THE OBSERVER'S HANDBOOK FOR 1936

PUBLISHED BY

The Royal Astronomical Society of Canada

EDITED BY C. A. CHANT

TWENTY-EIGHTH YEAR OF PUBLICATION

TORONTO
198 COLLEGE STREET
PRINTED FOR THE SOCIETY
1936

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

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

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

JULIAN DAY CALENDAR, 1936

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

Jan. 1	8169	May 1	8290	Sept. 1	8413
Feb. 1	8200	June 1	8321	Oct. 1	8443
Mar. 1	8229	July 1	8351	Nov. 1	8474
Apr. 1	8260	Aug. 1	8382	Dec. 1	8504

The Julian Day commences at noon.
Thus, J.D. 2428169.0 = Jan. 1.5 G.C.T.

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CONTENTS

PREFACE

Following the example of 1934 and 1935, there is no list of stars occulted by the moon in the present issue of the HANDBOOK. The computations for Toronto and Ottawa, published in 1931, 1932, demanded much labour which seemed hardly warranted by the results attained. Our country extends over so many degrees of longitude that predictions for a single place are of limited use. The Editor would be glad to publish brief lists for well distributed stations and asks for suggestions.

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 assistance has been received from Mr. Gordon Shaw and Mr. Robert Peters of the Victoria Centre, as well as Dr. W. E. Harper and Dr. J. A. Pearce of the Dom. Astroph. Obs'y; Miss M. S. Burland and Dr. R. J. McDiarmid of the Dom. Obs'y, Ottawa; and Miss Ruth Northcott, Dr. F. S. Hogg and Dr. P. M. Millman of the David Dunlap Observatory.
Richmond Hill, Ont., December 1935.

THE EDITOR

ANNIVERSARIES AND FESTIVALS 1936

New Year's Day	Wed.	Jan. 1
Epiphany	Mon.	Jan. 6
Septuagesima Sunday		Feb. 9
Quinquagesima (Shrove Sunday)		Feb. 23
Ash Wednesday		Feb. 26
St. David	Sun.	Mar. 1
Quadragesima (First Sunday in Lent)		Mar. 1
St. Patrick	Tues.	Mar. 17
Annunciation (Lady Day)	Wed.	Mar. 25
Palm Sunday		Apr. 5
Good Friday		Apr. 10
Easter Sunday		Apr. 12
St. George	Thurs.	Apr. 23
Accession of King George V (1910)	Wed.	May 6
Rogation Sunday		May 17
Ascension Day	Thurs.	May 21
Empire (Victoria) Day	Sun.	May 24
Birthday of Queen Mary (1867)	Tues.	May 26
Pentecost (Whit Sunday)		May 31
Birthday of King George V (1865)	Wed.	June 3
Corpus Christi	Thurs.	June 11
Birthday of Prince of Wales (1894)	Tues.	June 23
St. John Baptist (Midsummer Day)	Wed.	June 24
Dominion Day	Wed.	July 1
Labour Day	Mon.	Sept. 7
Hebrew New Year (Rosh Hashana)	Thurs.	Sept. 17
St. Michael (Michaelmas Day)		Sept. 29
All Saints' Day	Sun.	Nov. 1
Remembrance Day	Wed.	Nov. 11
First Sunday in Advent		Nov. 29
St. Andrew	Mon.	Nov. 30
Christmas Day	Fri.	Dec. 25

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.

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 Australis	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
Triangulum 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.

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.

Date	Apparent R.A.	Equation of Time	Apparent Dec.
	h m s	m s	° ′ ″
Jan. 1	18 40 56	+ 3 0.75	−23 6 52
" 4	18 54 10	+ 4 25.64	−22 51 49
" 7	19 7 21	+ 5 47.04	−22 32 42
" 10	19 20 28	+ 7 4.27	−22 9 35
" 13	19 33 30	+ 8 16.71	−21 42 33
" 16	19 46 27	+ 9 23.82	−21 11 43
" 19	19 59 18	+10 25.09	−20 37 14
" 22	20 12 3	+11 20.05	−19 59 13
" 25	20 24 41	+12 8.27	−19 17 50
" 28	20 37 11	+12 49.35	−18 33 15
" 31	20 49 35	+13 23.02	−17 45 40
Feb. 3	21 1 51	+13 49.14	−16 55 15
" 6	21 13 59	+14 7.76	−16 2 10
" 9	21 26 0	+14 19.03	−15 6 37
" 12	21 37 54	+14 23.20	−14 8 46
" 15	21 49 41	+14 20.53	−13 8 47
" 18	22 1 21	+14 11.34	−12 6 53
" 21	22 12 55	+13 55.94	−11 3 13
" 24	22 24 24	+13 34.64	− 9 58 0
" 27	22 35 46	+13 7.72	− 8 51 26
Mar. 1	22 47 4	+12 35.54	− 7 43 42
" 4	22 58 17	+11 58.56	− 6 34 59
" 7	23 9 25	+11 17 33	− 5 25 27
" 10	23 20 30	+10 32.44	− 4 15 17
" 13	23 31 32	+ 9 44.50	− 3 4 36
" 16	23 42 31	+ 8 54.13	− 1 53 37
" 19	23 53 28	+ 8 1.90	− 0 42 28
" 22	0 4 24	+ 7 8.38	+ 0 28 40
" 25	0 15 20	+ 6 14 02	+ 1 39 38
" 28	0 26 15	+ 5 19.24	+ 2 50 14
" 31	0 37 10	+ 4 24.52	+ 4 0 18
Apr. 3	0 48 5	+ 3 30.37	+ 5 9 42
" 6	0 59 2	+ 2 37.36	+ 6 18 16
" 9	1 10 0	+ 1 46.06	+ 7 25 51
" 12	1 21 1	+ 0 57.04	+ 8 32 19
" 15	1 32 4	+ 0 10.82	+ 9 37 31
" 18	1 43 11	− 0 32.12	+10 41 19
" 21	1 54 21	− 1 11.39	+11 43 31
" 24	2 5 36	− 1 46.76	+12 43 59
" 27	2 16 54	− 2 18.00	+13 42 34
" 30	2 28 17	− 2 44.91	+14 39 6
May 3	2 39 44	− 3 7.24	+15 33 27
" 6	2 51 16	− 3 24.74	+16 25 30
" 9	3 2 53	− 3 37.21	+17 15 5
" 12	3 14 36	− 3 44.47	+18 2 5
" 15	3 26 23	− 3 46.41	+18 46 23
" 18	3 38 17	− 3 43.05	+19 27 50
" 21	3 50 15	− 3 34.54	+20 6 19
" 24	4 2 18	− 3 21.20	+20 41 43
" 27	4 14 25	− 3 3.37	+21 13 54
" 30	4 26 37	− 2 41.42	+21 42 47
June 2	4 38 52	− 2 15.69	+22 8 17
" 5	4 51 11	− 1 46.55	+22 30 19
" 8	5 3 33	− 1 14.40	+22 48 48
" 11	5 15 57	− 0 39.64	+23 3 42
" 14	5 28 24	− 0 2.77	+23 14 56
" 17	5 40 52	+ 0 35.64	+23 22 29
" 20	5 53 21	+ 1 14.85	+23 26 19
" 23	6 5 50	+ 1 54.11	+23 26 26
" 26	6 18 18	+ 2 32.68	+23 22 50
" 29	6 30 45	+ 3 9.89	+23 15 33

Date	Apparent R.A.	Equation of Time	Apparent Dec.
	h m s	m s	° ′ ″
July 2	6 43 10	+ 3 45.14	+23 4 36
" 5	6 55 32	+ 4 17.91	+22 50 1
" 8	7 7 52	+ 4 47.74	+22 31 52
" 11	7 20 8	+ 5 14.23	+22 10 12
" 14	7 32 20	+ 5 36.98	+21 45 6
" 17	7 44 29	+ 5 55.57	+21 16 39
" 20	7 56 32	+ 6 9.54	+20 44 56
" 23	8 8 31	+ 6 18.50	+20 10 5
" 26	8 20 23	+ 6 22.14	+19 32 13
" 29	8 32 12	+ 6 20.31	+18 51 26
Aug. 1	8 43 54	+ 6 12.91	+18 7 52
" 4	8 55 31	+ 5 59.98	+17 21 39
" 7	9 7 2	+ 5 41.68	+16 32 53
" 10	9 18 29	+ 5 18.20	+15 41 43
" 13	9 29 50	+ 4 49.72	+14 48 15
" 16	9 41 6	+ 4 16 41	+13 52 39
" 19	9 52 18	+ 3 38.40	+12 55 4
" 22	10 3 25	+ 2 55.92	+11 55 39
" 25	10 14 28	+ 2 9.22	+10 54 33
" 28	10 25 27	+ 1 18.67	+ 9 51 54
" 31	10 36 23	+ 0 24.66	+ 8 47 52
Sept. 3	10 47 15	− 0 32.30	+ 7 42 33
" 6	10 58 6	− 1 31.63	+ 6 36 6
" 9	11 8 54	− 2 32.76	+ 5 28 40
" 12	11 19 42	− 3 35.18	+ 4 20 23
" 15	11 30 28	− 4 38.42	+ 3 11 24
" 18	11 41 14	− 5 42.04	+ 2 1 54
" 21	11 52 0	− 6 45.58	+ 0 52 1
" 24	12 2 47	− 7 48.56	− 0 18 5
" 27	12 13 35	− 8 50.44	− 1 28 15
" 30	12 24 24	− 9 50.67	− 2 38 19
Oct. 3	12 35 16	−10 48.61	− 3 48 10
" 6	12 46 10	−11 43.57	− 4 57 37
" 9	12 57 9	−12 34.95	− 6 6 33
" 12	13 8 11	−13 22.21	− 7 14 46
" 15	13 19 18	−14 4.89	− 8 22 6
" 18	13 30 30	−14 42.59	− 9 28 22
" 21	13 41 47	−15 14.91	−10 33 24
" 24	13 53 10	−15 41.47	−11 37 1
" 27	14 4 40	−16 1.92	−12 39 2
" 30	14 16 15	−16 15.85	−13 39 17
Nov. 2	14 27 58	−16 22.83	−14 37 35
" 5	14 39 48	−16 22.47	−15 33 46
" 8	14 51 46	−16 14.50	−16 27 39
" 11	15 3 51	−15 58.80	−17 19 3
" 14	15 16 4	−15 35.36	−18 7 46
" 17	15 28 25	−15 4.28	−18 53 38
" 20	15 40 53	−14 25.76	−19 36 28
" 23	15 53 29	−13 40.05	−20 16 6
" 26	16 6 11	−12 47.47	−20 52 22
" 29	16 19 0	−11 48.32	−21 25 7
Dec. 2	16 31 55	−10 42.93	−21 54 14
" 5	16 44 56	− 9 31.72	−22 19 33
" 8	16 58 2	− 8 15.29	−22 40 59
" 11	17 11 12	− 6 54.38	−22 58 23
" 14	17 24 26	− 5 29.82	−23 11 43
" 17	17 37 43	− 4 2.56	−23 20 54
" 20	17 51 2	− 2 33.58	−23 25 51
" 23	18 4 21	− 1 3.87	−23 26 35
" 26	18 17 41	+ 0 25.64	−23 23 5
" 29	18 30 59	+ 1 54.10	−23 15 22

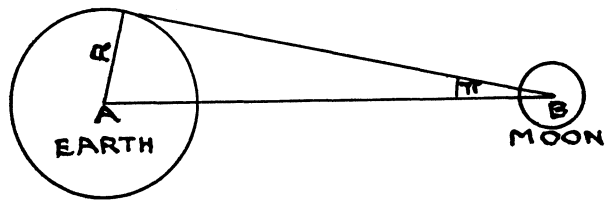
To obtain the R.A. of Mean Sun, subtract the Equation of Time from the Right Ascension; adding 12h to this gives the Sidereal Time at 0h G.C.T.

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

THE MOON'S PHASES AND DISTANCE

The times of the moon's phases and of its least distance (perigee) and greatest distance (apogee) from the earth are given in the astronomical phenomena for each month.

The moon's distance at any time can be found to the nearest 50 miles from the moon's horizontal parallax π, which is given for every 12 hours in the *Nautical Almanac* and the *American Ephemeris*, by means of a simple formula.



In the figure it will be seen that $\sin \pi$ is equal to R, the earth's radius (3963.34 miles), divided by the distance AB between the centres of the earth and moon; whence

$$\text{Distance } AB = R/\sin \pi$$

At apogee and perigee the change of π in 12 hours does not exceed 2″.5 and a change of 1″ is equivalent to about 50 miles. For more accurate distances interpolation formulae are necessary

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 (Mountain Standard Time).

JANUARY

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

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

FEBRUARY

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

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

MARCH

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

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

APRIL

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

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

MAY

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

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

JUNE

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

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

JULY

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

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

AUGUST

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

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

SEPTEMBER

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

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

OCTOBER

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

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

NOVEMBER

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

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

DECEMBER

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

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

THE PLANETS—1936

By R. J. McDiarmid

MERCURY

Mercury is the smallest, least massive, and swiftest in its orbital motion of the nine major planets. It also has the most eccentric orbit with the greatest inclination to the ecliptic. 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.

Its apparent separation from the sun is never great, the maximum value ranging from 18° to 28°. During 1936 Mercury reaches a maximum apparent separation from the sun seven times. 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 1936 are on January 16, 18° 50′; May 7, 21° 20′; September 4, 27° 5′; and December 29, 19° 37′.

During the spring the ecliptic runs most nearly vertical at sunset, and hence the elongation on January 16 is the most favourable at which to look for Mercury in the evening sky.

The maximum western elongations of Mercury during 1936 are on February 26, 26° 51′; June 25, 22° 18′; and October 16, 18° 10′.

Since the ecliptic is most nearly vertical at sunrise in September, the elongation of October will be most suitable for observing Mercury in the morning sky.

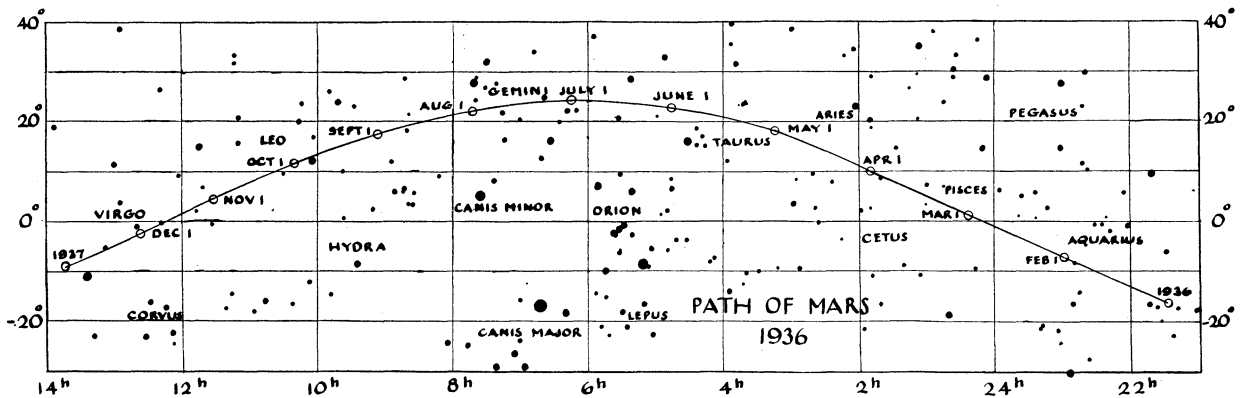
Of the seven elongations of Mercury in 1936, that of January 16 is probably the most favourable to observe the planet.

VENUS

Venus is the planet whose orbit lies next outside that of Mercury. It is by far the brightest and most conspicuous of all in our skies. It is nearly the earth's twin in respect to magnitude, density, and general constitution, if not in other physical conditions.

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, Eros, perhaps another asteroid, and an occasional comet. Its mean distance from the sun is 67 million miles, and its distance from the earth ranges from 26 million to 160 million miles.

It is so brilliant that it is easily seen with the naked eye in the day time for several weeks near its greatest elongation. At the beginning of 1936 Venus is about five times brighter than Sirius. A morning star, rising nearly three hours before the sun, and it is moving eastward among the stars with respect to the



PATH OF MARS AMONG THE STARS DURING 1936.

The position of the planet is shown on the first of each month. From April to August the planet is less than one hour of right ascension away from the sun and consequently difficult to observe. On September 23 the planet will pass about a degree north of Regulus.

sun. It continues as a morning star during the early summer, being in superior conjunction with the sun June 29; several days later it becomes an evening star low in the western sky. It gradually noves eastward among the stars with respect to the sun, continuing as an evening star the remaining part of 1936.

During 1936 Venus never attains its greatest brilliancy, due to the fact that the planet is on the other side of the sun in its orbit with respect to the earth. The distance from the earth ranges from 90 millions to 150 millions of miles.

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 of any other planet.

At the beginning of 1936 Mars, a reddish star, is about first magnitude, visible in the western sky, setting about two hours after the sun. The sun is gaining on Mars in its apparent motion eastward among the stars so that by June 10 Mars is in conjunction with the sun, and some weeks later appears as a morning star.

The distance of Mars from the earth ranges from 34 to 235 millions of miles and during 1936 the distance of the planet varies from 156 to 230 millions of miles. It is due to this fact that Mars is not in good position for observation and never attains a greater brightness than first magnitude.

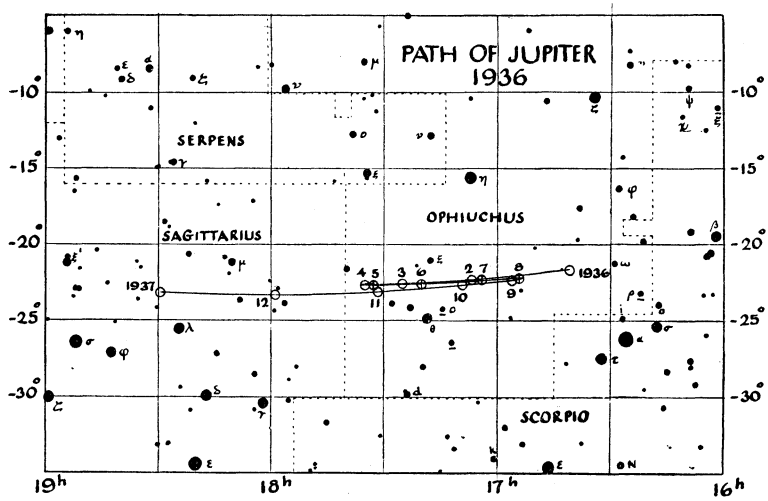
Mars has two Satellites, Phobos and Deimos.

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.

Jupiter is known to possess nine moons; the four brightest may be seen with a good pair of prism binoculars (two of them larger than Mercury), but the others are extremely faint bodies and require the most powerful instruments to detect them.

During 1936 Jupiter is in the constellation Ophiuchus. It is visible as a morning star, magnitude -1.4, at the beginning of the year. March 13 its apparent angular separation from the sun is 90° and it is a conspicuous object rising shortly after midnight. By June 10 it is in opposition (180° from the sun), and is visible all night. September 8 Jupiter is again in quadrature (90° from the sun) and is visible as an evening star for a short time, gradually approaching the sun, passing conjunction December 27.



PATH OF JUPITER AMONG THE STARS DURING 1936.
The positions of the planet on the first of each month are numbered from 1 to 12. From April to August the planet is regreding.

SATURN

Saturn has a system of rings which makes it a unique object for telescopic observation. These rings may be seen ordinarily with a good two-inch glass. In 1936, January 1, the line of sight from the earth to the planet Saturn makes an angle of 7° with the plane of the rings. July 1 this angle is zero and the rings of the planet are invisible, except for the shadow cast on the planet. December 1 the angle is 5°.

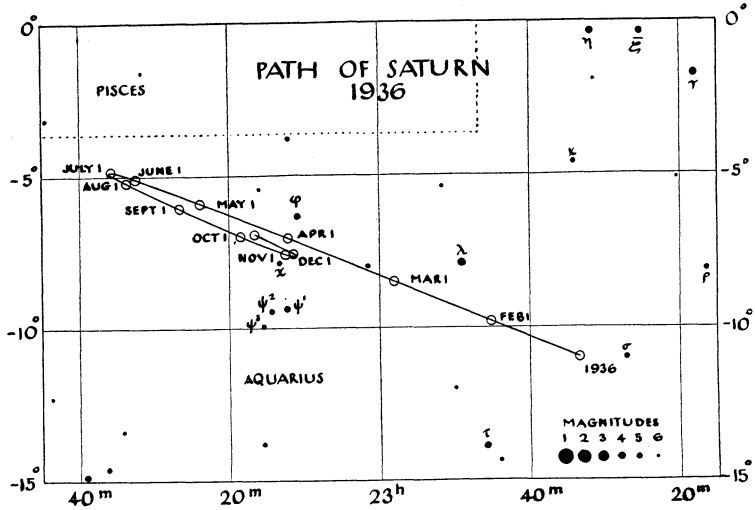
It has nine satellites, the brightest of these being conspicuous in a small telescope.*

At the beginning of the year it is visible in the southwest in the early part of the evening. Saturn rapidly approaches the sun and is in conjunction March 3, and enters the morning sky, but is too near the sun to be visible for a month or two. June 13 Saturn is in quadrature (*i.e.*, 90° from the sun) and rises about midnight. It starts to retrograde July 4 and is in opposition to the sun September 11. December 8 Saturn is again 90° from the sun. Saturn is in the constellation Aquarius, and is a bright yellow star shining with a steady light in the southern sky in late summer and autumn.

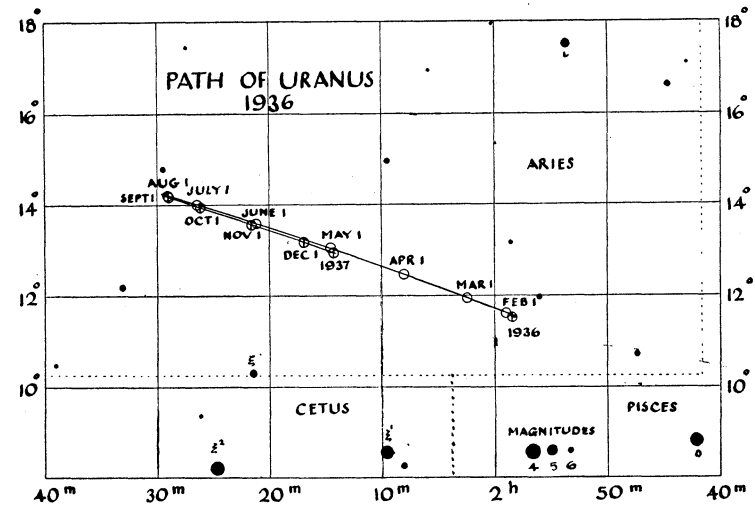
URANUS

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

*The discovery of a tenth Satellite was announced by W. H. Pickering in 1905, but this has never been confirmed.



PATH OF SATURN AMONG THE STARS DURING 1936.
The position of the planet is shown on the first of each month.



PATH OF URANS AMONG THE STARS DURING 1936.
The position of the planet is shown on the first of each month.
From August to the end of the year the planet is regreding.

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 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 10¾ hours. It is of the 6th 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.

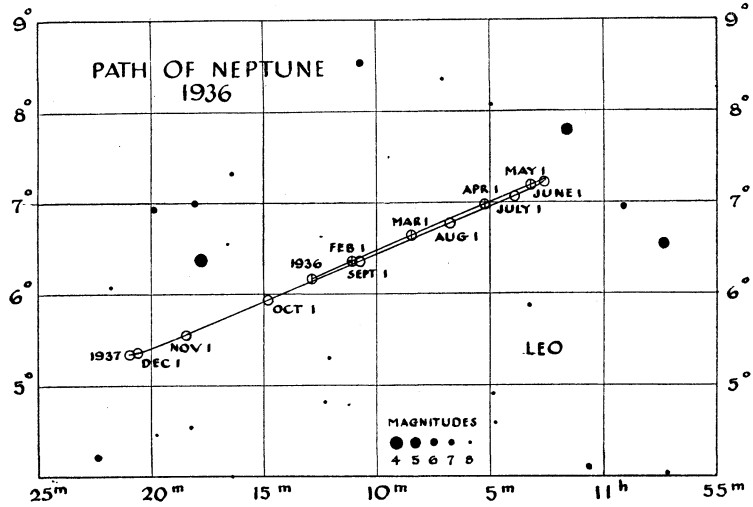
Uranus is in the constellation Aries during 1936. It is in conjunction with the sun on April 25, and a few months later may be observed in the morning sky. Opposition to the sun occurs October 30, at which time the planet is visible all night.

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 8th 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 five 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



PATH OF NEPTUNE AMONG THE STARS DURING 1936.
The position of the planet is shown on the first of each month.
From January to June the planet is regreding.

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 5, being visible most of the night during the first part of the year. Conjunction with the sun takes place September 9, 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 5° 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, although 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 and at a mean distance of 3700 million 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, so that it can be seen only in the largest telescopes. Estimates of the mass of Pluto vary all the way from equality with that of the earth to less than one-tenth of that value.

The approximate position of Pluto at the beginning of 1936 is R.A. 7h 38m, Decl. 23° 30′ N. Some idea of the remoteness of this planet may be had from the fact that the light from it requires approximately a quarter of a day to reach the earth.

THE PLANETARY SURFACES

During recent years intensive research has been carried on in connection with the atmospheres of the members of the solar system. The following table gives a brief summary of results as to the surface envelope and temperature:

Planet	*Atmosphere*	*Mean temperature*
Mercury	None	+343° F.*
Venus	Carbon dioxide	+130° F.
Earth	Oxygen, nitrogen, etc.	+ 57° F.
Mars	Slight oxygen—water vapour	+ 60° F. to −40° F.
Jupiter	Ammonia—Methane	−180° F.
Saturn	Methane, Ammonia slight	−220° F.
Uranus	Methane	
Neptune	Methane	
Pluto	.....	−380° F.

*Temperature of Mercury +343° F. if rotating rapidly, if surface directly under sun 675° F., indicating a long period.

Larger planets, atmosphere of hydrocarbons.

Medium sized planets. atmosphere of compounds of oxygen.

Small planets, Asteroids and Satellites } No atmosphere.

ECLIPSES, 1936

By M. S. BURLAND

During the year 1936 there will be four eclipses, two of the sun and two of the moon.

I. A total eclipse of the moon, January 8, invisible in Canada except in the northwestern portion. The beginning will be visible generally in the northeastern part of the Atlantic Ocean, Europe, eastern Africa, Madagascar, Asia, the Indian Ocean, Australia, Polynesia, the western part of the Pacific Ocean, Alaska, northwestern Canada, and the Arctic Ocean; the ending will be visible generally in the eastern part of the Atlantic Ocean, Europe, Asia, and Africa, the Indian Ocean, Australia, with the exception of the southeastern part, the western part of the Pacific Ocean, northwestern Alaska, and the Arctic Ocean.

Circumstances of the Eclipse, 75th Meridian Civil Time

	m	d	h	m
Moon enters penumbra	January	8	10	17
Moon enters umbra	"	8	11	28
Total eclipse begins	"	8	12	58
Middle of the eclipse	"	8	13	10
Total eclipse ends	"	8	13	21
Moon leaves umbra	"	8	14	51
Moon leaves penumbra	"	8	16	02

Magnitude of the eclipse = 1.022 (Moon's diam. = 1.0)

II. A total eclipse of the sun, June 18-19, invisible in Canada. The path of totality crosses Europe and Asia.

Circumstances of the Eclipse, 75th Meridian Civil Time

					Long.		Lat.	
	m	d	h	m	° ′		° ′	
Eclipse begins	June	18	21	45	38 27	E.	22 58	N.
Central eclipse begins	"	18	22	50	15 58	E.	33 51	N.
Central eclipse ends	"	19	01	50	179 37	E.	25 36	N.
Eclipse ends	"	19	02	55	157 54	E.	14 32	N.

III. A partial eclipse of the moon, July 4, invisible in Canada.

IV. An annular eclipse of the sun, December 13, visible only in southerly latitudes.

THE SKY FOR JANUARY, 1936

Prepared by P. M. MILLMAN

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 41m to 20h 54m, and its Decl. changes from 23° 7′ S. to 17° 29′ S. The equation of time (see p. 7) increases from 3m 1s to 13m 33s. Owing to its 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 21st of the month the sun enters the sign Aquarius, the second winter zodiacal sign. The earth is nearest the sun, that is in perihelion, on January 4. For its distance at this time see opp. page.

The Moon—For its phases, perigee and apogee times and distances, and its conjunctions with the planets, see opp. page. There is a total eclipse of the moon on the 8th (see p. 29).

Mercury on the 15th is in R.A. 21h 00m, Decl. 17° 48′ S. and transits at 13.27. It is an evening star during January and reaches its greatest apparent distance from the sun in the evening sky on the 16th of the month. For a few days before and after this date there will be a fairly good opportunity of observing Mercury as a red star of mag. −0.4 setting just under two hours after the sun (see p. 22). Inferior conjunction with the sun is on January 31.

Venus on the 15th is in R.A. 16h 50m, Decl. 20° 27′ S. and transits at 9.17. It is a morning star of mag. −3.5 and rises about three hours before the sun. Venus is just over a degree north of Jupiter on the 15th.

Mars on the 15th is in R.A. 22h 11m, Decl. 12° 18′ S. and transits at 14.37. It is a faint red star poorly placed for observation in the south west after sunset. On the 25th it is less than a degree to the north of Saturn.

Jupiter on the 15th is in R.A. 16h 53m, Decl. 21° 57′ S. and transits at 9.19. It is a bright morning star slowly increasing its apparent distance from the sun. 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. 22h 38m, Decl. 10° 28′ S. and transits at 15.03 It is an evening star, low in the southwest at sunset and not well placed for observation.

Uranus on the 15th, is in R.A. 1h 58m, Decl. 11° 33′ N. and transits at 18.22.

Neptune on the 15th is in R.A. 11h 12m, Decl. 6° 14′ N. and transits at 3.38.

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

JANUARY

ASTRONOMICAL PHENOMENA

75th Meridian Civil Time

	d	h	m			h	m	Minima of Algol	Configurations of Jupiter's Satellites at 7h 45m
Wed.	1	10	15	☽ First Quarter					43O12
Thur.	2								4312O
Fri.	3	2	19	☌♁☾	♁ 5° 48′ S	4	40		342O1
Sat.	4	5		⊕ in Perihelion. Dist. from ☉, 91,338,500 mi.					1O432
Sun.	5								O1243
Mon.	6					1	30		21O34
Tues.	7								dO34*
Wed.	8	13	15	☽ Full Moon. Total Eclipse, see p. 29		22	10		3O124
Thur.	9								312O4
Fri.	10	16		♁ Stationary in R.A.					32O14
Sat.	11					19	00		1O324
Sun.	12								O4123
Mon.	13	13	09	☌♆☾	♆ 6° 21′ N				241O3
Tues.	14	19		Moon in Apogee. Dist. from ⊕, 251,450 mi		15	50		42O13
Wed.	15	13		☌♀♃	♀ 1° 23′ N				43O12
Thur.	16	1		☿ Greatest elongation E., 18° 50′					d431O
		14	41	☾ Last Quarter.					
Fri.	17					12	40		432O1
Sat.	18	2		☿ in ♌					41O2*
Sun.	19								4O123
Mon.	20	16	00	☌♃☾	♃ 3° 00′ N	9	30		241O3
Tues.	21	1	54	☌♀☾	♀ 3° 40′ N				2O143
Wed.	22	8		☿ Stationary in R.A.					3O24*
		14		□♁☉					
		17		☿ in Perihelion.					
Thur.	23					6	20		31O24
Fri.	24	2	18	● New Moon					32O14
Sat.	25	1	59	☌☿☾	☿ 1° 02′ S				13O24
		11		☌♂♄	♂ 0° 53′ N.				
Sun.	26	12		Moon in Perigee. Dist. from ⊕, 221,100 mi		3	10		O1234
		16	30	☌♄☾	♄ 6° 40′ S.				
		17	57	☌♂☾	♂ 5° 49′ S.				
Mon.	27								21O34
Tues.	28								2O143
Wed.	29					0	00		134O2
Thur.	30	7	55	☌♁☾	♁ 5° 43′ S				d34O2
		18	36	☽ First Quarter.					
Fri.	31	18		☌☿☉	Inferior	20	50		432O1

Explanation of symbols and abbreviations on p. 4, of time on p. 6

THE SKY FOR FEBRUARY, 1936

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 54m to 22h 47m and its Decl. changes from 17° 29′ S. to 7° 44′ S. The equation of time reaches a maximum value of 14m 23s on the 12th (see p. 7). For changes in the length of the day see p. 11. On the 19th the sun enters the sign Pisces, the third winter sign of the zodiac.

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

Mercury on the 15th is in R.A. 20h 15m, Decl. 17° 42′ S. and transits at 10.39. It is a morning star during February and reaches its greatest western elongation from the sun on the 26th. Though this is not a favourable elongation the planet may be glimpsed in the east shortly before sunrise during the last ten days of the month, given a clear horizon. Mercury will be a little over a degree south of the old moon on the 20th.

Venus on the 15th is in R.A. 19h 31m, Decl. 21° 18′ S. and transits at 9.57. It is a morning star, slowly approaching the sun. It rises almost two hours before the sun on the 15th.

Mars on the 15th is in R.A. 23h 41m, Decl. 2° 49′ S. and transits at 14.05. It is low in the west after sunset.

Jupiter on the 15th is in R.A. 17h 16m, Decl. 22° 28′ S. and transits at 7.40. It is a bright morning star, rising about three and a half hours before the sun and steadily improving its position for observation. 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. 22h 51m, Decl. 9° 9′ S. and transits at 13.14. It is rapidly approaching the sun in the evening sky and not well placed for observation.

Uranus on the 15th is in R.A. 2h 0m, Decl. 11° 45′ N. and transits at 16.22.

Neptune on the 15th is in R.A. 11h 10m, Decl. 6° 29′ N. and transits at 1.34.

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

FEBRUARY

ASTRONOMICAL PHENOMENA

75th Meridian Civil Time

	d	h	m		h	m	Minima of Algol	Configurations of Jupiter's Satellites at 6h 45m
Sat.	1	23		☿ Greatest Hel. Lat. N.				4310*
Sun.	2							40132
Mon.	3				17	30		41203
Tues.	4							42103
Wed.	5							41032
Thur.	6				14	20		34012
Fri.	7	6	19	☋ Full Moon				3204*
Sat.	8							3104*
Sun.	9	19	39	☌♆☾ ♆ 6° 15′ N.	11	10		03124
Mon.	10							12034
Tues.	11	13		Moon in Apogee. Dist. from ⊕, 252,000 mi.				20134
Wed.	12	12		☿ Stationary in R.A.	8	00		10324
Thur.	13							30124
Fri.	14							3204*
Sat.	15	10	45	☾ Last Quarter	4	50		d3240
Sun.	16							40312
Mon.	17	9	57	☌♃☾ ♃ 2° 29′ N.				d4103
Tues.	18				1	40		42013
Wed.	19							41023
Thur.	20	4	32	☌♀☾ ♀ 1° 17′ S.	22	30		43012
		16	35	☌☿☾ ☿ 1° 13′ S.				
Fri.	21							43210
Sat.	22	13	42	● New Moon				d4320
Sun.	23	7	42	☌♄☾ ♄ 6° 46′ S.	19	20		40124*
		17		Moon in Perigee. Dist. from ⊕, 223,250 mi.				
		20		♀ in ♉				
Mon.	24	15	45	☌♂☾ ♂ 6° 08′ S.				10243
Tues.	25	10		☿ in ♉				20134
Wed.	26	0		☿ Greatest elongation W., 26° 51′	16	10		10234
		15	3	☌♇☾ ♇ 5° 29′ S.				
Thur.	27							30124
Fri.	28							32104
Sat.	29	4	28	First Quarter	13	00		32014

Explanation of symbols and abbreviations on p. 4, of time on p. 6

THE SKY FOR MARCH, 1936

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 47m to 0h 41m and its Decl. changes from 7° 44′ S. to 4° 24′ N. The equation of time decreases from 12m 36s to 4m 6s (see p. 7). For changes in the length of the day see p. 12. On the 20th at 18h 58m (G.C.T.) the sun is at the vernal equinox and enters the sign Aries, crossing the equator on its journey north. This marks the beginning of spring.

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

Mercury on the 15th is in R.A. 22h 21m, Decl. 12° 31′ S. and transits at 10.52. It is a morning star during the entire month but is not favourably placed for observation.

Venus on the 15th is in R.A. 21h 57m, Decl. 13° 26′ S. and transits at 10.28. It can be seen as a bright star in the eastern sky shortly before sunrise.

Mars on the 15th is in R.A. 1h 02m, Decl. 6° 13′ N. and transits at 13.32. It is gradually approaching the sun in the evening sky and sets about two hours after the sun.

Jupiter on the 15th is in R.A. 17h 31m, Decl. 22° 40′ S., and transits at 6.00. It is in quadrature with the sun on the 14th and rises shortly after midnight at this time. 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. 23h 05m, Decl. 7° 49′ S. and transits at 11.33. It is too near the sun to be observed during March. Saturn is in conjunction with the sun on the 3rd at which time it passes into the morning sky.

Uranus on the 15th is in R.A. 2h 5m, Decl. 12° 9′ N. and transits at 14.33.

Neptune on the 15th is in R.A. 11h 7m, Decl. 6° 48′ N. and transits at 23.33.

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 5h 30m
Sun.	1			.....			3O24*
Mon.	2			.....			1O243
Tues.	3	8		☌♄☉	9	40	24O13
Wed.	4			.....			41O3*
Thur.	5	22		☌♆☉ Dist. from ⊕, 2,714,210,000 mi.			43O12
Fri.	6	16		☿ in Aphelion	6	30	4312O
Sat.	7			.....			432O1
Sun.	8	0	14	☍ Full Moon			431O2
		0	46	☌♆☾ ♆ 6° 10′ N.			
Mon.	9	23		Moon in Apogee. Dist. from ⊕, 252,450 mi....	3	20	d4O23
Tues.	10			.....			42O13
Wed.	11			.....			124O3
Thur.	12			.....	0	10	dO142
Fri.	13	19		□☌☉			d31O4
Sat.	14			.....	21	00	32O14
Sun.	15	23	41	☌☌☾ ☌ 2° 00′ N.			31O24
Mon.	16	3	35	☾ Last Quarter			O1324
Tues.	17			.....	17	50	2O34*
Wed.	18			.....			21O34
Thur.	19			.....			O3142
Fri.	20	13	58	☉ enters ♈, Spring commences. Long. of ☉, 0°.	14	40	314O2
Sat.	21	7	03	☌♀☾ ♀ 5° 46′ S.			342O1
		22	58	☌☿☾ ☿ 7° 32′ S.			
Sun.	22	0	21	☌♄☾ ♄ 6° 58′ S.			431O2
		12		☌☿♄ ☿ 0° 36′ S.			
		23	14	● New Moon.			
Mon.	23	4		Moon in Perigee. Dist. from ⊕, 221,900 mi....	11	30	4O312
Tues.	24	12	08	☌♂☾ ♂ 5° 23′ S.			42O3*
Wed.	25	3	25	☌♁☾ ♁ 5° 14′ S.			421O3
Thur.	26			.....	8	20	4O132
Fri.	27	1		☿ Greatest Hel. Lat. S.			341O2
Sat.	28			.....			32O41
Sun.	29	9		♀ in Aphelion	5	00	31O4*
		16	22	☽ First Quarter.			
Mon.	30	16		☌♀♄ ♀ 0° 26′ N.			O3124
Tues.	31			.....			21O34

Explanation of symbols and abbreviations on p. 4, of time on p. 6

THE SKY FOR APRIL, 1936

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 41m to 2h 32m, and its Decl. changes from 4° 24′ N. to 14° 57′ N. The equation of time changes from +4m 6s to −2m 53s (see p. 7). For changes in the length of the day see p. 13. On the 20th the sun enters the sign 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 opp. page.

Mercury on the 15th is in R.A. 1h 51m, Decl. 11° 23′ N. and transits at 12.21. It is a morning star at the beginning of the month, reaching superior conjunction with the sun on the 10th. It then becomes an evening star but is not well placed for observation during April.

Venus on the 15th is in R.A. 0h 20m, Decl. 0° 32′ N. and transits at 10.49. It rises less than an hour before the sun and is getting too near that body to be well observed.

Mars on the 15th is in R.A. 2h 29m, Decl. 14° 43′ N. and transits at 12.56. It is a faint evening star and too near the sun for observation.

Jupiter on the 15th is in R.A. 17h 36m, Decl. 22° 43′ S. and transits at 4.03. It is coming slowly into the evening sky and rises a little before midnight. Jupiter reaches a stationary point in its orbit on April 10, and moves westward after this date. For the configurations of its satellites see next page, and for their eclipses, etc., see p. 54.

Saturn on the 15th is in R.A. 23h 18m, Decl. 6° 29′ S. and transits at 9.45. It is in the morning sky and low in the southeast at sunrise, but not very well placed for observation.

Uranus on the 15th is in R.A. 2h 11m, Decl. 12° 43′ N. and transits at 12.37.

Neptune on the 15th is in R.A. 11h 4m, Decl. 7° 6′ N. and transits at 21.29.

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 4h 00m
Wed.	1						1 50	20134
Thur.	2							0234*
Fri.	3						22 40	31024
Sat.	4	5	21	☌☿☾	☿	6° 12′ N.		32014
Sun.	5							3104*
Mon.	6	1		Moon in Apogee. Dist. from ⊕, 252,500 mi.			19 30	43012
		17	46	☽ Full Moon.				
Tues.	7	23		☌♂♁	♂	0° 25′ N.		41203
Wed.	8							42013
Thur.	9						16 20	4023*
Fri.	10	8		☌☿☉		Superior.		43102
		13		♃ Stationary in R.A.				
Sat.	11							43201
Sun.	12	7	52	☌♃☾	♃	1° 39′ N.	13 10	43120
Mon.	13	19		♂ in ♌				43012
Tues.	14	16	21	☾ Last Quarter				d1043
Wed.	15	1		☿ in ♌			10 00	20143
Thur.	16							10234
Fri.	17	10		☌☿♁	☿	0° 56′ N.		d3024
Sat.	18	16	02	☌♄☾	♄	7° 15′ S.	6 50	32014
Sun.	19	16		☿ in Perihelion				32104
Mon.	20	4	56	☌♀☾	♀	7° 05′ S.		30124
		15		Moon in Perigree. Dist. from ⊕, 222,400 mi.				
		17		♀ Greatest Hel. Lat. S.				
Tues.	21	7	32	● New Moon			3 40	10234
		16	36	☌♁☾	♁	5° 03′ S.		
Wed.	22	7	03	☌☿☾	☿	2° 40′ S.		24013
		7	22	☌♂☾	♂	3° 55′ S.		
		11		☌☿♂	☿	1° 17′ N.		
Thur.	23							41023
Fri.	24						0 20	d4012
Sat.	25	17		☌♁☉				4320*
Sun.	26						21 10	43210
Mon.	27							43012
Tues.	28	6	16	☽ First Quarter				41023
Wed.	29	23		☿ Greatest Hel. Lat. N.			18 00	42013
Thur.	30							1403*

Explanation of symbols and abbreviations on p. 4, of time on p. 6

THE SKY FOR MAY, 1936

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 32m to 4h 35m and its Decl. changes from 14° 57′ N. to 22° 00′ N. The equation of time decreases from −2m 53s to a minimum of −3m 46s on the 15th and then increases to −2m 25s at the end of the month (see p. 7). For changes in the times of sunrise and sunset see p. 14. On May 21st the sun enters the sign Gemini. This is the third spring sign of the zodiac.

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

Mercury on the 15th is in R.A. 4h 46m, Decl. 24° 16′ N. and transits at 13.14. It is an evening star during May and reaches its greatest apparent distance from the sun on the 7th. The first two weeks of the month provide the most favourable opportunity of the year for observing Mercury in the evening sky. It will be 20° above the western horizon at sunset on the 7th. Inferior conjunction with the sun is on the 31st.

Venus on the 15th is in R.A. 2h 39m, Decl. 14° 16′ N. and transits at 11.09. It is a morning star but too near the sun to be well observed.

Mars on the 15th is in R.A. 3h 56m, Decl. 20° 43′ N. and transits at 12.25. Mars cannot be observed during May owing to its proximity to the sun.

Jupiter on the 15th is in R.A. 17h 28m, Decl. 22° 39′ S. and transits at 1.58. It is in view almost all night, rising in the east not long after sunset. During the month Jupiter increases in brightness from magnitude −2.0 to magnitude −2.2. For the configurations of its satellites see next page, and for their eclipses, etc., see p. 54.

Saturn on the 15th is in R.A. 23h 28m, Decl. 5° 29′ S., and transits at 7.57. It rises about two and a half hours before the sun in the southeast.

Uranus on the 15th is in R.A. 2h 18m, Decl. 13° 17′ N. and transits at 10.46.

Neptune on the 15th is in R.A. 11h 3m, Decl. 7° 14′ N. and transits at 19.29.

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

MAY

ASTRONOMICAL PHENOMENA

75th Meridian Civil Time

	d	h	m				Minima of Algol h	m	Configurations of Jupiter's Satellites at 2h 30m
Fri.	1	10	37	☌♆☾	♆	6° 21′ N			03142
Sat.	2						14	50	32104
Sun.	3	7		Moon in Apogee. Dist. from ⊕, 252,300 mi.					d3204
Mon.	4								30124
Tues.	5						11	40	10324
Wed.	6	10	01	☍ Full Moon					20134
Thur.	7	13		☿ Greatest elongation E., 21° 20′					12034
Fri.	8						8	30	03142
Sat.	9	11	03	☌♃☾	♃	1° 35′ N			34120
Sun.	10	4		☌♀♁	♀	0° 51′ S			34201
Mon.	11						5	20	43012
Tues.	12								41032
Wed.	13								42013
Thur.	14	1	12	☾ Last Quarter			2	10	41203
Fri.	15								40132
Sat.	16	4	46	☌♄☾	♄	7° 35′ S	23	00	d4310
Sun.	17								32041
Mon.	18	22		Moon in Perigee. Dist. from ⊕, 224,550 mi.					3024*
Tues.	19	5	23	☌♁☾	♁	5° 00′ S	19	50	1024*
		22	59	☌♀☾	♀	4° 49′ S.			
		23		☿ Stationary in R.A.					
Wed.	20	15	34	● New Moon					20134
Thur.	21	1	54	☌♂☾	♂	2° 05′ S			12034
		15	21	☌☿☾	☿	1° 18′ S.			
Fri.	22						16	30	01324
Sat.	23	9		☿ in ♉					13024
Sun.	24								32014
Mon.	25	15		♆ Stationary in R.A.			13	20	31024
Tues.	26								d4302
Wed.	27	21	46	☽ First Quarter					42013
Thur.	28	17	30	☌♆☾	♆	6° 31′ N	10	10	42103
Fri.	29	7		☌☿♂	☿	2° 11′ S			40123
Sat.	30	22		Moon in Apogee. Dist. from ⊕, 251,700 mi.					41302
Sun.	31	7		☌☿☉ Inferior			7	00	43201

Explanation of symbols and abbreviations on p. 4, of time on p. 6

THE SKY FOR JUNE, 1936

The times of transit are given in local mean time, 0h at midnight; the 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 35m to 6h 39m, and its Decl. from 22° 00′ N. to its maximum value of 23° 27′ N. on the 22nd and then drops to 23° 9′ N. at the end of the month. At 14h 22m (G.C.T.) on the 21st of the month the sun is at the summer solstice and enters the sign Cancer, the first summer zodiacal sign. Summer commences at this time. 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. 7. 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. There is a total eclipse of the sun on June 19. For details see p. 29.

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

Mercury on the 15th is in R.A. 4h 18m, Decl. 17° 4′ N. and transits at 10.44. It is a morning star throughout June and fairly well placed for observation just before sunrise during the last part of the month. Greatest western elongation occurs on the 25th.

Venus on the 15th is in R.A. 5h 15m, Decl. 23° 0′ N. and transits at 11.44. It is a morning star but too near the sun for observation. On the 29th it is in superior conjunction with the sun and moves into the evening sky.

Mars on the 15th is in R.A. 5h 28m, Decl. 23° 51′ N. and transits at 11.55. It is in conjunction with the sun on the 10th and passes into the morning sky on this date.

Jupiter on the 15th is in R.A. 17h 12m, Decl. 22° 27′ S. and transits at 23.36. Jupiter is in opposition to the sun on the 10th and is in view all night at this time, rising just at sunset. It is at its maximum luminosity, of magnitude −2.2. For the configurations of its satellites see next page and for their eclipses, etc., see p. 54.

Saturn on the 15th is in R.A. 23h 35m, Decl. 4° 55′ S. and transits at 6.01. It is a morning star of magnitude 1.4, rising four hours before the sun. At the end of June the earth passes through the plane of Saturn's ring system and for about a fortnight the rings will be invisible in even the largest telescope.

Uranus on the 15th is in R.A. 2h 24m, Decl. 13° 48′ N. and transits at 8.50.

Neptune on the 15th is in R.A. 11h 3m, Decl. 7° 11′ N. and transits at 17.28.

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 1h 00m
Mon.	1			.....			4310*
Tues.	2	16		☿ in Aphelion			43012
Wed.	3			.....	3	50	2043*
Thur.	4	16		□ΨΘ			21043
Fri.	5	0	22	☺ Full Moon			01234
		2		☌☿♀ ☿ 2° 59′ S.			
		11	46	☌♃☾ ♃ 1° 46′ N.			
Sat.	6			.....	0	40	d1024
Sun.	7			.....			32014
Mon.	8			.....	21	30	31204
Tues.	9			.....			30124
Wed.	10	10		☍♃Θ Dist. from ⊕, 397,981,000 mi.			12034
		19		☌♂Θ			
Thur.	11			.....	18	20	21403
Fri.	12	7	05	☾ Last Quarter			40123
		9		☿ Stationary in R.A.			
		13	48	☌♄☾ ♄ 7° 51′ S.			
Sat.	13	5		□♄Θ			41032
Sun.	14			.....	15	10	43201
Mon.	15	16		Moon in Perigee. Dist. from ⊕, 227,650 mi...			43120
		16		☌♁☾ ♁ 4° 59′ S.			
Tues.	16	0		♀ in ♌			43012
Wed.	17	14	08	☌☿☾ ☿ 6° 34′ S.	11	50	d4103
Thur.	18	19	03	☌♀☾ ♀ 0° 42′ S.			d4203
		20	12	☌♂☾ ♂ 0° 06′ S.			
Fri.	19			Total Eclipse of ☉, see p. 29			40123
		0	14	● New Moon.			
		23		☌♀♂ ♀ 0° 30′ S.			
Sat.	20			.....	8	40	10324
Sun.	21	9	22	☉ enters ♋, Summer commences. Long. of ☉, 90°			32014
Mon.	22			.....			31204
Tues.	23	0		☿ Greatest Hel. Lat. S.	5	30	30124
Wed.	24			.....			10234
Thur.	25	2	03	☌ΨΘ Ψ 6° 35′ N.			20134
		3		☿ Greatest elongation W., 22° 18′.			
Fri.	26	14	23	☽ First Quarter	2	20	0234*
Sat.	27	16		Moon in Apogee. Dist. from ⊕, 251,200 mi....			10432
Sun.	28			.....	23	10	32401
Mon.	29	4		☌♀Θ Superior			34210
Tues.	30			.....			43012

Explanation of symbols and abbreviations on p. 4, of time on p. 6

THE SKY FOR JULY, 1936

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 39m to 8h 44m, and its Decl. decreases from 23° 9′ N. to 18° 8′ N. The equation of time increases from 3m 34s to a maximum of 6m 22s on the 27th and then drops to 6m 13s at the end of the month. On the 23rd the sun enters the sign Leo, the second summer sign of the zodiac. For changes in the length of the day, see p. 16. On the 3rd the earth is in aphelion, the point on its orbit furthest from the sun. For our distance from the sun at this time see opp. page.

The Moon—For its phases, perigee and apogee times and distances, and its conjunctions with the planets, see opp. page. There is a partial eclipse of the moon on the 4th. For details see p. 29.

Mercury on the 15th is in R.A. 6h 51m, Decl. 23° 26′ N. and transits at 11.23. It is a morning star during most of July but not well placed for observation. Superior conjunction with the sun is on July 23, and Mercury passes into the evening sky on this date.

Venus on the 15th is in R.A. 7h 55m, Decl. 21° 51′ N. and transits at 12.25. It is too near the sun for observation during July.

Mars on the 15th is in R.A. 6h 56m, Decl. 23° 40′ N. and transits at 11.24. It is a morning star but still too near the sun for observation.

Jupiter on the 15th is in R.A. 16h 58m, Decl. 22° 13′ S. and transits at 21.24. It may be observed as a bright star in the eastern evening sky, shortly after 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. 23h 36m, Decl. 4° 58′ S. and transits at 4.04. It reaches a stationary point on the 4th and commences to move westward among the stars on this date. It may be observed in the southeast a few hours before sunrise.

Uranus on the 15th is in R.A. 2h 28m, Decl. 14° 8′ N. and transits at 6.56.

Neptune on the 15th is in R.A. 11h 5m, Decl. 6° 58′ N. and transits at 15.32.

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 23h 30m
Wed.	1			.....	20 00	43O12
Thur.	2	13	20	☌☿☾ ☿ 2° 01′ N.....		41O2*
Fri.	3	15		⊕ in Aphelion. Dist. from ☉, 94,452,100 mi...		42O13
Sat.	4			Partial Eclipse of moon. See p. 29.....	16 50	41O3*
		12	34	♋ Full Moon.		
		17		♄ Stationary in R.A.		
Sun.	5			.....		d4O32
Mon.	6			.....		432O1
Tues.	7			.....	13 40	321O4
Wed.	8			.....		3O124
Thur.	9	19	50	☌♄☾ ♄ 7° 59′ S.....		13O24
Fri.	10			.....	10 30	2O134
Sat.	11	11	28	☾ Last Quarter.....		12O34
		16		Moon in Perigee. Dist. from ⊕, 229,700 mi.		
Sun.	12	1		☿ in ♌.....		O1324
		23	52	☌♁☾ ♁ 4° 54′ S.		
Mon.	13			.....	7 10	32O4*
Tues.	14			.....		321O4
Wed.	15	12		☌☿♂ ☿ 0° 13′ S.....		3O412
Thur.	16	15		☿ in Perihelion.....	4 00	413O2
Fri.	17	14	36	☌♂☾ ♂ 1° 54′ N.....		42O13
		21	12	☌☿☾ ☿ 2° 23′ N.		
Sat.	18	10	19	● New Moon.....		412O3
		22	40	☌♀☾ ♀ 3° 47′ N.		
Sun.	19	16		♀ in Perihelion.....	0 50	4O123
Mon.	20			.....		d43O*
Tues.	21			.....	21 40	4321O
Wed.	22	11	34	☌♆☾ ♆ 6° 32′ N.....		43O21
Thur.	23	22		☌☿☉ Superior.....		341O2
Fri.	24			.....	18 30	2O413
Sat.	25	10		Moon in Apogee. Dist. from ⊕, 250,850 mi....		12O43
Sun.	26	7	36	☽ First Quarter.....		O1234
		22		☿ Greatest Hel. Lat. N.		
Mon.	27			.....	15 20	d2O14
Tues.	28			.....		d32O4
Wed.	29	18	12	☌☿☾ ☿ 2° 03′ N.....		3O214
Thur.	30			.....	12 10	31O24
Fri.	31			.....		2O314

Explanation of symbols and abbreviations on p. 4, of time on p. 6

THE SKY FOR AUGUST, 1936

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 August the sun's R.A. increases from 8h 44m to 10h 40m, and its Decl. decreases from 18° 8′ N. to 8° 26′ N. The equation of time decreases from 6m 13s to 0m 06s, see p. 7. The sun enters the sign Virgo, the third summer zodiacal sign, on the 23rd. For changes in the length of the day see p. 17.

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

Mercury on the 15th is in R.A. 10h 54m, Decl. 7° 41′ N. and transits at 13.22. It is in the evening sky but unfavourably placed for observation till the last few days of the month (see p. 22).

Venus on the 15th is in R.A. 10h 29m, Decl. 11° 06′ N. and transits at 12.56. It is an evening star and may be glimpsed low in the west just after sunset.

Mars on the 15th is in R.A. 8h 22m, Decl. 20° 31′ N. and transits at 10.49. It is in the morning sky and rises about two hours before the sun at the end of the month.

Jupiter on the 15th is in R.A. 16h 53m, Decl. 22° 11′ S. and transits at 19.17. It is well above the eastern horizon at sunset and remains in view for most of the night. Jupiter ceases its retrograde motion on the 11th and commences to move eastward among the stars. 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. 23h 31m, Decl. 5° 35′ S. and transits at 1.58. It is slowly coming into the evening sky and rises four hours before midnight. Saturn is a pale yellow star, of magnitude 1.0 during August.

Uranus on the 15th is in R.A. 2h 29m, Decl. 14° 15′ N. and transits at 4.56.

Neptune on the 15th is in R.A. 11h 9m, Decl. 6° 36′ N. and transits at 13.34.

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 21h 45m
Sat.	1	8		☌☿♀	☿	0° 22′ N			21403
		19		□♁☉					
Sun.	2	22	47	☋ Full Moon			9	00	40123
Mon.	3								41032
Tues.	4								42301
Wed.	5						5	50	430**
Thur.	6	0	45	☌♄☾	♄	7° 59′ S			43102
		11		Moon in Perigee. Dist. from ⊕, 227,800 mi.					
Fri.	7								4201*
Sat.	8						2	40	42103
Sun.	9	5	52	☌♁☾	♁	4° 45′ S			40123
		15	59	☾ Last Quarter					
Mon.	10	11		♀ Greatest Hel. Lat. N			23	20	10324
Tues.	11	13		♃ Stationary in R.A					23014
Wed.	12								32104
Thur.	13						20	10	d3024
Fri.	14								2014*
Sat.	15	1		♁ Stationary in R.A					21034
		9	12	☌♂☾	♂	3° 51′ N			
Sun.	16	22	21	● New Moon			17	00	G2134
Mon.	17	11		☌☿Ψ	☿	0° 48′ S			10423
Tues.	18	8	24	☌♀☾	♀	6° 42′ N			23401
		21	05	☌Ψ☾	Ψ	6° 26′ N.			
Wed.	19	1	35	☌☿☾	☿	5° 28′ N	13	50	34210
		9		☿ in ♉					
Thur.	20								43012
Fri.	21								d430*
Sat.	22	4		Moon in Apogee. Dist. from ⊕, 251,700 mi.			10	40	42103
Sun.	23	15		☌♀Ψ	♀	0° 26′ N			40213
Mon.	24								41023
Tues.	25	0	49	☽ First Quarter			7	30	42301
Wed.	26	3	01	☌♃☾	♃	1° 47′ N			32104
Thur.	27								30124
Fri.	28						4	20	3024*
Sat.	29	15		☿ in Aphelion					21034
Sun.	30								0134*
Mon.	31						1	10	10234

Explanation of symbols and abbreviations on p. 4, of time on p. 6

THE SKY FOR SEPTEMBER, 1936

The times of transit are given in local mean time, 0h at midnight; to convert 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 40m to 12h 28m, and its Decl. decreases from 8° 26′ N. to 3° 02′ S. The equation of time decreases from +0m 6s to −10m 10s. For changes in the length of the day see p. 18. On the 23rd the sun is at the autumnal equinox and crosses the equator going south, entering Libra, the first autumnal sign of the zodiac. This event marks the beginning of autumn. Day and night are approximately equal all over the world (see p. 18).

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

Mercury on the 15th is in R.A. 12h 53m, Decl. 9° 41′ S. and transits at 13.16. It is an evening star throughout the month and is at greatest eastern elongation from the sun on Sept. 4. It is so low in the sky, however, that it will be difficult to observe. Mercury sets about 40 minutes after the sun on the 4th.

Venus on the 15th is in R.A. 12h 49m, Decl. 4° 22′ S. and transits at 13.14. It is an evening star, setting almost an hour after the sun on the 15th.

Mars on the 15th is in R.A. 9h 42m, Decl. 15° 5′ N. and transits at 10.06. It is slowly moving into the morning sky but is still faint and inconspicuous.

Jupiter on the 15th is in R.A. 17h 01m, Decl. 22° 28′ S. and transits at 17.23. It is a bright star in the evening sky, setting over four hours after the sun. For the configurations of its satellites see next page, and for their eclipses, etc., see p. 55. Jupiter is near the moon on the 22nd.

Saturn on the 15th is in R.A. 23h 23m, Decl. 6° 31′ S. and transits at 23.44 It is in opposition to the sun on the 11th and well placed for observation this month. It rises in the southeast about sunset and is in view all night. Saturn is at its maximum brightness for the year, magnitude 0.8.

Uranus on the 15th is in R.A. 2h 28m, Decl. 14° 7′ N. and transits at 2.52.

Neptune on the 15th is in R.A. 11h 13m, Decl. 6° 10′ N. and transits at 11.36.

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

SEPTEMBER

ASTRONOMICAL PHENOMENA

75th Meridian Civil Time

	d	h	m			Minima of Algol h	Minima of Algol m	Configurations of Jupiter's Satellites at 20h 15m
Tues.	1	7	37	☍ Full Moon				23014
Wed.	2	6	26	☌♄☾	♄ 7° 55′ S.	21	50	32104
Thur.	3	4		Moon in Perigee. Dist. from ⊕, 224,700 mi.				30412
Fri.	4	18		☿ Greatest elongation E., 27° 05′				34102
Sat.	5	11	51	☌♁☾	♁ 4° 34′ S.	18	40	42013
Sun.	6							4203*
Mon.	7	22	14	☾ Last Quarter				41023
Tues.	8	11		□♃☉		15	30	42031
Wed.	9	5		☌♆☉				43210
Thur.	10							43012
Fri.	11	21		☍♄☉ Dist. from ⊕, 800,965,000 mi.		12	20	34102
Sat.	12							20143
Sun.	13	3	44	☌♂☾	♂ 5° 31′ N.			2043*
Mon.	14					9	10	10234
Tues.	15	5	54	☌♆☾	♆ 6° 25′ N.			d0314
		12	41	● New Moon				
		19		☌☿♀	☿ 4° 59′ S.			
Wed.	16							32104
Thur.	17	12	54	☌☿☾	☿ 0° 58′ N.	6	00	30214
		17	06	☌♀☾	♀ 5° 55′ N.			
		20		☿ Stationary in R.A.				
Fri.	18	20		Moon in Apogee. Dist. from ⊕, 252,350 mi.				31024
		23		☿ Greatest Hel. Lat. S.				
Sat.	19							20314
Sun.	20					2	50	21043
Mon.	21							d4023
Tues.	22	15	06	☌♃☾	♃ 1° 16′ N.	23	40	40213
Wed.	23	0	26	☉ enters ♎, Autumn commences. Long. of ☉, 180°				42310
		17	12	☽ First Quarter				
Thur.	24							4301*
Fri.	25					20	30	43102
Sat.	26							4201*
Sun.	27							42103
Mon.	28					17	20	40123
Tues.	29	13	41	☌♄☾	♄ 7° 54′ S.			0243*
Wed.	30	16	01	☍ Full Moon				23104
		19		☌☿☉ Inferior				

Explanation of symbols and abbreviations on p. 4, of time on p. 6

THE SKY FOR OCTOBER, 1936

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 28m to 14h 24m, and its Decl. changes from 3° 02′ S. to 14° 18′ S. On the 23rd the sun enters the sign Scorpio, the second autumnal sign of the zodiac. The equation of time decreases from −10m 10s to −16m 21s during the month. 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 opp. page.

Mercury on the 15th is in R.A. 12h 15m, Decl. 0° 03′ N. and transits at 10.42. It is at inferior conjunction with the sun on the 1st and becomes a morning star. It reaches its greatest apparent distance from the sun on Oct. 16. For a week before and after this date the planet is well situated for observation before sunrise. It rises nearly two hours before the sun.

Venus on the 15th is in R.A. 15h 9m, Decl. 18° 9′ S. and transits at 13.37. It is slowly moving into the evening sky and may be observed as a bright star in the west after sunset.

Mars on the 15th is in R.A. 10h 53m, Decl. 8° 32′ N. and transits at 9.19. It is a red star of the 2nd magnitude rising three and a half hours before the sun.

Jupiter on the 15th is in R.A. 17h 18m, Decl. 22° 53′ S. and transits at 15.43. It appears as a bright star in the western evening sky, setting about three hours after the sun. 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. 23h 15m, Decl. 7° 19′ S. and transits at 21.38. It is in view most of the night, setting three hours before sunrise.

Uranus on the 15th is in R.A. 2h 24m, Decl. 13° 48′ N. and transits at 0.51.

Neptune on the 15th is in R.A. 11h 17m, Decl. 5° 46′ N. and transits at 9.42.

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

OCTOBER

ASTRONOMICAL PHENOMENA

75th Meridian Civil Time

	d	h	m			Minima of Algol h m	Configurations of Jupiter's Satellites at 19h 00m
Thur.	1	10		Moon in Perigee. Dist. from ⊕, 222,300 mi.		14 00	3O14*
Fri.	2	19	26	☌☊☾	☊ 4° 26′ S.		31O24
Sat.	3						23O14
Sun.	4					10 50	21O34
Mon.	5	13		☿ in ♉			O1234
Tues.	6						1O243
Wed.	7	7	28	☾ Last Quarter		7 40	d234O
Thur.	8	0		☿ in ♌			342O1
Fri.	9	3		☿ Stationary in R.A.			431O2
Sat.	10					4 30	432O1
Sun.	11	21	51	☌♂☾	♂ 6° 41′ N.		421O3
Mon.	12	13	54	☌♆☾	♆ 6° 32′ N.		4O123
		15		☿ in Perihelion			
Tues.	13	20	29	☌☿☾	☿ 6° 58′ N.	1 20	41O23
Wed.	14						d42O1
Thur.	15	5	20	● New Moon		22 10	342O*
		19		♂ Greatest Hel. Lat. N.			
Fri.	16	3		Moon in Apogee. Dist. from ⊕, 252,650 mi.			31O42
		7		☿ Greatest elongation W., 18° 10′			
Sat.	17	23	13	☌♀☾	♀ 2° 09′ N.		d3O14
Sun.	18					19 00	21O34
Mon.	19						O2134
Tues.	20	5	32	☌♃☾	♃ 0° 36′ N.		1O234
Wed.	21					15 50	2O134
Thur.	22	21		☿ Greatest Hel. Lat. N.			32O4*
Fri.	23	7	54	◑ First Quarter			31O42
Sat.	24					12 40	34O21
Sun.	25	11		☌♂♆	♂ 0° 24′ N.		421O*
Mon.	26	21	54	☌♄☾	♄ 7° 59′ S.		4O13*
Tues.	27					9 20	41O23
Wed.	28						42O13
Thur.	29	22		Moon in Perigee. Dist. from ⊕, 221,600 mi.			4321O
Fri.	30	0	58	○ Full Moon		6 10	d43O2
		4	45	☌☊☾	☊ 4° 26′ S.		
		23		☍☊☉	Dist. from ⊕, 1,745,030,000 mi.		
Sat.	31						43O12

Explanation of symbols and abbreviations on p. 4, of time on p. 6

THE SKY FOR NOVEMBER, 1936

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 24m to 16h 28m, and its Decl. decreases from 14° 18′ S. to 21° 45′ S. On the 22nd the sun enters the sign Sagittarius, the third autumnal sign of the zodiac. The equation of time decreases from −16m 21s to a minimum value of −16m 24s on the 3rd and then increases to −11m 5s at the end of the month (see p. 7). 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 opp. page.

Mercury on the 15th is in R.A. 15h 12m, Decl. 17° 48′ S. and transits at 11.38. It is a morning star until Nov. 18 when it is in superior conjunction with the sun and passes into the evening sky. It is too near the sun for observation during this month.

Venus on the 15th is in R.A. 17h 50m, Decl. 25° 12′ S. and transits at 14.16. It sets about two hours after the sun in the evening sky. Venus is less than 2° south of Jupiter on the 13th.

Mars on the 15th is in R.A. 12h 3m, Decl. 1° 14′ N. and transits at 8.27. It is growing brighter and increasing its apparent distance from the sun in the morning sky.

Jupiter on the 15th is in R.A. 17h 44m, Decl. 23° 15′ S. and transits at 14.06. It is rapidly approaching the sun in the evening sky and during the latter part of the month will be too near the sun to be well observed. 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. 23h 11m, Decl. 7° 38′ S. and transits at 19.32. It is a yellow star of magnitude 1.2, setting about a hour and a half after midnight. On the 20th it reaches a stationary point in its orbit and starts to move eastward again among the stars.

Uranus on the 15th is in R.A. 2h 19m, Decl. 13° 24′ N. and transits at 22.40.

Neptune on the 15th is in R.A. 11h 20m, Decl. 5° 27′ N. and transits at 7.43.

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 17h 45m
Sun.	1							10243
Mon.	2					3	00	20134
Tues.	3							23104
Wed.	4					23	50	30124
Thur.	5	20	28	☾ Last Quarter				3024*
Fri.	6							23104
Sat.	7					20	40	20143
Sun.	8	21	28	☌♆☾	♆ 6° 43′ N.			14023
Mon.	9	1		☿ in Aphelion				d4013
		15	14	☌♂☾	♂ 7° 10′ N.			
Tues.	10					17	30	42130
Wed.	11							43012
Thur.	12	5		Moon in Apogee. Dist. from ⊕, 252,550 mi.				43102
Fri.	13	7		☌☿♃	☿ 1° 52′ S.	14	20	d4230
		19	57	☌☿☾	☿ 3° 16′ N.			
		23	42	● New Moon				
Sat.	14							42013
Sun.	15	8		☿ in ♉				41023
Mon.	16	21	49	☌♃☾	♃ 0° 04′ S.	11	10	40213
Tues.	17	6	00	☌☿☾	☿ 2° 26′ S.			d2104
Wed.	18	6		☌☿☉ Superior				30214
Thur.	19	19		♄ Stationary in R.A.		8	00	31024
Fri.	20							32014
Sat.	21	0		♂ in Aphelion				2034*
		20	19	☽ First Quarter				
Sun.	22					4	40	10234
Mon.	23	5	58	☌♄☾	♄ 8° 03′ S.			02134
Tues.	24							21034
Wed.	25	14		☿ in Aphelion		1	30	3401*
Thur.	26	14	17	☌♁☾	♁ 4° 32′ S.			34102
Fri.	27	9		Moon in Perigee. Dist. from ⊕, 222,400 mi.		22	20	43201
Sat.	28	11	12	○ Full Moon				4203*
Sun.	29							41023
Mon.	30					19	10	40123

Explanation of symbols and abbreviations on p. 4, of time on p. 6

THE SKY FOR DECEMBER, 1936

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 28m to 18h 40m, and its Decl. changes from 21° 45′ S. to its extreme southerly value of 23° 27′ S. on the 22nd and then rises to 23° 08′ S. at the end of the month. At 0h 27m (G.C.T.) on the 22 the sun is at the winter solstice and enters Capricornus, the first winter sign of the zodiac. Winter begins at this time. The length of daylight is at its minimum and changes very slightly for several days (see p. 21). The equation of time changes from −11m 5s at the beginning of the month to +2m 52s at the end (see p. 7). There is an annular eclipse of the sun on the 13th. For details see p. 29.

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

Mercury on the 15th is in R.A. 18h 32m, Decl. 25° 30′ S. and transits at 13.00. It steadily increases its apparent distance from the sun in the evening sky reaching greatest elongation east on the 29th. For a week before and after this date it will be fairly well placed for observation, setting a hour and a half after the sun.

Venus on the 15th is in R.A. 20h 28m, Decl. 21° 21′ S. and transits at 14.54. It is still separating from the sun in the evening sky and brightens from mag. −3.5 to mag. −3.7 during the month.

Mars on the 15th is in R.A. 13h 8m, Decl. 5° 35′ S. and transits at 7.34. It is a red star of magnitude 1.5 rising shortly after midnight on the 15th.

Jupiter on the 15th is in R.A. 18h 12m, Decl. 23° 19′ S. and transits at 12.37. It is too near the sun to be observed during December. Jupiter is in conjunction with the sun on the 27th and passes into the morning sky at this time.

Saturn on the 15th is in R.A. 23h 13m, Decl. 7° 20′ S. and transits at 17.36. It is in quadrature with the sun on the 8th, and sets about midnight at this time. Its brightness is gradually diminishing, the magnitude of Saturn being 1.4 at the end of the month.

Uranus on the 15th is in R.A. 2h 15m, Decl. 13° 5′ N. and transits at 20.38.

Neptune on the 15th is in R.A. 11h 21m, Decl. 5° 20′ N. and transits at 5.46.

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 17h 45m
Tues.	1	9		♀ Greatest Hel. Lat. S.					42103
Wed.	2			.....					
Thur.	3			.....		16	00		
Fri.	4			.....					
Sat.	5	13	20	☾ Last Quarter					
Sun.	6	5	17	☌♆☾	♆ 6° 32′ N.	12	50		
Mon.	7			.....					
Tues.	8	4		□♄☉					
		7	37	☌♂☾	♂ 6° 56′ N.				
Wed.	9	15		Moon in Apogee. Dist. from ⊕, 252,100 mi.		9	40		
Thur.	10	23		□♆☉					
Fri.	11	9		☌☿☋	☿ 2° 18′ S.				
Sat.	12			.....		6	30		
Sun.	13			Annular Eclipse of Sun, see p. 29					
		18	25	● New Moon					
Mon.	14	15	56	☌☋☾	☋ 0° 42′ S.				
Tues.	15	1	43	☌☿☾	☿ 3° 31′ S.	3	20		
		23		☿ Greatest Hel. Lat. S.					
Wed.	16			.....					
Thur.	17	12	07	☌♀☾	♀ 6° 02′ S.				
Fri.	18			.....		0	10		
Sat.	19			.....					
Sun.	20	13	44	☌♄☾	♄ 8° 01′ S.	20	50		
Mon.	21	6	30	☽ First Quarter					
		16		♆ Stationary in R.A.					
		19	27	☉ enters ♑. Winter commences. Long. of ☉, 270°					
Tues.	22			.....					
Wed.	23	22	13	☌♇☾	♇ 4° 36′ S.	17	40		
Thur.	24			.....					
Fri.	25	16		Moon in Perigee. Dist. from ⊕, 225,900 mi.					
Sat.	26			.....		14	30		
Sun.	27	23	00	☽ Full Moon					
		11		☌☋☉					
Mon.	28			.....					
Tues.	29	9		☿ Greatest elongation E., 19° 27′		11	20		
Wed.	30			.....					
Thur.	31			.....					

Explanation of symbols and abbreviations on p. 4, of time on p. 6

Jupiter being near the Sun, phenomena of the Satellites are not given from December 2 to the end of the year

PHENOMENA OF JUPITER'S SATELLITES, 1936

Prepared by ROBERT PETERS

E—Eclipse, O—occultation, T—transit, S—shadow, D—disappearence, R—reappearence
I—ingress. e—egress. The Roman numerals denote the satellites.
75th Meridian Civil Time. (For other times see p. 6.)

JANUARY

d	h	m	Sat.	Phen.	d	h	m	Sat.	Phen.
7	5	53	I	TI		6	31	I	Te
9	5	59	II	Te	25	5	57	II	OR
16	6	11	II	TI	29	5	55	III	Te
18	5	46	III	ED	30	5	21	I	SI
22	6	16	I	ED		6	19	I	TI
23	5	38	I	Se	31	5	50	I	OR

FEBRUARY

d	h	m	Sat.	Phen.	d	h	m	Sat.	Phen.
5	5	53	III	Se	16	4	15	I	OR
7	4	32	I	ED		4	43	III	OR
8	4	57	I	Te	17	4	15	II	SI
	6	38	II	ED	19	3	25	II	OR
10	4	13	II	Se	22	5	29	I	SI
	6	28	II	Te	23	3	57	III	ER
14	6	26	I	ED		6	12	I	OR
15	3	36	I	SI	24	3	19	I	Te
	4	43	I	TI	26	6	4	II	OR
	5	46	I	Se					

MARCH

d	h	m	Sat.	Phen.	d	h	m	Sat.	Phen.
1	4	41	I	ED	17	2	56	I	ED
	5	31	III	ED	18	2	15	I	Se
2	3	4	I	TI		3	30	I	Te
	4	0	I	Se	19	3	19	III	SI
	5	14	I	Te		5	43	III	Se
4	3	35	II	ED	20	3	52	II	SI
5	2	53	III	Te	22	3	9	II	OR
6	3	49	II	Te	24	4	49	I	ED
9	3	44	I	SI	25	1	58	I	SI
	4	58	I	TI		3	12	I	TI
	5	54	I	Se		4	8	I	Se
10	4	30	I	OR		5	22	I	Te
12	4	26	III	TI	26	2	44	I	OR
13	3	48	II	TI	30	2	19	III	OD
	3	52	II	Se		4	51	III	OR
16	5	37	I	SI					

APRIL

d	h	m	Sat.	Phen.	d	h	m	Sat.	Phen.
1	3	51	I	SI	16	4	58	I	ED
	5	3	I	TI	17	1	59	III	Te
2	1	11	I	ED		2	6	I	SI
	4	35	I	OR		3	10	I	TI
3	1	42	I	Te		4	17	I	Se
5	3	8	II	ED	18	2	41	I	OR
6	1	19	III	ED		23	48	I	Te
	3	48	III	ER	21	3	26	II	SI
7	0	38	II	TI	23	2	14	II	OR
	0	53	II	Se	24	1	36	III	Se
	3	14	II	Te		3	5	III	TI
9	3	4	I	ED		3	59	I	SI
10	1	21	I	TI	25	1	19	I	ED
	2	23	I	Se		4	29	I	OR
	3	32	I	Te		23	25	I	TI
11	0	53	I	OR	26	0	39	I	Se
14	0	52	II	SI		1	36	I	Te
	3	4	II	TI	30	0	9	II	ED
	3	28	III	Se		4	36	II	OR

MAY

d	h	m	Sat	Phen.	d	h	m	Sat.	Phen.
1	3	4	III	SI		1	12	I	TI
	23	36	II	Te		2	33	I	Se
2	3	13	I	ED		3	23	I	Te
3	0	21	I	SI	4	0	42	I	OR

MAY—*Cont.*

d	h	m	Sat.	Phen.	d	h	m	Sat.	Phen.
	22	58	III	OR		4	12	I	OR
7	2	44	II	ED		22	37	I	SI
8	23	18	II	TI		23	9	I	TI
9	0	28	II	Se	19	1	5	III	ED
	1	55	II	Te		1	21	I	Te
10	2	15	I	SI		22	39	I	OR
	2	57	I	TI	23	2	59	II	SI
	4	26	I	Se		3	51	II	TI
	23	34	I	ED	24	21	14	II	ED
11	2	28	I	OR	25	0	41	II	OR
	22	55	I	Se		3	22	I	ED
	23	35	I	Te	26	0	31	I	SI
	23	41	III	ER		0	53	I	TI
	23	53	III	OR		2	43	I	Se
12	2	24	III	OR		3	5	I	Te
16	0	25	II	SI		21	50	I	ED
	1	35	II	TI	27	0	23	I	OR
	3	2	II	Se		21	12	I	Se
	4	12	II	Te		21	31	I	Te
17	4	8	I	SI	29	21	30	III	Se
	22	25	II	OR		22	35	III	Te
18	1	28	I	ED	31	23	50	II	ED

JUNE

d	h	m	Sat.	Phen.	d	h	m	Sat.	Phen.
1	2	57	II	OR	16	23	40	II	TI
2	2	25	I	SI		23	58	II	SI
	2	37	I	TI	17	2	16	II	Te
	21	28	II	Se		2	36	II	Se
	21	49	II	Te		3	22	I	OD
	23	44	I	ED	18	0	31	I	TI
3	2	6	I	OR		0	42	I	SI
	20	54	I	SI		2	44	I	Te
	21	3	I	TI		2	54	I	Se
	23	6	I	Se		21	2	II	ER
	23	15	I	Te		21	48	I	OD
4	20	32	I	OR	19	0	12	I	ER
5	22	54	III	SI		21	10	I	Te
	23	23	III	TI		21	24	I	Se
6	1	30	III	Se	23	23	36	III	ER
	1	53	III	Te	24	1	54	II	TI
8	2	26	II	ED		2	32	II	SI
9	21	23	II	SI	25	2	16	I	TI
	21	26	II	TI		2	37	I	SI
10	0	2	II	Se		20	13	II	OD
	0	2	II	Te		23	32	I	OD
	1	38	I	ED		23	39	II	ER
	3	50	I	OR	26	2	6	I	ER
	22	47	I	TI		20	42	I	TI
	22	48	I	SI		21	6	I	SI
11	0	59	I	Te		22	54	I	Te
	1	0	I	Se		23	19	I	Se
	22	18	I	ER	27	20	35	I	ER
13	2	40	III	TI	30	23	0	III	OD
	2	52	III	SI					

JULY

d	h	m	Sat	Phen.	d	h	m	Sat.	Phen.
2	22	31	II	OD		0	56	I	SI
3	1	17	I	OD		20	57	II	SI
	2	17	II	ER		21	29	I	OD
	22	28	I	TI		21	29	III	Se
	23	1	I	SI		22	11	II	Te
4	0	40	I	Te		23	36	II	Se
	1	13	I	Se	12	0	24	I	ER
	21	2	II	Se		20	52	I	Te
	22	29	I	ER		21	37	I	Se
10	0	49	II	OD	18	21	53	II	TI
11	0	14	I	TI					

JULY—*Cont.*

d	h	m	Sat.	Phen.	d	h	m	Sat.	Phen.
	21	59	III	Te		20	51	II	ER
	22	46	III	SI	25	22	56	III	TI
	23	15	I	OD	26	0	14	II	TI
	23	32	II	SI		22	16	I	TI
19	0	30	II	Te		23	15	I	SI
	20	28	I	TI	27	0	28	I	Te
	21	19	I	SI		22	41	I	ER
	22	40	I	Te		23	29	II	ER
	23	32	I	Se	28	19	56	I	Se
20	20	46	I	ER					

AUGUST

d	h	m	Sat.	Phen.	d	h	m	Sat.	Phen.
3	0	6	I	TI		2	59	I	ER
	21	11	II	OD		22	42	III	OR
	21	19	I	OD		23	13	II	Se
4	20	45	I	Te	18	22	16	I	TI
	21	51	I	Se	19	19	28	I	OD
5	20	38	II	Se		20	43	II	TI
	20	48	III	ED		22	54	I	ER
	23	35	III	ER		23	8	II	SI
10	23	9	I	OD	20	20	11	I	Se
	23	39	II	OD	21	20	42	II	ER
11	20	24	I	TI	23	21	30	III	Se
	21	34	I	SI	26	21	20	I	OD
	22	36	I	Te	27	19	54	I	SI
	23	46	I	Se		20	49	I	Te
12	20	2	III	OD		22	6	I	Se
	20	33	II	SI	28	19	18	I	ER
	20	52	II	Te	30	20	16	III	Te

SEPTEMBER

d	h	m	Sat.	Phen.	d	h	m	Sat.	Phen.
3	20	32	I	TI		20	18	II	Te
	21	49	I	SI	17	20	44	III	ED
4	20	36	II	OD	19	18	53	I	TI
	21	12	I	ER		20	9	I	SI
6	20	16	II	Se		21	5	I	Te
	21	32	III	TI	20	19	32	I	ER
10	19	37	III	ER		20	17	II	TI
11	19	38	I	OD	22	20	33	II	ER
12	19	8	I	Te	24	19	41	III	OD
	20	26	I	Se	26	20	50	I	TI
13	20	11	II	SI	28	18	46	I	Se

OCTOBER

d	h	m	Sat.	Phen.	d	h	m	Sat.	Phen.
4	19	57	I	OD	15	19	50	II	SI
5	18	28	I	SI	20	18	25	I	OD
	18	42	III	SI	21	17	59	I	Te
	19	30	I	Te		19	0	I	Se
8	19	57	II	Se	28	17	46	I	Te
12	18	12	III	TI		18	42	I	SI
	19	17	I	TI	29	18	4	I	ER
13	19	45	I	ER	31	18	22	II	OD

NOVEMBER

d	h	m	Sat.	Phen.	d	h	m	Sat.	Phen.
9	18	6	I	Te	18	17	27	II	ER
10	17	39	III	Se	28	17	29	I	OD
16	18	11	II	TI	29	17	33	I	Se

GREATEST EASTERN AND WESTERN ELONGATIONS OF SATURN'S SATELLITES TITAN AND JAPETUS

TITAN

	Eastern			Western	
	d	h		d	h
Jan.	14	4.6	Jan.	6	10.0
	30	5.0		22	10.2
June	6	7.3	May	29	11.9
	22	6.5	June	14	11.3
July	8	5.3		30	10.2
	24	3.7	July	16	8.8
Aug.	9	1.7	Aug.	1	7.0
	24	23.4		17	4.9
Sept.	9	20.9	Sept.	2	2.6
	25	18.4		18	0.2
Oct.	11	16.0	Oct.	3	21.8
	27	14.0		19	19.7
Nov.	12	12.3	Nov.	4	17.9
	28	11.0		20	16.4
Dec.	14	10.2	Dec.	6	15.4
	30	9.8		22	14.7

JAPETUS

	Eastern			Western	
	d	h		d	h
Jan.	20	13.0	May	22	18.2
June	30	6.7	Aug.	10	3.9
Sept.	16	19.8	Oct.	27	9.1
Dec.	4	13.8			

JAPETUS, CONJUNCTION WITH PLANET

	Inferior			Superior	
	d	h		d	h
July	20	16.0	Jan.	1	7.1
Oct.	6	21.1	June	11	4.8
Dec.	25	2.8	Aug.	29	3.6
			Nov.	15	14.5

Stellar mag.: Titan 8.5; Japetus 11

From January until May Jupiter's satellites I, II, III a e eclipsed on the west side of the planet, and from June until November on the east side. In June the satellites reappear quite near the disc, the place of reappearance getting further from the disc until October. Satellite IV is not eclipsed during 1936.

METEORS OR SHOOTING STARS

By Peter M. Millman

Meteors are small fragmentary particles of iron or stone, the debris of space, which, on entering the earth's atmosphere at high velocity, ignite and are in general completely vaporized. On a clear moonless night a single observer should see on the average about 7 meteors per hour during the first six months of the year and approximately twice this number during the second half of the year. The above figures are averages over the whole night, however, and it should be noted that meteors are considerably more numerous during the second half of the night at which time the observer is on the preceding hemisphere of the earth in its journey around the sun.

In addition to the so-called sporadic meteors mentioned above there are well-marked groups of meteors which travel in elliptical orbits about the sun and appear at certain seasons of the year. The meteors of any one group, or shower, move along parallel paths and hence, owing to the laws of perspective, seem to radiate from a point in the sky known as the radiant. The shower is usually named after the constellation in which the radiant is located. Prof. C. P. Olivier, president of the American Meteor Society, has listed the chief meteoric showers of the year as follows:

The Most Important Meteoric Showers of the Year

Shower	Duration in days	Date of maximum (evening date)	Hourly number of all meteors on this date (for one observer)
Quadrantids	4	Jan. 2	28
Lyrids	4	Apr. 21	7
Eta Aquarids	8	May 4	7
Delta Aquarids	3	July 28	27
Perseids	25	Aug. 11	69
Orionids	14	Oct. 19	21
Leonids	7	Nov. 15	21
Geminids	14	Dec. 12	23

In addition to the above dates there are three other periods at which good displays have appeared in certain years. Large number of meteors appeared on June 28, 1916; Oct. 9, 1933; and on Nov. 20 during the latter part of the nineteenth century. These dates should be carefully watched because of the possibility of a reappearance of these showers.

Of recent years the study of meteors has become increasingly important both because of its cosmic significance and because of its close association with studies of the upper atmosphere. The amateur who does not possess a telescope can render more real assistance in this field than in any other. In particular, all observations of very bright meteors or fireballs should be reported immediately in full to an observatory where such objects are being studied. Maps and instructions for meteor observations may be secured from the writer at the Dunlap Observatory, Richmond Hill, Ont.

Important records of meteors may also be made photographically by anyone possessing a camera of speed F 6.3 or better. The Perseids and the Geminids are the best subjects for meteor photography. For more complete details see *Popular Astronomy*, vol. 41, p. 298, 1933.

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 Canum Venat.	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 eyes 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, RS Ophiuchi.
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	Design.	Max.	Min.	Sp.	Period	Type	Date	Discoverer
η Aql	194700	3.7	4.3	G4	7.17668	VIII	1784	Pigott
N Aql	184300	-0.2	10.9	Q	Irr.	I	1918	Bower
ϵ Aur	045443	3.3	4.1	F5p	9900.	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]	0214*o3*	2.0	9.6	M5e	329.5	V	1596	Fabricius
RR Cet	012700	8.4	9.0	F0	0.55304	IX	1906	Oppolzer
R CrB	154428	5.8	13.8	Goe	Irr.	III	1795	Pigott
χ Cyg	194632	4.2	13.4	M7e	408.3	V	1686	Kirch
P Cyg	201437a	3.5	6.0	B1qk	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	VII	1847	Schmidt
η Gem	060822	3.3	4.2	M2	235.15	V	1865	Schmidt
R Gem	070122a	6.5	13.5	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	1324*22*	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	7.1	7.8	A5	0.56684	IX	1901	Fleming
α Ori[2]	054907	0.2	1.2	M2	Irr.	VI	1840	J. Herschel
U Ori	054920	5.4	12.2	M7e	376.1	V	1885	Gore
β Per[3]	030140	2.3	3.5	B8	2.86731	X	1669	Montanari
ρ Per	025838	3.3	4.1	M4	Irr.	VI	1854	Schmidt
R Sge	200916	8.4	10.4	cG7	70.84	VII	1859	Baxendell
R Sct	1842*05*	4.5	9.0	K5e	141.5	VII	1795	Pigott
λ Tau	035512	3.8	4.2	B3	3.95294	X	1848	Baxendell
RV Tau	044126	8.7	11.8	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
N Her	180445	1.5	14.0	Q	Irr.	I	1934	Prentice

[1] o Cet (Mira); [2] α Ori (Betelgeuse); [3] β Per (Algol); [4] α UMi (Polaris).

Most of the data in this Table are from Prager's 1931 *Katalog und Ephemeriden Veranderlicher 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, δ Cephei, is R.A. 22h 25m, 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 discoverer and 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 observations, deduced the parallax of Alpha Centauri to be 0″.75. For a long time this was considered to be the nearest of all the stars in the sky, but in 1913 Innes, director of the Union Observatory, Johannesburg, South Africa, discovered a small 11th mag. star, 2° 13′ from Alpha Centauri, with a large proper motion and 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

By J. A. Pearce

Through the kindness of Dr. Adriaan van Maanen, who has supplied the fundamental data, this table has been revised to contain all stars known to be nearer than five parsecs or 16.3 light-years. One star of the former table, has been discarded, and five new members have been added, making a total of forty stars in a space of 125 cubic parsecs. With the exceptions of Sirius, Procyon and Altair, all the stars are dwarfs; the list including the three white dwarfs, Sirius B, 40 Eridani B, and van Maanen's star. Wolf 359 and Ross 248, are intrinsically the faintest known stars. Forty-five per cent. of the stars are members of binary systems.

Star	α(1900) h m	δ ° ′	Sp	μ ″	π ″	L.y.	m	M	L
Sun	.....	.....	G0				−26.7	4.8	1.0
Groom 34A	0 13	+43 27	M2	2.89	0.274	11.9	8.1	10.3	.0063
Groom 34B	.....	.....	M5	2.85	.271	12.1	10.7	12.9	.0006
van Maanen	0 44	+ 4 55	F3	3.01	.242	13.5	12.3	14.2	.0002
τCeti	1 39	−16 28	G7	1.92	.292	11.2	3.6	5.9	.36
εEri	3 28	− 9 48	K1	0.96	.304	10.7	3.8	6.2	.28
40 Eri A	4 11	− 7 49	K0	4.08	.213	15.3	4.5	6.1	.30
40 Eri B	.....	.....	A0	4.03	.213	15.3	9.7	11.3	.0025
40 Eri C	.....	.....	M6	4.03	.213	15.3	10.8	12.4	.0009
Gould 5h 243	5 08	−44 59	M0	8.70	.264	12.3	9.2	11.3	.0025
αCMa A	6 41	−16 35	A2	1.32	.373	8.7	− 1.6	1.3	25.1
αCMa B	.....	.....	F0	1.32	.373	8.7	8.4	11.3	.0025
αCMi A	7 34	+ 5 29	F4	1.24	.303	10.8	0.5	2.9	5.8
αCMi B	.....	.....	.....	1.24	.303	10.8	12.5	14.9	.00009
Groom 1618	10 05	+49 58	M0	1.45	.230	14.2	6.8	8.6	.030
WB 10h 234	10 14	+20 22	M4e	0.49	.217	15.0	9.0	10.7	.0044
Wolf 359	10 52	+ 7 36	M6e	4.84	.413	7.9	13.5	16.6	.00002
Lal 21185	10 58	+36 38	M2	4.78	.381	8.6	7.6	10.5	.0052
Innes	11 12	−57 02	.....	2.69	.339	9.6	(12.5)	13.2	.0004
αCen A	14 33	−60 25	G5	3.68	.758	4.3	0.3	4.7	1.10
αCen B	.....	.....	K1	3.68	.758	4.3	1.7	6.1	.30
Prox. Cen	14 23	−62 15	M	3.85	.758	4.3	11.0	15.4	.00006
DM−12.4523	16 25	−12 24	M5	1.24	.270	12.1	9.5	11.7	.0017
DM−46.11540	17 21	−46	.....	1.06	.239	13.6	9.4	11.3	.0025
CD−44.11909	17 30	−44	.....	1.14	.215	15.2	(12.9)	12.6	.0008
AO 17415	17 37	+68 26	M4	1.33	.214	15.2	9.1	10.7	.0044
Barnard	17 53	+ 4 25	M5	10.30	.541	6.0	9.7	13.4	.0004
Bu 8798A	18 42	+59 29	M4	2.31	.290	11.2	9.2	11.5	.0021
Bu 8798B	.....	.....	M5	2.31	.290	11.2	9.7	12.0	.0013
αAqu	19 46	+ 8 36	A2	0.66	.207	15.7	0.9	2.5	8.3
61 Cyg A	21 02	+38 15	K8	5.27	.301	10.8	5.6	8.0	.052
61 Cyg B	.....	.....	M0	5.15	.301	10.8	6.3	8.7	.028
Lac 8760	21 11	−39 15	M1	3.53	.255	12.8	6.6	8.6	.030
εIndi	21 56	−57 12	K8	4.70	.288	11.3	4.7	7.0	.13
Kruger 60A	22 24	+57 12	M3	0.87	.247	13.2	9.2	11.2	.0028
Kruger 60B	.....	.....	M4	0.92	.247	13.2	10.8	12.8	.0006
BD+43.4305	22 42	+43 49	M5e	0.86	.217	15.0	9.5	11.2	.0028
Lac 9352	22 59	−36 26	M2	6.90	.274	11.9	7.4	9.6	.012
Ross 248	23 36	+43	M6	1.82	.319	10.2	(13.8)	14.3	.0002
DM−37.15492	23 59	−37 51	M3	6.11	.217	15.0	8.3	10.0	.0083

Note.—Magnitudes in brackets are photographic, all others are visual. A colour index of +2.0 has been taken to compute the visual absolute magnitudes of these stars. *Symbols*: Sp, spectrum; μ, proper motion; π, parallax; L.-y., light-year; m, apparent magnitude; M, absolute magnitude; L, luminosity compared to the sun.

THE BRIGHTEST STARS

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

By W. E. HARPER

The accompanying table contains the principal facts regarding 257 stars brighter than apparent magnitude 3.51 which it is thought may be of interest to our amateur members. The various columns should be self-explanatory but some comments may be in order.

The first column gives the name of the star and if it is preceded by the sign || such means that the star is a visual double and the combined magnitude is entered in the fourth column. Besides the 44 thus indicated there are 12 others on the list with faint companions but for these it is not thought that there is any physical connection. In the case of the 13 stars variable in light this fourth column shows their maximum and minimum magnitudes. The 20 first magnitudes stars are set up in bold face type.

In the fifth column are given the types as revised at various observatories—principally at our own, but omitting the *s* and *n* designations descriptive of the line character. The annual proper motion follows in the next column and these may not necessarily be correct to the third decimal place.

The parallaxes are taken from Schlesinger's Catalogue of Bright Stars, 1930. The distance is given also in light years in the eighth column as to the lay mind that seems a fitting unit. In only one case (α Cygni) was the parallax negative and it was entered as formerly as ″.005. The absolute magnitudes in the ninth column are the magnitudes the stars would have if all were at a uniform distance of 32.6 light years ($\pi = 0.''1$). At that distance the sun would appear as a star of magnitude 4.8.

The radial velocities in the last column have been taken from Vol. 18 of the Lick Publications. An asterisk * following the velocity means that such is variable. In these cases the velocity of the system, if known, is given; otherwise a mean velocity for the observations to date is set down.

Of the 257 stars or star systems here listed 144 are south and 113 north of the equator. This is to be expected from the fact that the northern half of the sky includes less of the Milky Way than the southern.

The number in each spectral class, apart from the one marked peculiar, is as follows: O, 3; B, 72; A, 55; F, 22; G, 43; K, 42 and M, 19. The B-stars are intrinsically luminous and appear in this list out of all proportion to their total number. The stars of Classes A and K are by far the most numerous but the revision of types throws many originally labelled K back into the G group.

From the last column we see that 92 velocities are starred, indicating that 36 per cent. of the bright stars, or at least one in every three, are binary in character. For visual binaries the proportion has usually been listed as one in nine. Our list shows one in six but it is only natural to expect that we would observe a higher proportion among the nearby stars, such as these are on the average.

Other relationships can be established from the list if our amateur members care to study it.

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	A1	.217	.040	81	0.2	−13.0*
β Cassiopeiae	4	+58 36	2.4	F2	.561	.071	46	1.7	+11.4
γ Pegasi	8	+14 38	2.9	B2	.010	.010	326	−2.1	+ 5.0*
β Hydri	20	−77 49	2.9	G0	2.243	.141	23	3.6	+22.8
α Phoenicis	21	−42 51	2.4	G5	.446	.045	72	0.7	+74.6*
δ Andromedae	34	+30 19	3.5	K3	.167	.028	116	0.7	− 7.1*
α Cassiopeiae	35	+55 59	2.2–2.8	G8	.062	.017	192	−1.6	− 3.8
β Ceti	39	−18 32	2.2	G7	.230	.040	81	0.3	+13.1
‖γ Cassiopeiae	51	+60 11	2.2	B0e	.031	.036	91	0.0	− 6.8
‖β Phoenicis	1 2	−47 15	3.4	G4	.042	.021	155	0.0	− 1.2
β Andromedae	4	+35 5	2.4	M0	.219	.044	74	0.6	+ 0.1
δ Cassiopeiae	19	+59 43	2.8	A3	.306	.030	109	0.2	+ 6.8
‖α Ursae Minoris	23	+88 46	2.1	F7	.043	.012	272	−2.3	−17.4*
γ Phoenicis	24	−43 50	3.4	M1	.222	.024	136	0.3	+25.7*
α **Eridani**	34	−57 44	0.6	B9	.093	.045	72	−1.1	+19
ϵ Cassiopeiae	47	+63 11	3.4	B5	.043	.013	251	−1.0	− 8.1
β Arietis	49	+20 19	2.7	A3	.150	.066	49	1.8	− 0.6*
α Hydri	56	−62 3	3.0	A7	.256	.067	49	2.2	+ 7.0*
‖γ Andromedæ	1 58	+41 51	2.3	K0	.073	.015	217	−1.0	−11.7
α Arietis	2 2	+22 59	2.2	K2	.242	.040	81	0.2	−14.3
β Trianguli	4	+34 31	3.1	A6	.161	.027	121	0.2	+10.4*
‖o Ceti	14	− 3 26	1.7–9.6	M6e	.239	.013	251	−2.7	+59.8*
‖θ Eridani	54	−40 42	3.4	A2	.071	.022	148	0.1	+11.9*
α Ceti	57	+ 3 42	2.8	M1	.080	.017	192	−0.1	−25.7
γ Persei	58	+53 7	3.1	F9	.012	.017	192	−0.8	+ 1.0*
ρ Persei	59	+38 27	3.4–4.2	M6	.176	.018	181	−0.3	+28.2
β Persei	3 2	+40 34	2.1–3.2	B8	.011	.025	130	−0.9	+ 5.7*
α Persei	17	+49 30	1.9	F4	.041	.020	163	−1.6	− 2.4
δ Persei	36	+47 28	3.1	B5	.047	.015	217	−1.0	−10.0*
‖η Tauri	41	+23 48	3.0	B5p	.053	.013	251	−1.5	+10.3
ζ Persei	48	+31 35	2.9	B1	.023	.006	543	−3.2	+20.9
γ Hydri	49	−74 33	3.2	M3	.128	.012	272	−1.4	+16.0
‖ϵ Persei	51	+39 43	3.0	B2	.041	.006	543	−3.2	− 6. *
γ Eridani	53	−13 47	3.2	M0	.133	.021	155	−0.2	+61.7
λ Tauri	55	+12 12	3.3–4.2	B3	.015	.006	543	−2.8	+13.0*
α Reticuli	4 13	−62 43	3.4	G5	.069	.022	148	0.1	+35.6

Star	R.A. 1900	Decl. 1900	Mag.	Type	Ann. Proper Motion	Parallax	Distance in Light Years	Abs. Mag.	Rad. Vel.
	h m	° ′			″	″			km./sec.
α **Tauri**	4 30	+16 18	1.1	K8	.205	.057	57	−0.1	+54.1
α Doradus	32	−55 15	3.5	A0p	.003	....	....	.....	+25.6
π^3 Orionis	44	+ 6 47	3.3	F5	.474	.124	26	3.0	+24.6
ι Aurigae	50	+33 0	2.9	K4	.030	.021	155	−0.5	+17.6
ε Aurigae	55	+43 41	3.4–4.1	F2	.015	.006	543	−2.8	− 4.1*
η Aurigae	5 0	+41 6	3.3	B3	.082	.012	272	−1.3	+ 7.8
ε Leporis	1	−22 30	3.3	K5	.074	.026	125	0.4	+ 1.0
β Eridani	3	− 5 13	2.9	A1	.117	.052	63	1.5	− 7.
μ Leporis	8	−16 19	3.3	A0p	.053	.030	109	0.7	+27.7
||α **Aurigae**	9	+45 54	0.2	G1	.439	.068	48	−0.6	+30.2*
||β **Orionis**	10	− 8 19	0.3	B8p	.005	.006	543	−5.8	+23.6*
||η Orionis	19	− 2 29	3.4	B0	.009	.007	466	−2.3	+19.5*
γ Orionis	20	+ 6 16	1.7	B2	.019	.017	192	−2.2	+18.0
β Tauri	20	+28 31	1.8	B8	.180	.035	93	−0.5	+ 8.0
β Leporis	24	−20 50	3.0	G2	.095	.021	155	−0.4	−13.5
||δ Orionis	27	− 0 22	2.4	B0	.006	.009	362	−2.8	+19.9*
α Leporis	28	−17 54	2.7	F6	.006	.017	192	−1.2	+24.7
ι Orionis	31	− 5 59	2.9	O8	.007	.007	466	−2.9	+21.5*
ε Orionis	31	− 1 16	1.8	B0	.004	.008	407	− .73	+25.8
ζ Tauri	32	+21 5	3.0	B3e	.028	.014	233	−1.3	+16.4*
||ζ Orionis	36	− 2 0	1.8	B0	.012	.008	407	−3.4	+18.0
α Columbae	36	−34 8	2.8	B8	.040	.022	148	−0.5	+34.6
κ Orionis	43	− 9 42	2.2	B0	.009	.013	251	−2.2	+20.1
β Columbae	47	−35 48	3.2	K0	.397	.019	172	−0.4	+89.4
α **Orionis**	50	+ 7 23	0.5–1.1	M2	.032	.012	272	−4.1	+21.0*
β Aurigae	52	+44 56	2.1	A0p	.046	.029	112	−0.4	−18.1*
θ Aurigae	53	+37 12	2.7	A1	.106	.032	102	0.2	+28.6
η Geminorum	6 9	+22 32	3.2–4.2	M2	.062	.013	251	−1.2	+21.4*
μ Geminorum	17	+22 34	3.2	M3	.129	.016	204	−0.8	+54.8
β Canis Majoris	18	−17 54	2.0	B1	.003	.012	272	−2.6	+34.4*
α **Carinae**	22	−52 38	−0.9	F0	.022	.016	204	−4.8	+20.5
γ Geminorum	32	+16 29	1.9	A2	.066	.047	69	0.3	−11.3*
ν Puppis	35	−43 6	3.2	B8	.020	.025	130	0.2	+28.2*
ε Geminorum	38	+25 14	3.2	G9	.020	.010	326	−1.8	+ 9.9
ξ Geminorum	40	+13 0	3.4	F5	.230	.048	68	1.8	+25.1
||α **Canis Majoris**	41	−16 35	−1.6	A2	1.315	.375	9	1.3	− 7.5*
α Pictoris	47	−61 50	3.3	A5	.271	....	....	.....	+20.9

Star	R.A. 1900	Decl. 1900	Mag.	Type	Ann. Proper Motion	Parallax	Distance in Light Years	Abs. Mag.	Rad. Vel.
	h m	° ′			″	″			km./sec.
τ Puppis	6 47	−50 30	2.8	G8	.094	.031	105	0.3	+36.4*
‖ϵ Canis Majoris	55	−28 50	1.6	B1	.005	.012	272	−3.0	+27.4
ζ Geminorum	58	+20 43	3.7–4.3	G0p	.007	.004	815	−3.3	+ 6.7*
o^2 Can. Majoris	59	−23 41	3.1	B5p	.000	.007	466	−2.7	+48.6
δ Can. Majoris	7 4	−26 14	2.0	G4p	.005	.010	326	−2.9	+34.3*
L^2 Puppis	10	−44 29	3.4–6.2	M5e	.334	....	....	.....	+53.0
π Puppis	14	−36 55	2.7	K5	.012	.023	142	−0.4	+15.8
β Can. Minoris	22	+ 8 29	3.1	B8	.063	.024	136	0.0	+23.
σ Puppis	26	−43 6	3.3	M0	.192	.027	121	0.4	+88.1
α_2 Geminorum	28	+32 6	2.0	A2	.201	.074	44	1.4	+ 6.0*
α_1 Geminorum	28	+32 6	2.8	A0	.209	.074	44	2.2	−1.2*
‖α **Can. Minoris**	34	+ 5 29	0.5	F5	1.242	.310	10	2.9	− 3.0*
β **Geminorum**	39	+28 16	1.2	G9	.623	.110	30	1.4	+ 3.3
ξ Puppis	45	−24 37	3.5	K1	.007	.004	815	−3.5	+ 3.7*
ζ Puppis	8 0	−39 43	2.3	O8	.036	....	....	.....	−24.
ρ Puppis	3	−24 1	2.9	F6	.097	.016	204	−1.1	+46.6
‖γ Velorum	6	−47 3	2.2	OW9	.002	....	....	.....	+35.
‖ϵ Carinae	20	−59 11	1.7	K0	.032	.014	233	−2.5	+11.5
o Urs. Majoris	22	+61 3	3.5	G2	.166	.011	296	−1.3	+19.8
‖ϵ Hydrae	41	+ 6 47	3.5	F9	.193	.024	136	0.4	+36.8*
δ Velorum	42	−54 20	2.0	A0	.093	.030	109	−0.6	+ 2.2
ζ Hydrae	50	+ 6 20	3.3	G7	.101	.016	204	−0.7	+22.6
ι Urs. Majoris	52	+48 26	3.1	A4	.500	.070	47	2.3	+12.6
λ Velorum	9 4	−43 2	2.2	K4	.022	.018	181	−1.5	+18.4
β Carinae	12	−69 18	1.8	A0	.192	....	....	.....	− 5.
ι Carinae	14	−58 51	2.2	F0	.023	....	....	.....	+13.3
α Lyncis	15	+34 49	3.3	K8	.214	.023	142	0.1	+37.4
κ Velorum	19	−54 35	2.6	B3	.017	.015	217	−1.5	+21.7*
α Hydrae	23	− 8 14	2.2	K4	.036	.016	204	−1.8	− 4.4
θ Urs. Majoris	26	+52 8	3.3	F7	1.096	.060	54	2.2	+15.8
N Velorum	28	−56 36	3.0	K5	.041	.039	84	1.4	−13.9
ϵ Leonis	40	+24 14	3.1	G0	.045	.012	272	−1.4	+ 5.1
‖υ Carinae	45	−64 36	3.1	F0	.019	....	....	.....	+13.6
α **Leonis**	10 3	+12 27	1.3	B6	.244	.055	59	0.0	+ 2.6
q Carinae	14	−60 50	3.4	K5	.045	.012	272	−1.2	+ 8.6
‖γ Leonis	14	+20 21	2.3	G8	.347	.024	136	−0.7	−36.8

Star	R.A. 1900	Decl. 1900	Mag.	Type	Ann. Proper Motion	Parallax	Distance in Light Years	Abs. Mag.	Rad. Vel.
	h m	° ′			″	″			km./sec.
μ Urs. Majoris	10 16	+42 0	3.2	K4	.082	.033	99	0.8	−20.3
θ Carinae	39	−63 52	3.0	B0	.023	.008	407	−2.4	+24. *
η Carinae	41	−59 10	1.0-7.4	Pec.	.007	....	....	.....	−25.0
μ Velorum	42	−48 54	2.8	G5	.084	.028	116	0.1	+ 6.9
ν Hydrae	45	−15 40	3.3	K3	.214	.033	99	0.9	−1..0
β Urs. Majoris	56	+56 55	2.4	A3	.089	.043	76	0.6	−12.1*
α Urs. Majoris	58	+62 17	2.0	G5	.137	.030	109	−0.7	− 8.6
ψ Urs. Majoris	11 4	+45 2	3.2	K0	.067	.044	74	1.4	− 3.6
δ Leonis	9	+21 4	2.6	A2	.208	.072	45	1.9	−23.2
θ Leonis	9	+15 59	3.4	A2	.103	.025	130	0.4	+ 7.8
λ Centauri	31	−62 28	3.3	B9	.046	.022	148	0.0	+ 7.9
β Leonis	44	+15 8	2.2	A2	.507	.095	34	2.1	− 2.3
γ Urs. Majoris	49	+54 15	2.5	A0	.095	.041	79	0.6	−11.1
δ Centauri	12 3	−50 10	2.9	B3e	.044	.018	181	−0.8	+ 9.
ϵ Corvi	5	−22 4	3.2	K2	.063	.027	121	−0.4	+ 4.9
δ Crucis	10	−58 12	3.1	B3	.051	....	....	.....	+26.4
δ Urs. Majoris	10	+57 35	3.4	A0	.113	.044	74	1.7	−12.
γ Corvi	11	−16 59	2.8	B8	.159	.021	155	−0.6	− 4.2*
α^1 Crucis	21	−62 33	1.6	B1	.048	.015	217	−2.5	−12.2*
α^2 Crucis	21	−62 32	2.1	B3	.048	.015	217	−2.0	+ 0.3*
||δ Corvi	25	−15 58	3.1	A0	.249	.030	109	0.5	+ 8.7
γ Crucis	26	−56 33	1.5	M4	.270	....	....	.....	+21.3
β Corvi	29	−22 51	2.8	G5	.061	.020	163	−0.6	− 7.7
α Muscae	31	−68 35	2.9	B5	.038	.012	272	−1.7	+18.
||γ Centauri	36	−48 24	2.4	A0	.200	.032	102	−0.1	− 7.5
||γ Virginis	36	− 0 54	2.9	F0	.561	.085	38	2.6	−19.6
β Muscae	40	−67 34	3.3	B3	.041	.014	233	−1.0	+42. *
β Crucis	42	−59 9	1.5	B1	.054	.011	296	−3.3	+20.0
ϵ Urs. Majoris	50	+56 30	1.7	A2	.117	.045	72	0.0	−11.9*
||α Can. Venat.	51	+38 51	2.8	A1	.233	.025	130	−0.1	− 3.6*
ϵ Virginis	57	+11 30	3.0	G6	.270	.034	96	0.6	−14.0
γ Hydrae	13 13	−22 39	3.3	G7	.085	.017	192	−0.5	− 5.4
ι Centauri	15	−36 11	2.9	A2	.351	....	....	.....	+ 0.1
||ζ^1 Urs. Majoris	20	+55 27	2.4	A2p	.131	.043	76	0.6	− 9.9*
α **Virginis**	20	−10 38	1.2	B2	.051	.017	192	−2.6	+ 1.6*
ζ Virginis	30	− 0 5	3.4	A2	.285	.036	91	1.2	−13.1

Star	R.A. 1900	Decl. 1900	Mag.	Type	Ann. Proper Motion	Parallax	Distance in Light Years	Abs. Mag.	Rad. Vel.
	h m	° ′			″	″			km./sec
ϵ Centauri	13 34	−52 57	2.6	B2	.040	.013	251	−1.9	+ 5.6
η Urs. Majoris	44	+49 49	1.9	B3	.116	.013	251	−2.5	−10.9
μ Centauri	44	−41 59	3.3	B3e	.030	....	.....	.....	+12.6
ζ Centauri	49	−46 48	3.1	B3	.079	.010	326	−1.9	*
η Boötis	50	+18 54	2.8	G1	.370	.100	33	2.8	− 0.2*
β **Centauri**	57	−59 53	0.9	B3	.039	.020	163	−2.6	+12.0*
π Hydrae	14 1	−26 12	3.5	K3	.165	.036	91	−1.3	+27.2
θ Centauri	1	−35 53	2.3	G8	.748	.067	49	−1.4	+ 1.3
α **Boötis**	11	+19 42	0.2	K0	2.287	.085	38	−0.1	− 5.1
γ Boötis	28	+38 45	3.0	A3	.182	.058	56	1.8	−35.5
η Centauri	29	−41 43	2.6	B3e	.052	.016	204	−1.3	− 0.2
‖α **Centauri**	33	−60 25	0.1	G0	3.682	.760	4	4.7	−22.2
α Circini	34	−64 32	3.4	F0	.312	.070	47	2.6	+ 7.4
α Lupi	35	−46 58	2.9	B2	.036	.009	362	−2.3	+ 7.3*
‖ϵ Boötis	41	+27 30	2.7	G8	.045	.018	181	−1.0	+16.4
‖α^2 Librae	45	−15 38	2.9	F1	.129	.073	45	2.2	−10. *
β Urs. Minoris	51	+74 34	2.2	K4	.028	.035	93	0.0	+16.9
β Lupi	52	−42 44	2.8	B3	.066	.012	272	−1.8	− 0.3*
κ Centauri	53	−41 42	3.4	B2	.037	.009	362	−1.9	+ 9.1*
σ Librae	58	−24 53	3.4	M4	.094	.024	136	0.3	− 4.3
ζ Lupi	15 5	−51 43	3.5	G5	.132	.017	192	−0.4	− 9.7
γT Australis	10	−68 19	3.1	A0	.064	....	.....	.....	0.
β Librae	12	− 9 1	2.7	B8	.108	.024	136	−0.4	−37. *
δ Lupi	15	−40 17	3.4	B3	.032	.010	326	−1.6	+ 1.6
γ Urs. Minoris	21	+72 11	3.1	A2	.017	.042	78	1.3	− 3.9*
ι Draconis	23	+59 19	3.5	K3	.010	.031	105	0.9	−11.1
‖γ Lupi	28	−40 50	3.0	B3	.042	.016	204	−1.0	+ 6.
α Cor. Borealis	30	+27 3	2.3	A0	.160	.044	74	0.5	+ 1.0*
α Serpentis	39	+ 6 44	2.8	K3	.142	.045	72	1.0	+ 3.0
βT Australis	46	−63 7	3.0	F0	.440	.090	36	2.8	− 0.3
π Scorpii	53	−25 50	3.0	B3	.042	.012	272	−1.6	− 3.0*
δ Scorpii	54	−22 20	2.5	B1	.042	.011	296	−2.3	−16. *
‖β Scorpii	16 0	−19 32	2.8	B3	.041	.005	652	−1.4	− 9.3*
δ Ophiuchi	9	− 3 26	3.3	K8	.159	.029	112	0.4	−19.8
ϵ Ophiuchi	13	− 4 27	3.3	G9	.088	.030	109	0.7	−10.3
‖σ Scorpii	15	−25 21	3.1	B1	.033	.007	466	−2.7	− 0.4*
‖η Draconis	23	+61 44	2.9	G5	.062	.038	86	0.8	−14.3

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 **Scorpii**	16 23	−26 12	1.2	M1	.032	.020	163	−2.3	− 3.2*
β Herculis	26	+21 42	2.8	G4	.104	.021	155	−0.6	−25.8*
τ Scorpii	30	−28 1	2.9	B1	.042	.007	466	−2.9	+ 0.6
ζ Ophiuchi	32	−10 22	2.7	B0	.024	.009	362	−2.5	−19. *
‖ζ Herculis	38	+31 47	3.0	G0	.601	.106	31	3.1	−70.8*
αT Australis	38	−68 51	1.9	K5	.034	.030	109	−0.7	− 3.7
ε Scorpii	44	−34 7	2.4	G9	.668	.040	81	0.4	− 2.5
μ^1 Scorpii	45	−37 53	3.1	B3	.032	.012	272	−1.5	*
ζ Arae	50	−55 50	3.1	K5	.047	.021	155	−0.3	− 6.0
κ Ophiuchi	53	+ 9 32	3.4	K3	.296	.037	88	1.3	−55.6
‖η Ophiuchi	17 5	−15 36	2.6	A2	.094	.036	91	0.4	− 1.0
η Scorpii	5	−43 6	3.4	A7	.294	.069	47	2.6	−28.4
ζ Draconis	8	+65 50	3.2	B8	.023	.026	125	0.3	−14.1
‖α Herculis	10	+14 30	3.1-3.9	M7	.030	.007	466	−2.7	−32.5
δ Herculis	11	+24 57	3.2	A2	.164	.036	91	0.9	−39. *
π Herculis	12	+36 55	3.4	K3	.021	.022	148	0.1	−25.7
θ Ophiuchi	16	−24 54	3.4	B2	.030	.009	362	−1.9	− 3.6
β Arae	17	−55 26	2.8	K1	.035	.017	192	−1.0	− 0.4
υ Scorpii	24	−37 13	2.8	B3	.040	.010	326	−2.2	+18. *
α Arae	24	−49 48	3.0	B3e	.085	.017	192	−0.9	− 2.2
λ Scorpii	27	−37 2	1.7	B2	.040	.016	204	−2.3	0. *
β Draconis	28	+52 23	3.0	G0	.012	.008	407	−2.5	−20.1
θ Scorpii	30	−42 56	2.0	F0	.010	....	....	.....	+ 1.4
α Ophiuchi	30	+12 38	2.1	A0	.264	.052	63	0.7	+15. *
κ Scorpii	36	−38 58	2.5	B3	.032	.011	296	−2.3	−10. *
β Ophiuchi	38	+ 4 37	2.9	K2	.157	.036	91	0.7	−11.9
ι^1 Scorpii	41	−40 5	3.1	F8	.004	.007	466	−2.6	−27.6
‖μ Herculis	43	+27 47	3.5	G5	.817	.112	29	3.7	−16.1
G Scorpii	43	−37 1	3.2	K2	.068	.028	116	0.5	+24.7
ν Ophiuchi	54	− 9 46	3.5	G7	.118	.023	142	0.3	+12.4
γ Draconis	54	+51 30	2.4	K5	.026	.028	116	−0.3	−27.8
γ Sagittarii	59	−30 26	3.1	K0	.206	.041	79	−1.1	+22.3*
η Sagittarii	18 11	−36 48	3.2	M4	.223	.032	102	0.7	+ 0.5
δ Sagittarii	15	−29 52	2.8	K4	.042	.035	93	0.6	−20.0
η Serpentis	16	− 2 55	3.4	G9	.898	.060	54	2.3	+ 8.9
ε Sagittarii	18	−34 26	2.0	A0	.139	....	....	.....	−10.8
λ Sagittarii	22	25 29	2.9	K1	.197	.048	68	−1.4	−43.3
α **Lyrae**	34	+38 41	0.1	A1	.348	.123	26	0.6	−13.8

Star	R.A. 1900	Decl. 1900	Mag.	Type	Ann. Proper Motion	Parallax	Distance in Light Years	Abs. Mag.	Rad. Vel.
	h m	° ′			″	″			km./sec.
ϕ Sagittarii	18 39	−27 6	3.3	B8	.053	.018	181	−0.4	+21.5*
‖β Lyrae	46	+33 15	3.4–4.1	B2p	.011	.003	1086	−4.2	−19.0*
σ Sagittarii	49	−26 25	2.1	B3	.081	.018	181	−1.6	−10.7
γ Lyrae	55	+32 33	3.3	B9p	.010	.016	204	−0.7	−21.5*
‖ζ Sagittarii	56	−30 1	2.7	A2	.026	.036	91	0.5	+22.1
τ Sagittarii	19 1	−27 49	3.4	K0	.265	.043	76	1.6	+45.4*
ζ Aquilae	1	+13 43	3.0	A0	.103	.037	88	0.9	−25. *
π Sagittarii	4	−21 11	3.0	F2	.041	.022	148	−0.3	− 9.8
δ Draconis	13	+67 29	3.2	G8	.135	.032	102	0.8	+24.8
δ Aquilae	21	+ 2 55	3.4	A3	.267	.057	57	2.2	−32.3*
‖β Cygni	27	+27 45	3.2	K0	.010	.020	163	0.3	−23.9*
γ Aquilae	42	+10 22	2.8	K3	.018	.023	142	−0.4	− 2.0
‖δ Cygni	42	+44 53	3.0	A1	.067	.034	96	0.6	−20.
α Aquilae	46	+ 8 36	0.9	A2	.659	.200	16	2.4	−26.1
θ Aquilae	20 6	− 1 7	3.4	A0	.035	.017	192	−0.5	−28.6*
‖β Capricorni	15	−15 6	3.2	F8	.042	.017	192	−0.6	−19.0*
α Pavonis	18	−57 3	2.1	B3	.090	.013	251	−2.3	+ 1.8*
γ Cygni	19	+39 56	2.3	F8	.006	.007	466	−3.4	− 7.6
α Indi	31	−47 38	3.2	G2	.072	.036	91	1.0	− 1.1
α Cygni	38	+44 55	1.3	A2p	.004	.005	652	−5.2	− 6.3*
ϵ Cygni	42	+33 36	2.6	G7	.485	.045	72	0.9	−10.5*
ζ Cygni	21 9	+29 49	3.4	G6	.061	.018	181	−0.3	+16.9*
α Cephei	16	+62 10	2.6	A2	.163	.078	42	2.1	− 8.
β Aquarii	26	− 6 1	3.1	G1	.020	.006	543	−3.0	+ 6.7
β Cephei	27	+70 7	3.3	B1	.013	.008	407	−2.2	− 7.2*
ϵ Pegasi	39	+ 9 25	2.5	K2	.028	.020	163	−1.0	+ 5.2
δ Capricorni	42	−16 35	3.0	A3	.395	.095	34	2.9	− 6.4*
γ Gruis	48	−37 50	3.2	B8	.108	.018	181	−0.6	− 2.1
α Aquarii	22 1	− 0 48	3.2	G0	.018	.007	466	−2.6	+ 7.6
α Gruis	2	−47 27	2.2	B5	.200	.028	116	−0.6	+11.8
α Tucanae	12	−60 45	2.9	K5	.085	.023	142	−0.3	+42.2*
β Gruis	37	−47 24	2.2	M6	.132	.015	217	−1.9	+ 1.6
η Pegasi	38	+29 42	3.1	G1	.039	.013	251	−1.3	+ 4.4*
α P Australis	52	−30 9	1.3	A3	.367	.122	26	1.7	+ 6.5
β Pegasi	59	+27 32	2.6	M3	.235	.020	163	−0.9	+ 8.6
α Pegasi	59	+14 40	2.6	A0	.077	.034	96	0.2	− 4. *
γ Cephei	23 35	+77 4	3.4	K1	.167	.069	47	2.6	−42.0

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