THE OBSERVER'S HANDBOOK FOR 1927

PUBLISHED BY

The Royal Astronomical Society of Canada

EDITED BY C. A. CHANT

NINETEENTH YEAR OF PUBLICATION

TORONTO
198 COLLEGE STREET
PRINTED FOR THE SOCIETY
1927

1927 CALENDAR 1927

JANUARY						
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	..

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

MARCH						
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	..	

APRIL						
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	30	

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

JUNE						
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	..	
Sat.	4	11	18	25	..	

JULY						
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	..

AUGUST						
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	..	

SEPTEMBER						
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	..	

OCTOBER						
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	..

NOVEMBER						
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	..	

DECEMBER						
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	

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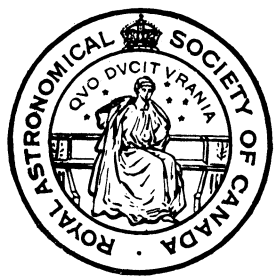

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CONTENTS

PREFACE

In this issue of the HANDBOOK several errors, which were pointed out by widely-distributed friends, have been corrected. These were chiefly in the tables headed "The Distances of the Stars" and "The Brightest Stars."

The suggestion was received that a set of star-maps with brief descriptions of the constellations, such as at one time appeared in the HANDBOOK, should be included again. It has not been found possible to do this, chiefly on account of the expense involved.

It may be stated that four circular star-maps, 9 inches in diameter, roughly for the four seasons, may be obtained from the Director of University Extension, University of Toronto, for one cent each; also a set of 12 circular maps, 5 inches in diameter, with brief explanation, is supplied by *Popular Astronomy*, Northfield, Minn., for 15 cents. Besides these may be mentioned Young's *Uranography*, containing four maps with R.A. and Decl. circles and excellent descriptions of the constellations, price 72 cents; Norton's *Star Atlas and Telescopic Handbook* (10*s.* 6*d.*); Olcott's *A Field-book of the Stars* ($1.50); McKready's *A Beginner's Star Book* ($5.00).

In the preparation of this HANDBOOK the Editor has been assisted by Mr. R. M. Motherwell, Dominion Observatory, Ottawa, who computed the occultations of stars by the moon; Mr. J. A. Pearce, Dominion Astrophysical Observatory, Victoria, B.C.; Mr. R. M. Petrie, Victoria, B.C.; Mr. J. H. Horning, Toronto; and his colleague, Dr. R. K. Young, of the University of Toronto.

The times of the minima of Algol are given by Chandler's formula corrected by −2h 50m. (see Preface to 1926 HANDBOOK).

TORONTO, December, 1926. THE EDITOR.

ANNIVERSARIES AND FESTIVALS, 1927

New Year's Day	Sat., Jan. 1	Pentecost (Whit Sunday)	June 5
Epiphany	Thur., Jan. 6	Trinity Sunday	June 12
Septuagesima Sunday	Feb. 13	Corpus Christi	Thur., June 16
Quinquagesima (Shrove Sunday)	Feb. 27	St. John Baptist	Fri., June 24
St. David	Tues., Mar. 1	Dominion Day	Fri., July 1
Ash Wednesday	Mar. 2	Labour Day	Mon., Sept. 5
St. Patrick	Thur., Mar. 17	St. Michael (Michaelmas Day)	Thur., Sept. 29
Palm Sunday	Apr. 10	All Saints Day	Tues., Nov. 1
Good Friday	Apr. 15	First Sunday in Advent	Nov. 27
Easter Sunday	Apr. 17	St. Andrew	Wed., Nov. 30
St. George	Sat., Apr. 23	Conception Day	Thur., Dec. 8
Rogation Sunday	May 22	St. Thomas Day	Wed., Dec. 21
Victoria Day	Tues., May 24	Christmas Day	Sun., Dec. 25
Ascension Day	Thur., May 26		

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.

1927 EPHEMERIS OF THE SUN AT 0h GREENWICH CIVIL TIME

Date	Apparent R.A.	Equation of Time	Apparent Decl.	Date	Apparent R.A.	Equation of Time	Apparent Decl.
	h m s	m s	° ′ ″		h m s	m s	° ′ ″
Jan. 1	18 41 40	− 3 4.2	−23 6 10	Apr. 1	0 37 45	− 4 19.9	+ 4 04 07
" 4	18 54 54	− 4 29.2	−22 50 54	" 4	0 48 41	− 3 26.2	+ 5 13 31
" 7	19 8 6	− 5 50.9	−22 31 33	" 7	0 59 38	− 2 33.7	+ 6 22 05
" 10	19 21 13	− 7 8.2	−22 8 11	" 10	1 10 37	− 1 42.8	+ 7 29 39
" 13	19 34 15	− 8 20.5	−21 40 56	" 13	1 21 38	− 0 54.0	+ 8 36 04
" 16	19 47 11	− 9 27.1	−21 9 53	" 16	1 32 42	− 0 07.8	+ 9 41 11
" 19	20 0 1	−10 27.7	−20 35 13	" 19	1 43 48	+ 0 35.2	+10 44 51
" 22	20 12 45	−11 21.8	−19 57 2	" 22	1 54 58	+ 1 14.7	+11 46 55
" 25	20 25 22	−12 9.2	−19 15 30	" 25	2 06 13	+ 1 50.2	+12 47 16
" 28	20 37 52	−12 49.6	−18 30 46	" 28	2 17 31	+ 2 21.2	+13 45 44
" 31	20 50 15	−13 22.9	−17 43 2	May 1	2 28 54	+ 2 47.6	+14 42 11
Feb. 3	21 2 31	−13 49.0	−16 52 26	" 4	2 40 22	+ 3 09.3	+15 36 28
" 6	21 14 39	−14 07.6	−15 59 11	" 7	2 51 55	+ 3 26.1	+16 28 24
" 9	21 26 40	−14 18.8	−15 3 27	" 10	3 03 33	+ 3 38.0	+17 17 53
" 12	21 38 34	−14 22.7	−14 5 28	" 13	3 15 16	+ 3 44.8	+18 04 44
" 15	21 50 20	−14 19.6	−13 5 23	" 16	3 27 04	+ 3 46.6	+18 48 51
" 18	22 2 0	−14 09.7	−12 3 24	" 19	3 38 57	+ 3 43.4	+19 30 07
" 21	22 13 33	−13 53.5	−10 59 41	" 22	3 50 55	+ 3 35.0	+20 08 24
" 24	22 25 1	−13 31.5	− 9 54 26	" 25	4 02 58	+ 3 21.7	+20 43 37
" 27	22 36 23	−13 04.2	− 8 47 49	" 28	4 15 05	+ 3 03.6	+21 15 38
Mar. 2	22 47 41	−12 31.9	− 7 40 1	" 31	4 27 18	+ 2 41.2	+21 44 21
" 5	22 58 54	−11 55.0	− 6 31 12	June 3	4 39 34	+ 2 14.8	+22 09 41
" 8	23 10 2	−11 14.0	− 5 21 35	" 6	4 51 53	+ 1 45.0	+22 31 32
" 11	23 21 7	−10 29.2	− 4 11 20	" 9	5 04 15	+ 1 12.4	+22 49 49
" 14	23 32 9	− 9 41.2	− 3 00 37	" 12	5 16 40	+ 0 37.4	+23 04 30
" 17	23 43 8	− 8 50.6	− 1 49 38	" 15	5 29 06	+ 0 00.7	+23 15 32
" 20	23 54 5	− 7 58.0	− 0 38 30	" 18	5 41 34	− 0 37.3	+23 22 52
" 23	0 5 0	− 7 04.0	+ 0 32 35	" 21	5 54 03	− 1 16.1	+23 26 30
" 26	0 15 55	− 6 09.3	+ 1 43 29	" 24	6 06 31	− 1 55.1	+23 26 25
" 29	0 26 50	− 5 14.4	+ 2 54 3	" 27	6 19 00	− 2 33.7	+23 22 37
				" 30	6 31 27	− 3 11.2	+23 15 07

1927 EPHEMERIS OF SUN AT 0h GREENWICH CIVIL TIME

Date	Apparent R.A.	Equation of Time	Apparent Decl.	Date	Apparent R.A.	Equation of Time	Apparent Decl.
	h m s	m s	° ′ ″		h m s	m s	° ′ ″
July 3	6 43 52	− 3 46.8	+23 03 57	Oct. 1	12 25 02	+ 9 52.7	− 2 42 28
" 6	6 56 15	− 4 19.9	+22 49 10	" 4	12 35 55	+10 50.1	− 3 52 20
" 9	7 08 34	− 4 49.8	+22 30 48	" 7	12 46 50	+11 44.8	− 5 01 47
" 12	7 20 50	− 5 16.1	+22 08 56	" 10	12 57 48	+12 36.1	− 6 10 39
" 15	7 33 02	− 5 38.3	+21 43 38	" 13	13 08 50	+13 23.5	− 7 18 46
" 18	7 45 10	− 5 56.2	+21 15 01	" 16	13 19 57	+14 6.3	− 8 26 1
" 21	7 57 13	− 6 09.6	+20 43 09	" 19	13 31 09	+14 43.9	− 9 32 12
" 24	8 09 11	− 6 18.1	+20 08 08	" 22	13 42 27	+15 15.9	−10 37 10
" 27	8 21 04	− 6 21.6	+19 30 05	" 25	13 53 50	+15 42.0	−11 40 43
" 30	8 32 52	− 6 19.9	+18 49 08	" 28	14 05 20	+16 1.6	−12 42 41
Aug. 2	8 44 34	− 6 12.6	+18 05 22	" 31	14 16 57	+16 14.8	−13 42 52
" 5	8 56 11	− 5 59.8	+17 18 58	Nov. 3	14 28 40	+16 21.0	−14 41 4
" 8	9 07 43	− 5 41.4	+16 30 02	" 6	14 40 31	+16 20.2	−15 37 8
" 11	9 19 08	− 5 17.6	+15 38 43	" 9	14 52 29	+16 12.0	−16 30 51
" 14	9 30 29	− 4 48.5	+14 45 09	" 12	15 4 34	+15 56.3	−17 22 3
" 17	9 41 45	− 4 14.5	+13 49 28	" 15	15 16 47	+15 32.8	−18 10 36
" 20	9 52 56	− 3 36.0	+12 51 49	" 18	15 29 8	+15 1.6	−18 56 17
" 23	10 04 03	− 2 53.2	+11 52 18	" 21	15 41 37	+14 22.7	−19 38 56
" 26	10 15 06	− 2 06.5	+10 51 05	" 24	15 54 13	+13 36.4	−20 18 24
" 29	10 26 05	− 1 16.1	+ 9 48 19	" 27	16 6 56	+12 43.0	−20 54 29
Sept. 1	10 37 01	− 0 22.4	+ 8 44 08	" 30	16 19 45	+11 43.0	−21 27 3
" 4	10 47 54	+ 0 34.4	+ 7 38 42	Dec. 3	16 32 41	+10 37.0	−21 55 57
" 7	10 58 44	+ 1 33.7	+ 6 32 10	" 6	16 45 42	+ 9 25.5	−22 21 2
" 10	11 09 32	+ 2 35.0	+ 5 24 41	" 9	16 58 48	+ 8 9.2	−22 42 13
" 13	11 20 19	+ 3 37.8	+ 4 16 24	" 12	17 11 58	+ 6 48.6	−22 59 23
" 16	11 31 05	+ 4 41.5	+ 3 07 26	" 15	17 25 12	+ 5 24.3	−23 12 28
" 19	11 41 51	+ 5 45.3	+ 1 57 55	" 18	17 38 29	+ 3 57.2	−23 21 24
" 22	11 52 37	+ 6 48.9	+ 0 48 01	" 21	17 51 48	+ 2 28.2	−23 26 8
" 25	12 03 24	+ 7 51.6	− 0 22 07	" 24	18 5 8	+ 0 58.2	−23 26 38
" 28	12 14 12	+ 8 53.0	− 1 32 20	" 27	18 18 27	− 0 31.6	−23 22 53
				" 30	18 31 46	− 2 0.4	−23 14 54

To obtain the R.A. of Mean Sun, subtract the Equation of Time from the Right Ascension; adding 12h to this gives the Sidereal Time at 0h G.C.T.

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, 1927

By R. M. Motherwell

These occultations are of more than usual interest this year as there are two occultations of Saturn, one in January and one in July, the former being nearly central. The occultation of ν Virginis on June 7 is of very short duration and of a grazing nature so there may be considerable errors in the given times. Observers must bear in mind that these predictions are for the latitude of Ottawa and will vary according to the location of the observer. Stars fainter than magnitude 4.5 have not been included.

Date	Star	Mag.	Immersion	Emersion	Position Angle	
					Immer.	Emer.
1927			h m	h m	°	°
Jan. 7	τ Aquarii	4.2	.....	11 33.9	..	219
Jan. 15	η Geminorum	3.2	17 53.5	18 54.5	57	278
Jan. 15	μ Geminorum	3.2	22 30.1	23 23.1	34	215
Jan. 28	SATURN	0.7	7 14.0	8 36.0	107	294
Feb. 12	η Geminorum	3.2	2 06.1	.....	90	...
Mar. 17	ν Virginis	4.2	19 56.8	21 09.3	112	301
Apr. 5	ϵ Tauri	3.6	18 38.1	19 29.6	118	217
Apr. 19-20	ν Scorpii	3.9	23 14.9	0 26.4	98	312
May 4	1 Geminorum	4.3	19 27.6	20 11.1	45	318
June 7	ν Virginis	4.2	16 59.6	17 16.6	199	223
July 10	SATURN...	0.5	16 57.1	17 35.9	57	348
July 24	ϵ Tauri	3.6	4 25.3	5 20.5	102	217
Aug. 22	1 Geminorum	4.3	.....	2 24.5	...	295
Sept. 30	β' Scorpii	2.9	19 43.6	.....	63	...
Oct. 22	ν Virginis	4.2	.....	4 22.0	...	247
Oct. 29	b Ophiuchi	4.3	14 38.1	15 59.1	83	303
Oct. 30	λ Sagittarii	2.9	19 14.1	.....	68	...
Nov. 18	ν Virginis	4.2	12 03.0	12 53.0	77	339
Dec. 1	τ Aquarii	4.2	19 26.2	20 31.2	19	278

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.

FEBRUARY

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

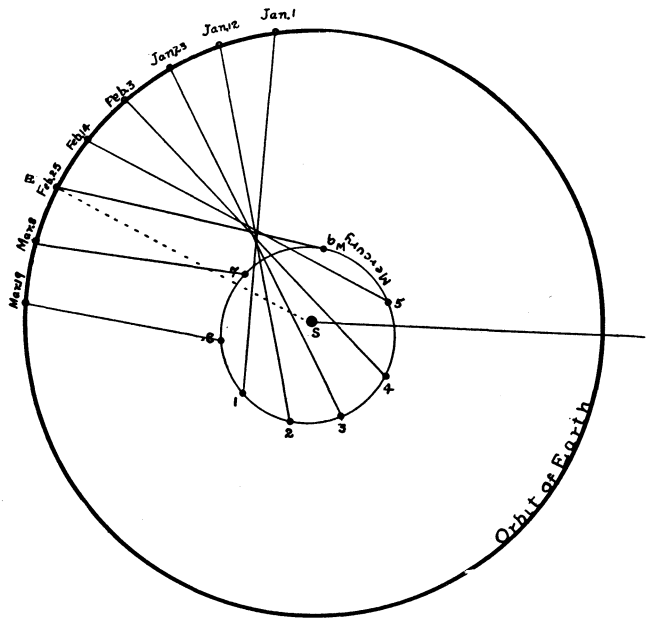
Day of Month	Latitude 44°		Latitude 46°		Latitude 48°		Latitude 50°		Latitude 52°	
	Sunrise	Sunset	Sunrise	Sunset	Sunrise	Sunset	Sunrise	Sunset	Sunrise	Sunset
	h m	h m	h m	h m	h m	h m	h m	h m	h m	h m
1	7 15	4 23	7 22	4 16	7 29	4 9	7 37	4 1	7 46	3 54
2	7 16	4 23	7 23	4 16	7 31	4 9	7 39	4 1	7 47	3 53
3	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 reader may consult the pages headed *The Sky for the Month* (pages 28, 30, . . .) to find the conjunctions and other phenomena for the planets desired. In the following notes an account is given of some phenomena connected with their orbits and positions relative to the sun and earth.

MERCURY

Mercury is the planet closest to the sun and as it makes a revolution in about 88 days its motions in the sky are rapid. Also, it can never appear far from the sun and hence is difficult to see either as an evening star setting soon after the sun or as a morning star rising just a little in advance of the sun. A diagram of



Orbit of Mercury and the Earth, showing relative positions of the two planets for one complete revolution of Mercury.

its orbit is shown. The angle SEM is called the elongation of the planet. It will be greatest when the line EM is tangent to the orbit of Mercury. The positions of both the earth and the planet are marked at intervals of eleven days from January 1 to March 19. In this interval Mercury goes one complete revolution. The best times for observing the planet occur at or near the greatest elongations. During the year 1927 these occur at the following dates:

Greatest eastern elongations (Mercury sets after the sun): February 25, June 22, October 18.

Greatest western elongations (Mercury rises before the sun): April 10 August 8, November 27.

Not all elongations are equally favourable for observation. This for two reasons: (1) The elongations are greater sometimes than others, and (2) the height of the planet above the horizon at sunset depends also on the position of the ecliptic. The elongations of February 25 and June 22 are best for evening observation but are not quite so favourable as those in the morning of August 8 and November 17. Under favourable weather conditions the planet may be seen for a week or more at the time of elongation.

Venus

The planet Venus has the distinction of being at times the most conspicuous object in the sky outside of the sun and moon. It is of a pale yellow, almost white, colour and can usually be recognized by its appearance without any reference to the nearby stars. Like Mercury, Venus revolves in an orbit between the sun and earth; but, owing to the larger size of its orbit, its elongations are greater than in the case of Mercury.

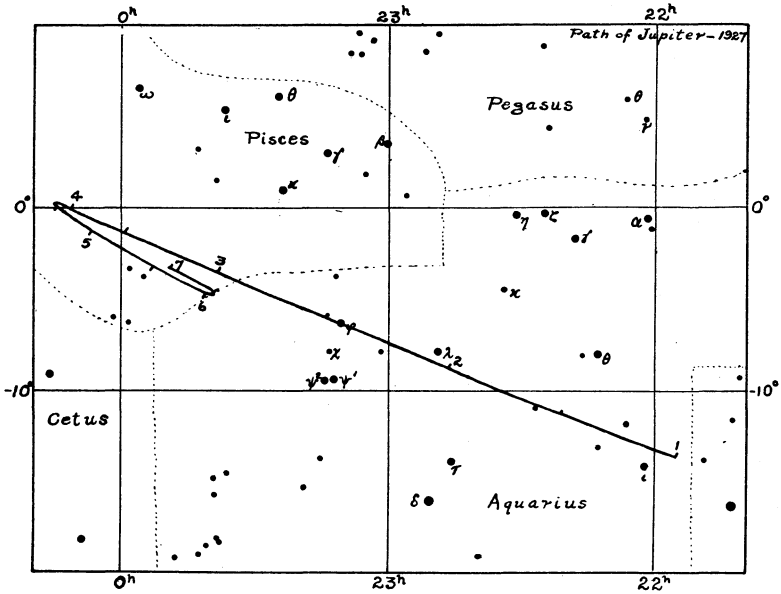
On the first of January Venus will be in the western sky, but so near the sun as to be invisible. The distance between the sun and the planet will increase so that by March 1 Venus will be a fine evening star and will continue so till near the end of August. It will be at greatest elongation on July 2, and will attain its greatest brilliancy about August 5, at which time it may be seen in the day time. By September it will be again near the sun and becomes a morning star. From the middle of October till the end of the year it will be a brilliant star in the early morning hours.

Mars

On account of the length of the synodic period of Mars, 780 days, the planet comes to opposition once in about two years. At these times it makes its closest approach to the earth and the most favourable opportunities for observation occur then. During 1927 there will be no opposition, the last one occurring in October, 1926. However, the planet will be fairly well situated during the early part of the year. In January it will be found in the constellation of Aries. It will move eastward into the constellation of Taurus, but diminishing its angular distance from the sun so that each night at sunset it will be found farther west. In February the lines drawn from the earth to Mars and from the earth to the sun will include a right angle and at this time the planet, if viewed through a telescope will show a half disk much like the moon when seen with the naked eye at first quarter. In March Mars will be found about five degrees away from the red star Aldebaran, which it will resemble strikingly to the naked eye, Mars being a little the brighter. By the end of the month Mars will be fainter than Aldebaran and farther east. Toward the middle of August the planet will be found nearer the sun and from then till the end of the year will not be well situated for observation.

JUPITER

The planet Jupiter is a very good object for observation with a small telescope. Under ordinary circumstances, when seen with a three or four inch instrument, the disk of the planet may be seen and several dark bands running parallel to the equator. In addition four satellites may be seen which move around the planet in short periods so that from night to night they alter their relative positions rapidly and a study of their motions is interesting and instructive.



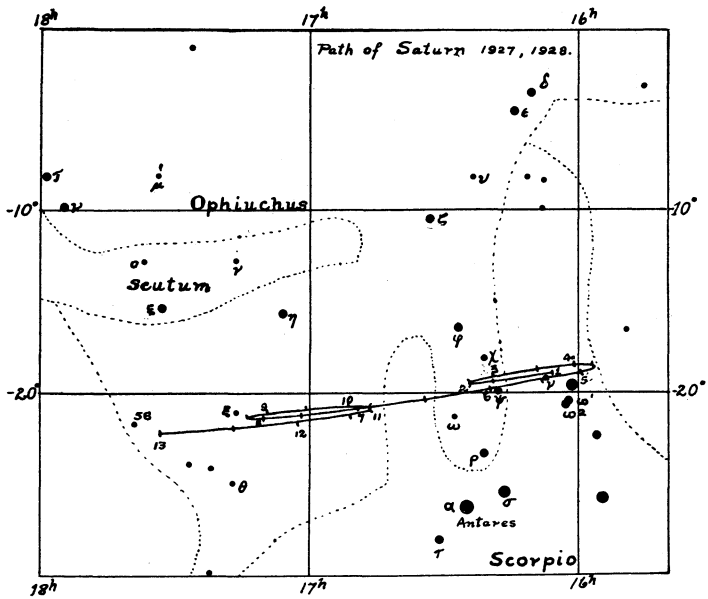
Path of Jupiter among the Stars during 1927. The positions of the planet are shown on the first of each month. The numbers refer to the following dates:—1, Jan. 1, 1927; 2, Mar. 1; 3, May, 1; 4, July, 1; 5, Sept. 1; 6, Nov. 1; 7, Jan. 1, 1928.

With a large telescope and a magnifying power of two or three hundred the surface markings show much detail. Owing to the great distance of the planet from the sun and the consequent long period of revolution, Jupiter moves slowly among the stars. Its path is shown in the accompanying diagram. During the year 1927 it will be found in the constellations Aquarius and Pisces. At the beginning of the year it is an evening star, but rather close to the sun, and during February and March it will be difficult to observe. From April on it will be seen as a morning star and be well visible from then till the end of the year.

SATURN

The path of Saturn among the stars resembles that of Jupiter. The accompanying diagram shows the path for two years, 1927 and 1928. During all of

1927 the planet will never be very far from the bright star Antares. To most people the planet Saturn is the best for amateur observation with a small telescope. The rings with their changing appearance from year to year make a remarkable picture. There are three rings usually spoken of as an outer, inner and crepe, or dusky, ring. The inner ring is much brighter than the outer, and the dusky ring is difficult to see in a small telescope. There is no doubt of the



Path of Saturn among the Stars during 1927 and 1928. The positions of the planet are marked on the first of each month, the numbers referring to the following dates:—1, Jan. 1, 1927; 2, March, 1; 4, July, 1; 5, Sept. 1; 6, Nov. 1; 7, Jan. 1, 1928; 8, March, 1; 9, May, 1; 10, July, 1; 11, Sept. 1; 12, Nov. 1; 13, Jan. 1, 1929.

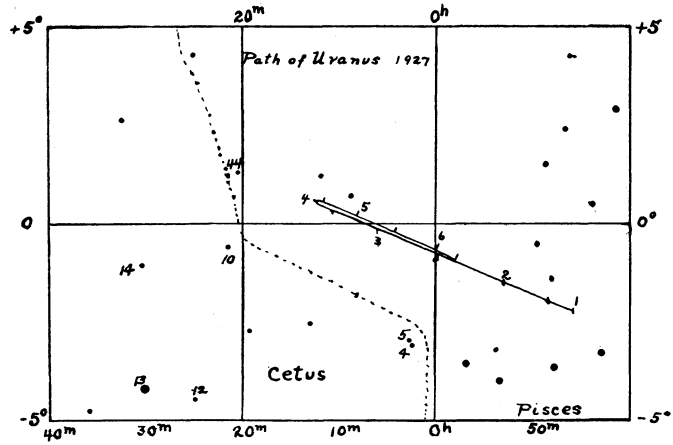
nature of the rings. They consist of swarms of small moons in independent revolution about Saturn. The plane of the rings coincides with the plane of the equator of Saturn or are inclined at about 28° to the ecliptic. When the earth is in this plane we see the rings edge-on and they are almost invisible. Seven years later the rings appear widest. The last disappearance was in 1921.

In the early part of the year Saturn will be a morning star, but later it moves farther west of the sun and will be well visible all summer and fall.

Uranus

Uranus was the first of the planets of the solar system, not known to antiquity, discovered by modern astronomy. It was discovered by Sir William Herschel in 1781. Its period of revolution about the sun is 84 years; hence it advances only about 4 degrees per year. It is not readily visible to the naked eye, but

can be seen with a pair of opera glasses. For this reason in the chart showing its path among the stars the scale has been made quite large, and stars down to the sixth magnitude are shown. During the whole of the year it will be in the



Path of Uranus among the Stars during 1927. The positions are indicated on the first of each month. The numbers on the path refer to the following dates:—1, Jan. 1, 1927; 2, March 1; 3, May 1; 4, July 1; 5, Sept. 1; 6, Nov. 1.

constellation Pisces being in opposition in September. With any but a large telescope the appearance of the planet will not differ from that of a star of about the sixth magnitude, but a study of the planet's position from night to night will soon detect its motion among the stars.

Neptune

The planet Neptune is of little interest to the amateur unless it be to test his powers of observation. It appears as a star of the eighth magnitude in the constellation of Leo, a little north of the bright star Regulus. The planet is the most distant in the Solar system, being 2,800 million miles from the sun and requiring 165 years to complete a revolution. Its satellite, which is invisible in any but the largest telescope, revolves about the planet in the reverse direction from that of all the planets. The existence of the planet was foretold mathematically from computations based on the observed motions of Uranus. The manner of its discovery makes an interesting and inspiring story which the amateur may find in any good text of astronomy.

ECLIPSES, 1927

There will be five eclipses in 1927, three of the Sun and two of the Moon.

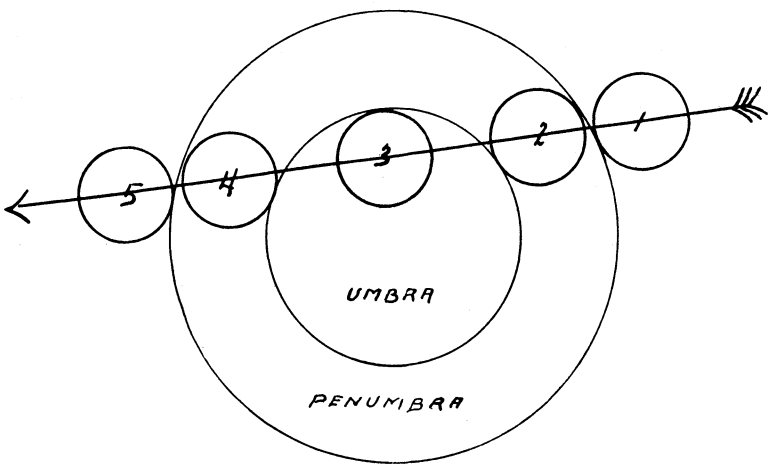
I. An Annular Eclipse of the Sun, January 3, 1927, visible only in the extreme southern part of the Pacific Ocean, the southwestern part of South America and the southeastern corner of Australia. The path of the Annular Eclipse touches the extreme northern part of New Zealand and crosses the southern part of South America.

II. A Total Eclipse of the Moon, June 15, 1927; the beginning of this eclipse will be visible generally in the Atlantic Ocean, North America, except the northern limit, South America and the Pacific Ocean. The ending will be visible in all North America except the northeastern part, South America except the extreme eastern part, the Pacific Ocean and Australia.

Circumstances of the Eclipse:

		d	h	m	
Moon enters penumbra	June	15	5	34.1	
Moon enters umbra	"	15	6	42.8	
Total Eclipse begins	"	15	8	13.5	Greenwich
Middle of Eclipse	"	15	8	24.2	Civil
Total Eclipse ends	"	15	8	35.0	Time
Moon leaves umbra	"	15	10	5.7	
Moon leaves penumbra	"	15	11	14.6	

Magnitude of the Eclipse = 1.018 (Moon's diameter = 1.0)



Total Eclipse of the Moon, June 15th, 1927. Passage of the Moon through the Earth's Shadow (Drawn by Dorothy Stone).

(Continued on 3rd page of Cover)

The times of transit are given in Local Mean Time; to change to Standard Time, see p. 9. Estimates of altitude are for an observer in latitude 45° N.

The Sun.—During January the sun's R.A. increases from 18h 42m to 20h 54m and its Decl. from 23° 6′ S to 17° 26′ S. The equation of time (see page 6) increases from 3m 4s to 13m 32s. 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 21st the sun enters the sign Aquarius, the second of the winter signs of the zodiac. On January 3 the sun is in perihelion (see opp. page for distance). On January 3 there is an annular eclipse of the sun visible in the South Atlantic and Pacific Oceans, not visibl in Canada (see page 27).

The Moon.—For its phases and conjunctions with the planets, see opp. page. On January 7 and 15 the moon occults three stars, and on the 28th the planet Saturn (see p. 8).

Mercury on the 15th is in R.A. 19h 7m, Decl. 24° 2′ S, and transits at 11.35. The planet was at its greatest elongation west of the sun on December 13, 1926, and hence at the beginning of the year it is still a morning star but too near the sun for observation. On the 28th it reaches superior conjunction and becomes a morning star.

Venus on the 15th is in R.A. 20h 39m, Decl. 19° 54′ S, and transits at 13.06. Venus is an evening star at the beginning of the year, but as it is only about 10° east of the sun and low in the S.W. at sunset it is not in a good position for observation. During the month, however, it nearly doubles its elongation from the sun and thus improves its visibility as an evening star.

Mars on the 15th is in R.A. 2h 39m, Decl. 17° 11′ N, and transits at 19.30. It was in opposition with the sun on November 4, 1926, and is still a brilliant object visible much of the night. It is in the constellation Aries during the month.

Jupiter on the 15th is in R.A. 22h 7m, Decl. 12° 38′ S, and transits at 14.31. It is an evening star but being comparatively low in the S.W. sky it cannot be well observed. It is in the constellation Aquarius. For the configuration of its satellites, see opp. page; for their eclipses, etc., see page 52.

Saturn on the 15th is in R.A. 16h 12m, Decl. 19° 14′ S, and transits at 8.37. It is a morning star, rising in the S.E. at about 3 a.m. Its low declination r nders its altitude not great at any time. It is in the constellation Scorpio, and its position among the stars can be found from the map on page 25. Stellar mag. of Saturn during January, +0.7.

Uranus on the 15th is in R.A. 23h 47m, Decl. 2° 11′ S, and transits at 16.11.

Neptune on the 15th is in R.A. 9h 55m, Decl. 13° 8′ N, and transits at 2.21.

For further information regarding the planets, with maps of their paths, see pages 22 to 26.

JANUARY

ASTRONOMICAL PHENOMENA

(75th Meridian Civil Time)

			Minima of Algol		Configurations of Jupiter's Satellites at 18h 30m
			h	m	
Sat.	1		9	20	42O31
Sun.	2	11h 30m ☌ ☿ ☾, ☿ 1° 13′ S.; 21h ⊕ in Perihelion, 91,346,100 miles			421O3
(New) Mon.	3	15h 28m N.M.; ☉ Annular ecl. invisible in Canada (see p. 27)			4O123
Tues.	4	10h 51m ☌ ♀ ☾, ♀ 0° 21′ N	6	10	41O32
Wed.	5	14h ♀ in Aphelion			423O1
Thur.	6	17h 6m ☌ ♃ ☾, ♃ 3° 15′ N			3O***
Fri.	7		3	00	31O24
Sat.	8	15h 8m ☌ ♁ ☾, ♁ 4° 48′ N			2O14*
Sun.	9		23	40	21O34
(1st Q) Mon.	10	9h 43m Moon F.Q.; 20h ☿ in Aphelion			O1234
Tues.	11	20h 44m ☌ ♂ ☾, ♂ 6° 20′ N			1O234
Wed.	12		20	30	23O14
Thur.	13				32O4*
Fri.	14				31O42
Sat.	15		17	20	42O1*
Sun.	16				421O3
(Full) Mon.	17	17h 27m F.M			4O213
Tues.	18		14	10	41O23
Wed.	19				423O1
Thur.	20	0h 23m ☌ ♆ ☾, ♆ 3° 39′ S			4321O
Fri.	21		11	00	d43O2
Sat.	22				d43O1
Sun.	23				21O3*
Mon.	24		7	50	O2143
(Last Q) Tues.	25	21h 5m Moon L.Q			1O234
Wed.	26				23O14
Thur.	27		4	40	321O4
Fri.	28	5h ♀ Greatest Hel. Lat. S.; 7h 55m ☌ ♄ ☾, ♄ 0° 50′ S.; 9h ☌ ☿ ☉, Superior			31O24
Sat.	29				32O4*
Sun.	30		1	30	21O34
Mon.	31	5h ☿ Greatest Hel. Lat. S			O413*

Explanation of symbols and abbreviations on page 4.

THE SKY FOR FEBRUARY, 1927

The times of transit are given in Local Mean Time. To change to Standard Time, see p. 9. Estimates of altitude are for an observer in latitude 45° N.

The Sun.—During February the sun's R.A. increases from 20h 54m to 22h 44m, and its Decl. changes from 17° 26′ S to 8° 3′ S. The equation of time reaches a maximum value of 14m 23s on the 12th (see page 6). For the change in the length of the day, see page 11. On the 19th the sun enters the third winter sign of the zodiac, Pisces.

The Moon.—For its phases and conjunctions with the planets, see opp. page. On the 12th the moon occults a star in Gemini (see p. 8).

Mercury on the 15th is in R.A. 22h 42m, Decl. 9° 7′ S, and transits at 13.07. During the first half of the month the planet moves out from the sun and on the 15th it attains its greatest eastern elongation, being then 18° 8′ from the sun. After this it draws in towards the sun. At sunset on the 15th the planet will be about 17° above the horizon and 20° south of the west point, and hence in good position to be seen. Indeed it should be visible for about ten days before and a week after greatest elongation. A field-glass will help to locate it (see page 22).

Venus on the 15th is in R.A. 23h 9m, Decl. 6° 56′ S, and transits at 13.34. Venus is now a good evening star, of stellar magnitude −3.4. At the end of the month it is on the celestial equator and hence is directly in the west when it sets. On February 5 Venus is in close conjunction with Jupiter (see opp. page).

Mars on the 15th is in R.A. 3h 35m, Decl. 21° 3′ N, and transits at 17.57. About the 13th the planet passes into the constellation Taurus, and on the 19th it is directly south of Alcyone. Its brightness falls during the month from stellar magnitude 0.4 to 0.9, due to its increasing distance from the earth. On the 17th it is in quadrature with the sun, *i.e.*, it is 90° from it.

Jupiter on the 15th is in R.A. 22h 34m, Decl. 10° 3′ S, and transits at 12.56. The planet is too near the sun to be well observed. For that reason the configurations of the satellites are omitted from the 12th onwards. On the 5th Jupiter and Venus are in conjunction (see Venus above).

Saturn on the 15th is in R.A. 16h 21m, Decl. 19° 34′ S, and transits at 6.44. On the 26th Saturn is in quadrature with the sun, being 90° west of the sun. It is seen well as a morning star; stellar magnitude, +0.7. For its position in the constellation Scorpio, see page 25.

Uranus on the 15th is in R.A. 23h 52m, Decl. 1° 37′ S, and transits at 14.14.

Neptune on the 15th is in R.A. 9h 52m, Decl. 13° 25′ N, and transits at 0.16.

For further information regarding the planets, with maps of their paths, see pages 22 to 26.

FEBRUARY

ASTRONOMICAL PHENOMENA

(75th Meridian Civil Time)

			Minima of Algol	Configurations of Jupiter's Satellites at 18h 15m
			h m	
	Tues.	1	22 10	41O23
◍	Wed.	2 3h 54m N.M.; 9h 33m ☌ ☿ ☾, 1° 20′ N		d42O1
	Thur.	3 8h 45m ☌ ♀ ☾, ♀ 2° 51′ N.; 11h 58m ☌ ♃ ☾, ♃ 3° 35′ N		4321O
	Fri.	4	19 00	43O12
	Sat.	5 0h 30m ☌ ♁ ☾, ♁ 4° 44′ N.; 9h ☌ ♀ ☾, ♀ 0° 37′ S		431O2
	Sun.	6		421O3
	Mon.	7	15 50	4O13*
◑	Tues.	8 18h 54m Moon F.Q		41O23
	Wed.	9 0h 8m ☌ ♂ ☾, ♂ 5° 30′ N		2O31*
	Thur.	10	12 40	321O4
	Fri.	11		3O124
	Sat.	12		Invisible
	Sun.	13 7h ☌ ☿ ♃, ☿ 0° 8′ S	9 30	
	Mon.	14		
	Tues.	15 2h ☍ ♆ ☉		
♍	Wed.	16 6h 5m ☌ ♆ ☾, ♆ 3° 33′ S.; 11h 18m F.M	6 20	
	Thur.	17 0h □ ♂ ☉		
	Fri.	18		
	Sat.	19 5h ☿ in ♌	3 10	Invisible
	Sun.	20		
	Mon.	21		
	Tues.	22	0 00	
	Wed.	23 20h ☿ in Perihelion		
☾	Thur.	24 14h ☌ ♀ ♁, ♀ 0° 29′ S.; 15h 42m Moon L.Q.; 19h 29m ☌ ♄ ☾, ♄ 0° 27′ S	20 50	
	Fri.	25 10h ☿ Greatest elong. E., 18° 8′		
	Sat.	26 18h □ ♄ ☉		
	Sun.	27	17 40	
	Mon.	28		

Explanation of symbols and abbreviations on page 4.

THE SKY FOR MARCH, 1927

The times of transit are given in Local Mean Time. To change to Standard Time, see p. 9. Estimates of altitude are for an observer in latitude 45° N.

The Sun.—During March the sun's R.A. increases from 22h 44m to 0h 38m, and its Decl. changes from 8° 3′ S to 4° 27′ N. The equation of time decreases from 12m 43s to 4m 20s (see page 6). For changes in the length of the day, see page 12. On the 21st at 9.59 a.m. the sun enters the first spring sign of the zodiac, Aries (see opp. page).

The Moon.—For its phases and conjunctions with the planets, see opp. page. On the 17th the moon occults a star in Virgo (see p. 8).

Mercury on the 15th is in R.A. 23h 20m, Decl. 0° 35′ S, and transits at 11.50. The planet continually approaches the sun until the 13th when it reaches inferior conjunction, *i.e.*, it comes (approximately) between the earth and the sun. It then separates westward from the sun and hence is a morning star, but throughout the month it is too near the sun for observation (see page 22.

Venus on the 15th is in R.A. 1h 16m, Decl. 7° 28′ N, and transits at 13.50. During this month Venus further improves its position as an evening star, and on the 31st it sets about two hours after the sun. Its stellar magnitude is still −3.4, or about six times as bright as Sirius.

Mars on the 15th is in R.A. 4h 38m, Decl. 23° 50′ N, and transits at 17.10. During this month the planet is in the constellation Taurus. It is about 7° north of Aldebaran on the 13th and of almost the same brightness.

Jupiter on the 15th is in R.A. 22h 59m, Decl. 7° 31′ S, and transits at 11.34. On the 1st of March Jupiter is in conjunction with the sun, and after this it is a morning star. During the entire month it is too near the sun for observation.

Saturn on the 15th is in R.A. 16h 25m, Decl. 19° 38′ S, and transits at 4.58. On the 18th the planet reaches a stationary point and begins to retrograde, which it continues to do until August 6. Stellar magnitude, +0.6; well placed for morning observations.

Uranus on the 15th is in R.A. 23h 58m, Decl. 1° 0′ S, and transits at 12.29.

Neptune on the 15th is in R.A. 9h 49m, Decl. 13° 41′ N, and transits at 22.11.

For further information regarding the planets, with maps of their paths, see pages 22 to 26.

MARCH

ASTRONOMICAL PHENOMENA

(75th Meridian Civil Time)

Minima of Algol

Configurations of Jupiter's Satellites

			h	m
	Tues.	1 6h ☌ ♃ ☉		
	Wed.	2	14	20
●	Thur.	3 9h 11m ☌ ♃ ☾, ♃ 3° 53′ N.; 14h 25m N.M.; 13h ☿ Stationary		
	Fri.	4 8h 58m ☌ ☿ ☾, ☿ 8° 42′ N.; 12h 59m ☌ ♁ ☾, ♁ 4° 40′ N		
	Sa.	5 4h 51m ☌ ♀ ☾, ♀ 4° 30′ N	11	10
	Sun.	6 3h ☿ Greatest Hel. Lat. N		
	Mon.	7		
	Tues.	8	8	00
	Wed.	9 9h 50m ☌ ♂ ☾, ♂ 4° 2′ N		
◑	Thur.	10 6h 3m Moon F.Q		
	Fri.	11	4	50
	Sat.	12		
	Sun.	13 10h ☌ ☿ ☉, Inferior		
	Mon.	14	1	40
	Tues.	15 10h 41m ☌ ♆ ☾, ♆ 3° 34′ S		
	Wed.	16	22	30
	Thur.	17		
♒	Fri.	18 2h ♄ Stationary; 5h 24 F.M		
	Sat.	19	19	20
	Sun.	20 15h ☌ ☿ ♃, ☿ 3° 27′ N.; 19h ☌ ♁ ☉		
	Mon.	21 9h 59m ☉ enters ♈, Spring commences		
	Tues.	22	16	10
	Wed.	23		
	Thur.	24 3h 0m ☌ ♄ ☾, ♄ 0° 5′ S		
	Fri.	25 12h ♀ in ♌; 20h ☿ Stationary	13	00
☾	Sat.	26 6h 35m Moon L.Q		
	Sun.	27		
	Mon.	28	9	40
	Tues.	29 14h ☿ in ♉		
	Wed.	30		
	Thur.	31 2h 31m ☌ ☿ ☾, ☿ 4° 46′ N.; 6h 32m ☌ ♃ ☾, ♃ 4° 9′ N	6	30

Invisible by reason of the proximity of Jupiter to the Sun.

Explanation of symbols and abbreviations on page 4.

THE SKY FOR APRIL, 1927

The times of transit are given in Local Mean Time. To change to Standard Time, see p. 9. Estimates of altitude are for an observer in latitude 45° N.

The Sun.—During April the sun's R.A. increases from 0h 38m to 2h 29m and its Decl. from 4° 4′ N to 14° 42′ N. The equation of time changes from −4m 20s to +2m 48s (see page 6). For the length of daylight in various latitudes, consult page 13. On the 21st the sun enters the second spring sign, Taurus.

The Moon.—For its phases and conjunctions with the planets, see opp. page. On the 5th the moon occults a star in Taurus and on the 19th one in Scorpio (see p. 8).

Mercury on the 15th is in R.A. 23h 52m, Decl. 3° 29′ S, and transits at 10.24. During the first ten days of the month Mercury is separating from the sun, and on the 10th it reaches its greatest elongation west. At this time it is 27° 44′ from the sun. This is a wide separation, but at sunrise the planet is hardly 10° above the horizon (10° S of E point) and hence it is not well placed for observation. A field-glass, however, will probably enable one to see it. After the 10th it moves in towards the sun on the way to superior conjunction (see page 22).

Venus on the 15th is in R.A. 3h 41m, Decl. 20° 41′ N, and transits at 14.13. The planet continues to separate from the sun, and on the 30th it sets about 2¾ hours after the sun. During the month it increases slightly its brightness, its stellar magnitude changing from −3.4 to −3.5.

Mars on the 15th is in R.A. 5h 55m, Decl. 25° 4′ N, and transits at 16.25. It passes from Taurus into Gemini about the 13th. Its stellar magnitude is now about 1.5.

Jupiter on the 15th is in R.A. 23h 26m, Decl. 4° 46′ S, and transits at 9.56. During this month the planet separates from the sun sufficiently for observation. On the 30th it is about 18° above the horizon at sunrise and about 20° south of the E. point. Its magnitude −1.6 renders it easily visible. For its path among the stars see page 24. 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. 16h 22m, Decl. 19° 28′ S, and transits at 2.53. The planet is still retrograding and is a short distance north of Antares (see map, page 25). Stellar magnitude, +0.4; visible almost all night.

Uranus on the 15th is in R.A. 0h 4m, Decl. 0° 20′ S, and transits at 10.34.

Neptune on the 15th is in R.A. 9h 47m, Decl. 13° 51′ N, and transits at 19.55.

For further information regarding the planets, with maps of their paths, see pages 22 to 26.

APRIL

ASTRONOMICAL PHENOMENA

(75th Meridian Civil Time)

			Minima of Algol	Configurations of Jupiter's Satellites at 5h 0m
			h m	
♍ Fri.	1	2h 38m ☌ ♁ ☾, ♁ 4° 40′ N.; 23h 24m N.M.		
Sat.	2			Invisible
Sun.	3		3 20	
Mon.	4	2h 34m ☌ ♀ ☾, ♀ 4° 23′ N.		
Tues.	5			
Wed.	6	0h ☌ ☿ ♃, ☿ 0° 29′ S.; 23h 14m ☌ ♂ ☾, ♂ 2° 15′ N	0 10	
Thur.	7			
♎ Fri.	8	19h 21m Moon F.Q.; 20h ☿ in Aphelion	21 00	
Sat.	9			
Sun.	10	3h ☿ Greatest elong. W 27° 44′		34102
Mon.	11	15h 30m ☌ ♆ ☾, ♆ 3° 44′ S.	17 50	43201
Tues.	12			42103
Wed.	13			d4023
Thur.	14		14 40	40123
Fri.	15			42103
♏ Sat.	16	22h 35m F.M.		43201
Sun.	17	9h ☌ ☿ ♁, ☿ 2° 3′ S.	11 30	34102
Mon.	18			d3041
Tues.	19			2104*
Wed.	20	7h 5m ☌ ♄ ☾, ♄ 0° 6′ N.	8 20	01234
Thur.	21			0234*
Fri.	22			21034
Sat.	23		5 00	23014
☾ Sun.	24	17h 21m Moon L.Q.		31024
Mon.	25			32014
Tues.	26		1 50	21304
Wed.	27			40213
Thur.	28	1h ♀ in Perhelion; 1h 53m ☌ ♃ ☾, ♃ 4° 22′ N.; 15h 4m ☌ ♁ ☾, ♁ 4° 47′ N.	22 40	4023*
Fri.	29	4h ☿ Greatest Hel. Lat. S.; 19h 46m ☌ ☿ ☾, ☿ 2° 34′ N.		d4203
Sat.	30			42301

Explanation of symbols and abbreviations on page 4.

THE SKY FOR MAY, 1927

The times of transit are given in Local Mean Time. To change to Standard Time, see p. 9. Estimates of altitude are for an observer in latitude 45° N.

The Sun.—During May the sun's R.A. increases from 2h 29m to 4h 31m, and its Decl. from 14° 42′ N to 21° 53′ N. The equation of time increases from 2m 48s to a maximum of 3m 47s on the 16th, and then falls to 2m 41s on the 31st (see page 6). For changes in the length of the day, see page 14. On the 22nd the sun enters Gemini, the third sign of the zodiac.

The Moon.—For its phases and conjunctions with the planets see opp. page. On the 4th the moon occults a star in Gemini (see p. 8).

Mercury on the 15th is in R.A. 2h 59m, Decl. 16° 21′ N, and transits at 11.34. All through May the planet is too near the sun for observation. It reaches superior conjunction on the 20th, *i.e.*, on that date it is directly behind the sun.

Venus on the 15th is in R.A. 6h 13m, Decl. 25° 38′ N, and transits at 14.47. The planet continues to separate from the sun and on the 31st it sets more than 3 hours after the sun. During the month its brightness increases still further, the stellar magnitude changing from −3.5 to −3.6. It passes from Taurus into Gemini during the month.

Mars on the 15th is in R.A. 7h 12m, Decl. 23° 55′ N, and transits at 15.44. During the month the planet is in the constellation Gemini. On the 26th it is 5° directly south of Pollux and somewhat fainter than that star.

Jupiter on the 15th is in R.A. 23h 49m, Decl. 2° 26′ S, and transits at 8.20. The planet is now a fine morning star in Pisces, near the celestial equator. Its stellar magnitude is −1.7, slightly brighter than Sirius. For its position among the stars see page 24. 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. 16h 15m, Decl. 19° 08′ S, and transits at 0.48. The planet is in opposition with the sun on the 26th, at which time it rises as the sun sets and is visible all night. Stellar magnitude, +0.2; the brightest the planet is during the year. See map on page 25 for its position among the stars.

Uranus on the 15th is in R.A. 0h 9m, Decl. 0° 13′ N, and transits at 8.41.

Neptune on the 15th is in R.A. 9h 47m, Decl. 13° 54′ N, and transits at 18.17.

For further information regarding the planets, including maps of their paths, see pages 22 to 26.

MAY

ASTRONOMICAL PHENOMENA

(75th Meridian Civil Time)

			Minima of Algol		Configurations of Jupiter's Satellites at 3h 45m
			h	m	
● Sun.	1	7h 40m N.M	19	30	43102
Mon.	2				43021
Tues.	3				42130
Wed.	4	2h 17m ☌ ☿ ☾, ☿ 2° 38′ N	16	20	4013*
Thur.	5	14h 35m ☌ ♂☾, ♂ 0° 26′ N.; 22h ♆ Stationary			10423
Fri.	6				20134
Sat.	7		13	10	d204*
☽ Sun.	8	10h 27m Moon F.Q.; 21h 56m ☌ ♆☾, ♆ 3° 57′ S.			31024
Mon.	9				30124
Tues.	10		10	00	23104
Wed.	11				20314
Thur.	12				10243
Fri.	13		6	50	20413
Sat.	14				2403*
Sun.	15	21h □ ♆ ☉			d4302
♋ Mon.	16	14h 3m F.M	3	40	43012
Tues.	17	9h 44m ☌ ♄ ☾, ♄ 0° 3′ N			43210
Wed.	18	4h ☿ in ♌			42031
Thur.	19	22h ☌ ☿ ☉, Superior	0	30	41023
Fri.	20	0h ☿ Greatest Hel. Lat. N			d4013
Sat.	21		21	10	2103*
Sun.	22	0h ♂ Greatest Hel. Lat. N.; 19h ☿ in Perihelion			d3024
Mon.	23				30124
☾ Tues.	24	0h 34m Moon L.Q	18	00	32104
Wed.	25	17h 48m ☌ ♃ ☾, ♃ 4° 28′ N			2014*
Thur.	26	0h 46m ☌ ♁ ☾, ♁ 4° 54′ N.; 10h ☍ ♄ ☉			10234
Fri.	27		14	50	02134
Sat.	28				21034
Sun.	29				3014*
● Mon.	30	16h 6m N.M	11	40	d302*
Tues.	31	16h 40m ☌ ☿ ☾, ☿ 2° 21′ N			34210

Explanation of symbols and abbreviations on page 4.

The times of transit are given in Local Mean Time. To change to Standard Time, see p. 9. Estimates of altitude are for an observer in latitude 45° N.

The Sun.—During June the sun's R.A. increases from 4h 31m to 6h 36m, and its Decl. rises from 21° 53′ N on the 1st to its maximum 23° 27′ on the 22nd. On that date the sun reaches the summer solstice and enters the first summer sign of the zodiac, Cancer. The duration of daylight is then the longest, but it does not change appreciably for several days, before and after this date (see page 15). The Decl. falls to 23° 15′ on the 30th. The increase in the equation of time (for which see p. 6), taken with the decreasing length of daylight, causes the local mean time of sunset to appear unchanged for several days at the end of June and the beginning of July. On June 29 there is a total eclipse of the sun visible in Europe, Northern Africa, Northern Asia and Alaska, not visible in Canada.

The Moon.—For its phases and conjunctions with the planets, see opp. page. On the 7th the moon occults a star in Virgo (see p. 8).

Mercury on the 15th is in R.A. 7h 12m, Decl. 24° 7′ N, and transits at 13.44. Proceeding from superior conjunction on May 20 the planet continually separates from the sun and reaches greatest elongation east on June 22. Its distance from the sun is then 25° 5′. At sunset it is about 17° above the horizon, 15° N of the W point. It should therefore be easily visible, though it will be in a fairly bright sky due to the long twilight at this time of the year. Look for it from about the 15th to the 27th. (See page 22.)

Venus on the 15th is in R.A. 8h 41m, Decl. 20° 32′ N, and transits at 15.12. During June the planet becomes still brighter, its stellar magnitude changing from −3.6 to −3.9, and it sets over 3 hours later than the sun. It is a beautiful evening star.

Mars on the 15th is in R.A. 8h 31m, Decl. 20° 17′ N, and transits at 15.02. During this month the planet passes through the constellation, Cancer. On the 16th it is near Praesepe, the open cluster. It is still quite visible as an evening star, but it has now fallen to about the same brightness as Polaris. On June 9 Mars and Venus are in close conjunction.

Jupiter on the 15th is in R.A. 0h 06m, Decl. 0° 41′ S, and transits at 6.36. On the 24th it is in quadrature with the sun, being then 90° west of the sun. A fine morning star of magnitude −2.0. For its position among the stars, see page 24. 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. 16h 5m, Decl. 18° 45′ S, and transits at 22.32. The planet is slightly fainter than a month ago, being of magnitude +0.3, and is well placed for evening observations. It is still retrograding.

Uranus on the 15th is in R.A. 0h 13m, Decl. 0° 35′ N, and transits at 6.42.

Neptune on the 15th is in R.A. 9h 48m, Decl. 13° 45′ N, and transits at 16.17.

For further information regarding the planets, with maps of their paths, see pages 22 to 26.

JUNE

ASTRONOMICAL PHENOMENA

(75th Meridian Civil Time)

			Minima of Algol		Configurations of Jupiter's Satellites at 2h 45m
			h	m	
Wed.	1	.....			42O1*
Thur.	2	2h ☿ Greatest Hel. Lat. N.....			41O23
Fri.	3	0h 50m ☌ ♀ ☾, ♀ 0° 2′ N; 6h 48m ☌ ♂ ☾, ♂ 1° 16′ S	8	30	4O213
Sat.	4	.....			421O3
Sun.	5	6h 24m ☌ ♆ ☾, ♆ 4° 6′ S.....			43O1*
Mon.	6	.....	5	20	431O2
☽ Tues.	7	2h 49m Moon F.Q.....			d342O
Wed.	8	.....			23O14
Thur.	9	13h ☌ ♀ ♂, ♀ 0° 58′ N.....	2	10	1O234
Fri.	10	.....			O1234
Sat.	11	.....	23	00	21O34
Sun.	12	.....			d2O14
Mon.	13	13h 6m ☌ ♄ ☾, ♄ 0° 10′ S.....			31O24
Tues.	14	.....	19	50	d3O14
♋ Wed.	15	3h 19m F.M., Total ecl. visible in Canada, (see p. 27)			23O4*
Thur.	16	.....			14O23
Fri.	17	.....	16	30	4O123
Sat.	18	.....			421O3
Sun.	19	.....			42O31
Mon.	20	.....	13	20	431O2
Tues.	21	.....			43O21
☾ Wed.	22	5h 22m ☉ enters ♋, Summer commences; 5h 29m Moon L.Q.; 5h 44m ☌ ♃ ☾, ♃ 4° 23′ N.; 6h ☿ Greatest elong. E 25° 5′; 7h 43m ☌ ♁ ☾, ♁ 4° 56′ N.....			423O*
Thur.	23	.....	10	10	41O23
Fri.	24	10h □ ♃ ☉.....			4O123
Sat.	25	13h ☿ in ♉; 17h □ ♁ ☉.....			21O43
Sun.	26	23h ♂ in Aphelion.....	7	00	2O314
Mon.	27	.....			31O24
Tues.	28	.....			3O214
♍ Wed.	29	1h 32m N.M., Total ecl. of ☉, invisible in Canada (see p. 27).....	3	50	321O4
Thur.	30	20h 10m ☌ ☿ ☾, ☿ 4° 8′ S.....			dO34*

Explanation of symbols and abbreviations on page 4.

THE SKY FOR JULY, 1927

The times of transit are given in Local Mean Time. To change to Standard Time, see p. 9. Estimates of altitude are for an observer in latitude 45° N.

The Sun.—During July the sun's R.A. increases from 6h 36m to 8h 41m, and its Decl. decreases from 23° 12′ N to 18° 20′ N. The equation of time increases from 3m 24s on the 1st to 6m 22s on the 28th and then falls to 6m 18s on the 31st (see p. 7). On the 23rd 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 the 3rd (see opp. page for distance).

The Moon.—For its phases and conjunctions with the planets, see opp. page. On July 10 the moon occults Saturn and on the 24th a star in Taurus (see p. 8).

Mercury on the 15th is in R.A. 8h 3m, Decl. 15° 53′ N, and transits at 12.32. The planet reaches inferior conjunction on the 20th and hence is not in suitable position for observation during the entire month.

Venus on the 15th is in R.A. 10h 33m, Decl. 9° 13′ N, and transits at 15.04. On the 2nd the planet reaches its greatest distance east of the sun (see opp. page). At this time its disc in a telescope looks like a half-moon. On the 5th the planet is close to Regulus, being about 30′ north of it. During July the brightness still further increases, the stellar magnitude rising from −3.9 to −4.1.

Mars on the 15th is in R.A. 9h 45m, Decl. 14° 45′ N, and transits at 14.17. During the month the planet is in the constellation Leo. On the 23rd it is about 1° north of Regulus, but almost one magnitude fainter than that star.

Jupiter on the 15th is in R.A. 0h 15m, Decl. 0° 6′ N, and transits at 4.46. It now rises at about 10.30 p.m. and is a brilliant objec in the sky during the rest of the night. Stellar magnitude −2.2. On July 9 Jupiter and Uranus are close together: a good time to locate Uranus. For its position among the stars, see page 24. 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. 15h 59m, Decl. 18° 32′ S, and transits at 20.28. The planet is now very well placed for observation, although its southerly declination causes it to be never very high in the sky. Its stellar magnitude +0.4; still retrograding, but not so rapidly.

Uranus on the 15th is in R.A. 0h 14m, Decl. 0° 40′ N, and transits at 4.46.

Neptune on the 15th is in R.A. 9h 51m, Decl. 13° 29′ N, and transits at 14.22.

For further information regarding the planets, with maps of their paths, see pages 22 to 26.

JULY

ASTRONOMICAL PHENOMENA

(75th Meridian Civil Time)

			Minima of Algol		Configurations of Jupiter's Satellites at 2h 0m
			h	m	
Fri.	1	23h 29m ☌ ♂ ☾, ♂ 2° 45′ S.			O1234
Sat.	2	0h ☌ ♀ Ψ, ♀ 0° 49′ N.; 16h ♀ Greatest elong. E. 45° 27′; 16h 14m ☌ Ψ ☾, Ψ 4° 8′ S.; 17h 27m ☌ ♀ ☾, ♀ 3° 25′ S.	0	40	21O43
Sun.	3	14h ⊕ in Aphelion, 94,454,200 miles			24O13
Mon.	4		21	30	431O2
Tues.	5	12h ☿ Stationary; 19h ☿ in Aphelion			43O21
☽ Wed.	6	19h 52m Moon F.Q			4321O
Thur.	7		18	20	43O1*
Fri.	8				4O23*
Sat.	9	10h ☌ ♃ ♁, ♃ 0° 38′ S.; 15h ♁ Stationary			412O3
Sun.	10	18h 28m ☌ ♄ ☾, ♄ 0° 22′ S.	15	00	42O13
Mon.	11				13O42
Tues.	12				3O124
Wed.	13		11	50	321O4
♉ Thur.	14	14h 22m F.M			2O14*
Fri.	15	1h ♀ in ♉			O324*
Sat.	16		8	40	ddO34
Sun.	17	12h ☌ ♂ Ψ, ♂ 0° 43′ N.			2O134
Mon.	18				13O24
Tues.	19	13h 22m ☌ ♁ ☾, ♁ 4° 51′ N.; 14h 1m ☌ ♃ ☾, ♃ 4° 10′ N.; 19h ☌ ☿ ☉, Inferior	5	30	3O412
Wed.	20				3421O
☾ Thur.	21	9h 43m Moon L.Q			432O1
Fri.	22		2	20	41O32
Sat.	23				4O123
Sun.	24		23	10	42O13
Mon.	25	0h ♃ Stationary			d41O2
Tues.	26	4h ☿ Greatest Hel. Lat. S.			43O12
Wed.	27	11h 45m ☌ ☿ ☾, ☿ 6° 30′ S.	20	00	3412O
♍ Thur.	28	12h 36m N.M			32O41
Fri.	29				1O324
Sat.	30	2h 12m ☌ Ψ ☾, Ψ 4° 7′ S.; 3h ☿ Stationary; 16h 43m ☌ ♂ ☾, ♂ 3° 52′ S.	16	50	O1234
Sun.	31	19h 8m ☌ ♀ ☾, ♀ 8° 1′ S.			2O34*

Explanation of symbols and abbreviations on page 4.

THE SKY FOR AUGUST, 1927

The times of transit are given in Local Mean Time. To change to Standard Time, see p. 9. Estimates of altitude are for an observer in latitude 45° N.

The Sun.—During August the sun's R.A. increases from 8h 41m to 10h 37m and its Decl. decreases from 18° 20′ N to 8° 44′ N. The equation of time falls from 6m 16s to 0m 23s (see page 7). For changes in the length of daylight, see page 17. On the 24th the sun enters the third summer sign of the zodiac, Virgo.

The Moon.—For its phases and conjunctions with the planets, see opp. page. On the 22nd the moon occults a star in Gemini (see p. 8).

Mercury on the 15th is in R.A. 8h 26m, Decl. 19° 23′ N, and transits at 10.57. From July 30 the planet is continually separating from the sun and it reaches greatest westerly elongation on August 8. At that date it is 19° 5′ from the sun. The autumn is the best time to observe a westerly elongation. At sunrise the planet has an altitude of almost 15°, and it is about 15° N of the E point of the horizon. For almost the first half of August the planet should be visible. (See page 22.)

Venus on the 15th is in R.A. 11h 32m, Decl. 2° 18′ S, and transits at 14.00. The planet is now moving in towards the sun and on the 31st it is only ¾ hour east of it. Conjunction with the sun occurs on the 10th of next month. On August 5 the planet attains its greatest brilliancy, at which time its stellar magnitude is −4.2, or about 15 times as bright as Sirius. Its disc when viewed in a telescope looks like the moon 4 days old.

Mars on the 15th is in R.A. 10h 59m, Decl. 7° 34′ N, and transits at 13.28. During this month Mars is in the constellation Leo, but it is so faint and so close to the sun that it is not suitable for observation.

Jupiter on the 15th is in R.A. 0h 13m, Decl. 0° 17′ S, and transits at 2.42. On July 25 Jupiter reached a stationary point and began to retrograde and on the 19th it comes to conjunction with Uranus again. It is a fine star in the east in early evening. For its path in the sky, see page 24. 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. 15h 57m, Decl. 18° 35′ S and transits at 18.25. On the 6th the planet reaches a stationary point and ceases to retrograde. On the 25th it is in quadrature with the sun. The planet is well placed for observation as an evening star.

Uranus on the 15th is in R.A. 0h 12m, Decl. 0° 27′ N, and transits at 2.42.

Neptune on the 15th is in R.A. 9h 56m, Decl. 13° 7′ N, and transits at 12.24.

For further information regarding the planets, with the maps of their paths, see pages 22 to 26.

AUGUST

ASTRONOMICAL PHENOMENA

(75th Meridian Civil Time)

			Minima of Algol h m	Configurations of Jupiter's Satellites at 1h 0m
	Mon.	1		1034*
	Tues.	2	13 40	30124
	Wed.	3		31204
	Thur.	4		32014
☽	Fri.	5 10h ♀ Greatest brilliancy, −4m.2; 13h 5m Moon F.Q	10 30	10432
	Sat.	6 2h ♄ Stationary		40123
	Sun.	7 2h 5m ☌ ♄ ☾, ♄ 0° 24′ S.		42103
	Mon.	8 7h ☿ Gr?atest elong. W. 19° 5′	7 10	d403*
	Tues.	9		43012
	Wed.	10		43120
	Thur.	11	4 00	43201
♋	Fri.	12 23h 37m F. M.		41032
	Sat.	13		0123d
	Sun.	14 4h ☿ in ☊	0 50	21043
	Mon.	15 19h 36m ☌ ♁ ☾, ♁ 4° 41′ N.; 19h 50m ☌ ♃ ☾, ♃ 3° 52′ N		20134
	Tues.	16	21 40	3024*
	Wed.	17 23h ♀ Stationary		d3104
	Thur.	18 9h ♀ in Aphelion; 19h ☿ in Perihelion		32014
☾	Fri.	19 0h ☌ ♃ ♁, ♃ 0° 50′ S.; 14h 54m Moon L.Q	18 30	1024*
	Sat.	20 13h ☌ ♆ ☉		01234
	Sun.	21		21043
	Mon.	22	15 20	24013
	Tues.	23		4302*
	Wed.	24		43102
	Thur.	25 8h □ ♄ ☉	12 10	43201
	Fri.	26 8h 57m ☌ ☿ ☾, ☿ 2° 47′ S.; 11h 15m ☌ ♆ ☾, ♆ 4° 8′ S.; 20h ☌ ♀ ♂, ♀ 8° 50′ S.		41302
♎	Sat.	27 0h ☌ ☿ ♆, ☿ 1° 19′ N.; 1h 46m N.M.		40123
	Sun.	28 7h 54m ☌ ♀ ☾, ♀ 13° 35′ S.; 10h 56m ☌ ♂ ☾, ♂ 4° 31′ S.	9 00	42103
	Mon.	29 1h ☿ Greatest Hel. Lat. N		42013
	Tues.	30		31042
	Wed.	31	5 50	d3024

Explanation of symbols and abbreviations on page 4.

THE SKY FOR SEPTEMBER, 1927

The times of transit are given in Local Mean Time. To change to Standard Time, see p. 9. Estimates of altitude are for an observer in latitude 45° N.

The Sun.—During September the sun's R.A. increases from 10h 37m to 12h 25m, and its Decl. changes from 8° 44′ N to 2° 42′ S. The equation of time is 0m 33s on the 1st, becomes zero on the 2nd and then increases to 9m 53s. For the change in the length of daylight, see page 18. On the 24th the sun crosses the equator going southward and enters the first autumn sign of the zodiac, Libra.

The Moon.—For its phases and conjunctions with the planets, see opp. page. On the 30th the moon occults a star in Scorpio (see p. 8).

Mercury on the 15th is in R.A. 12h 7m, Decl. 0° 4′ N, and transits at 12.36. On the 2nd the planet reaches superior conjunction, and though it is separating from the sun during all the rest of the month it does not get far enough away to be conveniently observed.

Venus on the 15th is in R.A. 10h 49m, Decl. 1° 47′ S and transits at 11.15. On the 10th the planet reaches inferior conjunction and becomes a morning star. Of course it cannot be observed at this time. It then rapidly separates from the sun and at the end of the month rises about two hours before the sun and so can be seen easily.

Mars on the 15th is in R.A. 12h 12m, Decl. 0° 27′ S, and transits at 12.39. The planet is in Virgo during this month, but it is so faint and so near to the sun that it cannot be well observed.

Jupiter on the 15th is in R.A. 0h 1m, Decl. 1° 40′ S, and transits at 0.29. On the 12th Jupiter is in opposition with the sun and is visible practically all night. Its stellar magnitude is −2.5. 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. 16h 2m, Decl. 18° 57′ S, and transits at 16.28. Saturn has now diminished in brightness to magnitude +0.7, a little fainter than Procyon. It is still well seen as an evening star.

Uranus on the 15th is in R.A. 0h 8m, Decl. 0° 1′ N, and transits at 0.36.

Neptune on the 15th is in R.A. 10h 0m, Decl. 12° 45′ N, and transits at 10.26.

For further information regarding the planets, with maps of their paths, see pages 22 to 26.

SEPTEMBER

ASTRONOMICAL PHENOMENA

(75th Meridian Civil Time)

			Minima of Algol		Configurations of Jupiter's Satellites at 0h 15m
			h	m	
	Thur.	1			32O14
	Fri.	2 10h ☌ ☿ ☉, Superior			31O4*
	Sat.	3 11h 27m ☌ ♄ ☾, ♄ 0° 13′ S.	2	40	O1324
☽	Sun.	4 5h 44m Moon F.Q.			12O34
	Mon.	5 20h ☌ ☿ ♀, ☿ 10° 58′ N.	23	20	2O134
	Tues.	6			13O24
	Wed.	7			3O142
	Thur.	8	20	10	324O*
	Fri.	9 22h ♀ Greatest Hel. Lat. S.			431O*
	Sat.	10 13h ☌ ♀ ☉, Inferior			4O132
♍	Sun.	11 7h 54m F.M.	17	00	412O3
	Mon.	12 0h 44m ☌ ♃ ☾, ♃ 3° 42′ N.; 3h 30m ☌ ♁ ☾, ♁ 4° 35′ N.			42O13
	Tues.	13			41O32
	Wed.	14	13	50	43O12
	Thur.	15			3241O
	Fri.	16 1h ☌ ☿ ♂, ☿ 0° 6′ S.			321O4
☾	Sat.	17 22h 30m Moon L.Q.	10	40	O1324
	Sun.	18			d1O34
	Mon.	19			2O134
	Tues.	20	7	30	1O324
	Wed.	21 12h ☿ in ♉			3O124
	Thur.	22 7h ☍ ♃ ☉; 19h 2m ☌ ♆ ☾, ♆ 4° 16′ S.			321O4
	Fri.	23 12h 29m ☌ ♀ ☾, ♀ 13° 14′ S.; 20h 17m ☉ enters ♎, Autumn commences	4	20	d32O4
	Sat.	24			4O132
♏	Sun.	25 7h ☍ ♁ ☉; 17h 11m N.M.			d41O3
	Mon.	26 6h 44m ☌ ♂ ☾, ♂ 4° 31′ S.	1	10	42O13
	Tues.	27 4h 20m ☌ ☿ ☾, ☿ 5° 33′ S.			41O23
	Wed.	28	22	00	43O12
	Thur.	29 22h ♀ Stationary			4321O
	Fri.	30 21h 54m ☌ ♄ ☾, 0° 6′ N.			432O1

Explanation of symbols and abbreviations on page 4.

THE SKY FOR OCTOBER, 1927

The times of transit are given in Local Mean Time. To change to Standard Time, see p. 9. Estimates of altitude are for an observer in latitude 45° N.

The Sun.—During October the sun's R.A. increases from 12h 25m to 14h 21m, and its Decl. increases from 2° 42′ S to 14° 2′ S. On the 24th the sun enters the second autumnal sign of the zodiac, Scorpio. The equation of time rises from 9m 53s to 16m 18s, to be subtracted from apparent or sun dial time (see p. 7). For the change in the length of daylight, see page 19.

The Moon.—For its phases and conjunctions with the planets, see opp. page. The moon occults stars on the 22nd, 29th and 30th (see p. 8).

Mercury on the 15th is in R.A. 14h 46m, Decl. 18° 50′ S, and transits at 13.17. The planet continues to move out from the sun, and on the 18th it reaches elongation east, 24° 41′ from the sun. The autumn is not a good season to observe an eastern elongation, since, although the planet is nearly 25° from the sun, its altitude above the horizon at sunrise is only about 10°. It is a little N. of S.W. With a field-glass, however, the planet can probably be detected.

Venus on the 15th is in R.A. 10h 48m, Decl. 4° 1′ N, and transits at 9.17. On the 17th the planet attains greatest brilliancy, being then of stellar magnitude −4.3. It is steadily separating from the sun and is a magnificent object in the eastern sky before sunrise. It is so bright that it is visible in broad daylight. If one knows just where to look he can see the planet easily. On the 21st the moon comes to conjunction with it (see next page) and by picking out the moon in the daytime the planet can be located from it.

Mars on the 15th is in R.A. 13h 24m, Decl. 9° 37′ S, and transits at 11.46. On the 21st the planet comes to conjunction with the sun. During the entire month it is too near the sun for observation.

Jupiter on the 15th is in R.A. 23h 47m, Decl. 3° 10′ S, and transits at 22.13. Jupiter now rises at abou 4 p.m. and in the early evening is a fine star in the south-east. Its stellar magnitude is −2.4. It is still retrograding. For its path among the stars, see page 24. 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. 16h 12m, Decl. 19° 29′ S, and transits at 14.40. The planet is still visible as an evening star as it sets about 2½ hours after the sun. Stellar magnitude, +0.8.

Uranus on the 15th is in R.A. 0h 4m, Decl. 0° 26′ N, and transits at 23.51.

Neptune on the 15th is in R.A. 10h 3m, Decl. 12° 26′ N, and transits at 8.40.

For further information regarding the planets, with maps of their paths, see pages 22 to 26.

OCTOBER

ASTRONOMICAL PHENOMENA

(75th Meridian Civil Time)

			Minima of Algol		Configurations of Jupiter's Satellites at 22h 45m
			h	m	
Fri.	0	21h 54m ☌ ♄ ☾, ♄ 0° 6′ N			4O2**
Sat.	1	18h ☿ in Aphelion	18	40	41O23
Sun.	2				2O143
☽ Mon.	3	21h 2m Moon F. Q			1O341
Tues.	4		15	30	3O124
Wed.	5				312O4
Thur.	6				32O14
Fri.	7		12	20	13O24
Sat.	8				dO234
Sun.	9	6h 3m ☌ ♃ ☾, ♃ 3° 45′ N.; 12h 42m ☌ ♁ ☾, ♁ 4° 37′°N			2O143
♋ Mon.	10	16h 15m F.M	9	10	412O3
Tues.	11				43O12
Wed.	12				4312O
Thur.	13		6	00	432O1
Fri.	14				413O2
Sat.	15				4O123
Sun.	16		2	50	42O3*
☾ Mon.	17	9h 32m Moon L.Q.; 15h ♀ Greatest brilliancy, −4m.3			412O3
Tues.	18	11h ☿ Greatest elong. E. 24° 41′	23	40	3O412
Wed.	19				312O4
Thur.	20	2h 3m ☌ ♆ ☾, ♆ 4° 29′ S.; 22h ☌ ♂ ☉			32O14
Fri.	21	8h 0m ☌ ♀ ☾, ♀ 7° 49′ S	20	30	31O24
Sat.	22	3h ☿ Greatest Hel. Lat. S			O1234
Sun.	23				2O34*
Mon.	24		17	20	21O34
♍ Tues.	25	4h 32m ☌ ♂ ☾, ♂ 3° 51′ S.; 10h 37m N.M			dO124
Wed.	26				d31O4
Thur.	27	8h 15m ☌ ☿ ☾, ☿ 5° 23′ S	14	00	324O1
Fri.	28	9h 9m ☌ ♄ ☾, ♄ 0° 25′ N			431O2
Sat.	29				4O132
Sun.	30	5h ☿ Stationary	10	50	421O3
Mon.	31				

Explanation of symbols and abbreviations on page 4.

THE SKY FOR NOVEMBER, 1927

The times of transit are given in Local Mean Time. To change to Standard Time, see p. 9. Estimates of altitude are for an observer in latitude 45° N.

The Sun.—During November the sun's R.A. increases from 14h 21m to 16h 24m, and its Decl. changes from 14° 2′ S to 21° 37′ S. On the 23rd the sun enters Sagittarius, the third autumnal sign of the zodiac. The equation of time on the 4th rises to a maximum of 16m 22s, to be subtracted from apparent time—that is, the sun dial is that amount ahead of the mean time clock (see page 7). For the changes in the length of daylight, see page 20.

The Moon.—For its phases and conjunctions with the planets, see opp. page. On the 18th the moon occults a star in Virgo (see p. 8).

Mercury on the 15th is in R.A. 14h 38m, Decl. 13° 52′ S, and transits at 11.02. The planet reaches inferior conjunction on November 10, and on this occasion it comes squarely in front of the sun and crosses its face. The planet enters on the face of the sun at about 3.02 and leaves at about 8.29 a.m. Greenwich Time. This is before the sun has risen to people in North America and hence the transit is not visible here. For further information ee pages 22, 27.

After this conjunction the planet separates from the sun and reaches greatest westerly elongation on the 27th. At sunrise it will be easily visible, about 13° above the S.E. point of the horizon.

Venus on the 15th is in R.A. 12h 20m, Decl. 1° 4′ N, and transits at 8.48. Venus continues to separate from the sun until the 21st, when it reaches its greatest elongation, 46° 43′ (see opp. page). From this time it slowly draws in towards the sun. All month it is a splendid morning star.

Mars on the 15th is in R.A. 14h 45m, Decl. 15° 44′ S, and transits at 11.12. The planet is now a morning star. During the month it is in the constellations Virgo and Libra, but it is too near the sun and also too faint for observation.

Jupiter on the 15th is in R.A. 23h 39m, Decl. 3° 53′ S, and transits at 20.03. On the 20th the planet reaches a stationary point and begins to move eastward among the stars again. Its magnitude is −2.2 and it is a fine object for observation. 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. 16h 26m, Decl. 20° 7′, and transits at 12.52. The planet is now too near the sun for convenient observation. On the 13th it is 6° north of Antares. Stellar magnitude, +0.7.

Uranus on the 15th is in R.A. 0h 0m, Decl. 0° 48′ S, and transits at 20.24.

Neptune on the 15th is in R.A. 10h 6m, Decl. 12° 15′ N, and transits at 6.32.

For further information regarding the planets, with maps of their paths, see pages 22 to 26.

NOVEMBER

ASTRONOMICAL PHENOMENA

(75th Meridian Civil Time)

			Minima of Algol		Configuration of Jupiter's Satellites at 21h 30m
			h	m	
	Mon.	0			d4203
	Tues.	1			4032*
☽	Wed.	2 10h 16m Moon F.Q.	7	40	43102
	Thur.	3			32401
	Fri.	4			3104
	Sat.	5 5h ☿ in ♌; 12h 27m ☌ ♃ ☾, ♃ 3° 59′ N.; 21h 44m ☌ ♁ ☾, ♁ 4° 45′ N	4	30	03124
	Sun.	6			21034
	Mon.	7			20134
	Tues.	8	1	20	0324*
♋	Wed.	9 1h 36m F.M.			31024
	Thur.	10 0h 35m ☌ ☿ ☉, Inferior, Transit, invisible in Canada (see p. 27); 3h ☿ in ♌	22	10	32014
	Fri.	11			3104*
	Sat.	12			40312
	Sun.	13 14h ☌ ☿ ♂, ☿ 0° 56′ N	19	00	41203
	Mon.	14 18h ☿ in Perihelion			42013
	Tues.	15			41032
☾	Wed.	16 0h 28m Moon L.Q.; 9h 21m ☌ ♆ ☾, ♆ 4° 40′ S.	15	50	d4302
	Thur.	17			43201
	Fri.	18 23h ☿ Stationary			43120
	Sat.	19 18h 48m ☌ ♀ ☾, ♀ 3° 48′ S.	12	40	4012*
	Sun.	20 3h ♃ Stationary			d1403
	Mon.	21 7h ♀ Greatest elong. W. 46° 43′			20143
	Tues.	22 6h □ ♆ ☉; 11h 0m ☌ ☿ ☾, ☿ 0° 52′ S.	9	30	10234
	Wed.	23 4h 18m ☌ ♂ ☾, ♂ 2° 36′ S.			d3024
♎	Thur.	24 5h 9m N.M; 21h 24m ☌ ♄ ☾, ♄ 0° 42′ N.			3204*
	Fri.	25 0h ☿ Greatest Hel. Lat. N	6	10	31204
	Sat.	26 19h ☿ Greatest elong. W. 20° 1′			30124
	Sun.	27			d1034
	Mon.	28	3	00	20143
	Tues.	29			14023
	Wed.	30	23	50	

Explanation of symbols and abbreviations on page 4.

THE SKY FOR DECEMBER, 1927

The times of transit are given in Local Mean Time. To change to Standard Time, see p. 9. Estimates of altitude are for an observer in latitude 45° N.

The Sun.—During December the sun's R.A. increases from 16h 24m to 18h 41m, and its Decl. reaches a maximum value 23° 27′ S on the 23rd. This is the time of the winter solstice and the sun enters the first of the winter signs of the zodiac, Capricornus. It is then vertical to points on the tropic of Capricorn on the earth. From this time it slowly moves northward, the daylight period being the shortest and changing very little for several days before and after the solstice (see p. 21). The equation of time changes from 11m 22s watch slow to 2m 59s watch fast (see page 7). On December 24 there is a partial eclipse of the sun, not visible in Canada.

The Moon.—For its phases and conjunctions with the planets, see opp. page. On the 1st the moon occults a star in Aquarius (see p. 8).

Mercury on the 15th is in R.A. 16h 27m, Decl. 21° 56′ S, and transits at 10.57. During the month the planet is continually approaching the sun and hence it is not suitably placed for observation. It reaches superior conjunction on January 9, 1928.

Venus on the 15th is in R.A. 14h 21m, Decl. 11° 23′ S, and transits at 8.51. During December the planet continues to be a splendid morning star, slowly moving in towards the sun. On December 1 the stellar magnitude is −4.0 and on the 31st it is −3.7.

Mars on the 15th is in R.A. 16h 11m, Decl. 21° 10′ S, and transits at 10.40. During this month the planet is in the constellations Libra and Scorpio, but it is still faint (about mag. 2) and low down in the sky, due to its southerly declination. On the 20th it is about 5½ degrees S. of Antares, of the same reddish colour but fainter.

Jupiter on the 15th is in R.A. 23h 43m, Decl. 3° 18′ S, and transits at 18.06. On the 17th it is in quadrature with the sun. Stellar magnitude −2.0 and a fine evening star. 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. 16h 41m, Decl. 20° 39′ S, and transits at 11.08. The planet is in conjunction with the sun on the 3rd, after which it is a morning star. It is too near the sun all month for convenient observation.

Uranus on the 15th is in R.A. 23h 59m, Decl. 0° 52′ S, and transits at 18.26.

Neptune on the 15th is in R.A. 10h 6m, Decl. 12° 16′ N, and transits at 4.34.

For further information regarding the planets, with maps of their paths, see pages 22 to 26.

DECEMBER

ASTRONOMICAL PHENOMENA

(75th Meridian Civil Time)

			Minima of Algol		Configurations of Jupiter's Satellites at 20h 30m
			h	m	
Wed.	0	.....	23	50	43O12
☽ Thur.	1	21h 15m Moon F.Q.....			432O*
Fri.	2	12h ♆ Stationary; 20h 12m ☌ ♃ ☾, ♃ 4° 14′ N...			4321O
Sat.	3	3h ☌ ♄ ☉; 5h 14m ☌ ♁ ☾, ♁ 4° 53′ N.....	20	40	43O12
Sun.	4	.....			41O23
Mon.	5	16h ♂ in ♉.....			42O13
Tues.	6	.....	17	30	41O3*
Wed.	7	.....			dO12*
♋ Thur.	8	12h 32m F.M., Total ecl. invisible in Canada (see p. 27); 23h ♀ in Perihelion.....			321O4
Fri.	9	18h ☌ ☿ ♂, ☿ 1° 8′ N.; 23h Stationary.....	14	20	d32O4
Sat.	10	.....			3O124
Sun.	11	.....			1O234
Mon.	12	.....	11	10	2O134
Tues.	13	17h 41m ☌ ♆ ☾, ♆ 4° 44′ S.....			12O34
Wed.	14	.....			O3124
☾ Thur.	15	19h 4m Moon L.Q.....	8	00	312O4
Fri.	16	.....			324O1
Sat.	17	5h ☌ ☿ ♄, ☿ 1° 24′ S.; 16h □ ♃ ☉.....			43O2*
Sun.	18	11h ☿ in ♂.....	4	50	41O2*
Mon.	19	22h 57m ☌ ♀ ☾, ♀ 0′ 34′ S.....			42O13
Tues.	20	.....			412O3
Wed.	21	.....	1	30	4O312
Thur.	22	5h □ ♁ ☉; 5h 22m ☌ ♂ ☾, ♂ 1° 0′ S.; 10h 50m ☌ ♄ ☾, ♄ 0° 58′ N.; 15h 18m ☉ enters ♑, Winter commences.....			d431O
♍ Fri.	23	3h 26m ☌ ☿ ☾, ☿ 0° 19′ S.; 23h 13m N.M., ☉ Partial ecl. invisible in Canada (see p. 27).....	22	20	324O1
Sat.	24	.....			31O42
Sun.	25	.....			1O324
Mon.	26	17h ☌ ♂ ♄, ♂ 1° 46′ S.....	19	10	2O134
Tues.	27	.....			12O34
Wed.	28	18h ☿ in Aphelion.....			O3124
Thur.	29	.....	16	00	31O24
Fri.	30	6h 2m ☌ ♃ ☾, ♃ 4° 18′ N.; 11h 25m ☌ ♁ ☾, ♁ 4° 52′ N.; 17h ♀ Greatest Hel. Lat. N.....			32O14
☽ Sat.	31	6h 22m Moon F.Q.....			3O4*
Sun.	32	.....	12	50	3O142

Explanation of symbols and abbreviations on page 4.

PHENOMENA OF JUPITER'S SATELLITES, 1927

E—Eclipse, O—occultation, T—transit, S—shadow, D—disappearance, R—reappearance
I—ingress, e—egress. The Roman numerals denote the satellites.
75th Meridian Civil Time.

JANUARY

d	h	m	Sat.	Phen.	d	h	m	Sat.	Phen.
5	18	43	I	TI	15	18	21	II	Se
	19	37	I	SI	21	17	57	I	SI
6	19	7	I	ER	22	18	9	II	SI
13	17	59	I	OD	23	18	33	IV	OR
	19	27	II	OD	26	18	11	III	Se
14	18	19	I	Se	31	18	31	II	ER
15	17	41	III	OD					

FEBRUARY

d	h	m	Sat.	Phen.
6	18	11	I	Te

APRIL

d	h	m	Sat.	Phen.
29	4	32	I	Se

MAY

6	4	11	I	SI	21	3	34	IV	ED
11	4	16	II	ED	22	3	40	I	TI
13	3	29	II	Te	23	3	6	I	OR
14	3	12	I	ED	27	3	42	II	SI
15	3	56	I	Te	29	3	58	II	OR
20	3	34	II	TI	30	2	55	IV	TI
	3	50	II	Se	31	2	20	I	Te

JUNE

6	3	24	I	ED	23	1	8	II	OR
7	2	3	I	TI		1	13	I	Se
	2	58	I	Se		2	34	I	Te
12	3	40	III	Te	26	3	12	III	SI
	3	53	II	ED	28	3	30	II	SI
14	2	37	I	SI	29	3	35	I	ED
	3	42	II	Te	30	0	53	I	SI
	3	59	I	TI		1	1	II	ER
15	3	25	I	OR		1	7	II	OD
19	2	17	III	Se		1	47	III	OR
21	3	35	II	Se		2	15	I	TI
	3	44	II	TI		3	7	I	Se
22	1	40	I	ED		3	42	II	OR
	5	20	I	OR					

JULY

1	1	42	I	OR	11	1	2	IV	OR
2	2	43	IV	SI	14	1	16	III	ED
7	0	21	III	ER		3	28	II	ED
	0	54	II	ED		4	21	III	ER
	2	47	I	SI	15	1	52	I	ED
	2	57	III	OD	16	0	26	I	TI
	3	35	II	ER		0	45	II	Se
	3	39	II	OD		0	47	II	TI
	4	7	I	TI		1	22	I	Se
	23	58	I	ED	16	2	38	I	Te
8	3	35	I	OR		3	21	II	Te
9	0	47	I	Te		23	54	I	OR
	0	49	II	Te	17	23	17	III	Te
11	0	10	IV	OD	19	0	4	IV	Se

JULY—*Continued*

d	h	m	Sat.	Phen.	d	h	m	Sat.	Phen.
22	3	46	I	ED	25	0	23	III	TI
23	0	41	II	SI		2	59	III	Te
	1	2	I	SI	30	2	56	I	SI
	2	16	I	TI		3	18	II	SI
	3	16	I	Se		4	5	I	TI
	3	17	II	TI	31	0	9	I	ED
	3	22	II	Se		3	34	I	OR
	4	28	I	Te		22	32	I	TI
24	1	45	I	OR		23	14	III	SI
	22	55	I	Te		23	38	I	Se
25	0	21	II	OR					

AUGUST

1	0	44	I	Te	18	21	21	III	ED
	2	14	III	Se	19	0	21	III	ER
	2	45	II	OR		0	57	III	OD
	4	4	III	TI		3	30	III	OR
7	2	4	I	ED	22	3	5	I	SI
	23	18	I	SI		3	52	I	TI
8	0	20	I	TI	23	0	21	I	ED
	0	29	II	ED		3	21	I	OR
	1	31	I	Se		21	34	I	SI
	2	31	I	Te		22	18	I	TI
	3	15	III	SI		23	48	I	Se
	23	49	I	OR	24	0	29	II	SI
9	21	55	II	Se		0	30	I	Te
	23	53	II	Te		2	2	II	TI
12	0	2	III	OR		3	9	II	Se
12	22	55	IV	ED		4	34	II	Te
13	1	45	IV	ER		21	47	I	OR
14	3	58	I	ED	25	22	52	II	OR
15	1	11	I	SI	26	1	23	III	ED
	2	6	I	TI	29	4	59	I	SI
	3	4	III	ED		20	27	III	Te
	3	25	I	Se	30	2	16	I	ED
	4	18	I	Te		23	28	I	SI
	22	27	I	ED	31	0	2	I	TI
16	1	35	I	OR		1	42	I	Se
	21	52	II	SI		2	14	I	Te
	21	54	I	Se		3	7	II	SI
	22	44	I	Te		4	20	II	TI
	23	43	II	TI		20	45	I	ED
17	0	32	II	Se		23	32	I	OR
	2	14	II	Te					

SEPTEMBER

1	20	10	I	Se	7	4	0	IV	SI
	20	40	I	Te		22	40	I	ED
	21	31	II	ED	8	1	16	I	OR
2	1	7	II	OR		19	50	I	SI
3	20	0	II	Te		20	12	I	TI
5	21	14	III	TI		22	4	I	Se
	22	14	III	Se		22	24	I	Te
	23	46	III	Te	9	0	6	II	ED
6	4	11	I	ED		3	22	II	OR
7	1	22	I	SI		19	42	I	OR
	1	46	I	TI	10	19	44	II	TI
	3	36	I	Se		21	43	II	Se
	3	58	I	Te		22	16	II	Te

SEPTEMBER—*Continued*

d	h	m	Sat.	Phen.	d	h	m	Sat.	Phen.
12	23	20	III	SI	22	23	39	I	SI
13	0	30	III	TI		23	39	I	TI
	2	14	III	Se	23	1	51	I	Te
	3	3	III	Te		1	53	I	Se
14	3	16	I	SI		5	17	II	OD
	3	30	I	TI		20	24	III	ER
15	0	35	I	ED		20	56	I	OD
	3	0	I	OR		22	23	IV	SI
	21	45	I	SI		23	13	I	ER
	21	55	I	TI	24	0	31	IV	Se
	23	59	I	Se		20	17	I	Te
16	0	8	I	Te		20	22	I	Se
	2	42	II	ED	25	0	13	II	TI
	19	3	I	ED		0	20	II	SI
	21	26	I	OR		2	46	II	Te
17	21	42	II	SI		2	58	II	Se
	21	59	II	TI	26	21	12	II	ER
18	0	21	II	Se	29	4	14	I	OD
	0	31	II	Te	30	1	22	I	SI
20	3	22	III	SI		1	34	I	SI
	3	45	III	TI		3	35	I	Te
21	5	11	I	SI		3	48	I	Se
	5	13	I	TI		20	44	III	OD
22	2	30	I	ED		22	40	I	OD
	4	44	I	ER					

OCTOBER

1	0	24	III	ER	16	23	27	I	ER
	1	8	I	ER	17	18	21	I	SI
	19	48	I	TI		19	56	I	Te
	20	3	I	SI		20	35	I	Se
	22	1	I	Te	18	1	7	II	OD
	22	17	I	Se		18	22	IV	OD
2	2	28	II	TI		19	30	III	SI
	2	57	II	SI		19	32	IV	OR
	19	37	I	ER		19	34	III	Te
3	20	37	II	OD		22	19	III	Se
	23	48	II	ER	19	0	19	IV	ED
5	18	54	II	Se		2	6	IV	ER
7	3	6	I	TI		20	9	II	TI
	3	29	I	SI		21	32	II	SI
8	0	0	III	OD		22	44	II	Te
	0	24	I	OD	20	0	8	II	Se
	3	3	I	ER	21	18	19	II	ER
	21	32	I	TI	23	1	3	I	TI
	21	57	I	SI		1	48	I	SI
	23	45	I	Te		22	22	I	OD
9	0	11	I	Se	24	1	23	I	ER
	18	51	I	OD		19	29	I	TI
	21	32	I	ER		20	17	I	SI
10	18	11	I	Te		21	42	I	Te
	18	36	IV	Se		22	30	I	Se
	18	40	I	Se	25	19	52	I	ER
	22	51	II	OD		20	14	III	TI
11	2	24	II	ER		22	59	III	Te
	18	18	III	Se		23	32	III	SI
12	18	54	II	SI	26	2	19	III	Se
	20	26	II	Te		22	28	II	TI
	21	31	II	Se	27	0	10	II	SI
15	2	9	I	OD		1	4	II	Te
	3	19	III	OD		2	45	II	Se
	23	17	I	TI	28	20	55	II	ER
	23	53	I	SI	31	0	9	I	OD
16	1	30	I	Te		21	16	I	TI
	2	6	I	Se		22	12	I	SI
	20	36	I	OD		23	30	I	Te

NOVEMBER

d	h	m	Sat.	Phen.	d	h	m	Sat.	Phen
1	0	25	I	Se	16	19	22	I	TI
	18	36	I	OD		20	32	I	SI
	21	47	I	ER		21	35	I	Te
	23	42	III	TI		22	45	I	Se
2	17	57	I	Te	17	20	7	I	ER
	18	54	I	Se	18	23	46	II	OD
3	0	50	II	TI	19	20	51	III	OD
4	18	46	IV	ED		23	45	III	OR
	18	56	II	OD	20	18	54	II	TI
	20	10	IV	ER		21	22	II	SI
	23	32	II	ER		21	31	II	Te
5	17	44	III	ED		23	54	II	Se
	20	31	III	ER	21	1	7	IV	OD
6	18	41	II	Se	22	18	5	II	ER
7	1	57	I	OD	23	0	5	I	OD
	23	5	I	TI		18	25	III	Se
8	0	7	I	SI		21	13	I	TI
	1	18	I	Te		22	28	I	SI
	20	24	I	OD		23	27	I	Te
	23	42	I	ER	24	0	40	I	Se
9	17	32	I	TI		18	33	I	OD
	18	36	I	SI		22	2	I	ER
	19	45	I	Te	25	17	55	I	Te
	20	49	I	Se		19	9	I	Se
10	18	11	I	ER	27	0	37	III	OD
11	21	19	II	OD		21	24	II	TI
12	18	33	IV	TI		23	59	II	SI
	20	3	III	OR	28	0	1	II	Te
	20	32	IV	Te	29	18	9	II	OR
	21	46	III	ED		18	9	II	ED
13	0	32	III	ER		20	43	II	ER
	18	44	II	SI	30	17	18	III	Te
	19	3	II	Te		19	47	III	SI
	21	18	II	Se		22	27	III	Se
15	0	54	I	TI		23	6	I	TI
	22	14	I	OD					

DECEMBER

1	0	23	I	SI	15	18	26	II	Te
	20	26	I	OD		18	32	II	SI
	23	58	I	ER		21	3	II	Se
2	17	34	I	TI	16	21	23	I	TI
	18	52	I	SI		22	44	I	SI
	19	48	I	Te	17	18	43	I	OD
	21	5	I	Se		22	18	I	ER
3	18	27	I	ER	18	18	1	III	ED
4	23	56	II	TI		18	6	I	Te
6	18	3	II	OD		19	25	I	Se
	20	43	II	OR		20	40	III	ER
	20	47	II	ED	20	23	17	II	OD
	23	21	II	ER	22	18	26	II	TI
7	18	12	IV	OD		21	3	II	Te
	18	18	III	TI		21	9	II	SI
	20	43	IV	OR	24	17	56	II	ER
	21	12	III	Te		20	39	I	OD
	23	50	III	SI	25	17	49	I	TI
8	18	26	II	Se		19	9	I	SI
	22	19	I	OD		19	27	III	OR
9	19	28	I	TI		20	3	I	Te
	20	48	I	SI		21	21	I	Se
	21	42	I	Te		22	3	III	ED
	23	1	I	Se	26	18	42	I	ER
10	20	22	I	ER	29	21	6	II	TI
11	17	30	I	Se	31	17	58	II	OR
13	20	39	II	OD		18	3	II	ED
	23	18	II	OR		20	35	II	ER
13	23	26	II	ED		22	37	I	OD
14	22	16	III	TI					

Jupiter's Satellites.—During the last four months of the year the configurations are given for the day 0. The times given in the *N.A.* make this necessary. The configurations for Sept. 30, Oct. 31, and Nov. 30 are given for Oct. 0, Nov. 0, and Dec. 0. This should cause no confusion to the thinking reader of the HANDBOOK.

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. h	m	Decl. °
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
α β 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 22s
♃ 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	2793.4	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.
o Cygni.....	4.3, 7.5, 5.5	337.8, 106.8	Yellow, Blue.
24 Coma Beren..	5.6, 7	21	Orange, Lilac.
o 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.
o 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.
o 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 Leon Campbell, Harvard Observatory, Cambridge, Mass., 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
α 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
α 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 ober vations, 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 1 1th mag. star, 2° 13′ from Alpha Centauri, with a large proper motion and to which, from his measurements, he assigned a parallax of 0″.78. Its brightness is only 1/20,000 that of Alpha Centauri. 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″.53. 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) h	m	Decl. (1900) ′	″	Vis. Mag. Harvard	Parallax ″	Distance Light Years
Prox. Cen	14	22.9	−62	15	10.5	0.78	4.08
* 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
εIndi	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
O^2 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
eErid	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
* αUrs. Min	1	22.6	+88	46	2.12	.041	79.5
βCentauri	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
ι Cygni	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.

THE BRIGHTEST STARS

Their Magnitudes, Types, Proper Motions, Distances and Radial Velocities

Prepared by W. E. HARPER

The accompanying table contains the chief known facts regarding 260 stars brighter than apparent magnitude 3.51 as listed in *Harvard Annals*, Volume 50. The position of the star for 1900 is given in the second and tnird columns. The fourth and fifth columns give the apparent visual magnitude and type taken from the same publication. In a few cases the type is changed to conform with a later determination.

The parallaxes are taken from Schlesinger's Advance Copy of Catalogue of Parallaxes, 1924 Edition, and for such stars the proper motions are copied from the same source. The remaining proper motions were computed using the abbreviated μ_α and μ_δ as they appeared in the HANDBOOK for 1915, where this table first appeared, and are not necessarily correct to the third decimal place. Three or four spectroscopic parallaxes have been added to those given in Schlesinger's catalogue. The small letter *s* following the parallax indicates a spectroscopic determination has also been made. The distance is also given in light years in the eighth column as to the lay mind that seems a fitting unit. The real parallax of a star cannot be a negative quantity, but in some cases the result of the calculation gives a negative quantity. In each such case the distance in light years is computed on the assumption that the parallax is positive and equal to $''.001$. The sign (:) after it indicates that the value is uncertain. The absolute magnitude or the magnitude the star would appear to have if it were at a distance of 32.6 light years is given in the ninth column. At that distance the sun would appear as a star of magnitude 5.5. The radial velocity, taken from Voûte's list supplemented from our observatory card catalogue, is given in the last column. Those starred indicate that the star is a spectroscopic binary for which the velocity of the system is given. Where only the whole number appears the velocity may be regarded as approximate. There are 74 starred out of 235 radial velocities set down or one in three of the bright stars is a spectroscopic binary. The sign || denotes a visual double and the combined magnitude is given.

The 20 first magnitude stars are printed in black face type.

NOTE.—Some of the parallaxes in this table differ slightly from those given in the previous table. The reader should be not surprised at this, and it has not been thought worth while to harmonize the two tables.—EDITOR.

Star	R.A. 1900	Decl. 1900	Mag.	Type	Ann. Proper Motion	Parallax	Distance in Light Years	Abs. Mag.	Rad. Vel.
	h m	° ′			″	″			km./sec.
α Andromedae	0 3	+28 32	2.2	Aop	.207	.....	.....	.....	−13.0*
β Cassiopeiae	4	+58 36	2.4	F5	.561	.071 s	46	1.7	+12.8
γ Pegasi	8	+14 38	2.9	B2	.010	.....	.....	.....	+ 7. *
β Hydri	20	−77 49	2.9	G0	2.243	.141	23	3.6	+22.2
α Phoenicis	21	−42 51	2.4	K0	.446	.....	.....	.....	+75.8*
δ Andromedae	34	+30 19	3.5	K2	.167	.026 s	125	0.6	− 5. *
α Cassiopeiae	35	+55 59	2.2–2.8	K0	.062	.016 s	204	−1.8	− 3.0
β Ceti	39	−18 32	2.2	K0	.230	.042 s	78	0.3	+13.5
||γ Cassiopeiae	51	+60 11	2.2	B0p	.031	.036	91	0.0	− 4.7
β Phoenicis	1 2	−47 15	3.4	K0	.042	.....	.....	.....	− 0.6
β Andromedae	4	+35 5	2.4	M0	.219	.045 s	72	0.7	− 2.
δ Cassiopeiae	19	+59 43	2.8	A5	.306	.....	.....	.....	+ 9.
||α Ursae Minoris	23	+88 46	2.1	F8	.043	.007 s	466	−3.7	−14.8*
γ Phoenicis	24	−43 50	3.4	K5	.222	.....	.....	.....	+26. *
α **Eridani**	34	−57 44	0.6	B5	.093	.049 s	67	−1.0	
ε Cassiopeiae	47	+63 11	3.4	B3	.043	.001 s	3260	−6.6	− 7.4
β Arietis	49	+20 19	2.7	A5	.150	.064 s	51	1.7	− 0.6*
α Hydri	56	−62 3	3.0	F0	.256	.....	.....	.....	− 5.
||γ Andromedae	58	+41 51	2.3	K0	.073	.007 s	466	−3.5	−10.9
α Arietis	2 2	+22 59	2.2	K2	.242	.033 s	99	−0.2	−14.3
β Trianguli	4	+34 31	3.1	A5	.161	.014	262	−1.2	.....*
o Ceti	14	− 3 26	1.7–9.6	M6e	.239	.062	53	0.7	+63.9
||θ Eridani	54	−40 42	3.4	A2	.071	.....	.....	.....	+20.
α Ceti	57	+ 3 42	2.8	MJ	.080	.011 s	296	−2.0	−25.8
γ Persei	58	+53 7	3.1	Gp.	.012	.012 s	272	−1.5	+ 2. *
ρ Persei	59	+38 27	3.4–4.2	M6	.176	.038 s	86	1.3	+28.6
β Persei	3 2	+40 34	2.1–3.2	B8	.011	.....	.....	.....	+ 5. *
α Persei	17	+49 30	1.9	F5	.041	.015 s	217	−2.2	− 2.4
δ Persei	36	+47 28	3.1	B5	.047	.005 s	652	−3.4	+ 0.7
||η Tauri	41	+23 48	3.0	B5p	.053	.007 s	466	−2.8	+15.
ζ Persei	48	+31 55	2.9	B1	.023	−.003 s	3260 :	−7.1	+21.2
γ Hydri	49	−74 33	3.2	Ma	.128	.....	.....	.....	+16.8
||ε Persei	51	+39 43	3.0	B1	.041	−.012 s	3260 :	−7.0	.....*
γ Eridani	53	−13 47	3.2	K5	.133	.018 s	181	−0.5	+62.2
λ Tauri	55	+12 12	3.3–4.2	B3	.015	−.008	3260 :	−6.7	+13.6*
α Reticuli	4 13	−62 43	3.4	G5	.069	.....	.....	.....	+35.4

Star	R.A. 1900	Decl. 1900	Mag.	Type	Ann. Proper Motion	Parallax	Distance in Light Years	Abs. Mag.	Rad. Vel.
	h m	° ′							km./sec.
α **Tauri**	4 30	+16 18	1.1	K5	.205	.057 s	57	−0.1	+54.5
α Doradus	32	−55 15	3.5	A0p	.003	.....	.....	.....	+26.
π^3 Orionis	44	+ 6 47	3.3	F8	.474	.136 s	24	4.0	+24.7
ι Aurigae	50	+33 0	2.9	K2	.030	.018 s	181	−0.8	+18.5
ϵ Aurigae	55	+43 41	3.4–4.1	F5p	.015	.002 s	1630	−5.0	− 9. *
η Aurigae	5 0	+41 6	3.3	B3	.082	.014 s	233	−1.0	+ 3.0
ϵ Leporis	1	−22 30	3.3	K5	.074	.022 s	148	0.0	+ 1.1
β Eridani	3	− 5 13	2.9	A3	.117	.052 s	63	1.5	− 8.
μ Leporis	8	−16 19	3.3	A0p	.053	.....	.....	.....	+28.0
$\|\|\alpha$ **Aurigae**	9	+45 54	0.2	G0	.439	.075 s	43	−0.4	+30.2*
$\|\|\beta$ **Orionis**	10	− 8 19	0.3	B8p	.005	.006	543	−5.8	+22.6*
$\|\|\eta$ Orionis	19	− 2 29	3.4	B1	.000	.....	.....	.....	+35.5*
γ Orionis	20	+ 6 16	1.7	B2	.019	.019 s	172	−1.9	+19.
β Tauri	20	+28 31	1.8	B8	.180	.024 s	136	−1.3	+11.
β Leporis	24	−20 50	3.0	G0	.095	.004 s	815	−4.0	−13.7
$\|\|\delta$ Orionis	27	− 0 22	2.4	B0	.006	.009 s	362	−2.8	+17.6*
α Leporis	28	−17 54	2.7	F0	.006	.014 s	233	−1.6	+24.6
$\|\|\iota$ Orionis	31	− 5 59	2.9	Oe5	.000	.....	.....	.....	+21.3*
ϵ Orionis	31	− 1 16	1.8	B0	.004	.005 s	652	−3.7	+26.3
ζ Tauri	32	+21 5	3.0	B3p	.028	−.001 s	3260:	−7.2	+16.4*
$\|\|\zeta$ Orionis	36	− 2 0	1.8	B0	.012	−.019 s	3260:	−8.2	+17.9
α Columbae	36	−34 8	2.8	B5p	.040	.....	.....	.....	.....
κ Orionis	43	− 9 42	2.2	B0	.009	.029 s	112	2.5	+19.
β Columbae	47	−35 48	3.2	K0	.397	.....	.....	.....	+89.2
α **Orionis**	50	+ 7 23	1.0–1.4	M1	.032	.017 s	192	−2.8	+21.3*
β Aurigae	52	+44 56	2.1	A0p	.046	.034 s	96	−0.2	−19. *
$\|\|\theta$ Aurigae	53	+37 12	2.7	A0p	.106	.016 s	204	−1.3	+28.5
η Geminorum	6 9	+22 32	3.2–4.2	M2	.062	.014 s	233	−1.1	+20. *
μ Geminorum	17	+22 34	3.2	M3	.129	.016 s	204	−0.8	+55.2
β Can. Majoris	18	−17 54	2.0	B1	.003	.012 s	272	−2.6	+33. *
α **Carinae**	22	−52 38	−0.9	F0	.022	.005 s	652	−7.4	+20.2
γ Geminorum	32	+16 29	1.9	A0	.066	.043 s	76	0.1	−12.3*
ν Puppis	35	−43 6	3.2	B8	.020	.....	.....	.....	+26.0*
ϵ Geminorum	38	+25 14	3.2	G5	.020	.007 s	466	−2.6	+ 9.5
ξ Geminorum	40	+13 0	3.4	F5	.230	.048 s	68	1.8	+26.7
$\|\|\alpha$ **Can. Majoris**	41	−16 35	−1.6	A0	1.315	.371 s	9	1.2	− 7.4*
α Pictoris	47	−61 50	3.3	A5	.271	.....	.....	.....	.....
τ Puppis	47	−50 30	2.8	K0	.094	.....	.....	.....	+37. *

Star	R.A. 1900	Decl. 1900	Mag.	Type	Ann. Proper Motion	Parallax	Distance in Light Years	Abs. Mag.	Rad. Vel.
	h m	° ′			″	″			km./sec.
||ε Can. Majoris	6 55	−28 50	1.6	B1	.000	.....	.....	.....	+28.2
ζ Geminorum	58	20 43	3.7–4.3	G0p	.007	.005 s	652	−2.8	+ 6.8*
o^2 Can. Majoris	59	−23 41	3.1	B5p	.000	.....	.....	.....	.....
δ Can. Majoris	7 4	−26 14	2.0	G2p	.005	.010	326	−2.9	+34. *
L ^{2}Puppis	10	−44 29	3.4–6.2	Md	.334	.....	.....	.....	+52.6
π Puppis	14	−36 55	2.7	K5	.012	.....	.....	.....	+16.3
β Can. Minoris	22	+ 8 29	3.1	B8	.063	.020 s	163	−0.4	.....
σ Puppis	26	−43 6	3.3	K5	.192	.....	.....	.....	+87.3
||$α_2$ Geminorum	28	+32 6	2.0	A0	.201	.077 s	42	1.4	+ 6.2*
$α_1$ Geminorum	28	+32 6	2.8	A0	.209	.....	.....	.....	− 1.0*
α **Can. Minoris**	34	+ 5 29	0.5	F5	1.242	.312 s	10	3.0	− 4.3
β **Geminorum**	39	+28 16	1.2	K0	.623	.101 s	32	1.2	+ 3.6
ξ Puppis	45	−24 37	3.5	G6p	.007	.003 s	1087	−4.2	+ 4.2
ζ Puppis	8 0	−39 43	2.3	Od	.036	.....	.....	.....	.....
ρ Puppis	3	−24 1	2.9	F5	.097	.028 s	116	0.1	+46.
||γ Velorum	6	−47 3	2.2	Oap	.000	.....	.....	.....	.....
||ε Carinae	8 20	−59 11	1.7	K0	.032	.....	.....	.....	+11.7
o Urs. Majoris	22	+61 3	3.5	G0	.166	− .004 s	3260 :	−6.5	+20.3
||ε Hydrae	41	+ 6 47	3.5	F8	.193	.015 s	217	−0.6	+37.2*
δ Velorum	42	−54 20	2.0	A0	.093	.....	.....	.....	.....
ζ Hydrae	50	+ 6 20	3.3	K0	.101	.014 s	233	−1.0	+23.0
ι Urs. Majoris	52	+48 26	3.1	A5	.500	.070 s	47	2.3	+ 8.
λ Velorum	9 4	−43 2	2.2	K5	.022	.....	.....	.....	+18.8
β Carinae	12	−69 18	1.8	A0	.192	.....	.....	.....	−16.0
ι Carinae	14	−58 51	2.2	F0	.023	.....	.....	.....	+13.1
α Lyncis	15	+34 49	3.3	K5	.214	.002 s	1630	−5.1	+38.5
κ Velorum	19	−54 35	2.6	B3	.017	.....	.....	.....	+21.9*
α Hydrae	23	− 8 14	2.2	K2	.036	.006 s	543	−3.9	− 4.0
θ Urs. Majoris	26	+52 8	3.3	F8p	1.096	.056 s	58	2.0	+15.8
N Velorum	28	−56 36	3.0	K5	.041	.....	.....	.....	−13.9
ε Leonis	40	+24 14	3.1	G0p	.045	− .001 s	3260 :	−6.9	+ 5.1
||υ Carinae	45	−64 36	3.1	F0	.062	.....	.....	.....	+13.2
α **Leonis**	10 3	+12 27	1.3	B8	.244	.058 s	56	0.1	.....
q Carinae	14	−60 50	3.4	K5	.045	.....	.....	.....	+ 9.2
||γ Leonis	14	+20 21	2.3	K0	.347	.004 s	815	−4.7	−36.
μ Urs. Majoris	16	+42 0	3.2	K5	.082	.034 s	96	0.9	−22.

Star	R.A. 1900	Decl. 1900	Mag.	Type	Ann. Proper Motion	Parallax	Distance in Light Years	Abs. Mag.	Rad. Vel.
	h m	° ′			″	″			km./sec.
θ Carinae	10 39	−63 52	3.0	B0	.063	.....	.....	.....	+16.
η Carinae	41	−59 10	1.0–7.4	Pec	.000	.....	.....	.....	.....
μ Velorum	42	−48 54	2.8	G5	.084	.....	.....	.....	+ 7.1
ν Hydrae	45	−15 40	3.3	K0	.214	.035 s	93	1.0	− 0.7
β Urs. Majoris	56	+56 55	2.4	A0	.089	.047 s	69	0.8	−10.9*
α Urs. Majoris	58	+62 17	2.0	G5	.137	.074 s	44	1.4	− 8.
ψ Urs. Majoris	11 4	+45 2	3.2	K0	.067	.049 s	67	1.6	− 3.4
δ Leonis	9	+21 4	2.6	A3	.208	.078 s	42	2.1	−18.
θ Leonis	9	+15 59	3.4	A0	.103	.019 s	172	−0.2	+ 6.8
λ Centauri	31	−62 28	3.3	B9	.046	.....	.....	.....	+11.
β Leonis	44	+15 8	2.2	A2	.507	.101 s	32	2.2	+ 1.3
γ Urs. Majoris	49	+54 15	2.5	A0	.095	.004 s	815	−4.5	−10.0
δ Centauri	12 3	−50 10	2.9	B3p	.044	.....	.....	.....	.....
ε Corvi	5	−22 4	3.2	K0	.063	.025 s	130	0.2	+ 5.2
δ Crucis	10	−58 12	3.1	B3	.051	.....	.....	.....	+25.
δ Urs. Majoris	10	+57 35	3.4	A2	.113	.045 s	72	1.7	−10.7
γ Corvi	11	−16 59	2.8	B8	.159	.....	.....	.....	− 7. *
α **Crucis**	21	−62 33	1.0	B1	.048	.030	109	−1.6	+19.
‖δ Corvi	25	−15 58	3.1	A0	.249	.010 s	326	−1.9	−53.5
γ Crucis	26	−56 33	1.5	M6	.270	.....	.....	.....	+21.5
β Corvi	29	−22 51	2.8	G5	.061	.028	116	0.0	− 7.4
α Muscae	31	−68 35	2.9	B3	.038	.....	.....	.....	+13.5
γ Centauri	36	−48 24	2.4	A0	.200	.....	.....	.....	− 9.
γ Virginis	36	− 0 54	2.9	F0	.561	.073 s	45	2.2	−20.0
β Muscae	40	−67 34	3.3	B3	.041	.....	.....	.....	+35. *
β Crucis	42	−59 9	1.5	B1	.054	.008 s	408	−4.0	+13.
ε Urs. Majoris	50	+56 30	1.7	A0p	.117	.042	78	−0.2	−11.9*
‖α Can. Venat.	51	+38 51	2.8	A0p	.233	.015 s	217	−1.3	+ 1.0*
ε Virginis	57	+11 30	3.0	K0	.270	.048 s	68	1.4	−13.6
γ Hydrae	13 13	−22 39	3.3	G5	.085	.017 s	192	−0.5	− 5.1
ι Centauri	15	−36 11	2.9	A2	.111	.....	.....	.....	+ 2.0
‖ζ Urs. Majoris	20	+55 27	2.4	A2p	.131	.038 s	86	0.3	− 9.6*
α **Virginis**	20	−10 38	1.2	B2	.051	.009 s	362	−4.0	+ 1.6*
ζ Virginis	30	− 0 5	3.4	A2	.285	.038	86	1.3	.....
ε Centauri	34	−52 57	2.6	B1	.091	.....	.....	.....	+ 6.
η Urs. Majoris	44	+49 49	1.9	B3	.116	− .004 s	3260 :	−8.1	− 6.
μ Centauri	44	−41 59	3.3	B2p	.030	.....	.....	.....	+12.6

Star	R.A. 1900	Decl. 1900	Mag.	Type	Ann. Proper Motion	Parallax	Distance in Light Years	Abs. Mag.	Rad. Vel.
	h m	° ′			″	″			km./sec.
ζ Centauri	13 49	-46 48	3.1	B2p	.079	.....	.....	.....	.....
η Boötis	50	+18 54	2.8	G0	.370	.098 s	33	2.8	− 0.2*
β **Centauri**	57	−59 53	0.9	B1	.039	.036	91	−1.3	+12.0*
π Hydrae	14 1	−26 12	3.5	K0	.165	.....	.....	.....	+27.6
θ Centauri	1	−35 53	2.3	K0	.748	.....	.....	.....	+ 1.8
α **Boötis**	11	+19 42	0.2	K0	2.287	.080 s	41	−0.3	−5 .0
γ Boötis	28	+38 45	3.0	F0	.182	.058 s	56	1.8	−35.
η Centauri	29	−41 43	2.6	B3p	.052	.....	.....	.....	0.
||α **Centauri**	33	−60 25	0.3	G0	3.682	.758	4	4.7	+22.2
α Circini	34	−64 32	3.4	F0	.312	.....	.....	.....	+ 7.3
α Lupi	35	−46 58	2.9	B2	.036	.....	.....	.....	+ 8. *
||ε Boötis	41	+27 30	2.7	K0	.045	.016 s	204	−1.3	−16.4
||α² Librae	45	−15 38	2.9	K2	.129	.....	.....	.....	−17. *
β Urs. Minoris	51	+74 34	2.2	K5	.028	.011 s	296	−2.6	+17.0
β Lupi	52	−42 44	2.8	B2p	.066	.....	.....	.....	0. *
κ Centauri	53	−41 42	3.4	B3	.037	.....	.....	.....	+10. *
σ Librae	58	−24 53	3.4	M6	.094	.029 s	112	0.7	− 4.2
ζ Lupi	15 5	−51 43	3.5	K0	.132	.....	.....	.....	− 9.2
γT Australis	10	−68 19	3.1	A0	.064	.....	.....	.....	.....
β Librae	12	− 9 1	2.7	B8	.108	.....	.....	.....	−38. *
δ Lupi	15	−40 17	3.4	B2	.032	.....	.....	.....	.....
γ Urs. Minoris	21	+72 11	3.1	A2	.017	.....	.....	.....	− 8.
ι Draconis	23	+59 19	3.5	K0	.010	.034 s	96	1.2	−10.2
γ Lupi	28	−40 50	3.0	B3	.042	.....	.....	.....	.....
α Cor. Borealis	30	+27 3	2.3	A0	.160	.053 s	62	0.9	+ 0.4*
α Serpentis	39	+ 6 44	2.8	K0	.142	.046 s	71	1.1	+ 3.3
βT Australis	46	−63 7	3.0	F0	.440	.....	.....	.....	.....
π Scorpii	53	−25 50	3.0	B2p	.042	.....	.....	.....	*
δ Scorpii	54	−22 20	2.5	B0	.042	.....	.....	.....	*
||β Scorpii	16 0	−19 32	2.8	B1	.041	.....	.....	.....	− 9.5*
δ Ophiuchi	9	− 3 26	3.0	K8	.159	.040 s	82	1.0	−19.0
ε Ophiuch	13	− 4 27	3.3	K0	.088	.046 s	71	1.6	− 9.2
||σ Scorpii	15	−25 21	3.1	B1	.033	.....	.....	.....	+ 2.0*
||η Draconis	23	+61 44	2.9	G5	.062	.042 s	78	1.0	−13.9
||α **Scorpii**	23	−26 12	1.2	M2p	.032	.026 s	126	−1.7	− 3.1*
β Herculis	26	+21 42	2.8	K0	.104	.030 s	109	0.2	−25.5*
τ Scorpii	30	−28 1	2.9	B0	.042	.....	.....	.....	+ 1.5

Star	R.A. 1900	Decl. 1900	Mag.	Type	Ann. Proper Motion	Parallax	Distance in Light Years	Abs. Mag.	Rad. Vel.
	h m	° ′			″	″			km./sec.
ζ Ophiuchi	16 32	−10 22	2.7	B0	.024	.....	.....	.....	−15.0
‖ζ Herculis	38	+31 47	3.0	G0	.601	.111 s	29	3.2	−70. *
α T Australis	38	−68 51	1.9	K2	.034	.....	.....	.....	− 3.7
ε Scorpii	44	−34 7	2.4	K0	.668	.....	.....	.....	− 2.0
μ^1 Scorpii	45	−37 53	3.1	B3p	.032	.....	.....	.....	.....
ζ Arae	50	−55 50	3.1	Ma	.047	.....	.....	.....	− 6.1
κ Ophiuchi	53	+ 9 32	3.4	K0	.296	.208 s	116	0.6	−55.3
‖η Ophiuchi	17 5	−15 36	2.6	A0	.094	.....	.....	.....	− 1.1
η Scorpii	5	−43 6	3.4	F2	.291	.....	.....	.....	−28.
ζ Draconis	8	+65 50	3.2	B5	.023	.019 s	172	−0.4	−14.6
‖α Herculis	10	+14 30	3.1-3.9	M7	.030	− .002 s	3260:	−6.9	−32.4
δ Herculis	11	+24 57	3.2	A2	.164	.029 s	112	0.5	−42. *
π Herculis	12	+36 55	3.4	K2	.021	.019 s	172	−0.2	−25.1
θ Ophiuchi	16	−24 54	3.4	B3	.030	.....	.....	.....	− 0.9
β Arae	17	−55 26	2.8	K2	.035	....	.....	.....	− 1.0
υ Scorpii	24	−37 13	2.8	B3	.040	.....	.....	.....	.....
α Arae	24	−49 48	3.0	B3p	.085	.....	.....	.....	.....
λ Scorpii	27	−37 2	1.7	B2	.040	.....	.....	.....	− 1. *
β Draconis	28	+52 23	3.0	G0	.012	.004 s	815	−4.0	−19.7
θ Scorpii	30	−42 56	2.0	F0	.010	.....	.....	.....	+ 5.
α Ophiuchi	30	+12 38	2.1	A5	.264	.049 s	67	0.5	.....
κ Scorpii	36	−38 58	2.5	B2	.032	.....	.....	.....	.....
β Ophiuchi	39	+ 4 37	2.9	K0	.157	.024 s	136	−0.2	−11.5
ι^1 Scorpii	41	−40 5	3.1	F5p	.000	.....	.....	.....	−27.8
‖μ Herculis	43	+27 47	3.5	G5	.817	.111 s	29	3.7	−15.7
G Scorpii	43	−37 1	3.2	K2	.062	.....	.....	.....	+24.7
ν Ophiuchi	54	− 9 46	3.5	K0	.118	.026 s	126	0.6	+12.6
γ Draconis	54	+51 30	2.4	K5	.026	.017 s	192	−1.4	−27.0
γ Sagittarii	59	−30 26	3.1	K0	.206	.....	.....	.....	+22. *
η Sagittarii	18 11	−36 48	3.2	M6	.223	.....	.....	.....	0.0
δ Sagittarii	15	−29 52	2.8	K0	.042	.....	.....	.....	−20.2
η Serpentis	16	− 2 55	3.4	K0	.898	.065 s	50	2.5	+ 9.5
ε Sagittarii	18	−34 26	2.0	A0	.139	.....	.....	.....	−11.0
λ Sagittarii	22	−25 29	2.9	K0	.197	.....	.....	.....	−43.2
‖α **Lyrae**	34	+38 41	0.1	A0	.348	.124 s	26	0.6	−13.8
φ Sagittarii	39	−27 6	3.3	B8	.053	.....	.....	.....	+26. *
‖β Lyrae	46	+33 15	3.4-4.1	B2p	.011	− .014 s	3260:	−6.6	*
σ Sagittarii	49	−26 25	2.1	B3	.081	.....	.....	.....	− 1.

Star	R.A. 1900	Decl. 1900	Mag.	Type	Ann. Proper Motion	Parallax	Distance in Light Years	Abs. Mag.	Rad. Vel.
	h m	° ′			″	″			km./sec.
γ Lyrae	18 55	+32 33	3.3	A0	.010	.....	.....	.....	−20. *
||ζ Sagittarii	56	−30 1	2.7	A2	.026	.....	.....	.....	+22.
τ Sagittarii	19 1	−27 49	3.4	K0	.265	.....	.....	.....	+42. *
ζ Aquilae	1	+13 43	3.0	A0	.103	.040 s	82	1.0	−38.6
π Sagittarii	4	−21 11	3.0	F2	.041	.016 s	204	−1.0	−10.3
δ Draconis	13	+67 29	3.2	K0	.135	.038 s	86	1.1	+25.1
δ Aquilae	21	+ 2 55	3.4	F0	.267	.057 s	57	2.2	−32. *
||β Cygni	27	+27 45	3.2	K0p	.010	.003 s	1087	−4.4	−23. *
γ Aquilae	42	+10 22	2.8	K2	.018	.018 s	181	−0.9	− 2.1
||δ Cygni	42	+44 53	3.0	A0	.067	.038 s	86	0.9	−37.
α **Aquilae**	46	+ 8 36	0.9	A5	.659	.204 s	16	2.4	−33.
θ Aquilae	20 6	− 1 7	3.4	A0	.035	.015 s	217	−0.7	−29.2*
||β Capricorni	15	−15 6	3.2	G0p	.042	.005 s	652	−3.3	−18.8*
α Pavonis	18	−57 3	2.1	B3	.090	.....	.....	.....	+ 2.0*
γ Cygni	19	+39 56	2.3	F8p	.006	−.002 s	3260:	−7.7	− 5.6
α Indi	31	−47 38	3.2	K0	.072	.....	.....	.....	− 0.8
α **Cygni**	38	+44 55	1.3	A2p	.004	.005	652	−5.2	− 4.
ε Cygni	42	+33 36	2.6	K0	.485	.041 s	80	0.7	−10. *
ζ Cygni	21 9	+29 49	3.4	K0	.061	.024 s	136	0.3	+17. *
α Cephei	16	+62 10	2.6	A5	.163	.083 s	39	2.2	−30.7
β Aquarii	26	− 6 1	3.1	G0	.020	−.003 s	3260:	−6.9	+ 6.4
β Cephei	27	+70 7	3.3	B1	.013	.007 s	466	−2.5	−14.1*
ε Pegasi	39	+ 9 25	2.5	K0	.028	.002 s	1630	−5.9	+ 5.3
δ Capricorni	42	−16 35	3.0	A5	.395	.114 s	29	3.3	*
γ Gruis	48	−37 50	3.2	A0	.108	.....	.....	.....	− 3.
α Aquarii	22 1	− 0 48	3.2	G0	.009	.009 s	362	−2.0	+ 7.1
α Gruis	2	−47 27	2.2	B5	.200				
α Tucanae	12	−60 45	2.9	K2	.085	.....	.....	.....	+41.
β Gruis	37	−47 24	2.2	M6	.122	.....	.....	.....	+ 1.2
η Pegasi	38	+29 42	3.1	G0	.039	−.001 s	3260:	−6.9	+ 4.3*
α **P. Australis**	52	−30 9	1.3	A3	.367	.137	24	2.0	+ 6.7
β Pegasi	59	+27 32	2.6	M3	.235	.016 s	204	−1.4	+ 8.6
α Pegasi	59	+14 40	2.6	A0	.077	.038 s	86	0.5	+ 4. *
γ Cephei	23 35	+77 4	3.4	K1	.167	.069 s	47	2.6	−41.6

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.

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III. A Total Eclipse of the Sun, June 29, 1927. This eclipse will be visible as a partial eclipse along the northern edge of Africa, Europe, central and northern Asia, the Arctic Ocean, Greenland, the northern edge of North America and Alaska. The path of the Total Eclipse begins in the Atlantic Ocean southeast of Ireland, passes across England, the North Sea, Norway, Finland, the Arctic Ocean, the northeastern point of Siberia and ends just east of the Aleutian Islands.

Circumstances of the Eclipse:

	G.C.T.			Long. from Greenwich		Latitude	
	d	h	m	°	′	°	′
Eclipse begins.....June	29	3	59.7	−18	24	+26	36
Central Eclipse begins..... "	29	5	20.1	+16	14	+46	29
Central Eclipse at local appar. noon "	29	6	27.4	−83	55	+78	25
Central Eclipse ends..... "	29	7	25.8	+168	34	+51	01
Eclipse ends..... "	29	8	46.4	−154	33	+31	38

IV. A Total Eclipse of the Moon, December 8, 1927; the beginning will be visible in the Pacific Ocean, except the southern part, Australia, the Indian Ocean, Asia, the eastern part of Africa and Europe, and the northern border of North America. The ending will be visible in the western part of the Pacific Ocean, Australia, the Indian Ocean, Asia, Africa and the northern part of North America.

Circumstances of the Eclipse:

	d	h	m	
Moon enters penumbra.....December	8	14	53.0	
Moon enters umbra..... "	8	15	51.9	
Total Eclipse begins..... "	8	16	54.5	Greenwich
Middle of the Eclipse..... "	8	17	34.6	Civil
Total Eclipse ends..... "	8	18	14.9	Time
Moon leaves umbra..... "	8	19	17.7	
Moon leaves penumbra..... "	8	20	17.2	

Magnitude of the eclipse = 1.358 (Moon's diameter = 1.0)

V. A Partial Eclipse of the Sun, December 24, 1927. This eclipse will be visible only in the southern part of the southern hemisphere and at the time of maximum eclipse only a little more than half of the Sun's surface will be hidden.

Transit of Mercury, November 10, 1927. There will be a Transit of Mercury over the Sun's disk on November 10, 1927, the ingress being visible in the Pacific Ocean, Australia, South and East Asia, the Indian Ocean, and the extreme eastern part of Africa; the egress being visible in Australia, Asia, except the northern part, the Indian Ocean, Europe, Africa, the Atlantic Ocean and the extreme eastern part of South America.

THE ROYAL ASTRONOMICAL SOCIETY OF CANADA

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