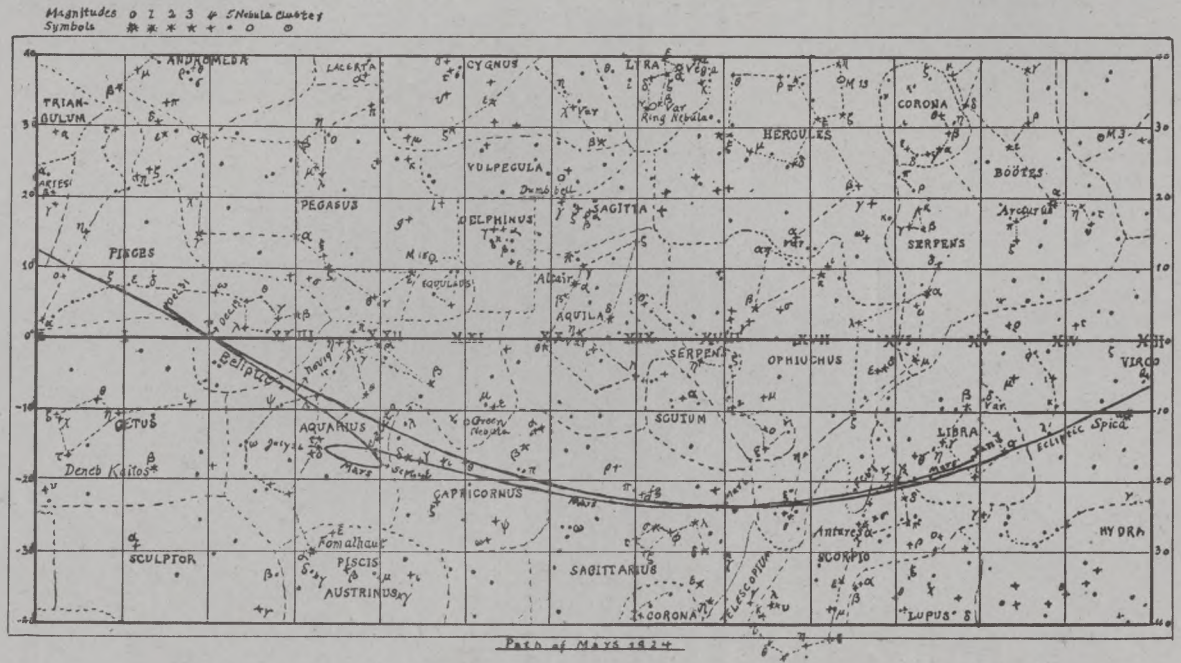
LOCAL CIRCUMSTANCES OF THE TRANSIT INGRESS

Place	G.M.T.						Standard Time		
	External contact			Internal contact			Internal contact		
Halifax, N.S.	9h	42m	25s	9h	45m	24s	5h	45m	24s
Quebec, Que.	9	42	29	9	45	28	4	45	28
Montreal	9	42	30	9	45	29	4	45	29
Ottawa, Ont.	9	42	31	9	45	30	4	45	30
Toronto, Ont.	9	42	33	9	45	32	4	45	32
London, Ont.	9	42	34	9	45	33	4	45	33
Winnipeg, Man.	9	42	47	9	45	46	3	45	46
Calgary, Alta.	9	43	02	9	46	00	2	46	00
Victoria, B.C.	9	43	12	9	46	10	1	46	10

For places not mentioned in the table a simple interpolation will suffice to determine the times of contact to the nearest second.

To observe a transit of Mercury a small telescope is necessary. Of course use a dark glass over the eyepiece.

In the above table the hours are numbered from noon.



Path of Mars among the Stars, 1924.

THE ROYAL ASTRONOMICAL SOCIETY OF CANADA

The Library and the offices of the General Secretary and the General Treasurer are at 198 College Street, Toronto.

Ordinary meetings are held in Toronto in the Physics Building on alternate Tuesdays, beginning in September and continuing to the end of May. In addition, ordinary meetings are at present held at Montreal, Ottawa, Winnipeg and Victoria. The Society also has organizations at Guelph, Hamilton, Peterborough and Regina, but during the war the meetings were discontinued and have not yet been revived.

The Society publishes a monthly JOURNAL, containing each year about 500 pages of interesting articles, and a yearly HANDBOOK of 64 pages, containing information for the amateur observer. Subscription, $2.00 a year; single copies of the JOURNAL or HANDBOOK, 25 cents.

Membership in the Society is open to anyone interested in Astronomy and many more members are desired. The annual fee of $2.00 includes subscription to the publications.

For further information apply to the General Secretary, Mr. A. F. Hunter, M.A., at the above address.