THE OBSERVER'S HANDBOOK FOR 1934

PUBLISHED BY

The Royal Astronomical Society of Canada

EDITED BY C. A. CHANT

TWENTY-SIXTH YEAR OF PUBLICATION

TORONTO
198 COLLEGE STREET
PRINTED FOR THE SOCIETY
1934

JANUARY					
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	....

FEBRUARY					
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	....
Fri.	2	9	16	23	....
Sat.	3	10	17	24	....

MARCH					
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

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

MAY					
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	....

JUNE					
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

JULY					
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	....

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

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

OCTOBER					
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	....

NOVEMBER					
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	....

DECEMBER					
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	....

JULIAN DAY CALENDAR, 1934

J. D. 2,420,000 plus the following

Jan.	1	7439	May	1	7559	Sept.	1	7682
Feb.	1	7470	June	1	7590	Oct.	1	7712
Mar.	1	7498	July	1	7620	Nov.	1	7743
Apr.	1	7529	Aug.	1	7651	Dec.	1	7773

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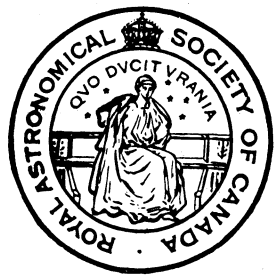

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CONTENTS

PREFACE

In the present issue of the HANDBOOK the list of stars occulted by the moon has been omitted, but any person who is able and willing to observe occultations will be supplied with the necessary information.

No star maps are included in the HANDBOOK, but the following are recommended: Four circular maps, 9 inches in diameter, roughly for the four seasons, obtainable from the Director of University Extension, University of Toronto, for one cent each. A set of 12 circular maps, 5 inches in diameter, with brief explanation, is supplied by *Popular Astronomy*, Northfield, Minn., for 15 cents. Young's *Uranography*, contains four maps with good descriptions of the constellations, suitable for small telescopes (Ginn and Co., 72 cents). Norton's *Star Atlas and Telescopic Handbook* is larger and excellent. (Gall and Inglis, price 12*s.* 6*d.*; supplied also by Eastern Science Supply Co., Boston).

In the preparation of this HANDBOOK the Editor has been assisted by Mr. H. Boyd Brydon, Victoria, who supplied much of the "copy" and read the proofs; Dr. J. A. Pearce and Dr. F. S. Hogg, of the Dominion Astrophysical Observatory. Victoria, B.C.; and his colleagues Dr. R. K. Young and Dr. P. M. Millman, of the University of Toronto.

The minima of Algol have been computed from an observation by Stebbins (*Ap. J.*, vol. 53, 1921), J. D. 2422619.7866 with the period 2.86731077, given by Hellerick (*A.N.*, vol. 209, p. 227, 1919).

TORONTO, December, 1933. THE EDITOR.

ANNIVERSARIES & FESTIVALS 1934

New Year's Day	Jan. 1	Trinity Sunday	May 27
Epiphany	Jan. 6	Corpus Christi	May 31
Septuagesima Sunday	Jan. 28	Birthday of King George V (1865)	June 3
Quinquagesima (Shrove) Sunday	Feb. 11	Birthday of Prince of Wales (1894)	June 23
Ash Wednesday	Feb. 14	St. John Baptist (Midsummer Day)	June 24
Quadragesima (First Sunday in Lent)	Feb. 18	Dominion Day	July 1
St. David	Mar. 1	Labour Day	Sept. 3
St. Patrick	Mar. 17	Jewish New Year (5695) (Rosh Hashanah)	Sept. 10
Palm Sunday	Mar. 25	Day of Atonement (Jewish)	Sept. 19
Annunciation (Lady Day)	Mar. 25	Tabernacles (Jewish)	Sept. 24
Good Friday	Mar. 30	St. Michael (Michaelmas Day)	Sept. 29
Passover, First Day	Mar. 31	All Saint's Day	Nov. 1
Easter Sunday	Apr. 1	Armistice Day	Nov. 11
Mohammedan New Year (1353)	Apr. 16	St. Andrew	Nov. 30
St. George	Apr. 23	First Sunday in Advent	Dec. 2
Rogation Sunday	May 6	Ramadan (Moslem)	Dec. 8
Accession of King George V (1910)	May 6	Christmas Day	Dec. 25
Ascension Day	May 10		
Pentecost (Whit Sunday)	May 20		
Empire (Victoria) Day	May 42		
Birthday of Queen Mary 1867)	May 26		

Thanksgiving Day, date set by Proclamation

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.

1934 EPHEMERIS OF THE SUN AT 0h GREENWICH CIVIL TIME

Date	Apparent R.A.	Equation of Time	Apparent Decl.
	h m s	m s	° ′ ″
Jan. 1	18 43 03	+ 3 14.0	−23 04 51
" 4	18 56 17	+ 4 38.2	−22 49 09
" 7	19 09 28	+ 5 58.9	−22 29 23
" 10	19 22 34	+ 7 15.6	−22 05 37
" 13	19 35 36	+ 8 27.6	−21 37 57
" 16	19 48 32	+ 9 34.1	−21 06 31
" 19	20 01 22	+10 34.5	−20 31 26
" 22	20 14 05	+11 28.3	−19 52 52
" 25	20 26 42	+12 14.9	−19 10 59
" 28	20 39 11	+12 54.4	−18 25 57
" 31	20 51 32	+13 26.4	−17 37 55
Feb. 3	21 03 47	+13 51.2	−16 47 05
" 6	21 15 54	+14 08.6	−15 53 35
" 9	21 27 54	+14 18.9	−14 57 38
" 12	21 39 47	+14 22.3	−13 59 24
" 15	21 51 33	+14 18.9	−12 59 04
" 18	22 03 13	+14 08.8	−11 56 51
" 21	22 14 46	+13 52.2	−10 52 56
" 24	22 26 13	+13 29.7	− 9 47 32
" 27	22 37 34	+13 01.5	− 8 40 48
Mar. 1	22 45 06	+12 39.8	− 7 55 40
" 4	22 56 19	+12 03.4	− 6 47 08
" 7	23 07 28	+11 22.9	− 5 37 43
" 10	23 18 34	+10 38.8	− 4 27 37
" 13	23 29 36	+ 9 51.7	− 3 16 58
" 16	23 40 36	+ 9 02.0	− 2 05 59
" 19	23 51 34	+ 8 10.2	− 0 54 49
" 22	0 02 31	+ 7 16.8	+ 0 16 20
" 25	0 13 26	+ 6 22.3	+ 1 27 18
" 28	0 24 20	+ 5 27.2	+ 2 37 56
" 31	0 35 15	+ 4 32.1	+ 4 38 05
Apr. 3	0 46 10	+ 3 37.7	+ 4 57 36
" 6	0 57 07	+ 2 44.5	+ 6 06 21
" 9	1 08 05	+ 1 53.1	+ 7 14 09
" 12	1 19 05	+ 1 04.1	+ 8 20 53
" 15	1 30 09	+ 0 17.7	+ 9 26 21
" 18	1 41 15	− 0 25.7	+10 30 24
" 21	1 52 25	− 1 05.7	+11 32 53
" 24	2 03 38	− 1 42.1	+12 33 39
" 27	2 14 55	− 2 14.4	+13 32 33
" 30	2 26 17	− 2 42.3	+14 29 26
May 3	2 37 43	− 3 05.6	+15 24 11
" 6	2 49 15	− 3 23.8	+16 16 39
" 9	3 00 52	− 3 36.8	+17 06 43
" 12	3 12 33	− 3 44.5	−17 54 13
" 15	3 24 21	− 3 47.0	+18 39 00
" 18	3 36 13	− 3 44.4	+19 20 58
" 21	3 48 10	− 3 36.9	+19 59 58
" 24	4 00 12	− 3 24.7	+20 35 53
" 27	4 12 18	− 3 07.8	+21 08 38
" 30	4 24 29	− 2 47.0	+21 38 06
June 2	4 36 44	− 2 21.9	+22 04 12
" 5	4 49 02	− 1 53.1	+22 26 50
" 8	5 01 24	− 1 21.0	+22 45 58
" 11	5 13 49	− 0 46.2	+23 01 29
" 14	5 26 15	− 0 09.3	+23 13 22
" 17	5 38 43	+ 0 29.0	+23 21 33
" 20	5 51 12	+ 1 08.0	+23 26 02
" 23	6 03 40	+ 1 47.0	+23 26 48
" 26	6 16 08	+ 2 25.4	+23 23 51
" 29	6 28 35	+ 3 02.6	+23 17 12

Date	Apparent R.A.	Equation of Time	Apparent Decl.
	h m s	m s	° ′ ″
July 2	6 41 01	+ 3 38.2	+23 06 53
" 5	6 53 24	+ 4 11.8	+22 52 55
" 8	7 05 44	+ 4 42.6	+22 35 22
" 11	7 18 02	+ 5 10.2	+22 14 17
" 14	7 30 15	+ 5 33.9	+21 49 45
" 17	7 42 24	+ 5 53.3	+21 21 52
" 20	7 54 28	+ 6 07.9	+20 50 43
" 23	8 06 28	+ 6 17.5	+20 16 25
" 26	8 18 22	+ 6 21.7	+19 39 04
" 29	8 30 10	+ 6 20.6	+18 58 47
Aug. 1	8 41 53	+ 6 14.3	+18 15 42
" 4	8 53 31	+ 6 02.6	+17 29 53
" 7	9 05 04	+ 5 45.7	+16 41 31
" 10	9 16 32	+ 5 23.4	+15 50 42
" 13	9 27 54	+ 4 56.1	+14 57 36
" 16	9 39 11	+ 4 23.6	+14 02 21
" 19	9 50 23	+ 3 46.2	+13 05 07
" 22	10 01 31	+ 3 04.2	+12 06 02
" 25	10 12 34	+ 2 17.9	+11 05 14
" 28	10 23 34	+ 1 27.8	+10 02 51
" 31	10 34 30	+ 0 34.5	+ 8 59 01
Sept. 3	10 45 24	− 0 21.7	+ 7 53 52
" 6	10 56 15	− 1 20.3	+ 6 47 33
" 9	11 07 04	− 2 20.8	+ 5 40 14
" 12	11 17 52	− 3 22.8	+ 4 32 03
" 15	11 28 38	− 4 26.0	+ 3 23 11
" 18	11 39 24	− 5 29.8	+ 2 13 47
" 21	11 50 10	− 6 33.7	+ 1 03 59
" 24	12 00 56	− 7 37.1	− 0 06 04
" 27	12 11 43	− 8 39.3	− 1 16 14
" 30	12 22 33	− 9 39.8	− 2 26 21
Oct. 3	12 33 24	−10 37.8	− 3 36 17
" 6	12 44 19	−11 33.0	− 4 45 52
" 9	12 55 17	−12 24.7	− 5 54 56
" 12	13 06 19	−13 12.5	− 7 03 18
" 15	13 17 25	−13 56.1	− 8 10 47
" 18	13 28 35	−14 34.9	− 9 17 14
" 21	13 39 52	−15 08.6	−10 22 27
" 24	13 51 13	−15 36.5	−11 26 18
" 27	14 02 41	−15 58.1	−12 28 36
" 30	14 14 16	−16 13.1	−13 29 11
Nov. 2	14 25 58	−16 20.9	−14 27 52
" 5	14 37 47	−16 21.5	−15 24 27
" 8	14 49 44	−16 14.5	−16 18 46
" 11	15 01 48	−16 00.1	−17 10 36
" 14	15 13 59	−15 38.1	−17 59 47
" 17	15 26 18	−15 08.7	−18 46 08
" 20	15 38 45	−14 31.9	−19 29 28
" 23	15 51 19	−13 47.7	−20 09 39
" 26	16 04 00	−12 56.4	−20 46 30
" 29	16 16 48	−11 58.2	−21 19 53
Dec. 2	16 29 42	−10 53.6	−21 49 38
" 5	16 42 42	− 9 43.0	−22 15 37
" 8	16 55 48	− 8 27.1	−22 37 43
" 11	17 08 58	− 7 06.9	−22 55 49
" 14	17 22 11	− 5 43.1	−23 09 51
" 17	17 35 27	− 4 16.7	−23 19 44
" 20	17 48 45	− 2 48.5	−23 25 25
" 23	18 02 04	− 1 19.2	−23 26 53
" 26	18 15 23	+ 0 10.3	−23 24 07
" 29	18 28 42	+ 1 39.1	−23 17 07

To obtain the R.A. of Mean Sun, subtract the Equation of Time from the Right Ascenion, 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.

PHASES OF THE MOON (75th Meridian Civil Time)

		D	h	m	D	h	m	D	h	m	D	h	m
☽	F.M.	Jan. 0	15	54	Mar. 30	20	14	June 27	00	08	Sept. 22	23	19
☾	L.Q.	8	16	36	Apr. 6	19	48	July 3	15	28	30	07	29
●	N.M.	15	08	37	13	18	57	11	12	06	Oct. 8	10	05
☽	F.Q.	22	06	50	21	16	20	19	13	53	15	14	29
☽	F.M.	30	11	31	29	07	45	26	07	09	22	10	01
☾	L.Q.	Feb. 7	04	22	May 6	01	41	Aug. 2	01	27	30	03	22
●	N.M.	13	19	43	13	07	30	10	03	46	Nov. 6	23	44
☽	F.Q.	21	01	05	21	10	20	17	23	33	13	21	39
☽	F.M.	Mar. 1	05	26	28	16	41	24	14	37	20	23	26
☾	L.Q.	8	13	06	June 4	07	53	31	14	40	29	00	39
●	N.M.	15	07	08	11	21	12	Sept. 8	19	20	Dec. 6	12	25
☽	F.Q.	22	20	44	20	01	37	16	07	26	13	05	52
☽	F.M.	30	20	14	27	00	08	22	23	19	20	15	53
☾	L.Q.	Apr. 6	19	48	July 3	15	28	30	07	29	28	21	08

PERIGEE		APOGEE	
Date	Distance	Date	Distance
D h	miles	D h	miles
Jan. 14 20	221,980	Jan. 27 14	252,320
Feb. 12 06	224,170	Feb. 24 05	251,820
Mar. 12 05	227,760	Mar. 24 01	251,260
Apr. 7 06	230,190	Apr. 20 21	251,200
May 2 21	228,260	May 18 15	251,590
May 30 14	225,130	June 15 05	252,180
June 27 20	226,340	July 12 13	252,560
July 26 05	225,590	Aug. 8 16	252,510
Aug. 23 15	226,650	Sept. 5 01	252,050
Sept. 20 20	225,460	Oct. 2 17	251,490
Oct. 18 09	228,700	Oct. 30 12	251,150
Nov. 12 09	229,750	Nov. 27 09	251,380
Dec. 9 03	226,620	Dec. 25 05	251,920

ABBREVIATIONS FOR THE CONSTELLATIONS

Andromeda	And	Andr
Antlia	Ant	Antl
Apus	Aps	Apus
Aquarius	Aqr	Aqar
Aquila	Aql	Aqil
Ara	Ara	Arae
Aries	Ari	Arie
Auriga	Aur	Auri
Bootes	Boo	Boot
Caelum	Cae	Cael
Camelopardalis	Cam	Caml
Cancer	Cnc	Canc
Canes Venatici	CVn	CVen
Canis Major	CMa	CMaj
Canis Minor	CMi	CMin
Capricornus	Cap	Capr
Carina	Car	Cari
Cassiopeia	Cas	Cass
Centaurus	Cen	Cent
Cepheus	Cep	Ceph
Cetus	Cet	Ceti
Chamaeleon	Cha	Cham
Circinus	Cir	Circ
Columba	Col	Colm
Coma Berenices	Com	Coma
Corona Austrina	CrA	CorA
Corona Borealis	CrB	CorB
Corvus	Crv	Corv
Crater	Crt	Crat
Crux	Cru	Cruc
Cygnus	Cyg	Cygn
Delphinus	Del	Dlph
Dorado	Dor	Dora
Draco	Dra	Drac
Equuleus	Equ	Equl
Eridanus	Eri	Erid
Fornax	For	Forn
Gemini	Gem	Gemi
Grus	Gru	Grus
Hercules	Her	Herc
Horologium	Hor	Horo
Hydra	Hya	Hyda
Hydrus	Hyi	Hydi
Indus	Ind	Indi
Lacerta	Lac	Lacr
Leo	Leo	Leon
Leo Minor	LMi	LMin
Lepus	Lep	Leps
Libra	Lib	Libr
Lupus	Lup	Lupi
Lynx	Lyn	Lync
Lyra	Lyr	Lyra
Mensa	Men	Mens
Microscopium	Mic	Micr
Monoceros	Mon	Mono
Musca	Mus	Musc
Norma	Nor	Norm
Octans	Oct	Octn
Ophiuchus	Oph	Ophi
Orion	Ori	Orio
Pavo	Pav	Pavo
Pegasus	Peg	Pegs
Perseus	Per	Pers
Phoenix	Phe	Phoe
Pictor	Pic	Pict
Pisces	Psc	Pisc
Piscis Austrinus	PsA	PscA
Puppis	Pup	Pupp
Pyxis	Pyx	Pyxi
Reticulum	Ret	Reti
Sagitta	Sge	Sgte
Sagittarius	Sgr	Sgtr
Scorpius	Scr	Scor
Sculptor	Scl	Scul
Scutum	Sct	Scut
Serpens	Ser	Serp
Sextans	Sex	Sext
Taurus	Tau	Taur
Telescopium	Tel	Tele
Triangulum	Tri	Tria
Ttiangulum Australe	TrA	TrAu
Tucana	Tuc	Tucn
Ursa Major	UMa	UMaj
Ursa Minor	UMi	UMin
Vela	Vel	Velr
Virgo	Vir	Virg
Volans	Vol	Voln
Vulpecula	Vul	Vulp

The 4-letter abbreviations are intended to be used in cases where a maximum saving of space is not necessary.

From *Transactions of the I.A.U.*, Vol. IV., 1932.

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 the 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 of 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 20	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.

At the beginning of 1934 the sun spots will be practically at a minimum. The last minimum occurred in 1923.6. According to the Mount Wilson observers the present cycle has been only ten and one quarter years behind similar phases of the last cycle. This would indicate October or November, 1933, as the time of the current minimum. Probably short period secondary fluctuations will prolong this until the end of 1933 or into 1934.

MERCURY

Mercury is the smallest, least massive, and swiftest, of the nine major planets. Since it is the planet whose orbit is closest to the sun it never appears in the sky very far removed from that body. For this reason Mercury is the least seen of any of the planets visible to the naked eye, though its observation, if attempted at the right time, is not nearly as difficult as many people suppose.

During the year 1934 Mercury reaches a maximum apparent separation from the sun six times, but never has an elongation greater than 28°. When Mercury is at eastern elongation it may be seen as a ruddy first magnitude star low in the west shortly after sunset, its light almost eclipsed by the evening twilight. At western elongation it is visible in the eastern morning sky just before sunrise.

The maximum eastern elongations of Mercury for 1934 are on February 18, 18° 7′; June 14, 24° 27′; October 10, 25° 13′. During the spring the ecliptic runs most nearly vertical at sunset and hence the elongation on February 18 is the most favourable at which to look for Mercury in the evening sky.

The maximum western elongations of Mercury during 1934 are on April 2, 27° 49′; July 31, 19° 31′; November 19, 19° 35′. Since the ecliptic is most nearly vertical at sunrise in September the two elongations on July 31 and November 19 will be equally suitable for observing Mercury in the morning sky.

The six elongations of Mercury which occur in 1934 are none of them extremely favourable for the observation of this planet.

VENUS

Venus is the planet whose orbit lies next outside that of Mercury. It, of all the heavenly bodies, is most like the earth in size, density and possibly constitution. For its path among the stars see Fig. 1.

The orbit of Venus lies just inside that of the earth and hence it comes closer to us than any other body with the exception of the moon, some of the asteroids, and an occasional comet. At its closest it is only 26 million miles away from us, at its greatest distance, 160 million miles.

At the beginning of the year Venus is at its greatest brilliancy, being of magnitude −4.4, 15 times as bright as Sirius and very conspicuous in the evening sky, setting some three hours after the sun. During January it rapidly decreases in brightness as it moves in between the earth and the sun. It starts to retrograde about the middle of the month and on February 4, is at inferior conjunction and becomes a morning star. By March 11 it has increased again to its greatest

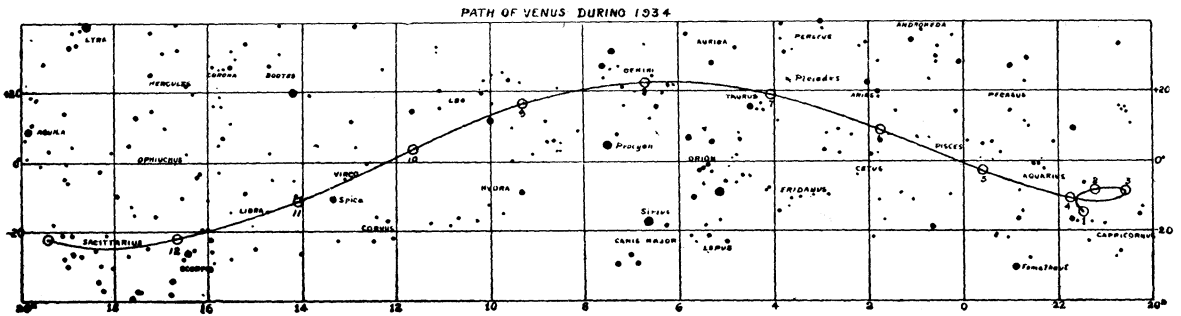

Fig. 1. Path of Venus. The positions of the planet at the beginning of each month are marked by open circles. *1* indicates, Jan. 1, 1934; *12*, Dec. 1, 1934. Between *1* and *2* Venus is an evening star, thereafter a morning star until early November.

brilliancy, a magnitude of −4.3. Its apparent separation from the sun becomes greater till on April 16 Venus is at its greatest elongation west of the sun, 46° 18′. If Venus is observed before sunrise at this time it should be easy to follow it on into broad daylight.

Venus continues as a morning star for several months, slowly approaching the sun and decreasing in brightness. On November 18 it is at superior conjunction and passes the sun on the far side, becoming an evening star. It is too near the sun to be well observed during the last three months of 1934.

MARS

Mars, whose orbit lies just outside that of the earth, is the second smallest of the major planets, with a diameter of only 4200 miles. It does not approach quite as close as Venus but when it is nearest to us its daylight hemisphere is towards the earth while the reverse is true for Venus so that we know more about the surface features of Mars than we do for any other planet.

1934 will not be a good year for making observations of Mars. At the beginning of the year it is low in the western sky at sunset being too faint to be noticeable in the evening twilight. It slowly approaches the sun and is in conjunction with that body on April 14, becoming a morning star. The apparent separation between Mars and the sun now gradually increases until by October 1 the planet rises about four hours before sunrise. It is then a red star of the second magnitude. It appears a little earlier each week and increases in brightness until by the end of December it is of the first magnitude and rises about midnight.

JUPITER

Jupiter is the largest and most massive planet of the solar system and though it does not approach the earth as closely as do Venus and Mars it is by far the easiest planetary object for observers with small telescopes because of its relatively large disk. An indication of this disk may be seen with a power of ten and with good seeing a power of twenty on a two inch telescope will reveal several dark bands lying on either side of the planet's equator. These are known as cloud belts and change slightly in form from month to month.

The four brightest moons of Jupiter may be seen with a good pair of prism binoculars. Their daily positions are given on the pages of astronomical phenomena for each month.

Except for the last two months of the year Jupiter, during 1934, will be found in the constellation Virgo. It is five degrees north of Spica in January and rises shortly after midnight, being a conspicuous object in the morning sky. It starts to retrograde on February 7 and is in opposition to the sun on April 8, when it is visible all night. The planet starts to move eastward again among the stars on June 11 and by August 1 is a second time just north of Spica. Conjunction with the sun occurs on October 27 and from the middle of September on Jupiter sets too soon after the sun in the evening sky to be well seen. It enters the constellation of Libra about November 1 and will be visible in the morning sky for the last month of the year. See Fig. 2 for its path among the stars.

SATURN

Saturn has a system of rings which make it a unique object for telescopic observation. These rings may be seen with a good two inch glass. It has nine satellites, the brightest of these being conspicuous in a small telescope.

For quite a number of years Saturn has been well south of the equator and hence has been visible for only a few months of the year and then low in the southern sky. Every year, however, it is progressing a little further north and will be quite favourably situated for observation during 1934. See Fig. 3.

At the beginning of the year it is just visible low in the southwest in the early part of the evening. Saturn rapidly approaches the sun and is in conjunc-

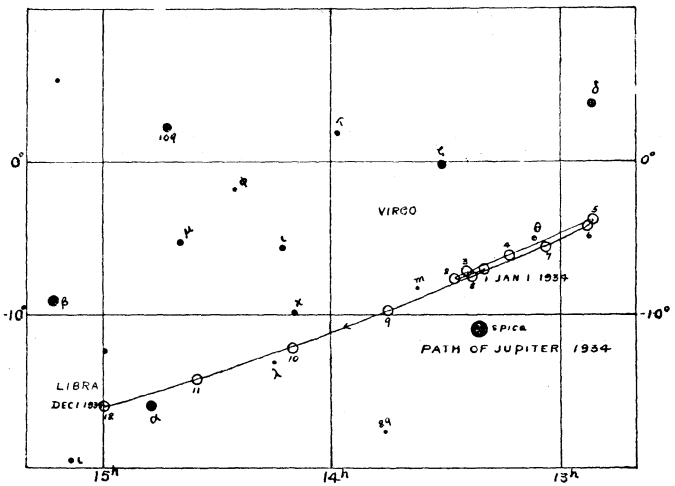

Fig. 2. The positions of the planet at the beginning of each month are shown by open circles.

tion with it on February 8 and enters the morning sky, but it is too near the sun to be well seen for a month or two. It starts to retrograde on June 9 and is in opposition to the sun on August 18. Saturn is in the constellation of Capricornus during the greater part of the year and is a bright yellow star shining with a steady light in the southern evening sky all summer and autumn.

URANUS

Uranus was discovered by Sir William Herschel in 1781. Before that time Saturn's path was considered the outermost boundary of the solar system, and when the planet was first seen by Herschel he thought it must be a comet. A year later its true nature was recognized. The planet has four satellites, two discovered by Herschel a few years after his discovery of Uranus. In 1851,

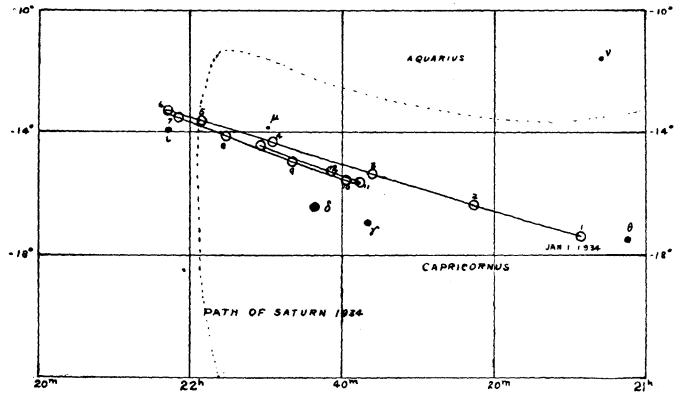

Fig. 3 Path of Saturn among the stars during 1934. The positions of the planet on the first of each month are shown by open circles.

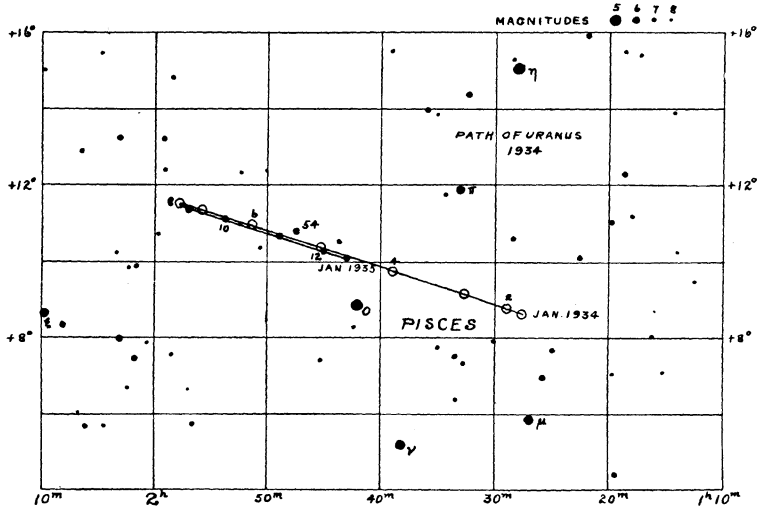

Fig. 4. Path of Uranus among the stars in 1934. The positions of the planet are shown at the beginning of each month. Open circles give the positions when the planet is moving eastward, filled circles when it is moving westward. The limiting magnitude of the stars shown is 8.0.

Lassell rediscovered and observed these two satellites, Oberon and Titania, and independently discovered and observed the two fainter satellites, Ariel and Umbriel. The satellites are very faint, about magnitude 14.

The period of Uranus about the sun is 84 years, and consequently its motion in the heavens is slow. Its period of rotation is $10\frac{3}{4}$ hours. It is of the sixth magnitude, a difficult object to recognize with the naked eye and better observed with a field glass. A large telescope is necessary to show an appreciable disk.

Uranus is in the constellation Pisces during 1934. It is in conjunction with the sun on April 17 and a few months later may be observed in the morning sky. Opposition to the sun occurs October 23, at which time the planet is visible all night. For its path among the stars see Fig. 4.

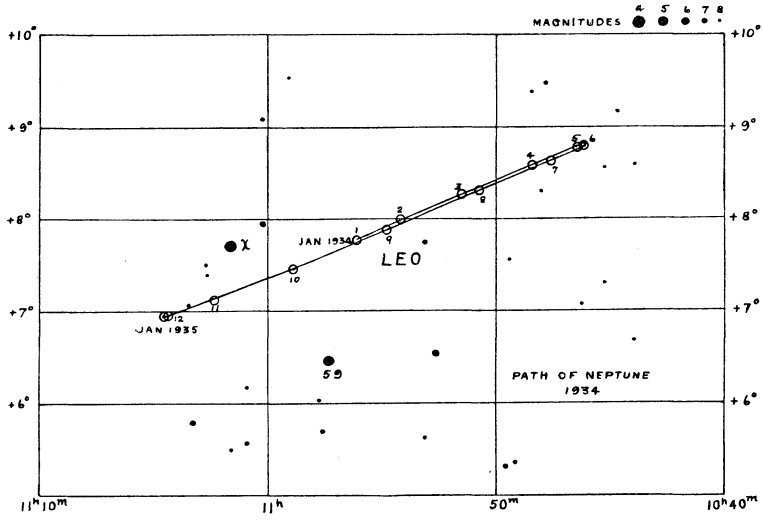

Fig. 5. Path of Neptune among the stars in 1934. The positions of the planet at the beginning of each month are shown by open circles.

NEPTUNE

Neptune was discovered in 1846 as the result of the mathematical discussion of the planet Uranus, which, for some unknown reason, was not following the path predicted for it. The discovery is one of the most interesting romances in the history of astronomy.

Neptune appears as an eighth magnitude star and hence can be seen only with a telescope. It has a single satellite, with a magnitude of about 13. The satellite was discovered by Lassell a few months following the discovery of the planet.

Neptune, until two years ago, was considered the most distant planet of the solar system, being 2.800 millions of miles from the sun, and requiring 165 years to complete a revolution. The discovery of a new member of the solar system, Pluto, at Flagstaff observatory, Arizona, in 1930, has robbed Neptune of this distinction.

Neptune is in the constellation Leo and in opposition to the sun on March 2, being visible most of the night during the first part of the year. Conjunction with the sun takes place September 5 and the planet will be too near the sun for observation several months before and after that date.

PLUTO

Pluto was discovered about the beginning of the year 1930 by the staff of the Lowell Observatory, at Flagstaff, Arizona. It was found to be within five degrees of the position predicted for it by Percival Lowell through his mathematical treatment of slight irregularities in the motion of Uranus. In the discovery of this planet history seems to have repeated itself though recently some doubt has been raised as to the possibility of Pluto causing large enough perturbations in the motion of Uranus to allow of its position being calculated. Even should this be so, however, it in no way detracts from the tribute due the late Percival Lowell without whose pioneer work the planet would not have been found. He it was who instituted the search for this planet and it was discovered by the observatory which he founded.

The image of Pluto has been found on plates dating back as far as 1914 and these have greatly facilitated the refinement of its computed orbit. It revolves about the sun once in 248 years at a mean distance of 3.7 billion miles from that body, and hence its motion among the stars is very slow. Just at present it is in the constellation Gemini, a few degrees south of Castor and Pollux, and visible all winter in the evening sky. Its visual magnitude is 15, however, so that it can only be seen in the largest telescopes. Latest results seem to indicate that its mass is between one and two tenths that of the earth. The ephemeris of Pluto for 1933-34 is given in Lick Observatory Bulletin No. 453.

ECLIPSES, 1934

In the year 1934 there will be four eclipses, two of the Sun and two of the Moon.

I. A Partial Eclipse of the Moon, January 30, 1934 invisible at Toronto; the beginning visible generally in the northwestern part of North America, the Arctic Ocean, the Pacific Ocean except the southeastern part, Australia, Asia, the Indian Ocean, the northeastern part of Africa and Europe except the southwestern part; the ending visible generally in the extreme northwestern part of North America, the Arctic Ocean, the Pacific Ocean except the eastern part, Australia, Asia, the Indian Ocean, Europe, Africa except the northwestern part.

Circumstances of the Eclipse

75th Meridian Civil Time

		d	h	m
Moon enters penumbra	January	30	9	7
Moon enters umbra	"	30	11	1
Middle of the eclipse	"	30	11	43
Moon leaves umbra	"	30	12	24
Moon leaves penumbra	"	30	14	17

Magnitude of the eclipse 0.117 (Moon's diam. = 1.0)

II. A Total Eclipse of the Sun, February 13-14, 1934 invisible at Toronto. The path of total eclipse begins off the coast of Borneo, passes eastward then northeastward across the Pacific Ocean and ends at sunset off Vancouver Island.

Circumstances of the Eclipse
75th Meridian Civil Time

		d h m	Long. ° ′	Lat. ° ′
Eclipse begins	February	13 17 05	120 45 E.	6 35 S.
Central eclipse begins	"	13 18 07	107 50 E.	3 55 N.
Central eclipse ends	"	13 21 10	136 41 W.	52 26 N.
Eclipse ends	"	13 22 11	146 40 W.	42 19 N.

III. A Partial Eclipse of the Moon July 26, 1934 invisible at Toronto; the beginning visible generally in the western part of North America, the western part of South America, the Pacific Ocean, the Antartic Ocean, Australia and the extreme eastern part of Asia; the ending visible generally in the extreme northwestern part of North America, the Pacific Ocean, the Antartic Ocean, Australia, the Indian Ocean and central and eastern Asia.

Circumstances of the Eclipse
75th Meridian Civil Time

		d h m
Moon enters penumbra	July	26 4 50
Moon enters umbra	"	26 5 54
Middle of the eclipse	"	26 7 15
Moon leaves umbra	"	26 8 36
Moon leaves penumbra	"	26 9 40

Magnitude of the eclipse 0.668 (Moon's diam. =1.0)

IV. An Annular Eclipse of the Sun August 10, 1934, invisible in North America.

Circumstances of the Eclipse
75th Meridian Civil Time

		d h m	Long. ° ′	Lat. ° ′
Eclipse begins	August	10 0 51	4 25 S.	2 44 E.
Central eclipse begins	"	10 2 12	10 47 N.	19 36 E.
Central eclipse ends	"	10 5 03	87 53 S.	62 31 E.
Eclipse ends	"	10 6 24	82 45 S.	47 12 E.

THE SKY FOR JANUARY, 1934

The times of transit are given in Local Mean Time, 0h at midnight; 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 43m to 20h 56m, and its Decl. changes from 23° 4′ S. to 17° 21′ S. The equation of time (see p. 6) increases from 3m 14s to 13m 35s. Owing to this rapid rise in value the time of mean noon appears, for the first ten days of the month, to remain at the same distance from sunrise, that is, the forenoons as indicated by our clocks are of the same length. On the 20th of the month the sun enters Aquarius, the second winter zodiacal sign. On the 2nd the earth is in perihelion.

The Moon—For its phases, perigee and apogee times and distances, and its conjunctions with the planets, see p. 7 and opp. page. There is a partial eclipse of the moon on the 30th (see p. 28).

Mercury on the 15th is in R.A. 19h 32 m, Decl. 23° 39′ S. and transits at 11.59. It is a morning star on the 1st, but not far from the sun, which it gradually approaches until it comes to superior conjunction on the 19th. From this date it is an evening star, but too near the sun for observation.

Venus on the 15th is in R.A. 21h 40m, Decl. 10° 37′ S. and transits at 14.01. On the 1st it is an evening star, at its maximum brilliancy. It is of magnitude −4.4. In the telescope it shows the crescent form, like the moon about three days old. During the month it rapidly moves in towards the sun and on February 4 comes to inferior conjunction.

Mars on the 15th is in R.A. 21h 7m, Decl. 17° 41′ S. and transits at 13.32. During the month this planet is low in the southwestern sky at sunset and is also faint. See statement on p. 24.

Jupiter on the 15th is in R.A. 13h 25m, Decl. 7° 28′ S. and transits at 5.48. From the map on p. 25 it is seen that Jupiter is in Virgo most of the year. During the month it is a brilliant morning star. For the configuration of its satellites see next page, and for their eclipses, etc., see p. 54.

Saturn on the 15th is in R.A. 21h 15m, Decl. 16° 59′ S. and transits at 13.37. From the map on p. 26 it is seen that this planet is in Capricornus most of the year. During January it is low in the southwest at sunset and is not well placed for observation.

Uranus on the 15th is in R.A. 1h 28m, Decl. 8° 37′ N. and transits at 17.50.

Neptune on the 15th is in R.A. 10h 55m, Decl. 7° 51′ N. and transits at 3.20.

Pluto—For information regarding this planet, see p. 28.

JANUARY

ASTRONOMICAL PHENOMENA

75th Meridian Civil Time

	d	h	m		Minima of Algol h m	Configurations of Jupiter's Satellites at 5h 15m
Mon.	1					32104
Tues.	2	5	..	⊕ in Perihelion	0 40	30124
		6	..	♁ Stationary.		
Wed.	3					13024
Thur.	4	23	..	☿ in Aphelion	21 30	20134
Fri.	5	23	40	☌♆☾, ♆ 3° 15′ N		1043*
Sat.	6					40132
Sun.	7				18 20	4320*
☾ Mon.	8	16	35.8	Last Quarter		43210
Tue.	9	4	08	☌♃☾, ♃ 6° 30′ N		43012
Wed.	10				15 10	4102*
Thur.	11					42013
Fri.	12	21	..	□♃☉		41203
Sat.	13	6	..	♀ Stationary	12 00	40123
Sun.	14	4	..	□♁☉		d3104
Mon.	15	3	20	☌☿☾, ☿ 0° 37′ N		d3204
●		8	37.1	New Moon.		
Tues.	16	18	13	☌♂☾, ♂ 0° 49′ S	8 40	30124
		19	05	☌ ♄☾, ♄ 0° 43′ S.		
Wed.	17	4	46	☌♄☾, ♄ 3° 43′ N		31024
		13	..	☌♂♄, ♂ 0° 09′ S.		
Thur.	18					20134
Fri.	19	21	..	☌ ☿ ☉, Superior	5 30	12034
Sat.	20					01234
Sun.	21	19	28	☌♁☾, ♁ 5° 48′ S		d1024
☽ Mon.	22	6	50.3	First Quarter	2 20	32014
		19	..	☌♀♂, ♀ 6° 36′ N.		
Tues.	23					3402*
Wed.	24				23 10	43102
Thur.	25	7	..	☿ Greatest Hel. Lat. S		42013
		14	..	♂ in Perihelion.		
Fri.	26					42103
Sat.	27				20 00	40123
Sun.	28	16	..	☌♀♄, ♀ 7° 53′ N		41032
Mon.	29	21	..	☌☿♀, ☿ 9° 08′ S		43201
Tues.	30	..	..	☾ Partial Eclipse	16 50	340**
		10	..	☌☿ ♄, ☿ 0° 58′ S.		
○		11	31.4	Full Moon.		
Wed.	31					31042

Explanation of symbols and abbreviations on page 4

THE SKY FOR FEBRUARY, 1934

The times of transit are given in Local Mean Time, 0h at midnight; 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 56m to 22h 45m and its Decl. changes from 17° 21′ S. to 7° 56′ S. The equation of time reaches a maximum value of 14m 22s on the 12th (see p. 6). For changes in the length of the day see p. 11. On the 19th the sun enters Pisces, the third winter sign of the zodiac. There is a total eclipse of the sun on February 13-14, visible on the Pacific Ocean (see p. 29).

The Moon—For its phases, perigee and apogee times and distances, and its conjunctions with the planets, see p. 7 and opp. page.

Mercury on the 15th is in R.A. 22h 57m, Decl. 6° 19′ S. and transits at 13.21. During the month Mercury separates from the sun until the 18th when it has its greatest eastern elongation (see opp. page). For some days before and after this date the planet should be visible. Read about Mercury on p. 22.

Venus on the 15th is in R.A. 20h 42m, Decl. 9° 43′ S. and transits at 11.01. On the 4th it is in inferior conjunction with the sun and after this date becomes a morning star. During the first part of the month it is so near the sun that it cannot easily be observed, but it is very brilliant at the end. See notes on Venus, p. 22.

Mars on the 15th is in R.A. 22h 42m, Decl. 9° 16′ S. and transits at 13.04. The planet slowly approaches the sun in the sky and is a faint object and hence is not suitably placed for observation.

Jupiter on the 15th is in R.A. 13h 28m, Decl. 7° 37′ S. and transits at 3.49. The planet rises about 9 o'clock p.m. and is a prominent object from that time to dawn. For the configuration of its satellites see next page and for their eclipses, etc., see p. 54.

Saturn on the 15th is in R.A. 21h 29m, Decl. 15° 53′ S. and transits at 11.50. The planet is in conjunction with the sun on the 8th and hence is too near the sun during the month for observation.

Uranus on the 15th is in R.A. 1h 31m, Decl. 8° 54′ N. and transits at 15.51.

Neptune on the 15th is in R.A. 10h 53m, Decl. 8° 7′ N. and transits at 1.15.

Pluto—For information regarding this planet, see p. 28.

FEBRUARY

ASTRONOMICAL PHENOMENA

75th Meridian Civil Time

	d	h	m		Minima of Algol h m	Configurations of Jupiter's Satellites at 3h 45m
Thur.	1	20	..	☿ in Perihelion		20134
Fri.	2	4	25	☌♆☾, ♆ 3° 18′ N	13 40	21034
Sat.	3					01234
Sun.	4	23	..	☌☿☉, Inferior		10324
Mon.	5	12	43	☌♃☾, ♃ 6° 45′ N	10 30	23014
Tue.	6					31204
☾ Wed.	7	4	21.6	Last Quarter		30124
		13	..	♃ Stationary.		
Thur.	8	1	..	☌♄☉	7 20	2403*
		18	..	☌☿☌♂, ♂ 0° 08′ N.		
Fri.	9					24103
Sat.	10					40213
Sun.	11				4 10	41032
Mon.	12	17	55	☌☿☾, ☿ 9° 35′ N		42301
Tues.	13	..	..	☉ Total Eclipse		43120
		8	..	☿ in ♌.		
		11	53	☌♄☾, ♄ 1° 05′ S.		
●		19	43.4	New Moon.		
Wed.	14	20	28	☌♂☾, ♂ 3° 02′ S	0 50	43012
Thur.	15	4	17	☌☿☾, ☿ 1° 59′ S		4302*
Fri.	16				21 40	24103
Sat.	17	23	..	☿ in Perihelion		02143
Sun.	18	2	..	☿ Greatest Elong. E. 18° 07′		10234
		5	43	☌♁☾, ♁ 5° 50′ S.		
Mon.	19	1	..	♃ in Aphelion	18 30	23014
Tues.	20					32104
☽ Wed.	21	1	04.7	First Quarter		30124
Thur.	22				15 20	31024
Fri.	23	16	..	☿ Greatest Hel. Lat. N		d2034
Sat.	24	1	..	☿ Stationary		02143
		18	..	☿ Stationary.		
Sun.	25				12 10	14023
Mon.	26					42301
Tues.	27	2	..	☌☿☌♂, ☿ 4° 28′ N		43210
Wed.	28	5	..	☿ Greatest Hel. Lat. N	9 00	43012

Explanation of symbols and abbreviations on page 4

THE SKY FOR MARCH, 1934

The times of transit are given in Local Mean Time, 0h at midnight; 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 45m to 0h 39m, and its Decl. changes 7° 56′ S. to 4° 11′ N. The equation of time decreases from 12m 40s to 4m 14s (see p. 6). For changes in the length of the day, see p. 12. On the 21st at 7.28 (G.C.T.) the sun enters Aries, the first spring sign of the zodiac, and spring begins. On that day the sun crosses the equator going north.

The Moon—For its phases, perigee and apogee times and distances, and its conjunctions with the planets, see p. 7 and opp. page.

Mercury on the 15th is in R.A. 22h 33m, Decl. 6° 52′ S. and transits at 11.03. On the 5th it is in inferior conjunction with the sun, after which it is a morning star. It continually separates from the sun until April 2 when its elongation is over 27°. Under favourable conditions the planet might be seen at the end of March but the spring is not a good time to observe Mercury as a morning star.

Venus on the 15th is in R.A. 20h 57m, Decl. 12° 17′ S. and transits at 9.28. On the 11th it attains greatest brilliancy and during the month it continues to separate from the sun. Being so bright, it can be seen in the south-east just before sunrise, but it is not very high above the horizon.

Mars on the 15th is in R.A. 0h 3m, Decl. 0° 30′ S. and transits at 12.34. The planet is still coming nearer to the sun in the sky and is not suitably placed for observation.

Jupiter on the 15th is in R.A. 13h 21m, Decl. 6° 51′ S. and transits at 1.53. The planet is still improving its position for observation, and at the end of the month is visible nearly all night. For the configuration of its satellites see next page, and for their eclipses, etc., see p. 54.

Saturn on the 15th is in R.A. 21h 42m, Decl. 14° 53′ S. and transits at 10.13. The planet is now a morning star, but is not well placed for observation.

Uranus on the 15th is in R.A. 1h 35m, Decl. 9° 22′ N. and transits at 14.06.

Neptune on the 15th is in R.A. 10h 50m, Decl. 8° 25′ N. and transits at 23.18.

Pluto—For information regarding this planet, see p. 28.

MARCH

ASTRONOMICAL PHENOMENA

75th Meridian Civil Time

	d	h	m		Minima of Algol h	m	Configurations of Jupiter's Satellites at 2h 30m
♋ Thur.	1	5	26.5	Full Moon			43102
		9	27	☌♆☾, ♆ 3° 13′ N.			
Fri.	2	2	..	☍♆☉			42013
Sat.	3				5	50	403**
Sun.	4	16	26	☌♃☾, ♃ 6° 47′ N			41023
Mon.	5	19	..	☌☿☉, Inferior			d2401
Tues.	6				2	40	32104
Wed.	7						30124
☾ Thur.	8	13	05.8	Last Quarter	23	20	31024
Fri.	9						20134
Sat.	10						21034
Sun.	11	13	..	♀ Greatest brilliancy	20	10	d0234
Mon.	12	5	26	☌♀☾, ♀ 6° 14′ N			20314
Tues.	13	3	03	☌♄☾, ♄ 1° 29′ S			32104
Wed.	14	2	45	☌☿☾, ☿ 0° 42′ N	17	00	34021
♍ Thur.	15	7	08.3	New Moon			43102
		22	38	☌♂☾, ♂ 4° 46′ S.			
Fri.	16						42031
Sat.	17	17	42	☌♁☾, ♁ 5° 46′ S	13	50	42103
Sun.	18	4	..	☿ Stationary			d4023
Mon.	19						d4013
Tues.	20				10	40	42310
Wed.	21	2	28	☉ enters ♈, Spring commences			34021
☽ Thur.	22	20	44.5	First Quarter			31042
Fri.	23	16	..	☿ in ♉	7	30	20314
Sat.	24						21034
Sun.	25						01234
Mon.	26				4	20	0234*
Tues.	27						23104
Wed.	28	15	56	☌♆☾, ♆ 3° 10′ N			30214
Thur.	29				1	10	31024
♋ Fri.	30	20	14.5	Full Moon			2041*
Sat.	31	18	08	☌♃☾, ♃ 6° 39′ N	22	00	42103

Explanation of symbols and abbreviations on page 4

THE SKY FOR APRIL, 1934

The times of transit are given in Local Mean Time, 0h at midnight; 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 39m to 2h 30m, and its Decl. changes from 4° 11′ N. to 14° 48′ N. The equation of time changes from +4m 14s to −2m 51s (see p. 6). For changes in the length of the day, see p. 13. On the 20th the sun enters Taurus, the second spring sign of the zodiac.

The Moon—For its phases, perigee and apogee times and distances, and its conjunctions with the planets, see p. 7 and opp. page.

Mercury on the 15th is in R.A. 0h 3m, Decl. 2° 29′ S. and transits at 10.34. On the 2nd the planet attains maximum elongation west (see opp. page), but the spring is not a good time to observe Mercury as a morning star, for the reason given on p. 22.

Venus on the 15th is in R.A. 22h 38m, Decl. 8° 0′ S. and transits at 9.08. It continues to separate from the sun until the 16th when it reaches its greatest elongation. It is interesting to observe the planet before sunrise and then continue to follow it into full daylight.

Mars on the 15th is in R.A. 1h 30m, Decl. 8° 59′ N. and transits at 12.00. On the 14th the planet is in conjunction with the sun. Consequently it is invisible all the month.

Jupiter on the 15th is in R.A. 13h 7m, Decl. 5° 25′ S. and transits at 23.33. On the 8th the planet is in opposition to the sun and rises as the sun sets. This month is a good one to observe Jupiter. For the configuration of its satellites see next page, and for their eclipses, etc., see p. 54.

Saturn on the 15th is in R.A. 21h 54m, Decl. 13° 57′ S. and transits at 8.23. The planet is a morning star rising about two hours before the sun but on account of its south declination it is not well placed for observation.

Uranus on the 15th is in R.A. 1h 42m, Decl. 9° 58′ N. and transits at 12.11.

Neptune on the 15th is in R.A. 10h 47m, Decl. 8° 41′ N. and transits at 21.14.

Pluto—For information regarding this planet, see p. 28.

APRIL

ASTRONOMICAL PHENOMENA

75th Meridian Civil Time

	d	h	m		Minima of Algol h m	Configurations of Jupiter's Satellites at 0h 45m
Sun.	1	10	..	☌☿♄, ☿ 3° 29′ N		40123
Mon.	2	6	..	☿ Greatest Elong. W. 27° 49′		41023
		23	..	☿ in Aphelion.		
Tues.	3				18 40	d4230
Wed.	4					43201
Thur.	5					43102
☾ Fri.	6	19	48.5	Last Quarter	15 30	43201
Sat.	7					21403
Sun.	8	16	..	☍☌☉		01243
• Mon.	9	15	10	☌♄☾, ♄ 1° 58′ S	12 20	10234
Tues.	10	4	22	☌☿☾, ☿ 0° 20′ S		23014
Wed.	11	22	40	☌☿☾, ☿ 6° 21′ S		3204*
Thur.	12				9 10	31024
● Fri.	13	18	57.0	New Moon		32014
		23	07	☌☌☾, ☌ 5° 33′ S		
Sat.	14	5	32	☌♁☾, ♁ 5° 43′ S		21034
		9	..	☌☌☉		
Sun.	15				6 00	02143
Mon.	16	3	..	☿ Greatest Elong. W. 46° 18′		14023
Tues.	17	22	..	☌♁☉		42301
Wed.	18				2 50	43210
Thur.	19	3	..	☌☌♁, ☌ 0° 08′ N		43102
Fri.	20	18	..	☿ in ♉	23 40	d4301
☽ Sat.	21	16	20.4	First Quarter		42103
Sun.	22					40213
Mon.	23	7	..	☿ Greatest Hel. Lat. S	20 30	41023
Tues.	24	23	47	☌♆☾, ♆ 3° 17′ N		d2401
Wed.	25					32104
Thur.	26				17 20	d3024
Fri.	27	20	53	☌♃☾, ♃ 6° 31′ N		30214
Sat.	28					21034
○ Sun.	29	7	45.4	Full Moon	14 10	02134
Mon.	30					10234

Explanation of symbols and abbreviations on page 4

THE SKY FOR MAY, 1934

The times of transit are given in Local Mean Time, 0h at midnight; 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 30m to 4h 33m, and its Decl. changes from 14° 48′ N. to 21° 56′ N. The equation of time decreases from −2m 51s to a minimum of −3m 47s on the 15th and then increases to −2m 31s at the end of the month (see p. 6). For changes in the times of sunrise and sunset, see p. 14. On May 21st the sun enters Gemini, the third spring sign of the zodiac.

The Moon—For its phases, perigee and apogee times and distances and conjunctions with the planets, see p. 7 and opp. page.

Mercury on the 15th is in R.A. 3h 33m, Decl. 19° 36′ N. and transits at 12.07. It is a morning star at the beginning of the month, but too close to the sun for observation. On the 13th it is in superior conjunction with the sun after which it becomes an evening star.

Venus on the 15th is in R.A. 0h 37m, Decl. 2° 11′ N. and transits at 9.09. It is a morning star about 20° above the eastern horizon at sunrise on the 15th.

Mars on the 15th is in R.A. 2h 56m, Decl. 16° 39′ N. and transits at 11.28. It is very close to the sun in the morning sky and cannot be seen.

Jupiter on the 15th is in R.A. 12h 55m, Decl. 4° 15′ S. and transits at 21.23. On the 15th its magnitude is −1.9 and it is high in the south-east at sunset. For the configurations of its satellites, see next page, and for their eclipses, etc., see p. 55.

Saturn on the 15th is in R.A. 22h 1m, Decl. 13° 24′ S. and transits at 6.32. It is a morning star about 25° above the southeastern horizon at sunrise.

Uranus on the 15th is in R.A. 1h 48m, Decl. 10° 35′ N. and transits at 10.18.

Neptune on the 15th is in R.A. 10h 46m, Decl. 8° 49′ N. and transits at 19.15.

Pluto—For information regarding this planet, see p. 28.

ASTRONOMICAL PHENOMENA

75 Meridian Civil Time

	d	h	m		Minima of Algol h m	Configurations of Jupiter's Satellites at 23h 45m
Teus.	1	9	..	☌☿♁, ☿ 1° 15′ S.		32104
Wed.	2				10 50	34012
Thur.	3					4302*
Fri.	4					42103
Sat.	5				7 40	4013*
☾ Sun.	6	1	41.0	Last Quarter		41023
Mon.	7	0	18	☌♄☾, ♄ 2° 30′ S.		42031
Tues.	8	7	..	☌☿☌♂, ☿ 0° 31′ S.	4 30	42310
Wed.	9	19	19	☌♀☾, ♀ 5° 51′ S.		34012
Thur.	10					31042
Fri.	11	15	49	☌♁☾, ♁ 5° 47′ S.	1 20	d2304
Sat.	12	7	..	☿ in ♌		20134
		21	27	☌♂☾, ♂ 5° 24′ S.		
Sun.	13	0	..	☌☿☉, Superior	22 10	10234
		7	30.1	New Moon.		
		11	14	☌☿☾, ☿ 4° 53′ S.		
Mon.	14					20134
Tues.	15					21304
Wed.	16	22	..	☿ in Perihelion	19 00	30124
Thur.	17					31024
Fri.	18					d2340
Sat.	19	8	..	□♄☉	15 50	42013
Sun.	20					41023
☽ Mon.	21	10	19.8	First Quarter		d4013
		13	..	Ψ Stationary.		
Tues.	22	8	11	☌Ψ☾, Ψ 3° 32′ N.	12 40	42130
Wed.	23					43021
Thur.	24	23	..	♀ in Aphelion		43102
Fri.	25	2	27	☌♃☾, ♃ 6° 30′ N.	9 30	42301
Sat.	26					2403*
Sun.	27	5	..	☿ Greatest Hel. Lat. N.		10423
		19	..	♂ in ♌.		
♍ Mon.	28	16	41.4	Full Moon	6 20	02134
Tues.	29					21304
Wed.	30					3014*
Thur.	31	14	..	□Ψ☉	3 00	31024

Explanation of symbols and abbreviations on page 4

THE SKY FOR JUNE, 1934

The times of transit are given in Local Mean Time, 0h at midnight; 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 33m to 6h 37m, and its Decl. from 21° 56′ N. to its maximum value of 23° 27′ N. on the 21st and then drops to 23° 11′ N. at the end of the month. On the 21st the sun reaches summer solstice and enters Cancer, the first summer zodiacal sign and summer commences. The duration of daylight is now at its longest and does not change appreciably for some days, see p. 15. For changes in the equation of time, see p. 6. The increase in this quantity at the end of the month taken with the shortening of daylight causes the local mean time of sunset to appear almost constant at the end of June and the beginning of July.

The Moon—For its phases, perigee and apogee times and distances, and its conjunctions with the planets, see p. 7 and opp. page.

Mercury on the 15th is in R.A. 7h 17m, Decl. 23° 14′ N. and transits at 13.47. On the 14th it reaches its greatest eastern elongation and at sunset should be seen about 15° above the western horizon.

Venus on the 15th is in R.A. 2h 50m, Decl. 14° 7′ N. and transits at 9.20. It is about 20° above the eastern horizon at sunrise.

Mars on the 15th is in R.A. 4h 28m, Decl. 21° 57′ N. and transits at 10.57. It is a morning star too close to the sun for observation.

Jupiter on the 15th is in R.A. 12h 51m, Decl. 3° 59′ S. and transits at 19.18. It is approaching quadrature with the sun and is just east of the meridian at sunset. For the configurations of its satellites, see next page, and for their eclipses, etc., see p. 55.

Saturn on the 15th is in R.A. 22h 30m, Decl. 13° 20′ S. and transits at 4.32. It rises shortly after midnight and its magnitude is +1.0.

Uranus on the 15th is in R.A. 1h 54m, Decl. 11° 5′ N. and transits at 8.22.

Neptune on the 15th is in R.A. 10h 47m, Decl. 8° 44′ N. and transits at 17.13.

Pluto—For information regarding this planet, see p. 28.

JUNE

ASTRONOMICAL PHENOMENA

75th Meridian Civil Time

	d	h	m		Minima of Algol h	m	Configurations of Jupiter's Satellites at 23h 00m
Fri.	1	12	..	☌♀ ♁, ♀ 1° 44′ S.			32O14
Sat.	2				23	50	21O34
Sun.	3	7	43	☌♄☾, ♄ 2° 57′ S.			dO423
☾ Mon.	4	7	52.7	Last Quarter			4O123
Tues.	5				20	40	d421O
Wed.	6						43O1*
Thur.	7						431O2
Fri.	8	0	18	☌♁☾, ♁ 5° 56′ S.	17	30	432O1
		14	38	☌♀☾, ♀ 7° 42′ S.			
Sat.	9	6	..	♄ Stationary			421O3
Sun.	10	18	11	☌♂☾, ♂ 4° 32′ S.			4O123
Mon.	11	0	..	♃ Stationary	14	20	4O23*
●		21	11.5	New Moon.			
Tues.	12						21O43
Wed.	13						32O14
Thur.	14	2	..	☿ Greatest Elong. E. 24° 27′	11	10	31O24
		2	06	☌☿☾, ☿ 1° 03′ S.			
Fri.	15						32O14
Sat.	16	14	..	♀ Greatest Hel. Lat. S.			21O34
Sun.	17				8	00	O1234
Mon.	18	16	22	☌♆☾, ♆ 3° 47′ N.			O234*
Tues.	19	15	..	☿ in ♉			21O34
☽ Wed.	20	1	36.7	First Quarter	4	50	32O41
Thur.	21	11	05	☌♃☾, ♃ 6° 34′ N.			341O2
		21	48	☉ enters ♋, Summer commences.			
Fri.	22						d43O1
Sat.	23				1	30	421O3
Sun.	24						4O213
Mon.	25				22	20	41O23
Tues.	26						d42O3
○ Wed.	27	0	07.9	Full Moon			432O1
		9	..	☿ Stationary.			
Thur.	28				19	10	341O2
Fri.	29	22	..	☿ in Aphelion			3O241
Sat.	30	14	48	☌♄☾, ♄ 3° 11′ S.			21O34

Explanation of symbols and abbreviations on page 4

THE SKY FOR JULY, 1934

The times of transit are given in Local Mean Time, 0h at midnight; 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 37m to 8h 42m, and its Decl. decreases from 23° 11′ N. to 18° 16′ N. The equation of time increases from 3m 27s on the 1st to 6m 22s on the 27th and then drops to 6m 14s at the end of the month. On the 23rd the sun enters Leo, the second summer sign of the zodiac. For changes in the length of day, see p. 16. On the 5th the earth is in aphelion at a distance of 94,450,000 miles from the sun.

The Moon—For its phases, perigee and apogee times and distances, and its conjunctions with the planets, see p. 7 and opp. page. A partial eclipse of the moon, invisible at Toronto, occurs on July 26, for the circumstances of which, see p. 29.

Mercury on the 15th is in R.A. 7h 9m, Decl. 21° 45′ N. and transits at 11.37. On the 11th it is in inferior conjunction with the sun, and on the 31st reaches its greatest elongation west but is not favourably situated for observation.

Venus on the 15th is in R.A. 5h 15m, Decl. 21° 45′ N. and transits at 9.47. It is a morning star about 25° above the horizon at sunrise.

Mars on the 15th is in R.A. 5h 57m, Decl. 23° 57′ N. and transits at 10.28. It is a morning star not far from Venus, but quite faint.

Jupiter on the 15th is in R.A. 12h 57m, Decl. 4° 45′ S. and transits at 17.26. It is in quadrature with the sun on the 6th, of magnitude −1.6. For the configurations of its satellites, see next page, and for their eclipses, etc., see p. 55.

Saturn on the 15th is in R.A. 21h 59m, Decl. 13° 46′ S. and transits at 2.30. It rises about two hours after sunset.

Uranus on the 15th is in R.A. 1h 57m, Decl. 11° 24′ N. and transits at 6.27.

Neptune on the 15th is in R.A. 10h 49m, Decl. 8° 30′ N. and transits at 15.17.

Pluto—For information regarding this planet, see p. 28.

JULY

ASTRONOMICAL PHENOMENA

75th Meridian Civil Time

	d	h	m		Minima of Algol h	m	Configurations of Jupiter's Satellites at 22h oom
Sun.	1				16	00	O134*
Mon.	2						1O234
☾ Tues.	3	15	27.9	Last Quarter			2O134
Wed.	4				12	50	2304*
Thr..	5	7	40	☌♁☾, ♁ 6° 07′ S.			31O24
		14	..	⊕ in Aphelion.			
Fri.	6	22	..	□♃☉			3O214
Sat.	7				9	40	213O4
Sun.	8	12	17	☌♀☾, ♀ 6° 01′ S.			4O13*
Mon.	9	14	15	☌♂☾, ♂ 3° 13′ S.			41O23
Tues.	10				6	30	42O13
Wed.	11	7	..	☌☿ ☉Inferior			4231O
		9	43	☌☿☾, ☿ 6° 55′ S.			
♌		12	05.9	New Moon.			
Thur.	12						d43O2
Fri.	13				3	20	43O12
Sat.	14						4231O
Sun.	15						42O13
Mon.	16	0	03	☌♆☾, ♆ 3° 57′ N.	0	10	1O423
Tues.	17						2O134
Wed.	18	22	10	☌♃☾, ♃ 6° 38′ N.	20	50	d21O4
☽ Thur.	19	13	52.9	First Quarter			d3O24
Fri.	20	7	..	☿ Greatest Hel. Lat. S.			3O24*
Sat.	21				17	40	321O4
Sun.	22	1	..	☿ Stationary			2O134
Mon.	23						1O423
Tues.	24	20	..	□♁☉	14	30	d4O13
Wed.	25						421O3
Thur.	26	..	..	☾ Partial Eclipse			43O12
♍		7	08.6	Full Moon.			
Fri.	27	22	15	☌♄☾, ♄ 3° 11′ S.	11	20	43O2*
Sat.	28						4321O
Sun.	29						42O31
Mon.	30				8	10	41O23
Tues.	31	16	..	☿ Greatest Elong. W. 19° 31′			4O123

Explanation of symbols and abbreviations on page 4

THE SKY FOR AUGUST, 1934

The times of transit are in Local Mean Time, 0h at midnight; 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 42m to 10h 38m and its Decl. decreases from 18° 16′ N. to 8° 37′ N. The equation of time decreases from 6m 14s to 0m 16s, see p. 6. The sun enters Virgo, the third summer zodiacal sign on the 23rd. For changes in the length of day, see p. 17. On the 10th there is an annular eclipse of the sun invisible in North America, see p. 29.

The Moon—For its phases, perigee and apogee times and distances, and its conjunctions with the planets, see p. 7 and opp. page.

Mercury on the 15th is in R.A. 8h 50m, Decl. 18° 54′ N. and transits at 11.22. On the 26th it is in superior conjunction with the sun.

Venus on the 15th is in R.A. 7h 55m, Decl. 20° 56′ N. and transits at 10.25. It is still a morning star visible in the east before sunrise.

Mars on the 15th is in R.A. 7h 27m, Decl. 22° 46′ N. and transits at 9.56. It is slowly separating from the sun in the morning sky, being 30° above the eastern horizon at sunrise.

Jupiter on the 15th is in R.A. 13h 12m, Decl. 6° 23′ S. and transits at 15.39. It is an evening star and is 20° above the southwestern horizon at sunset. For the configurations of its satellites see next page, and for their eclipses, etc., see p. 55.

Saturn on the 15th is in R.A. 21h 51m, Decl. 14° 32′ S. and transits at 0.21. On the 18th it is in opposition with the sun and rises just at sunset. It is still in Capricornus and well placed for observation during the whole month. At the end of the month it reaches its maximum brightness, stellar magnitude 0.5.

Uranus on the 15th is in R.A. 1h 58m, Decl. 11° 27′ N. and transits at 4.26.

Neptune on the 15th is in R.A. 10h 53m, Decl. 8° 8′ N. and transits at 13.20.

Pluto—For information regarding this planet, see p. 28.

AUGUST

ASTRONOMICAL PHENOMENA

75th Meridian Civil Time

	d	h	m		Minima of Algol h	m	Configurations of Jupiter's Satellites at 20h 45m
	Wed.	1	14	59 ☌♁☾, ♁ 6° 12′ S.			21403
☾	Thur.	2	1	26.9 Last Quarter	5	00	3014*
		16	..	☌♀♂, ♀ 1° 08′ S.			
	Fri.	3					31024
	Sat.	4					d3204
	Sun.	5			1	50	204**
	Mon.	6					10234
	Tues.	7	3	.. ♁ Stationary	22	40	02134
			10	33 ☌♂☾, ♂ 1° 32′ S.			
			16	26 ☌♀☾, ♀ 2° 14′ S.			
	Wed.	8	7	.. ☿ in ♌			21034
			14	06 ☌☿☾, ☿ 1° 02′ S.			
	Thur.	9					32014
	Fri.	10	..	.. ☉ Annular Eclipse	19	30	31402
●			3	46.6 New Moon.			
	Sat.	11	21	.. ♀ in ♌			34201
	Sun.	12	7	36 ☌♆☾, ♆ 4° 02′ N			4230*
			21	.. ☿ in Perihelion.			
	Mon.	13			16	20	41023
	Tues.	14					40123
	Wed.	15	11	05 ☌♃☾, ♃ 6° 38′ N			42103
	Thur.	16			13	10	42301
☽	Fri.	17	23	32.9 First Quarter			34102
	Sat.	18	6	11 ☍♄☉			d3401
	Sun.	19			10	00	23104
	Mon.	20					d0234
	Tues.	21					01234
	Wed.	22			6	40	21034
	Thur.	23	4	.. ☿ Greatest Hel. Lat. N			23014
	Fri.	24	5	46 ☌♄☾, ♄ 3° 01′ S			31024
○			14	36.7 Full Moon.			
	Sat.	25			3	30	30124
	Sun.	26	1	.. ☌☿☉ Superior			23104
	Mon.	27					d430*
	Tues.	28	22	57 ☌♁☾, ♁ 6° 09′ S	0	20	4023*
	Wed.	29					42103
	Thur.	30	22	.. ☌☿♆, ☿ 0° 43′ N	21	10	42031
☾	Fri.	31	14	39.9 Last Quarter			43102

Explanations of symbols and abbreviations on page 4

THE SKY FOR SEPTEMBER, 1934

The times of transit are given in Local Mean Time, 0h at midnight; 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 38m to 12h 26m, and its Decl. decreases from 8° 37′ N. to 2° 50′ S. The equation of time decreases from +0m 16s to −10m 00s. For changes in the length of the day, see p. 18. On the 23rd the sun crosses the equator going south and enters Libra, the first autumnal sign of the zodiac.

The Moon—For its phases, perigee and apogee times and distances, and its conjunctions with the planets, see p. 7 and opp. page.

Mercury on the 15th is in R.A. 12h 27m, Decl. 2° 50′ S., and transits at 12.55. It is an evening star during the month and slowly increasing its elongation but too close to the sun for observation.

Venus on the 15th is in R.A. 10h 28m, Decl. 10° 55′ N., and transits at 10.55. It is a morning star all month rising about 1h 30m before the sun. At sunrise on the 15th it will be seen almost due east and at an altitude of 15°. Its stellar magnitude is −3.4.

Mars on the 15th is in R.A. 8h 50m, Decl. 18° 53′ N., and transits at 9.16. It is a morning star all month. At sunrise on the 15th it is due east and at an altitude of 35° while Venus is lower down (cf. above).

Jupiter on the 15th is in R.A. 13h 33m, Decl. 8° 32′ S., and sets at 13.58. On the first of the month it may be seen as an evening star about 15° above the horizon in the southwest and close to the bright star Spica. It is approaching the sun and toward the end of the month is not favourably placed for observation.

Saturn on the 15th is in R.A. 21h 43m, Decl. 15° 17′ S., and transits at 22.06. During the month it can be seen for the greater part of the night. At sunset on the 15th it has an altitude of 20° above the eastern horizon.

Uranus on the 15th is in R.A. 1h 56m, Decl. 11° 15′ N., and transits at 2.22.

Neptune on the 15th is in R.A. 10h 57m, Decl. 7° 42′ N., and transits at 11.22.

Pluto—For information regarding this planet, see p. 28.

SEPTEMBER

ASTRONOMICAL PHENOMENA

75th Meridian Civil Time

	d	h	m		Minima of Algol h m	Configurations of Jupiter's Satellites at 19h 45m
Sat.	1					43021
Sun.	2				18 00	42310
Mon.	3					4013*
Tues.	4					41023
Wed.	5	5	..	☌☿☉	14 50	21043
		7	28	☌☌☾, ☌ 0° 29′ N.		
Thur.	6					20134
Fri.	7	4	49	☌♀☾, ♀ 2° 39′ N		31024
Sat.	8	15	45	☌☿☾, ☿ 4° 06′ N	11 40	30214
🌑		19	20.1	New Moon.		
Sun.	9					32104
Mon.	10	2	52	☌☿☾, ☿ 5° 09′ N		2014*
Tues.	11				8 30	10234
Wed.	12	1	40	☌♃☾, ♃ 6° 34′ N		d2043
Thur.	13					
Fri.	14	9	..	♀ in Perihelion	5 10	
Sat.	15	15	..	☿ in ♉		
☽ Sun.	16	7	25.9	First Quarter		
Mon.	17				2 00	
Tues.	18					
Wed.	19				22 50	
Thur.	20	12	38	☌♄☾, ♄ 2° 54′ S		
Fri.	21	1	..	☌♀♆, ♀ 0° 30′ N		
♎ Sat.	22	23	18.9	Full Moon	19 40	
Sun.	23	12	46	☉ enters ♎ Autumn Commences		
Mon.	24					
Tues.	25	7	23	☌♁☾, ♁ 6° 02′ S	16 30	
		21	..	☿ in Aphelion.		
Wed.	26					
Thur.	27					
Fri.	28				13 20	
Sat.	29	8	..	☌☿♃, ☿ 2° 57′ S		
☾ Sun.	30	7	29.2	Last Quarter		

Jupiter being near the Sun, Phenomena of the Satellites are not given from September 13 to November 12

Explanation of symbols and abbreviations on page 4

THE SKY FOR OCTOBER, 1934

The times of transit are given in Local Mean Time, 0h at midnight; 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 26m to 14h 22m, and its Decl. changes from 2° 50′ S. to 14° 9′ S. On the 24th the sun enters Scorpio, the second autumnal sign of the zodiac. The equation of time decreases from −9m 59s to −16m 19s. For changes in the length of the day, see p. 19.

The Moon—For its phases, perigee and apogee times and distances, and its conjunctions with the planets, see p. 7 and opp. page.

Mercury on the 15th is in R.A. 14h 48m, Decl. 19° 30′ S., and transits at 13.17. It is an evening star and on the 10th reaches its greatest elongation east being 25° 13′ from the sun. Owing to its southerly declination it will be difficult to observe.

Venus on the 15th is in R.A. 12h 47m, Decl. 3° 29′ S., and transits at 11.16. It is a morning star all month but too near the sun for observation.

Mars on the 15th is in R.A. 10h 4m, Decl. 13° 27′ N., and transits at 8.31. It is a morning star rising about 4h before the sun. On the 15th it will be near Regulus in R.A. and about 1° N.

Jupiter on the 15th is in R.A. 13h 56m, Decl. 10° 48′ S., and transits at 12.23. At the first of the month it may be seen as an evening star about ten degrees above the western horizon. Its motion takes it closer to the sun and the planet will not be visible toward the end of the month.

Saturn on the 15th is in R.A. 21h 38m, Decl. 15° 41′ S., and transits at 20.03. It is an evening star visible for most of the night. At sunset it will be seen in the southeast about 20° above the horizon. It has a stellar magnitude during the month 0.8 and is in the constellation Capricornus.

Uranus on the 15th is in R.A. 1h 51m, Decl. 10° 52′ N., and transits at 00.20.

Neptune on the 15th is in R.A. 11h 01m, Decl. 7° 19′ N., and transits at 9.28.

Pluto—For information regarding this planet, see p. 28.

OCTOBER

ASTRONOMICAL PHENOMENA

75th Meridian Civil Time

	d	h	m		Minima of Algol h	m
Mon.	1				10	10
Tues.	2					
Wed.	3					
Thur.	4	4	36	☌♂☾, ♂ 2° 41′ N	7	00
Fri.	5					
Sat.	6	0	59	☌♆☾, ♆ 4° 14′ N		
		9	..	☿ Greatest Hel. Lat. N.		
Sun.	7	17	15	☌☿☾, ☿ 6° 14′ N	3	50
● Mon.	8	10	04.9	New Moon		
Tues.	9	18	12	☌♃☾, ♃ 6° 27′ N		
Wed.	10	13	17	☌☿☾, ☿ 2° 15′ N	0	30
		17	..	☿ Greatest Elong. E. 25° 13′.		
Thur.	11					
Fri.	12				21	20
Sat.	13					
Sun.	14					
☽ Mon.	15	14	29.0	First Quarter	18	10
Tues.	16	4	..	☿ Greatest Hel. Lat. S.		
Wed.	17	18	36	☌♄☾, ♄ 2° 57′ S.		
Thur.	18				15	00
Fri.	19					
Sat.	20					
Sun.	21				11	50
○ Mon.	22	10	01.1	Full Moon		
		15	19	☌♁☾, ♁ 5° 56′ S.		
		20	..	☿ Stationary.		
Tues.	23	8	..	☍♁☉		
Wed.	24				8	40
Thur.	25					
Fri.	26	19	..	♄ Stationary		
Sat.	27	11	..	☌♃☉	5	30
Sun.	28					
Mon.	29					
☾ Tues.	30	3	21.8	Last Quarter	2	20
Wed.	31					

Jupiter being near the Sun, Phenomena of the Satellites are not given from September 13 to November 12

Explanation of symbols and abbreviations on page 4

THE SKY FOR NOVEMBER, 1934

The times of transit are given in Local Mean Time, 0h at midnight; 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 22m to 16h 25m, and its Decl. decreases from 14° 09′ S. to 21° 40′ S. On the 22nd the sun enters Sagittarius, the third autumn zodiacal sign. The equation of time decreases from −16m 19s to a minimum value of −16m 22s on the 4th and then increases to −11m 16s at the end of the month (see p. 6). For changes in the length of the day, see p. 20.

The Moon—For its phases, perigee and apogee times and distances, and its conjunctions with the planets, see p. 7 and opp. page.

Mercury on the 15th is in R.A. 14h 9m, Decl. 10° 34′ S. and transits at 10.34. On the 19th it reaches its greatest elongation west being about 20° from the sun. It may be seen in the early morning about 2° from Jupiter with which it is in conjunction on the 20th. At sunrise it will be about 17° above the horizon in the southeast.

Venus on the 15th is in R.A. 15h 15m, Decl. 17° 23′ S., and transits at 11.42. The planet is very close to the sun all month and not in a favourable position for observation. On the 18th it is in superior conjunction with the sun and becomes an evening star.

Mars on the 15th is in R.A. 11h 11m, Decl. 7° 06′ N., and transits at 7.37. It is a morning star all month being found in the constellation of Leo to the east of Regulus. On the 15th it rises about 1.05.

Jupiter on the 15th is in R.A. 14h 22m, Decl. 13° 5′ S., and transits at 10.47. At the beginning of the month it is too close to the sun to be seen and becomes a morning star toward the end of the month. On the 19th will be near Mercury (see above).

Saturn on the 15th is in R.A. 21h 40m, Decl. 15° 34′ S., and transits at 18.02. It is an evening star all month and at sunset on the 15th will be 2h east of the meridian and may be seen in the southeast at an altitude of 25°.

Uranus on the 15th is in R.A. 1h 47m, Decl. 10° 27′ N., and transits at 22.10.

Neptune on the 15th is in R.A. 11h 4m, Decl. 7° 2′ N., and transits at 7.29.

Pluto—For information regarding this planet, see p. 28.

NOVEMBER

ASTRONOMICAL PHENOMENA

75th Meridian Civil Time

	d	h	m		Minima of Algol h	m	Configurations of Jupiter's Satellites at 7h 30m
Thur.	1	21	..	☌♀♃, ♀ 0° 03′ N.	23	10	
Fri.	2	0	48	☌♂☾, ♂ 4° 49′ N.			
		11	01	☌♆☾, ♆ 4° 31′ N.			
Sat.	3	0	00	☌☿☉ Inferior.			
Sun.	4	6	..	☿ in ♌.	20	00	
		10	..	☌☿♀, ☿ 0° 58′ S.			
Mon.	5						
Tues.	6	12	..	☌☿♃, ☿ 0° 18′ S.			
		12	39	☌☿☾, ☿ 6° 06′ N.			
		12	42	☌♃☾, ♃ 6° 22′ N.			
		21	42	☌♀☾, ♀ 6° 10′ N.			
●		23	43.6	New Moon			
Wed.	7				16	40	
Thur.	8	21	..	☿ in Perihelion.			
Fri.	9						
Sat.	10				13	30	
Sun.	11	1	..	☌♂♆, ♂ 0° 49′ N.			
		18	..	☿ Stationary.			
Mon.	12						
☽ Tues.	13	21	39.4	First Quarter.	10	20	32014
Wed.	14	0	43	☌♄☾, ♄ 3° 13′ S.			13024
		16	..	□♄☉.			
Thur.	15						01234
Fri.	16				7	10	21034
Sat.	17						20134
Sun.	18	18	..	☌♀☉ Superior.			30124
		21	45	☌♁☾, ♁ 5° 59′ S.			
Mon.	19	3	..	☿ Greatest Hel. Lat. N.	4	00	31024
		8	..	☿ Greatest Elong. W. 19° 35′.			
Tues.	20	13	..	☌☿♃, ☿ 1° 23′ N.			32401
○		23	26.3	Full Moon.			
Wed.	21						41302
Thur.	22				0	50	40123
Fri.	23						42103
Sat.	24				21	40	42013
Sun.	25						4302*
Mon.	26						43102
Tues.	27				18	30	32401
Wed.	28	19	..	☌♂ Greatest Hel. Lat. N.			31024
☾ Thur.	29	0	39.0	Last Quarter.			01324
		20	48	☌♆☾, ♆ 4° 50′ N.			
Fri.	30	18	18	☌♂☾, ♂ 6° 35′ N.	15	20	12034

Jupiter being near the Sun, Phenomena of the Satellites are not given from September 13 to November 12

Explanation of symbols and abbreviations on page 4

THE SKY FOR DECEMBER, 1934

The times of transit are given in Local Mean Time, 0h at midnight; 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 25m to 18h 42m, and its Decl. changes from 21° 40′ S. to its maximum southerly value of 23° 27′ on the 22nd. The sun is then at the winter solstice, it enters Capricornus and winter begins. From this date the sun moves slowly northward. The length of daylight is at its minimum and changes very slightly for several days (see p. 21). The equation of time is −11m 16s at the beginning of the month and increases to zero on the 25th (see p. 6) and to +3m 6s at the end of the month.

The Moon—For its phases, perigee and apogee times and distances, and its conjunctions with the planets, see p. 7 and opp. page.

Mercury on the 15th is in R.A. 16h 48m, Decl. 22° 40′ S., and transits at 11.17. It is a morning star till the last day of the month when it passes the sun and becomes an evening star. The planet is not favourably situated for observation during the month.

Venus on the 15th is in R.A. 17h 54m, Decl. 23° 58′ S., and transits at 12.23. It is an evening star all month but too close to the sun for observation.

Mars on the 15th is in R.A. 12h 10m, Decl. 1° 08′ N., and transits at 6.37. It is favourably placed for morning observations rising a little after midnight. On the 15th it has a stellar magnitude of 1.2.

Jupiter on the 15th is in R.A. 14h 46m, Decl. 14° 59′ S., and transits at 9.13. At sunrise on the 15th it is about 1h 40m east of the meridian and about 30° above the horizon. It is a morning star all month. Its stellar magnitude on the 15th is −1.3 and growing brighter. For the configurations of its satellites see next page, and for their eclipses, etc., see p. 55.

Saturn on the 15th is in R.A. 21h 45m, Decl. 15° 0′ S., and transits at 16.10. It is an evening star all month with a stellar magnitude 1.0. On the 15th it is close to the meridian at sunset and can be seen in the southern sky about 30° above the horizon.

Uranus on the 15th is in R.A. 1h 44m, Decl. 10° 09′ N., and transits at 20.08.

Neptune on the 15th is in R.A. 11h 05m, Decl. 6° 56′ N., and transits at 5.32.

Pluto—For information regarding this planet, see p. 28.

DECEMBER

ASTRONOMICAL PHENOMENA

75th Meridian Civil Time

	d	h	m		h	m	Minima of Algol	Configurations of Jupiter's Satellites at 7h 15m
Sat.	1	10	..	♀ in ♍				2O134
Sun.	2							1O324
Mon.	3				12	00	d3O24	
Tues.	4	8	28	☌ ♃☾, ♃ 6° 20′ N				32O14
Wed.	5	13	35	☌ ☿☾, ☿ 5° 29′ N				31O4*
(New) Thur.	6	12	24.9	New Moon	8	50	O4312	
		20	52	☌ ♀☾, ♀ 3° 18′ N.				
Fri.	7	3	..	□ ♆☉				412O3
Sat.	8							42O13
Sun.	9				5	40	41O32	
Mon.	10							43O12
Tues.	11	9	09	☌ ♄☾, ♄ 3° 34′ S				432O*
Wed.	12	14	..	☿ in ♍	2	30	4321O	
(First) Thur.	13	5	51.6	First Quarter				4O312
Fri.	14				23	20	d41O3	
Sat.	15							2O413
Sun.	16	2	44	☌ ♁☾, ♁ 6° 08′ S				1O234
Mon.	17	19	..	♆ Stationary	20	10	3O124	
Tues.	18							32O4*
Wed.	19							321O4
(Full) Thur.	20	15	53.3	Full Moon	17	00	O124*	
Fri.	21							1O234
Sat.	22	7	50	☉ enters ♑ Winter commences				2O143
		21	..	☿ in Aphelion.				
Sun.	23				13	50	1O423	
Mon.	24							43O12
Tues.	25							4321O
Wed.	26				10	40	d432O	
Thur.	27	5	02	☌ ♆☾, ♆ 5° 04′ N				43O12
(Last) Fri.	28	21	08.1	Last Quarter				41O23
Sat.	29	6	50	☌ ♂☾, ♂ 7° 46′ N	7	20	42O13	
Sun.	30	21	..	☌ ☿☉ Superior				41O3*
Mon.	31							43O12

Explanation of symbols and abbreviations on page 4

PHENOMENA OF JUPITER'S SATELLITES, 1934

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.
1	2	46	I	Te	16	3	51	I	OR
3	3	04	III	ER	17	1	03	I	Te
	5	38	III	OD	21	0	57	III	Se
5	4	41	II	ED		3	36	III	TI
6	6	48	I	SI		4	47	II	SI
7	2	07	II	TI		5	38	III	Te
	2	09	II	Se	22	5	03	I	SI
	4	06	I	ED		6	16	I	TI
	4	30	II	Te	23	1	40	II	ER
8	1	17	I	SI		1	42	II	OD
	2	30	I	TI		2	19	I	ED
	3	28	I	Se		4	06	II	OR
	4	41	I	Te		5	43	I	OR
9	1	58	I	OR	24	0	44	I	TI
10	4	30	III	ED		1	44	I	Se
14	1	46	III	Te		2	54	I	Te
	2	14	II	SI	28	2	27	III	SI
	4	41	II	Se		4	54	III	Se
	4	41	II	TI	30	1	46	II	ED
	5	58	I	ED		4	12	I	ED
15	3	10	I	SI		6	37	II	OR
	4	24	I	TI	31	1	25	I	SI
	5	22	I	Se		2	36	I	TI
	6	34	I	Te		3	47	I	Se
16	1	32	II	OR		4	46	I	Te

FEBRUARY

d	h	m	Sat.	Phen.	d	h	m	Sat.	Phen.
1	1	16	II	Te	15	4	44	III	OD
	2	01	I	OR		5	39	I	OR
4	6	26	III	SI		6	05	II	Te
6	4	21	II	ED		23	40	I	SI
	6	05	I	ED	16	0	42	I	TI
7	3	19	I	SI		1	52	I	Se
	4	26	I	TI		2	52	I	Te
	5	30	I	Se	17	0	05	I	OR
	6	36	I	Te		0	44	II	OR
8	0	33	I	ED	22	4	14	II	SI
	1	05	III	OD		4	14	III	ED
	1	22	II	TI		4	19	I	ED
	1	35	II	Se		6	08	II	TI
	3	01	III	OR	23	1	34	I	SI
	3	42	II	Te		2	30	I	TI
	3	50	I	OR		3	46	I	Se
	23	59	I	Se		4	40	I	Te
9	1	03	I	Te		22	47	I	ED
14	5	12	I	SI		22	51	II	ED
	6	15	I	TI	24	1	52	I	OR
15	0	17	III	ED		3	08	II	OR
	1	42	II	SI		22	14	I	Se
	2	26	I	ED		23	07	I	Te
	2	43	III	ER	25	22	10	III	TI
	3	46	II	TI		23	58	III	Te
	4	08	II	Se					

MARCH

d	h	m	Sat.	Phen.	d	h	m	Sat.	Phen.
2	3	27	I	SI	12	21	05	I	Te
	4	17	I	TI	13	20	59	II	OR
	5	39	I	Se	17	4	27	I	ED
3	0	40	I	ED	18	1	43	I	SI
	1	27	II	ED		2	14	I	TI
	3	39	I	OR		3	55	I	Se
	5	29	II	OR		4	24	I	Te
	21	56	I	SI		22	55	I	ED
	22	44	I	TI	19	1	09	II	SI
4	0	08	I	Se		1	34	I	OR
	0	53	I	Te		2	10	II	TI
	21	37	II	TI		3	36	II	Se
	22	05	I	OR		4	28	II	Te
	22	17	III	SI		20	41	I	TI
	22	30	II	Se		22	24	I	Se
	23	56	II	Te		22	50	I	Te
5	0	39	III	Se	20	23	16	II	OR
	1	38	III	TI	22	23	47	III	OR
	3	26	III	Te	25	3	37	I	SI
9	5	21	I	SI		3	59	I	TI
10	2	34	I	ED	26	0	49	I	ED
	4	03	II	ED		3	18	I	OR
	5	24	I	OR		3	43	II	SI
	23	49	I	SI		4	24	II	TI
11	0	29	I	TI		22	06	I	SI
	2	02	I	Se		22	25	I	TI
	2	39	I	Te	27	0	18	I	Se
	22	36	II	SI		0	35	I	Te
	23	50	I	OR		21	44	I	OR
	23	54	II	TI		22	34	II	ED
12	1	03	II	Se	28	1	32	II	OR
	2	13	II	Te	29	19	50	II	Te
	2	15	III	SI	30	0	04	III	ED
	4	36	III	Se		3	05	III	OR
	5	02	III	TI					

APRIL

d	h	m	Sat.	Phen.	d	h	m	Sat.	Phen.
2	2	42	I	ED	6	4	02	III	ED
	5	02	I	OR	9	4	36	I	OD
3	0	00	I	SI		20	07	III	Te
	0	09	I	TI		20	27	III	Se
	2	12	I	Se	10	1	53	I	TI
	2	19	I	Te		1	54	I	SI
	21	11	I	ED		4	03	I	Te
	23	28	I	OR		4	06	I	Se
4	1	10	II	ED		23	02	I	OD
	3	48	II	OR	11	1	16	I	ER
	20	40	I	Se		3	42	II	OD
	20	45	I	Te		20	19	I	TI
5	19	33	II	SI		20	23	I	SI
	19	44	II	TI		22	29	I	Te
	21	59	II	Se		22	35	I	Se
	22	04	II	Te	12	19	44	I	ER

APRIL—*Continued*

d	h	m	Sat.	Phen.	d	h	m	Sat.	Phent
12	21	58	II	TI	20	2	32	II	Te
	22	07	II	SI		3	07	II	Se
13	0	18	II	Te	21	22	08	II	ER
	0	33	II	Se	24	0	45	III	TI
14	19	32	II	ER		2	05	III	SI
16	21	29	III	TI		2	44	III	Te
	22	07	III	SI		4	22	III	Se
	23	25	III	Te	25	2	29	I	OD
17	0	24	III	Se		23	47	I	TI
	3	37	I	TI	26	0	12	I	SI
	3	48	I	SI		1	58	I	Te
18	0	45	I	OD		2	23	I	Se
	3	10	I	ER		20	56	I	OD
	22	03	I	TI		23	32	I	ER
	22	17	I	SI	27	2	26	II	TI
19	0	13	I	Te		3	16	II	SI
	0	29	I	Se		20	24	I	Te
	21	38	I	ER		20	52	I	Se
20	0	11	II	TI	28	21	21	II	OD
	0	41	II	SI	9		44	II	ER

MAY

d	h	m	Sat.	Phen.	d	h	m	Sat.	Phen.
3	1	33	I	TI	14	22	32	II	TE
	2	06	I	SI	15	0	07	II	Se
	22	40	I	OD	18	2	13	I	OD
4	1	26	I	ER		23	33	I	TI
	19	42	III	OR	19	0	24	I	SI
	19	57	III	ED		0	25	III	OD
	19	59	I	TI		1	44	I	Te
	20	35	I	SI		20	40	I	OD
	22	10	I	Te		23	44	I	ER
	22	13	III	ER	20	20	11	I	Te
	22	46	I	Se		21	04	I	Se
5	19	55	I	ER	21	22	29	II	TI
	25	39	II	OD	22	0	18	II	SI
6	3	21	II	ER		0	53	II	Te
7	20	13	II	Te		20	14	III	Se
	21	33	II	Se	23	21	51	II	ER
11	0	26	I	OD	26	1	21	I	TI
	20	59	III	OD		22	28	I	OD
	21	45	I	TI	27	1	38	I	ER
	22	30	I	SI		20	48	I	SI
	23	08	III	OR		21	59	I	Te
	23	56	I	Te		22	59	I	Se
	23	56	III	ED	28	20	07	I	ER
12	0	41	I	Se	29	0	52	II	TI
	2	11	III	ER		20	06	III	Te
	21	49	I	ER		22	01	III	SI
13	1	58	II	OD	30	0	12	III	Se
14	20	09	II	TI	31	0	27	II	ER
	21	43	II	SI					

JUNE

d	h	m	Sat.	Phen.	d	h	m	Sat.	Phen.
3	0	17	I	OD	11	23	56	I	ER
	21	38	I	TI	12	20	07	I	Te
	22	43	I	SI		21	17	I	Se
	23	49	I	Te	14	0	49	II	OD
4	0	53	I	Se	15	21	22	II	SI
	22	02	I	ER		21	24	II	Te
5	21	28	III	TI		23	46	II	Se
	23	46	III	Te	16	22	02	III	ER
6	22	21	II	OD	18	22	27	I	OD
8	21	11	II	Se	19	21	01	I	SI
10	23	29	I	TI		21	59	I	Te
11	0	38	I	SI		23	11	I	Se
	20	35	I	OD					

JUNE—*Continued*

d	h	m	Sat.	Phen.	d	h	m	Sat.	Phen.
20	20	20	I	ER	24	21	32	II	ER
22	21	29	II	TI	26	21	42	I	TI
	23	56	II	Te		22	56	I	SI
	23	58	II	SI		23	53	I	Te
23	21	07	III	OR	27	22	15	I	ER
	23	52	III	ED	30	22	35	III	OD

JULY

d	h	m	Sat.	Phen.	d	h	m	Sat.	Phen.
1	21	38	II	OR	17	21	02	II	Te
	21	43	II	ED		21	06	II	SI
4	20	42	I	OD	18	20	44	III	TI
5	20	15	I	Te	19	21	55	I	TI
	21	30	I	Se	20	22	29	I	ER
8	21	44	II	OD	24	21	13	II	TI
10	20	53	II	Se	26	21	11	II	ER
11	21	57	III	SI	27	20	59	I	OD
	22	37	I	OD	28	20	32	I	Te
12	21	15	I	SI		21	42	I	Se
	22	11	I	Te	29	21	54	III	ER
14	20	34	I	ER					

AUGUST

d	h	m	Sat.	Phen.	d	h	m	Sat.	Phen.
4	20	19	I	TI	13	20	00	I	Se
	21	28	I	SI	16	19	55	III	Se
5	20	48	I	ER	20	19	45	I	SI
	21	26	III	OR	23	20	12	III	Te
11	20	39	II	Se					

SEPTEMBER

d	h	m	Sat.	Phen.	d	h	m	Sat.	Phen.
3	19	16	II	OD	12	19	02	II	Te
5	19	26	I	Te		19	04	I	TI

NOVEMBER

d	h	m	Sat.	Phen.	d	h	m	Sat.	Phen.
25	5	25	III	Te	26	6	31	I	Te
26	6	02	I	Se					

DECEMBER

d	h	m	Sat.	Phen.	d	h	m	Sat.	Phen.
2	5	28	III	SI	19	4	50	I	TI
3	5	46	I	SI		6	10	I	Se
	6	21	I	TI	20	5	19	III	ER
4	5	52	I	OR		6	47	III	OD
5	6	16	II	ED	21	6	30	II	SI
7	5	04	II	Te	23	4	50	II	OR
12	5	01	I	Te	26	5	54	I	SI
14	5	26	II	TI		6	49	I	TI
	6	19	II	Se	27	6	20	I	OR
18	6	52	I	ED					

METEORS AND SHOOTING STARS

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

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

Name of Shower	Duration	Greatest Display	Radiant Point R.A.		Decl.	
			h	m	°	
Quadrantids	Dec. 28-Jan. 9	Jan. 3	15	20	+	53
Aurigids	Feb. 7-23	Feb. 10	5	0	+	41
Lyrids	April 16-22	April 21	18	4	+	33
η Aquarids	April 29-May 8	May 4-6	22	32	−	2
Herculids	May 13-29	May 24	16	36	+	30
Scorpiids	May-June-July	June 4	16	48	−	21
Sagittids	June-July	July 28	20	12	+	24
Capricornids	July-Aug.	July 22	20	20	−	12
δ Aquarids	July 18-Aug. 12	July 28-31	22	36	−	11
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	30d (?)
⊕ Earth	1.000	92.9	365.26	1.00	7917.8	1.000	5.55	1.000	23h 56m 4s
♂ Mars	1.524	141.5	686.97	1.88	4216	0.108	3.92	0.151	24h 37m 23s
♃ Jupiter	5.203	483.3	4332.58	11.86	86728	318.4	1.32	1314	9h 55m ±
♄ Saturn	9.539	886.1	10759.2	29.46	72430	95.2	0.72	765	10h 14m ±
♅ Uranus	19.191	1782.8	30685.9	84.02	30878	14.6	1.22	59	10h 45m ±
♆ Neptune	30.071	2793.4	60187.6	164.79	32932	16.9	1.11	72	16 h
♇ Pluto	39.60	3700	....	247.7	....	1 (?)	....	....	....:..
☉ 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. Triton....	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

By FRANK S. HOGG

Of the naked eye stars visible to a northern observer, nearly a hundred are known to undergo variations in their light. With field glasses or a small telescope the number of variables is enormously increased. Thus there is no dearth of material with which an inquisitive amateur may satisfy himself as to the reality and nature of the fluctuations of the light of stars. Further this curiosity may be turned to real scientific value, in that the study of variable stars is one of the best organized and most fruitful fields of research for amateur observers. For years the professional astronomer has entrusted the visual observation of many of the most important variable stars entirely to amateurs, as organized into societies in England in 1890, America in 1911, and France in 1921. The American Association of Variable Star Observers has charts of the fields of 350 of these stars, and in general supervises the work of amateur observers. The Recorder is Mr. Leon Campbell, at the Harvard Observatory, Cambridge, Massachusetts. New observers are welcomed, and supplied with charts.

In our galaxy there are already known about 5,000 variables, while in globular clusters and outside systems there are some 3,000 more. Almost all those which have been sufficiently studied may be conveniently classified, according to their light variation into ten groups, by Ludendorff's classification. His classes, with their typical stars, are listed as follows:

I. New or temporary stars: Nova Aquilae 3, 1918.
II. Nova-like variables: T Pyxidis.
III. R Coronae stars: R Coronae Borealis. Usually at constant maximum, with occasional sharp minima.
IV. U Geminorum stars: U Geminorum. Usually at constant minimum, with occasional sharp maxima.
V. Mira stars: oCeti. Range of several magnitudes, fairly regular period of from 100 to 600 days.
VI. μCephei stars: μCephei. Red stars with irregular variations of a few tenths of a magnitude.
VII: RV Tauri stars: RV Tauri. Usually a secondary minimum occurs between successive primary minima.
VIII. Long period Cepheids: δCephei. Regular periods of one to forty-five days. Range about 1.5 magnitudes.
IX. Short period Cepheids: RR Lyrae. Regular periods less than one day. Range about a magnitude.
X. Eclipsing stars: βPersei. Very regular periods. Variations due to covering of one star by companion.

REPRESENTATIVE BRIGHT VARIABLE STARS

Name		Desig.	Max.	Min.	Sp.	Period	Type	Date	Discoverer
η	Aql	194700	3.7	4.4	G4	7.17652	VIII	1784	Pigott
N	Aql3	184300	−0.2	10.9	Q	Irr.	I	1918	Bower
ϵ	Aur	045443	3.1	3.8	F5p	9883.	X	1821	Fritsch
δ	Cep	222557	3.6	4.3	G0	5.36640	VIII	1784	Goodricke
U	Cep	005381	6.8	9.2	A0	2.49293	X	1880	W. Ceraski
o	Cet[1]	021**403**	2.0	10.1	M5e	329.5	V	1596	Fabricius
RR	Cet	012700	8.4	9.0	F0	0.55302	IX	1906	Oppolzer
R	CrB	154428	5.8	13.8	G0e	Irr.	III	1795	Pigott
χ	Cyg	194632	4.2	14.0	M7e	412.9	V	1686	Kirch
P	Cyg	201437a	3.5	6.0	Blqk	Irr.	II	1600	Blaeu
SS	Cyg	213843	8.1	12.0	Pec.	Irr.	IV	1896	Wells
XX	Cyg	200158	11.4	12.1	A	0.13486	IX	1904	L. Ceraski
ζ	Gem	065820	3.7	4.1	cG1	10.15353	VIII	1847	Schmidt
η	Gem	060822	3.3	4.2	M2	235.40	V	1865	Schmidt
R	Gem	070122a	6.5	14.3	Se	370.1	V	1848	Hind
U	Gem	074922	8.8	13.8	Pec.	Irr.	IV	1855	Hind
α	Her	171014	3.1	3.9	M5	Irr.	VI	1795	W. Herschel
R	Hya	132**422**	3.5	10.1	M7e	413.6	V	1670	Montanari
R	Leo	094211	5.0	10.5	M7e	310.3	V	1782	Koch
β	Lyr	184633	3.5	4.1	B5e	12.90801	X	1784	Goodricke
RR	Lyr	192242	7.2	8.0	A5	0.56684	IX	1901	Fleming
α	Ori[2]	054907	0.1	1.2	M2	2070.	VI	1840	J. Herschel
U	Ori	054920	5.4	12.2	M7e	383.3	V	1885	Gore
β	Per[3]	030140	2.2	3.5	B8	2.86731	X	1669	Montanari
ρ	Per	025838	3.3	.4.1	M4	Irr.	VI	1854	Schmidt
R	Sge	200916	8.6	10.4	cG7	70.84	VII	1859	Baxendell
R	Sct	184**205**	4.5	9.0	K5e	142.9	VII	1795	Pigott
λ	Tau	035512	3.8	4.1	B3	3.95294	X	1848	Baxendell
RV	Tau	044126	9.4	12.4	K0	78.60	VII	1905	L. Ceraski
SU	Tau	054319	9.5	15.4	G0e	Irr.	III	1908	Cannon
α	UMi[4]	012288	2.3	2.4	cF7	3.96815	VIII	1911	Hertzsprung

[1]oCet (Mira); [2]αOri (Betelgeuse); [3]βPer (Algol); [4]αUMi (Polaris).

Most of the data in this Table are from Prager's 1933 Katalog und Ephemeriden Veränderlicher Sterne. The stars are arranged alphabetically in order of constellations. The second column, the Harvard designation, gives the 1900 position of the star. The first four figures of the designation give the hour and minute of right ascension, the last two the declination in degrees, italicised for stars south of the equator. Thus the position of the fourth star of the list, δCephei, is R.A. $22^h\ 22^m$, Dec. +57°, (222557). The remaining columns give the maximum and minimum magnitudes, spectral class, the period in days and decimals of a day, the classification on Ludendorff's system, and the discovery date. In the case of eclipsing stars the spectrum is that of the brighter component.

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 obervations, deduced the parallax of Alpha Centauri to be 0″.75. For a long time this was considered to be the nearest of all the stars in the sky, but in 1913 Innes, director of the Union Observatory, Johannesburg, South Africa, discovered a small 11th mag. star, 2° 13′ from Alpha Centauri, with a large proper motion and 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 SUN'S NEIGHBOURS—STARS NEARER THAN FIVE PARSECS

This table includes all stars known to be nearer than five Parsecs = 16.3 l−y. The apparent magnitudes *m*, and type are taken from Luyten's Study of the Nearby Stars, H.A. *85*, 73. The parallaxes, π, and proper motions, μ, are taken from Schlesinger's Catalogue of Parallaxes. M is the absolute magnitude and L the luminosity, the Sun being taken as unity. Sirius A, Procyon A and Altair are the only giant stars, the remainder being dwarfs. Wolf 359, the fifth star nearest the Sun, is intrinsically the faintest star known. It is also noteworthy that fifty per cent. of the stars are members of binary systems.

Name	(1900)α		(1900)δ		m	Type	π	μ	M	L
	h	m	°	′			″	″		
Sun.....					−26.7	Go			4.8	1.00
Prox. Cen.....	14	22.8	−62	15	11.2	M(?)	0.765	3.76	15.6	.00005
αCen. A.....	14	32.8	−60	25	0.3	G2	.758	3.68	4.7	1.10
αCen. B.....	14	32.8	−60	25	1.7	K3	.760	3.68	6.1	0.30
Barnard.....	17	52.9	+ 4	25	9.7	Mb	.538	10.30	13.3	.0004
Wolf 359.....	10	51.6	+ 7	36	13.5	M4e	.404	.....	16.5	.00002
L1 21185.....	10	57.9	+36	38	7.6	Mb	.392	4.78	10.6	.005
Sirius A.....	6	40.7	−16	35	−1.6	A0	.371	1.32	1.2	28.
Sirius B.....	6	40.7	−16	35	8.4	F	.371	.....	11.2	.0028
B.D.−12.4523	16	24.8	−12	24	9.5	M5	.349	.....	12.2	.001
Innes.....	11	12.0	−57	02	12	.....	.340	2.69	14.7	.0001
C.Z.−5h243..	5	7.7	−44	59	9.2	K2	.317	8.75	11.7	.002
τCet.....	1	39.4	−16	28	3.6	K0	.315	1.92	6.1	.30
Procyon A....	7	34.1	+ 5	29	0.5	F5	.312	1.24	3.0	5.2
Procyon B....	7	34.1	+ 5	29	12.5	.....	.312	.....	15.0	.00008
ϵEri.....	3	28.2	− 9	48	3.8	K0	.310	.97	6.3	.25
61 Cyg. A.....	21	02.4	+38	15	5.6	K7	.300	5.20	8.0	.052
61 Cyg. B.....	21	02.4	+38	15	6.3	K8	.300	5.20	8.7	.028
Lac 9352.....	22	59.4	−36	26	7.1	Ma	.292	6.90	9.4	.014
Bu 8798A.....	18	41.7	+59	29	9.3	Mb	.287	2.31	11.6	.002
Bu 8798B.....	18	41.7	59	29	10.0	Mb	.287	.....	12.3	.001
Grmb 34A....	0	12.7	+43	27	8.1	Ma	.282	2.89	10.3	.006
Grmb 34B....	0	12.7	+43	27	10.7	Mb	.282	.....	12.9	.0006
ϵ Indi.....	21	55.7	−57	12	4.7	K5	.281	4.70	6.9	.14
Kruger 60A...	22	24.4	+57	12	9.6	Mb	.257	.87	11.6	.002
Kruger 60B...	22	24.4	+57	12	11.3	.....	.....	.....	13.3	.0004
van Maanen..	0	43.9	+ 4	55	12.3	Fo	.255	3.01	14.3	.0002
Lac 8760.....	21	11.4	−39	15	6.6	Ma	.253	3.53	8.6	.030
Anon.....	2	50.3	+52	05	9.2	.....	.239	0.49	11.1	.003
Gould 32416..	23	59.5	−37	15	8.2	Ma	.220	6.11	9.9	.009
Oe. Arg. 17415	17	37.0	+68	26	9.1	Mb	.213	1.33	10.7	.004
+20.2465....	10	14.2	+20	22	9.2	Ma	.207	.49	10.8	.004
Altair.....	19	45.9	+ 8	36	0.9	A5	.204	.66	2.4	9.1
o²Eri A.....	4	10.7	− 7	49	4.5	G5	.203	4.08	6.0	.33
o²Eri B.....	4	10.7	− 7	49	9.7	Ao	.203	4.08	11.2	.003
o²Eri C.....	4	10.7	− 7	49	10.8	Mb	.203	4.08	12.3	.001

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 third 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.—The revision of this table has been postponed until 1935.—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	M1	.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 Hydrii	49	−74 33	3.2	Ma	.128	.....	.....	.....	+16.8
||ε Persei	51	+39 43	3.0	B1	.041	−.012 s	3260 :	−7.0	.....*
γ Eridan	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
‖α **Aurigae**	9	+45 54	0.2	G0	.439	.075 s	43	−0.4	+30.2*
‖β **Orionis**	10	− 8 19	0.3	B8p	.005	.006	543	−5.8	+22.6*
‖η 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
‖δ 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
‖ι 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*
‖ζ 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. *
‖θ 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
‖α **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
||α^2 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 Ophiuchi	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

MAGNETIC DECLINATION FOR SOME PLACES IN CANADA

Station	Year	Long.		Lat.		Decl.	
		°	′	°	′	°	′
St. Anthony, Nfld.	'25	55	34W	51	22N	34	12W
Blanc Sablon, P.Q.	25	57	09	51	26	32	03W
West Turnavik, Lab.	25	59	20	55	16	36	42W
Sydney, N.S.	25	60	12	46	09	26	08W
Natashkwan, P.Q.	25	61	51	50	11	29	43W
Charlottetown, P.E.I.	25	63	07	46	14	24	38W
Halifax, N.S.	25	63	34	44	38	22	27W
Moncton, N.B.	26	64	49	46	06	23	17W
St. John, N.B.	26	66	03	45	17	21	35W
Rimouski, P.Q.	21	68	31	48	30	23	24W
Quebec, P.Q.	26	71	15	46	48	19	21W
Montreal, P.Q.	21	73	35	45	30	16	03W
Ottawa, Ont.	26	75	43	45	24	14	10W
Kingston, Jct., Ont.	21	76	28	44	15	15	15W
Agincourt, Ont.	29	79	16	43	47	7	24W
North Bay, Ont.	21	79	26	46	19	9	36W
Hamilton, Ont.	21	79	54	43	14	6	14W
London, Ont.	21	81	19	42	59	4	14W
Windsor, Ont.	21	83	00	42	18	2	40W
Sault Ste. Marie, Ont.	26	84	18	46	31	4	22W
Nipigon, Ont.	21	88	16	49	01	0	28E
York Factory, Man.	23	92	18	57	01	3	04E
Fort Frances, Ont.	21	93	24	48	37	6	16E
Winnipeg, Man.	21	97	10	49	52	13	18E
Brandon, Man.	21	99	59	49	52	14	33E
The Pas, Man.	22	101	14	53	50	17	52E
Regina, Sask.	21	104	37	50	27	19	02E
Medicine Hat, Alta.	21	110	40	50	03	21	50E
Meanook, Alta.	29	113	20	54	37	26	43E
Edmonton, Alta.	21	113	29	53	32	27	24E
Calgary, Alta.	21	114	04	51	05	25	11E
Fort Vermilion, Alta.	22	116	01	58	24	34	26E
Kamloops, B.C.	21	120	21	50	41	25	52E
Fort Simpson, N.W.T.	23	121	20	61	52	38	16E
Vancouver, B.C.	24	123	07	49	18	25	24E
Victoria, B.C.	24	123	22	48	24	24	37E
Fort Norman, N.W.T.	23	125	35	64	54	41	29E
Prince Rupert, B.C.	24	130	20	54	18	28	59E
Aklavik, N.W.T.	23	135	00	68	14	44	21E
Dawson, N.W.T.	24	139	26	64	03	35	03E

These results are taken chiefly from the publications of the Dominion Observatory (Agincourt and Meanook excepted). The declination given is for the year stated and is uncorrected for secular variation.

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