THE OBSERVER'S HANDBOOK FOR 1942

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C. A. CHANT, Editor
F. S. HOGG, Assistant Editor
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1942 CALENDAR 1942

JANUARY

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

FEBRUARY

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

MARCH

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

APRIL

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

MAY

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

JUNE

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

JULY

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

AUGUST

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

SEPTEMBER

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

OCTOBER

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

NOVEMBER

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

DECEMBER

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

JULIAN DAY CALENDAR, 1942

J.D. 2,430,000 plus the following:

Jan. 1..........361	May 1..........481	Sept. 1..........604
Feb. 1..........392	June 1..........512	Oct. 1..........634
Mar. 1..........420	July 1..........542	Nov. 1..........665
Apr. 1..........451	Aug. 1..........573	Dec. 1..........695

The Julian Day commences at noon.
Thus J.D. 2,430,361 = Jan. 1.5 G.C.T.

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PRINTED IN CANADA

PREFACE

The HANDBOOK for 1942 is the thirty-fourth issue. Its chief changes from that of last year are: (1) On pages 17 to 23 the times of moonrise and moonset are given for each day of the year for four latitudes. This information has been prepared in response to a request from instructors in the Air Force; (2) A table of meteorological information for stations in Europe and Asia is given on page 3 of the cover.

In order to make room for the moonrise and moonset tables it has been necessary to omit the pages ordinarily devoted to Lunar Occultations, Variable Stars and Distances of the Stars. For the latter two subjects reference may be made to previous issues.

Four circular star maps, 9 inches in diameter, are obtainable from the Director of University Extension, University of Toronto, for one cent each. For fuller information reference may be made to Norton's *Star Atlas and Reference Handbook* (Gall and Inglis, price 12*s* 6*d*; supplied also by Eastern Science Supply Co., Boston, Mass.). The seventh edition (1940) contains greatly extended lists of double and variable stars, and clusters and nebulae.

For the preparation of this volue Dr. F. S. Hogg, Assistant Editor, is largely responsible; but hearty thanks are due to those whose names are mentioned in the book, especially to Miss Ruth J. Northcott and to other members of the staff of the David Dunlap Obserfatory for their assistance.

C. A. CHANT.

David Dunlap Observatory,
Richmond Hill, Ont., December 1941.

ANNIVERSARIES AND FESTIVALS 1942

New Year's Day	Thu.	Jan.	1
Epiphany	Tue.	Jan.	6
Septuagesima Sunday		Feb.	1
Quinquagesima (Shrove Sunday)		Feb.	15
Ash Wednesday		Feb.	18
St. David	Sun.	Mar.	1
St. Patrick	Tue.	Mar.	17
Palm Sunday		Mar.	29
Good Friday		Apr.	3
Easter Sunday		Apr.	5
St. George	Thu.	Apr.	23
Rogation Sunday		May	10
Ascension Day	Thu.	May	14
Pentecost (Whit Sunday)		May	24
Empire Day (Victoria Day)	Sun.	May	24
Birthday of the Queen Mother, Mary (1867)	Tue.	May	26
Trinity Sunday		May	31
Corpus Christi	Thu.	Jun.	4
St. John Baptist (Midsummer Day)	Wed.	Jun.	24
Dominion Day	Wed.	Jul.	1
Birthday of Queen Elizabeth (1900)	Tue.	Aug.	4
Labour Day	Mon.	Sep.	7
Hebrew New Year (Rosh Hashanah)	Sat.	Sep.	12
St. Michael (Michaelmas Day)	Tue.	Sep.	29
All Saints' Day	Sun.	Nov.	1
Remembrance Day	Wed.	Nov.	11
First Sunday in Advent		Nov.	29
St. Andrew	Mon.	Nov.	30
Ascension of King George VI (1936)	Fri.	Dec.	11
Birthday of King George VI (1895)	Mon.	Dec.	14
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.	♇ Pluto

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

Α, α,	Alpha.	Ι, ι,	Iota.	Ρ, ρ,	Rho.
Β, β,	Beta.	Κ, κ,	Kappa.	Σ, σ, ς,	Sigma.
Γ, γ,	Gamma.	Λ, λ,	Lambda.	Τ, τ,	Tau.
Δ, δ,	Delta.	Μ, μ,	Mu.	Υ, υ,	Upsilon.
Ε, ε,	Epsilon.	Ν, ν,	Nu.	Φ, ϕ,	Phi.
Ζ, ζ,	Zeta.	Ξ, ξ,	Xi.	Χ, χ,	Chi.
Η, η,	Eta.	Ο, ο,	Omicron.	Ψ, ψ,	Psi.
Θ, θ, ϑ,	Theta.	Π, π,	Pi.	Ω, ω,	Omega.

THE CONFIGURATIONS OF JUPITER'S SATELLITES

In the Configurations of Jupiter's Satellites (pages 27, 29, 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.

THE CONSTELLATIONS

Latin and English Names with Abbreviations

Andromeda, (*Chained Maiden*)	And	Andr
Antlia, *Air Pump*	Ant	Antl
Apus, *Bird of Paradise*	Aps	Apus
Aquarius, *Water-bearer*	Aqr	Aqar
Aquila, *Eagle*	Aql	Aqil
Ara, *Altar*	Ara	Arae
Aries, *Ram*	Ari	Arie
Auriga, (*Charioteer*)	Aur	Auri
Bootes, (*Herdsman*)	Boo	Boot
Caelum, *Chisel*	Cae	Cael
Camelopardalis, *Giraffe*	Cam	Caml
Cancer, *Crab*	Cnc	Canc
Canes Venatici, *Hunting Dogs*	CVn	CVen
Canis Major, *Greater Dog*	CMa	CMaj
Canis Minor, *Lesser Dog*	CMi	CMin
Capricornus, *Sea-goat*	Cap	Capr
Carina, *Keel*	Car	Cari
Cassiopeia, (*Lady in Chair*)	Cas	Cass
Centaurus, *Centaur*	Cen	Cent
Cepheus, (*King*)	Cep	Ceph
Cetus, *Whale*	Cet	Ceti
Chamaeleon, *Chamaeleon*	Cha	Cham
Circinus, *Compasses*	Cir	Circ
Columba, *Dove*	Col	Colm
Coma Berenices, *Berenice's Hair*	Com	Coma
Corona Australis, *Southern Crown*	CrA	CorA
Corona Borealis, *Northern Crown*	CrB	CorB
Corvus, *Crow*	Crv	Corv
Crater, *Cup*	Crt	Crat
Crux, (*Southern*) *Cross*	Cru	Cruc
Cygnus, *Swan*	Cyg	Cygn
Delphinus, *Dolphin*	Del	Dlph
Dorado, *Swordfish*	Dor	Dora
Draco, *Dragon*	Dra	Drac
Equuleus, *Little Horse*	Equ	Equl
Eridanus, *River Eridanus*	Eri	Erid
Fornax, *Furnace*	For	Forn
Gemini, *Twins*	Gem	Gemi
Grus, *Crane*	Gru	Grus
Hercules, (*Kneeling Giant*)	Her	Herc
Horologium, *Clock*	Hor	Horo
Hydra, *Water-snake*	Hya	Hyda
Hydrus, *Sea-serpent*	Hyi	Hydi
Indus, *Indian*	Ind	Indi
Lacerta, *Lizard*	Lac	Lacr
Leo, *Lion*	Leo	Leon
Leo Minor, *Lesser Lion*	LMi	LMin
Lepus, *Hare*	Lep	Leps
Libra, *Scales*	Lib	Libr
Lupus, *Wolf*	Lup	Lupi
Lynx, *Lynx*	Lyn	Lync
Lyra, *Lyre*	Lyr	Lyra
Mensa, *Table* (*Mountain*)	Men	Mens
Microscopium, *Microscope*	Mic	Micr
Monoceros, *Unicorn*	Mon	Mono
Musca, *Fly*	Mus	Musc
Norma, *Square*	Nor	Norm
Octans, *Octant*	Oct	Octn
Ophiuchus, *Serpent-bearer*	Oph	Ophi
Orion, (*Hunter*)	Ori	Orio
Pavo, *Peacock*	Pav	Pavo
Pegasus, (*Winged Horse*)	Peg	Pegs
Perseus, (*Champion*)	Per	Pers
Phoenix, *Phoenix*	Phe	Phoe
Pictor, *Painter*	Pic	Pict
Pisces, *Fishes*	Psc	Pisc
Piscis Australis, *Southern Fish*	PsA	PscA
Puppis, *Poop*	Pup	Pupp
Pyxis, *Compass*	Pyx	Pyxi
Reticulum, *Net*	Ret	Reti
Sagitta, *Arrow*	Sge	Sgte
Sagittarius, *Archer*	Sgr	Sgtr
Scorpius, *Scorpion*	Scr	Scor
Sculptor, *Sculptor*	Scl	Scul
Scutum, *Shield*	Sct	Scut
Serpens, *Serpent*	Ser	Serp
Sextans, *Sextant*	Sex	Sext
Taurus, *Bull*	Tau	Taur
Telescopium, *Telescope*	Tel	Tele
Triangulum, *Triangle*	Tri	Tria
Triangulum Australe, *Southern Triangle*	TrA	TrAu
Tucana, *Toucan*	Tuc	Tucn
Ursa Major, *Greater Bear*	UMa	UMaj
Ursa Minor, *Lesser Bear*	UMi	UMin
Vela, *Sails*	Vel	Velr
Virgo, *Virgin*	Vir	Virg
Volans, *Flying Fish*	Vol	Voln
Vulpecula, *Fox*	Vul	Vulp

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

MISCELLANEOUS ASTRONOMICAL DATA

Units of Length

1 Angstrom unit = 10^{-8} cm.
1 micron = 10^{-4} cm.
1 meter = 10^{2} cm. = 3.28084 feet
1 kilometer = 10^{5} cm. = 0.62137 miles
1 mile = 1.60935×10^{5} cm. = 1.60935 km.
1 astronomical unit = 1.49504×10^{13} cm. = 92,897,416 miles
1 light year = 9.463×10^{17} cm. = 5.880×10^{12} miles = 0.3069 parsecs
1 parsec = 30.84×10^{17} cm. = 19.16×10^{12} miles = 3.259 l.y.
1 megaparsec = 30.84×10^{23} cm. = 19.16×10^{18} miles = 3.259×10^{6} l.y.

Units of Time

Sidereal day = 23*h* 56*m* 04.09*s* of mean solar time
Mean solar day = 24*h* 03*m* 56.56*s* of sidereal time
Synodical month = 29*d* 12*h* 44*m*; sidereal month = 27*d* 07*h* 43*m*
Tropical year (ordinary) = 365*d* 05*h* 48*m* 46*s*
Sidereal year = 365*d* 06*h* 09*m* 10*s*
Eclipse year = 346*d* 14*h* 53*m*

The Earth

Equatorial radius, a = 3963.35 miles; flattening, c = $(a-b)/a = 1/297.0$
Polar radius, b = 3950.01 miles
1° of latitude = $69.057 - 0.349 \cos 2\phi$ miles (at latitude ϕ)
1° of longitude = $69.232 \cos \phi - 0.0584 \cos 3\phi$ miles
Mass of earth = 6.6×10^{21} tons; velocity of escape from $\oplus$ = 6.94 miles/sec.

Earth's Orbital Motion

Solar parallax = 8.″80; constant of aberration = 20.″47
Annual general precession = 50.″26; obliquity of ecliptic = 23° 26′ 50″ (1939)
Orbital velocity = 18.5 miles/sec.; parabolic velocity at $\oplus$ = 26.2 miles/sec.

Solar Motion

Solar apex, R.A. 18*h* 04*m*; Dec. + 31°
Solar velocity = 12.2 miles/sec.

The Galactic System

North pole of galactic plane R.A. 12*h* 40*m*, Dec. + 28° (1900)
Centre, 325° galactic longitude, = R.A. 17*h* 24*m*, Dec. −30°
Distance to centre = 10,000 parsecs; diameter = 30,000 parsecs.
Rotational velocity (at sun) = 262 km./sec.
Rotational period (at sun) = 2.2×10^{8} years
Mass = 2×10^{11} solar masses

Extragalactic Nebulae

Red shift = +530 km./sec./megaparsec = +101 miles /sec./million l.y.

Radiation Constants

Velocity of light = 299,774 km./sec. = 186,271 miles/sec.
Solar constant = 1.93 gram calories/square cm./minute
Light ratio for one magnitude = 2.512; log ratio = 0.4000
Radiation from a star of zero apparent magnitude = 3×10^{-6} meter candles
Total energy emitted by a star of zero absolute magnitude = 5×10^{25} horsepower

Miscellaneous

Constant of gravitation, G = 6.670×10^{-8} c.g.s. units
Mass of the electron, m = 9.035×10^{-28} gm.; mass of the proton = 1.662×10^{-24} gm.
Planck's constant, h = 6.55×10^{-27} erg. sec.
Loschmidt's number = 2.705×10^{19} molecules/cu. cm. of gas at N.T.P.
Absolute temperature = T° K = T°C + 273° = 5/9 (T° F + 459°)

1 radian = 57°.2958
= 3437′.75
= 206,265″

π = 3.141,592,653,6
No. of square degrees in the sky = 41,253

1942 EPHEMERIS OF THE SUN AT 0h GREENWICH CIVIL TIME

Date	Apparent R.A.	Corr. to Sundial	Apparent Dec.
	h m s	m s	° ′
Jan. 1	18 43 17	+03 14	−23 04.3
" 4	18 56 31	+04 38	−22 48.5
" 7	19 09 41	+05 58	−22 28.7
" 10	19 22 47	+07 15	−22 04.9
" 13	19 35 48	+08 27	−21 37.1
" 16	19 48 45	+09 33	−21 05.6
" 19	20 01 35	+10 33	−20 30.5
" 22	20 14 18	+11 27	−19 51.9
" 25	20 26 54	+12 14	−19 10.0
" 28	20 39 23	+12 53	−18 24.9
" 31	20 51 45	+13 25	−17 36.8
Feb. 3	21 03 59	+13 50	−16 45.9
" 6	21 16 06	+14 07	−15 52.4
" 9	21 28 06	+14 17	−14 56.4
" 12	21 39 59	+14 20	−13 58.2
" 15	21 51 45	+14 17	−12 57.8
" 18	22 03 25	+14 07	−11 55.6
" 21	22 14 58	+13 50	−10 51.7
" 24	22 26 25	+13 28	−09 46.3
" 27	22 37 46	+13 00	−08 39.5
Mar. 2	22 49 03	+12 26	−07 31.6
" 5	23 00 14	+11 48	−06 22.7
" 8	23 11 22	+11 06	−05 13.1
" 11	23 22 27	+10 21	−04 02.8
" 14	23 33 28	+09 33	−02 52.0
" 17	23 44 28	+08 43	−01 41.0
" 20	23 55 25	+07 51	−00 29.8
" 23	00 06 21	+06 57	+00 41.3
" 26	00 17 16	+06 02	+01 52.1
" 29	00 28 10	+05 07	+03 02.6
Apr. 1	00 39 05	+04 12	+04 12.6
" 4	00 50 01	+03 18	+05 21.8
" 7	01 00 58	+02 26	+06 30.2
" 10	01 11 57	+01 35	+07 37.7
" 13	01 22 59	+00 47	+08 43.9
" 16	01 34 03	+00 02	+09 48.9
" 19	01 45 11	−00 40	+10 52.4
" 22	01 56 22	−01 19	+11 54.3
" 25	02 07 36	−01 54	+12 54.5
" 28	02 18 55	−02 24	+13 52.7
May 1	02 30 19	−02 51	+14 48.8
" 4	02 41 47	−03 12	+15 42.8
" 7	02 53 20	−03 29	+16 34.4
" 10	03 04 59	−03 40	+16 23.5
" 13	03 16 43	−03 46	+18 10.1
" 16	03 28 32	−03 46	+18 53.9
" 19	03 40 26	−03 42	+19 34.8
" 22	03 52 25	−03 32	+20 12.7
" 25	04 04 29	−03 18	+20 47.6
" 28	04 16 37	−03 00	+21 19.2
" 31	04 28 49	−02 37	+21 47.4
June 3	04 41 05	−02 11	+22 12.3
" 6	04 53 25	−01 41	+22 33.7
" 9	05 05 47	−01 08	+22 51.6
" 12	05 18 13	−00 32	+23 05.8
" 15	05 30 40	+00 05	+23 16.4
" 18	05 43 08	+00 44	+23 23.3
" 21	05 55 37	+01 23	+23 26.4
" 24	06 08 06	+02 02	+23 25.9
" 27	06 20 34	+02 40	+23 21.6
" 30	06 33 00	+03 17	+23 13.6

Date	Apparent R.A.	Corr. to Sundial	Apparent Dec.
	h m s	m s	° ′
July 3	06 45 25	+03 52	+23 02.0
" 6	06 57 47	+04 25	+22 46.8
" 9	07 10 06	+04 54	+22 28.0
" 12	07 22 22	+05 20	+22 05.7
" 15	07 34 34	+05 43	+21 40.0
" 18	07 46 42	+06 01	+21 10.9
" 21	07 58 44	+06 14	+20 38.6
" 24	08 10 42	+06 21	+20 03.2
" 27	08 22 34	+06 24	+19 24.8
" 30	08 34 20	+06 21	+18 43.5
Aug. 2	08 46 02	+06 12	+17 59.5
" 5	08 57 38	+05 59	+17 12.8
" 8	09 09 09	+05 40	+16 23.5
" 11	09 20 34	+05 16	+15 31.9
" 14	09 31 55	+04 47	+14 38.1
" 17	09 43 10	+04 12	+13 42.1
" 20	09 54 21	+03 33	+12 44.2
" 23	10 05 27	+02 50	+11 44.5
" 26	10 16 29	+02 02	+10 43.1
" 29	10 27 27	+01 11	+09 40.2
Sept. 1	10 38 22	+00 16	+08 35.9
" 4	10 49 15	−00 41	+07 30.4
" 7	11 00 05	−01 40	+06 23.7
" 10	11 10 53	−02 41	+05 16.1
" 13	11 21 41	−03 44	+04 07.7
" 16	11 32 27	−04 47	+02 58.6
" 19	11 43 13	−05 51	+01 49.1
" 22	11 53 58	−06 55	+00 39.2
" 25	12 04 45	−07 58	−00 30.9
" 28	12 15 33	−09 00	−01 41.0
Oct. 1	12 26 23	−10 00	−02 51.1
" 4	12 37 15	−10 57	−04 00.9
" 7	12 48 11	−11 51	−05 10.2
" 10	12 59 10	−12 42	−06 19.0
" 13	13 10 13	−13 28	−07 27.1
" 16	13 21 21	−14 10	−08 34.2
" 19	13 32 33	−14 47	−09 40.2
" 22	13 43 51	−15 19	−10 45.0
" 25	13 55 15	−15 45	−11 48.3
" 28	14 06 45	−16 04	−12 50.0
" 31	14 18 22	−16 17	−13 49.9
Nov. 3	14 30 06	−16 22	−14 47.8
" 6	14 41 58	−16 21	−15 43.6
" 9	14 53 57	−16 11	−16 37.0
" 12	15 06 04	−15 54	−17 28.0
" 15	15 18 18	−15 29	−18 16.2
" 18	15 30 40	−14 58	−19 01.5
" 21	15 43 08	−14 18	−19 43.7
" 24	15 55 45	−13 32	−20 22.7
" 27	16 08 28	−12 38	−20 58.4
" 30	16 21 18	−11 38	−21 30.5
Dec. 3	16 34 14	−10 31	−21 58.9
" 6	16 47 16	−09 19	−22 23.5
" 9	17 00 23	−08 01	−22 44.2
" 12	17 13 35	−06 40	−23 00.9
" 15	17 26 49	−05 15	−23 13.5
" 18	17 40 06	−03 48	−23 21.9
" 21	17 53 24	−02 19	−23 26.2
" 24	18 06 43	−00 50	−23 26.1
" 27	18 20 02	+00 39	−23 21.9
" 30	18 33 20	+02 08	−23 13.4

To obtain *local mean* time, apply *corr. to sundial* to *apparent* or *sundial* time.

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 is the ***equation of time.*** Or, in general, ***Apparent Time—Mean Time = Equation of Time.*** This is the same as *Correction to Sundial* on page 7, with the sign reversed.

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.

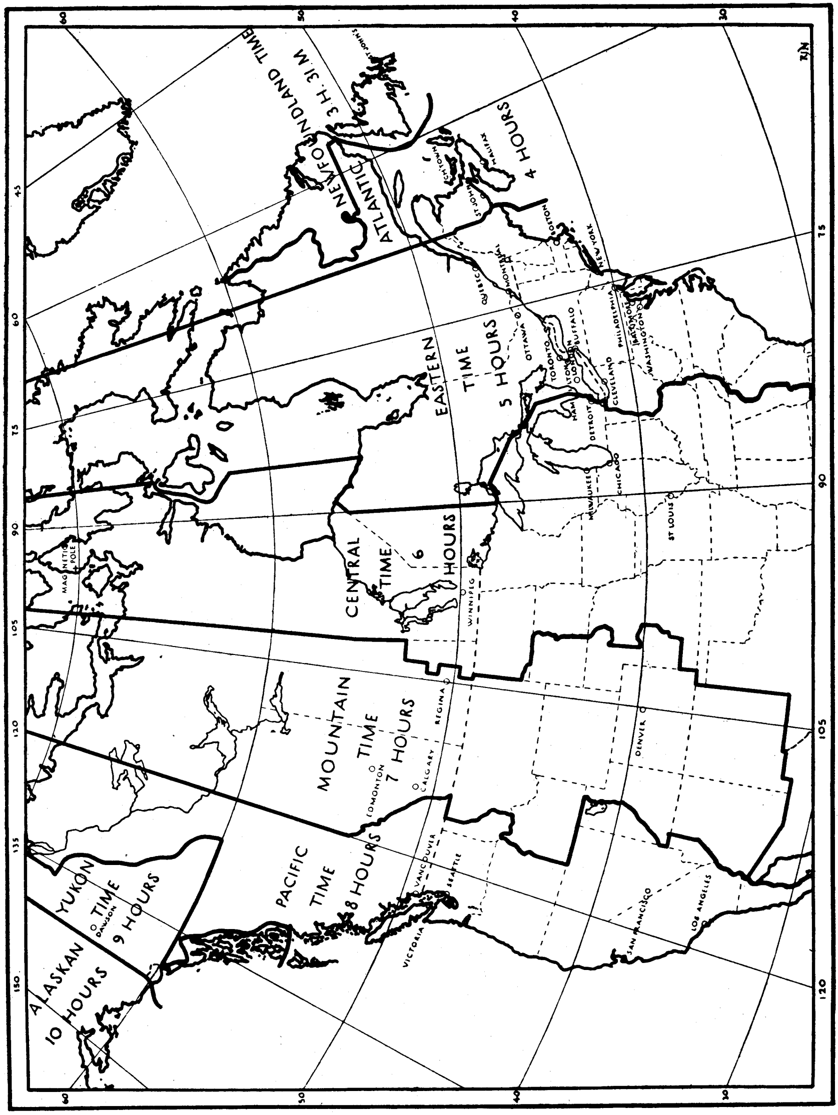
4. *Standard Time*—In everyday life we use still another kind of time. A moment's thought will show that in general two places will not have the same mean time; indeed, difference in longitude between two places is determined from their difference in time. But in travelling it is very inconvenient to 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.

The boundaries of the time belts are shown on the map on page 9.

Daylight Saving Time is the standard time of the next zone eastward. It is adopted in many places between certain specified dates during the summer. As a war-time measure many places are using daylight saving time throughout the year.

MAP OF STANDARD TIME ZONES



TIMES OF SUNRISE AND SUNSET

In the tables on pages 11 to 16 are given the times of sunrise and sunset for places in latitudes 36°, 40°, 44°, 46°, 48°, 50° and 52°. The times are given in Local Mean Time, and in the table below are given corrections to change from Local Mean to Standard Time for the cities and towns named.

How the Tables are Constructed

The time of sunrise and sunset at a given place, in local mean time, varies from day to day, and depends principally upon the declination of the sun. Variations in the equation of time, the apparent diameter of the sun and atmospheric refraction at the points of sunrise and sunset also affect the final result. These quantities, as well as the solar declination, do not have precisely the same values on corresponding days from year to year, and so the table gives only approximately average values. The times are for the rising and setting of the upper limb of the sun, and are corrected for refraction. 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 Standard 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 local time of sunrise and sunset for the proper latitude, on the desired day, and apply the correction to get the Standard Time.

34°	min.	**44°**	min.	**46°**	min.	**50°**	min.
Los Angeles	− 7	Brantford	+21	Glace Bay	0	Brandon	+40
		Guelph	+21	Moncton	+19	Kenora	+18
38°		Halifax	+14	Montreal	− 6	Medicine Hat	+22
St. Louis	+ 1	Hamilton	+20	New Glasgow	+11	Moose Jaw	+ 2
San Francisco	+10	Kingston	+ 6	North Bay	+18	Port. la Prairie	+33
Washington	+ 8	Kitchener	+22	Ottawa	+ 3	Regina	− 2
		Milwaukee	− 8	Parry Sound	+20	Trail	− 9
40°		Minneapolis	+13	Quebec	−15	Vancouver	+12
Baltimore	+ 6	Orillia	+18	St. John, N.B.	+24	Winnipeg	+28
New York	− 4	Oshawa	+15	Sault St. Marie	+37		
Philadelphia	+ 1	Owen Sound	+24	Sherbrooke	−12	**52°**	
Pittsburgh	+20	Peterborough	+13	Sudbury	+24	Calgary	+36
		St. Catharines	+17	Sydney	+ 1	Saskatoon	+ 6
42°		Stratford	+24	Three Rivers	−10		
Boston	−16	Toronto	+18			**54°**	
Buffalo	+15	Woodstock, Ont.	+23	**48°**		Edmonton	+34
Chicago	−10	Yarmouth	+24	Port Arthur	+57	Prince Albert	+ 1
Cleveland	+26			St. John's, Nfd.	0	Prince Rupert	+41
Detroit	−28	**46°**		Seattle	+ 9		
London, Ont.	+25	Charlottetown	+13	Timmins	+26	**60°**	
Windsor	+32	Fredericton	+26	Victoria	+13	Dawson	+18

Example.—Find the time of sunrise at Owen Sound, also at Regina, on February 12.

In the above list Owen Sound is under "44°", and the correction is + 24 min. On page 11 the time of sunrise on February 12 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 7.17 and subtracting 2 min. we get the time of sunrise 7.15 (Mountain Standard Time).

DATE		Latitude 36° Sunrise	Latitude 36° Sunset	Latitude 40° Sunrise	Latitude 40° Sunset	Latitude 44° Sunrise	Latitude 44° Sunset	Latitude 46° Sunrise	Latitude 46° Sunset	Latitude 48° Sunrise	Latitude 48° Sunset	Latitude 50° Sunrise	Latitude 50° Sunset	Latitude 52° Sunrise	Latitude 52° Sunset
		h m	h m	h m	h m	h m	h m	h m	h m	h m	h m	h m	h m	h m	h m
January	**1**	7 11	4 57	7 22	4 45	7 35	4 32	7 42	4 25	7 50	4 17	7 59	4 08	8 08	3 59
	3	7 11	4 58	7 23	4 47	7 35	4 34	7 42	4 26	7 50	4 19	7 59	4 10	8 08	4 01
	5	7 12	5 00	7 23	4 49	7 35	4 36	7 42	4 29	7 50	4 22	7 58	4 13	8 07	4 03
	7	7 11	5 02	7 22	4 50	7 35	4 38	7 42	4 31	7 49	4 23	7 58	4 15	8 06	4 06
	9	7 11	5 04	7 22	4 52	7 34	4 40	7 41	4 33	7 49	4 26	7 57	4 18	8 05	4 08
	11	7 11	5 06	7 22	4 54	7 34	4 42	7 40	4 36	7 48	4 28	7 56	4 20	8 05	4 11
	13	7 11	5 05	7 21	4 56	7 33	4 45	7 39	4 39	7 47	4 31	7 55	4 23	8 03	4 14
	15	7 10	5 10	7 20	4 58	7 32	4 48	7 38	4 41	7 45	4 34	7 54	4 26	8 01	4 18
	17	7 10	5 12	7 20	5 00	7 30	4 50	7 37	4 44	7 44	4 37	7 52	4 29	7 59	4 21
	19	7 09	5 14	7 19	5 02	7 29	4 53	7 35	4 46	7 42	4 39	7 50	4 32	7 57	4 24
	21	7 08	5 15	7 18	5 05	7 28	4 55	7 34	4 48	7 40	4 42	7 48	4 35	7 56	4 27
	23	7 07	5 17	7 15	5 08	7 26	4 57	7 32	4 51	7 39	4 45	7 46	4 38	7 54	4 31
	25	7 06	5 19	7 14	5 10	7 26	5 00	7 31	4 54	7 37	4 48	7 44	4 41	7 51	4 35
	27	7 05	5 21	7 12	5 13	7 24	5 02	7 29	4 57	7 35	4 51	7 42	4 45	7 48	4 38
	29	7 04	5 23	7 11	5 15	7 22	5 05	7 27	5 00	7 33	4 54	7 39	4 48	7 46	4 42
	31	7 02	5 25	7 10	5 17	7 19	5 08	7 24	5 03	7 30	4 57	7 36	4 51	7 43	4 45
February	**2**	7 00	5 27	7 08	5 20	7 17	5 11	7 22	5 06	7 27	5 00	7 33	4 55	7 39	4 49
	4	6 59	5 29	7 06	5 22	7 15	5 13	7 20	5 09	7 25	5 04	7 30	4 58	7 35	4 53
	6	6 57	5 32	7 04	5 25	7 13	5 16	7 18	5 11	7 22	5 07	7 27	5 02	7 32	4 56
	8	6 55	5 34	7 02	5 27	7 10	5 19	7 15	5 14	7 20	5 10	7 24	5 05	7 29	5 00
	10	6 53	5 36	7 00	5 29	7 08	5 22	7 13	5 17	7 17	5 13	7 21	5 08	7 25	5 03
	12	6 51	5 38	6 59	5 31	7 05	5 24	7 09	5 20	7 14	5 16	7 17	5 12	7 21	5 07
	14	6 49	5 40	6 55	5 34	7 03	5 27	7 06	5 23	7 10	5 19	7 14	5 15	7 18	5 10
	16	6 47	5 42	6 53	5 36	7 00	5 30	7 02	5 26	7 06	5 23	7 10	5 19	7 14	5 14
	18	6 45	5 44	6 50	5 39	6 57	5 33	6 59	5 29	7 03	5 26	7 07	5 22	7 11	5 18
	20	6 43	5 46	6 48	5 41	6 54	5 35	6 56	5 32	6 59	5 29	7 03	5 26	7 07	5 22
	22	6 40	5 48	6 45	5 43	6 50	5 38	6 53	5 35	6 56	5 32	6 59	5 29	7 02	5 26
	24	6 38	5 50	6 42	5 45	6 47	5 40	6 49	5 38	6 52	5 35	6 55	5 32	6 58	5 30
	26	6 35	5 52	6 39	5 47	6 44	5 43	6 46	5 41	6 49	5 38	6 51	5 36	6 53	5 33
	28	6 33	5 54	6 36	5 49	6 40	5 46	6 43	5 44	6 45	5 41	6 47	5 39	6 49	5 31

DATE		Latitude 36°		Latitude 40°		Latitude 44°		Latitude 46°		Latitude 48°		Latitude 50°		Latitude 52°	
		Sunrise	Sunset	Sunrise	Sunset	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	h m	h m	h m	h m
March	**2**	6 30	5 55	6 33	5 52	6 37	5 48	6 39	5 46	6 41	5 44	6 43	5 42	6 46	5 40
	4	6 27	5 57	6 30	5 54	6 34	5 51	6 36	5 49	6 37	5 47	6 39	5 46	6 41	5 44
	6	6 24	5 59	6 27	5 57	6 30	5 54	6 32	5 52	6 33	5 51	6 35	5 49	6 37	5 47
	8	6 22	6 01	6 24	5 59	6 26	5 56	6 28	5 55	6 29	5 54	6 31	5 53	6 32	5 51
	10	6 19	6 03	6 21	6 01	6 23	5 59	6 24	5 58	6 25	5 57	6 26	5 56	6 28	5 55
	12	6 17	6 04	6 18	6 03	6 19	6 02	6 20	6 01	6 21	6 00	6 22	5 59	6 23	5 58
	14	6 14	6 06	6 15	6 05	6 15	6 04	6 16	6 03	6 17	6 03	6 18	6 02	6 19	6 02
	16	6 11	6 07	6 12	6 07	6 12	6 07	6 13	6 06	6 13	6 06	6 14	6 05	6 14	6 05
	18	6 08	6 10	6 08	6 09	6 08	6 09	6 09	6 09	6 09	6 09	6 10	6 09	6 10	6 09
	20	6 06	6 11	6 05	6 11	6 05	6 11	6 05	6 11	6 05	6 12	6 05	6 12	6 05	6 12
	22	6 03	6 13	6 02	6 13	6 02	6 14	6 02	6 14	6 01	6 15	6 01	6 15	6 00	6 15
	24	6 00	6 15	5 59	6 15	5 58	6 16	5 58	6 16	5 57	6 18	5 57	6 18	5 55	6 19
	26	5 57	6 16	5 56	6 17	5 55	6 19	5 54	6 19	5 53	6 20	5 52	6 21	5 51	6 22
	28	5 54	6 18	5 52	6 19	5 51	6 21	5 50	6 22	5 49	6 23	5 48	6 24	5 46	6 26
	30	5 51	6 19	5 49	6 21	5 48	6 23	5 46	6 24	5 45	6 25	5 43	6 27	5 41	6 29
April	**1**	5 48	6 21	5 46	6 23	5 44	6 25	5 42	6 27	5 41	6 28	5 39	6 30	5 37	6 32
	3	5 45	6 22	5 43	6 25	5 40	6 28	5 38	6 29	5 37	6 31	5 35	6 33	5 32	6 36
	5	5 42	6 24	5 40	6 27	5 37	6 30	5 35	6 33	5 32	6 34	5 30	6 36	5 28	6 39
	7	5 40	6 26	5 36	6 29	5 33	6 33	5 31	6 35	5 28	6 37	5 26	6 40	5 23	6 43
	9	5 37	6 28	5 33	6 31	5 29	6 35	5 27	6 38	5 24	6 40	5 21	6 43	5 19	6 46
	11	5 34	6 29	5 30	6 33	5 25	6 38	5 23	6 40	5 20	6 43	5 17	6 46	5 14	6 49
	13	5 32	6 31	5 27	6 35	5 22	6 40	5 19	6 43	5 16	6 46	5 13	6 49	5 10	6 52
	15	5 29	6 32	5 24	6 38	5 19	6 43	5 16	6 46	5 13	6 49	5 09	6 52	5 06	6 56
	17	5 26	6 35	5 21	6 40	5 15	6 45	5 12	6 48	5 09	6 52	5 05	6 56	5 01	6 59
	19	5 24	6 37	5 18	6 42	5 12	6 48	5 09	6 51	5 05	6 55	5 01	6 59	4 56	7 02
	21	5 21	6 38	5 15	6 44	5 09	6 50	5 05	6 54	5 01	6 58	4 57	7 02	4 52	7 06
	23	5 18	6 40	5 12	6 46	5 06	6 53	5 02	6 56	4 58	7 01	4 53	7 05	4 48	7 09
	25	5 16	6 41	5 09	6 48	5 02	6 55	4 58	6 59	4 54	7 03	4 49	7 08	4 44	7 13
	27	5 13	6 43	5 07	6 50	4 59	6 57	4 55	7 01	4 51	7 06	4 45	7 11	4 40	7 16
	29	5 11	6 44	5 04	6 52	4 56	7 00	4 52	7 04	4 47	7 08	4 42	7 14	4 36	7 20

DATE		Latitude 36°		Latitude 40°		Latitude 44°		Latitude 46°		Latitude 48°		Latitude 50°		Latitude 52°	
		Sunrise	Sunset	Sunrise	Sunset	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	h m	h m	h m	h m
May	**1**	5 09	6 46	5 02	6 53	4 53	7 02	4 49	7 06	4 44	7 11	4 38	7 17	4 32	7 23
	3	5 07	6 48	4 59	6 56	4 50	7 04	4 46	7 09	4 40	7 14	4 34	7 20	4 28	7 26
	5	5 05	6 49	4 56	6 58	4 47	7 07	4 43	7 11	4 37	7 17	4 31	7 23	4 25	7 29
	7	5 03	6 51	4 54	7 00	4 44	7 09	4 40	7 14	4 34	7 20	4 27	7 26	4 21	7 32
	9	5 01	6 52	4 51	7 02	4 42	7 11	4 37	7 16	4 31	7 22	4 24	7 29	4 17	7 36
	11	4 59	6 54	4 49	7 04	4 39	7 14	4 34	7 19	4 28	7 25	4 21	7 32	4 14	7 39
	13	4 57	6 56	4 47	7 06	4 37	7 16	4 31	7 21	4 25	7 28	4 18	7 35	4 11	7 42
	15	4 55	6 57	4 45	7 08	4 35	7 18	4 28	7 24	4 22	7 30	4 15	7 38	4 07	7 45
	17	4 53	6 59	4 44	7 10	4 33	7 20	4 26	7 26	4 20	7 33	4 13	7 40	4 04	7 48
	19	4 51	7 01	4 42	7 11	4 31	7 22	4 24	7 28	4 17	7 35	4 10	7 43	4 01	7 52
	21	4 50	7 03	4 40	7 13	4 29	7 24	4 22	7 31	4 15	7 38	4 07	7 46	3 58	7 55
	23	4 49	7 04	4 39	7 15	4 27	7 26	4 20	7 33	4 13	7 40	4 05	7 48	3 55	7 57
	25	4 48	7 05	4 37	7 16	4 25	7 28	4 18	7 35	4 11	7 43	4 03	7 51	3 53	8 00
	27	4 47	7 07	4 36	7 18	4 24	7 30	4 16	7 37	4 09	7 45	4 01	7 53	3 51	8 03
	29	4 46	7 08	4 35	7 20	4 22	7 32	4 15	7 39	4 07	7 47	3 59	7 56	3 49	8 05
	31	4 45	7 10	4 34	7 21	4 21	7 34	4 14	7 41	4 06	7 49	3 57	7 58	3 47	8 08
June	**2**	4 45	7 11	4 33	7 23	4 20	7 35	4 13	7 43	4 05	7 51	3 56	8 00	3 45	8 10
	4	4 44	7 12	4 33	7 24	4 19	7 37	4 12	7 44	4 04	7 53	3 55	8 02	3 44	8 12
	6	4 44	7 13	4 32	7 25	4 18	7 38	4 11	7 46	4 02	7 54	3 53	8 04	3 42	8 14
	8	4 43	7 14	4 31	7 26	4 17	7 40	4 10	7 47	4 02	7 56	3 52	8 05	3 41	8 16
	10	4 43	7 16	4 31	7 27	4 17	7 41	4 09	7 49	4 01	7 57	3 51	8 07	3 40	8 18
	12	4 43	7 16	4 31	7 28	4 17	7 42	4 09	7 50	4 01	7 58	3 51	8 08	3 40	8 19
	14	4 43	7 17	4 31	7 29	4 17	7 43	4 08	7 51	4 00	7 59	3 50	8 09	3 39	8 20
	16	4 43	7 18	4 31	7 30	4 17	7 44	4 08	7 52	4 00	8 00	3 50	8 10	3 39	8 21
	18	4 43	7 19	4 31	7 31	4 17	7 45	4 08	7 53	4 00	8 01	3 50	8 11	3 39	8 22
	20	4 43	7 19	4 31	7 31	4 17	7 45	4 08	7 54	4 00	8 02	3 50	8 12	3 39	8 23
	22	4 44	7 20	4 31	7 32	4 17	7 46	4 08	7 55	4 01	8 03	3 50	8 12	3 39	8 23
	24	4 44	7 20	4 32	7 32	4 18	7 46	4 09	7 55	4 01	8 03	3 51	8 13	3 40	8 24
	26	4 44	7 21	4 32	7 33	4 18	7 47	4 10	7 55	4 02	8 03	3 52	8 13	3 41	8 24
	28	4 45	7 21	4 33	7 33	4 19	7 47	4 11	7 55	4 03	8 03	3 53	8 13	3 42	8 24
	30	4 46	7 21	4 34	7 33	4 20	7 47	4 12	7 55	4 04	8 03	3 54	8 13	3 43	8 24

DATE		Latitude 36° Sunrise	Latitude 36° Sunset	Latitude 40° Sunrise	Latitude 40° Sunset	Latitude 44° Sunrise	Latitude 44° Sunset	Latitude 46° Sunrise	Latitude 46° Sunset	Latitude 48° Sunrise	Latitude 48° Sunset	Latitude 50° Sunrise	Latitude 50° Sunset	Latitude 52° Sunrise	Latitude 52° Sunset
		h m	h m	h m	h m	h m	h m	h m	h m	h m	h m	h m	h m	h m	h m
July	**2**	4 47	7 20	4 35	7 33	4 21	7 47	4 13	7 54	4 05	8 03	3 55	8 13	3 44	8 23
	4	4 48	7 20	4 36	7 33	4 22	7 46	4 14	7 54	4 06	8 02	3 56	8 12	3 46	8 22
	6	4 49	7 19	4 37	7 32	4 23	7 46	4 15	7 53	4 07	8 01	3 58	8 11	3 47	8 21
	8	4 50	7 19	4 38	7 31	4 25	7 45	4 17	7 52	4 09	8 00	3 59	8 10	3 49	8 20
	10	4 51	7 18	4 39	7 30	4 26	7 44	4 18	7 51	4 10	7 59	4 01	8 08	3 51	8 18
	12	4 52	7 18	4 41	7 30	4 28	7 43	4 20	7 50	4 12	7 58	4 03	8 07	3 53	8 17
	14	4 53	7 18	4 42	7 29	4 29	7 42	4 22	7 49	4 14	7 57	4 05	8 06	3 55	8 15
	16	4 55	7 17	4 44	7 28	4 31	7 40	4 24	7 47	4 16	7 56	4 07	8 04	3 58	8 13
	18	4 56	7 16	4 45	7 26	4 32	7 39	4 26	7 46	4 18	7 54	4 10	8 02	4 00	8 11
	20	4 57	7 15	4 47	7 25	4 34	7 38	4 28	7 44	4 20	7 52	4 12	8 00	4 03	8 09
	22	4 59	7 13	4 48	7 23	4 36	7 36	4 30	7 42	4 22	7 50	4 14	7 58	4 06	8 07
	24	5 00	7 12	4 50	7 22	4 38	7 34	4 32	7 40	4 25	7 48	4 17	7 55	4 08	8 04
	26	5 02	7 11	4 52	7 20	4 40	7 32	4 34	7 38	4 27	7 45	4 19	7 53	4 11	8 01
	28	5 03	7 09	4 53	7 18	4 42	7 30	4 37	7 36	4 30	7 43	4 22	7 50	4 14	7 58
	30	5 05	7 07	4 55	7 17	4 44	7 27	4 39	7 33	4 32	7 40	4 25	7 47	4 17	7 55
August	**1**	5 06	7 05	4 57	7 15	4 46	7 25	4 41	7 31	4 35	7 38	4 28	7 44	4 21	7 52
	3	5 08	7 04	4 59	7 12	4 48	7 22	4 43	7 28	4 37	7 35	4 31	7 41	4 24	7 49
	5	5 09	7 02	5 01	7 01	4 50	7 20	4 45	7 26	4 40	7 31	4 33	7 37	4 27	7 45
	7	5 11	7 00	5 02	7 08	4 53	7 17	4 48	7 23	4 42	7 28	4 36	7 34	4 30	7 41
	9	5 12	6 58	5 04	7 06	4 55	7 15	4 50	7 20	4 45	7 25	4 39	7 31	4 33	7 37
	11	5 14	6 56	5 06	7 03	4 58	7 12	4 53	7 17	4 48	7 22	4 42	7 27	4 36	7 34
	13	5 15	6 53	5 08	7 01	5 00	7 09	4 55	7 13	4 50	7 18	4 45	7 24	4 39	7 30
	15	5 17	6 51	5 10	6 58	5 02	7 06	4 58	7 10	4 53	7 15	4 48	7 20	4 42	7 26
	17	5 19	6 49	5 12	6 55	5 05	7 03	5 00	7 07	4 56	7 11	4 51	7 16	4 46	7 21
	19	5 20	6 46	5 14	6 52	5 07	6 59	5 03	7 03	4 59	7 07	4 54	7 12	4 49	7 17
	21	5 22	6 43	5 16	6 49	5 09	6 56	5 05	7 00	5 01	7 04	4 57	7 08	4 52	7 13
	23	5 23	6 41	5 18	6 46	5 11	6 53	5 08	6 56	5 04	7 00	5 00	7 04	4 56	7 09
	25	5 25	6 38	5 20	6 43	5 14	6 50	5 11	6 53	5 07	6 57	5 03	7 00	4 59	7 05
	27	5 26	6 35	5 22	6 40	5 16	6 47	5 13	6 49	5 09	6 53	5 06	6 56	5 02	7 00
	29	5 28	6 33	5 24	6 37	5 18	6 43	5 15	6 45	5 12	6 49	5 09	6 52	5 05	6 56
	31	5 30	6 30	5 25	6 34	5 20	6 40	5 18	6 42	5 15	6 45	5 12	6 48	5 09	6 51

DATE		Latitude **36°** Sunrise	Latitude **36°** Sunset	Latitude **40°** Sunrise	Latitude **40°** Sunset	Latitude **44°** Sunrise	Latitude **44°** Sunset	Latitude **46°** Sunrise	Latitude **46°** Sunset	Latitude **48°** Sunrise	Latitude **48°** Sunset	Latitude **50°** Sunrise	Latitude **50°** Sunset	Latitude **52°** Sunrise	Latitude **52°** Sunset
		h m	h m	h m	h m	h m	h m	h m	h m	h m	h m	h m	h m	h m	h m
September	**2**	5 31	6 27	5 27	6 31	5 23	6 36	5 20	6 38	5 18	6 41	5 15	6 44	5 12	6 47
	4	5 33	6 24	5 29	6 28	5 25	6 32	5 23	6 34	5 20	6 37	5 18	6 40	5 15	6 41
	6	5 34	6 22	5 31	6 25	5 27	6 28	5 25	6 31	5 23	6 33	5 21	6 35	5 19	6 37
	8	5 36	6 19	5 33	6 22	5 30	6 25	5 28	6 27	5 26	6 29	5 24	6 31	5 22	6 33
	10	5 38	6 16	5 35	6 18	5 32	6 21	5 31	6 23	5 29	6 25	5 27	6 27	5 25	6 28
	12	5 39	6 13	5 37	6 15	5 34	6 17	5 33	6 19	5 31	6 21	5 30	6 22	5 28	6 23
	14	5 41	6 10	5 39	6 12	5 36	6 14	5 35	6 15	5 34	6 16	5 33	6 18	5 31	6 19
	16	5 42	6 07	5 41	6 08	5 39	6 10	5 38	6 11	5 37	6 12	5 36	6 13	5 34	6 14
	18	5 44	6 04	5 43	6 05	5 41	6 07	5 41	6 07	5 40	6 08	5 39	6 09	5 38	6 10
	20	5 46	6 01	5 45	6 02	5 44	6 03	5 44	6 03	5 43	6 04	5 42	6 05	5 41	6 05
	22	5 47	5 58	5 47	5 58	5 46	5 59	5 46	5 59	5 45	6 00	5 45	6 00	5 44	6 00
	24	5 49	5 55	5 49	5 55	5 48	5 55	5 48	5 55	5 48	5 56	5 48	5 56	5 47	5 56
	26	5 51	5 52	5 51	5 52	5 51	5 52	5 51	5 52	5 51	5 51	5 51	5 51	5 51	5 51
	28	5 52	5 49	5 52	5 49	5 53	5 48	5 53	5 48	5 54	5 57	5 54	5 47	5 54	5 46
	30	5 53	5 46	5 54	5 46	5 55	5 44	5 56	5 43	5 57	5 43	5 57	5 43	5 57	5 42
October	**2**	5 55	5 44	5 56	5 43	5 57	5 41	5 58	5 40	5 59	5 39	6 00	5 38	6 00	5 37
	4	5 56	5 41	5 58	5 40	5 59	5 37	6 01	5 36	6 02	5 35	6 03	5 34	6 04	5 32
	6	5 58	5 38	6 00	5 36	6 02	5 34	6 03	5 32	6 04	5 31	6 06	5 29	6 07	5 28
	8	5 59	5 35	6 02	5 33	6 04	5 30	6 06	5 28	6 07	5 27	6 09	5 25	6 11	5 23
	10	6 01	5 32	6 04	5 30	6 07	5 27	6 08	5 25	6 10	5 23	6 12	5 21	6 14	5 19
	12	6 03	5 30	6 06	5 27	6 09	5 24	6 11	5 21	6 13	5 19	6 15	5 17	6 17	5 15
	14	6 04	5 27	6 08	5 24	6 11	5 20	6 14	5 18	6 16	5 15	6 19	5 13	6 21	5 10
	16	6 06	5 25	6 10	5 21	6 14	5 17	6 17	5 14	6 19	5 11	6 22	5 09	6 25	5 06
	18	6 08	5 22	6 12	5 18	6 17	5 13	6 19	5 11	6 22	5 08	6 25	5 05	6 28	5 02
	20	6 10	5 19	6 15	5 15	6 20	5 10	6 22	5 07	6 25	5 04	6 28	5 01	6 32	4 58
	22	6 12	5 17	6 17	5 12	6 22	5 07	6 25	5 04	6 28	5 00	6 31	4 57	6 35	4 54
	24	6 14	5 14	6 19	5 09	6 25	5 04	6 28	5 00	6 31	4 57	6 35	4 53	6 39	4 50
	26	6 16	5 12	6 21	5 06	6 27	5 01	6 31	4 57	6 35	4 53	6 38	4 49	6 43	4 46
	28	6 18	5 09	6 24	5 03	6 30	4 57	6 34	4 53	6 38	4 49	6 42	4 45	6 47	4 42
	30	6 20	5 07	6 26	5 00	6 33	4 55	6 37	4 50	6 41	4 46	6 45	4 42	6 50	4 38

DATE		Latitude 36° Sunrise	Latitude 36° Sunset	Latitude 40° Sunrise	Latitude 40° Sunset	Latitude 44° Sunrise	Latitude 44° Sunset	Latitude 46° Sunrise	Latitude 46° Sunset	Latitude 48° Sunrise	Latitude 48° Sunset	Latitude 50° Sunrise	Latitude 50° Sunset	Latitude 52° Sunrise	Latitude 52° Sunset
		h m	h m	h m	h m	h m	h m	h m	h m	h m	h m	h m	h m	h m	h m
November	**1**	6 22	5 05	6 28	4 58	6 35	4 52	6 39	4 47	6 44	4 43	6 48	4 39	6 53	4 34
	3	6 24	5 03	6 31	4 55	6 38	4 49	6 42	4 44	6 47	4 40	6 52	4 35	6 57	4 30
	5	6 26	5 01	6 33	4 53	6 41	4 46	6 45	4 41	6 50	4 37	6 55	4 32	7 00	4 27
	7	6 27	4 59	6 35	4 51	6 43	4 43	6 48	4 38	6 53	4 34	6 58	4 28	7 04	4 23
	9	6 29	4 57	6 37	4 49	6 46	4 41	6 51	4 36	6 56	4 31	7 01	4 25	7 07	4 19
	11	6 31	4 56	6 39	4 47	6 48	4 39	6 53	4 33	6 59	4 29	7 04	4 22	7 11	4 16
	13	6 33	4 54	6 42	4 45	6 51	4 37	6 56	4 31	7 02	4 26	7 08	4 20	7 14	4 13
	15	6 35	4 52	6 44	4 44	6 54	4 35	6 59	4 29	7 05	4 24	7 11	4 17	7 18	4 10
	17	6 37	4 51	6 47	4 42	6 57	4 32	7 02	4 27	7 08	4 21	7 15	4 14	7 22	4 07
	19	6 39	4 50	6 49	4 41	6 59	4 31	7 04	4 25	7 10	4 19	7 18	4 12	7 25	4 04
	21	6 41	4 49	6 51	4 39	7 01	4 29	7 07	4 23	7 13	4 17	7 21	4 10	7 28	4 02
	23	6 43	4 48	6 54	4 38	7 04	4 28	7 10	4 21	7 16	4 15	7 24	4 08	7 31	4 00
	25	6 45	4 48	6 56	4 37	7 06	4 27	7 12	4 20	7 19	4 14	7 27	4 06	7 35	3 58
	27	6 47	4 47	6 58	4 36	7 09	4 25	7 15	4 19	7 22	4 12	7 30	4 04	7 38	3 56
	29	6 48	4 47	6 59	4 36	7 11	4 24	7 18	4 18	7 25	4 11	7 33	4 03	7 41	3 55
December	**1**	6 50	4 47	7 01	4 35	7 13	4 23	7 20	4 17	7 27	4 10	7 36	4 02	7 44	3 54
	3	6 52	4 46	7 03	4 35	7 15	4 23	7 22	4 16	7 30	4 09	7 38	4 01	7 47	3 52
	5	6 54	4 46	7 05	4 35	7 18	4 23	7 25	4 15	7 32	4 08	7 41	4 00	7 49	3 51
	7	6 56	4 46	7 07	4 35	7 20	4 22	7 27	4 15	7 35	4 07	7 43	3 59	7 52	3 50
	9	6 57	4 46	7 09	4 35	7 22	4 22	7 29	4 15	7 37	4 07	7 45	3 59	7 54	3 50
	11	6 59	4 46	7 10	4 35	7 24	4 22	7 31	4 15	7 39	4 07	7 48	3 58	7 57	3 49
	13	7 01	4 47	7 12	4 35	7 25	4 22	7 32	4 15	7 40	4 07	7 50	3 58	7 59	3 49
	15	7 02	4 47	7 14	4 36	7 27	4 23	7 34	4 16	7 42	4 07	7 51	3 59	8 01	3 49
	17	7 04	4 48	7 16	4 36	7 29	4 23	7 36	4 16	7 44	4 08	7 53	3 59	8 03	3 49
	19	7 05	4 49	7 17	4 37	7 30	4 24	7 37	4 17	7 45	4 08	7 54	4 00	8 04	3 49
	21	7 06	4 50	7 18	4 38	7 31	4 25	7 38	4 18	7 46	4 09	7 55	4 01	8 05	3 50
	23	7 07	4 51	7 19	4 39	7 32	4 26	7 39	4 19	7 47	4 10	7 56	4 02	8 06	3 51
	25	7 08	4 52	7 20	4 40	7 33	4 27	7 40	4 20	7 48	4 11	7 57	4 03	8 07	3 52
	27	7 09	4 53	7 21	4 41	7 34	4 28	7 41	4 21	7 49	4 13	7 58	4 04	8 08	3 54
	29	7 09	4 54	7 21	4 42	7 34	4 30	7 41	4 22	7 50	4 14	7 58	4 06	8 08	3 56
	31	7 10	4 56	7 22	4 44	7 35	4 31	7 42	4 24	7 50	4 16	7 59	4 07	8 08	3 58

BEGINNING OF MORNING AND ENDING OF EVENING TWILIGHT

	Latitude 35°		Latitude 40°		Latitude 45°		Latitude 50°		Latitude 52°	
	Morn.	Eve.	Morn.	Eve.	Morn.	Eve.	Morn.	Eve.	Morn.	Eve.
Jan. 1	5 38	6 29	5 45	6 22	5 52	6 15	6 00	6 07	6 04	6 04
11	5 39	6 37	5 45	6 31	5 52	6 24	5 59	6 17	6 02	6 14
21	5 38	6 45	5 43	6 40	5 48	6 35	5 54	6 30	5 56	6 28
31	5 34	6 54	5 38	6 50	5 41	6 47	5 45	6 44	5 46	6 42
Feb. 10	5 27	7 03	5 29	7 01	5 31	7 00	5 32	6 59	5 32	6 58
20	5 17	7 12	5 17	7 12	5 18	7 12	5 15	7 14	5 14	7 15
Mar. 2	5 06	7 20	5 04	7 22	5 02	7 26	4 56	7 30	4 54	7 33
12	4 52	7 29	4 48	7 33	4 43	7 39	4 35	7 47	4 31	7 51
22	4 38	7 38	4 31	7 45	4 23	7 54	4 11	8 06	4 05	8 11
Apr. 1	4 23	7 47	4 13	7 57	4 01	8 09	3 46	8 25	3 38	8 33
11	4 07	7 57	3 55	8 09	3 39	8 25	3 19	8 46	3 08	8 57
21	3 51	8 07	3 36	8 23	3 17	8 43	2 50	9 10	2 36	9 25
May 1	3 37	8 19	3 18	8 37	2 54	9 02	2 20	9 37	2 01	9 57
11	3 23	8 30	3 02	8 52	2 33	9 22	1 48	10 08	1 20	10 37
21	3 12	8 41	2 47	9 07	2 13	9 42	1 13	10 44	0 02	——
31	3 04	8 51	2 36	9 20	1 56	10 01	0 23	11 42	——	——
June 10	2 59	8 59	2 29	9 30	1 43	10 16	——	——	——	——
20	3 02	9 04	2 27	9 35	1 39	10 23	——	——	——	——
30	3 02	9 04	2 31	9 35	1 44	10 22	——	——	——	——
July 10	3 09	9 01	2 39	9 30	1 56	10 13	——	——	——	——
20	3 18	8 54	2 51	9 20	2 14	9 57	1 04	11 04	——	——
30	3 28	8 43	3 05	9 06	2 33	9 38	1 43	10 26	1 07	11 00
Aug. 9	3 39	8 30	3 20	8 50	2 52	9 16	2 15	9 53	1 53	10 15
19	3 50	8 16	3 34	8 32	3 12	8 53	2 42	9 23	2 26	9 38
29	4 00	8 00	3 47	8 14	3 29	8 31	3 06	8 53	2 54	9 05
Sept. 8	4 10	7 44	3 59	7 55	3 46	8 08	3 28	8 26	3 19	8 34
18	4 19	7 28	4 11	7 36	4 01	7 46	3 47	8 00	3 40	8 07
28	4 28	7 13	4 22	7 18	4 15	7 25	4 05	7 35	4 01	7 39
Oct. 8	4 35	6 59	4 32	7 02	4 28	7 06	4 22	7 12	4 18	7 15
18	4 43	6 46	4 42	6 47	4 40	6 49	4 37	6 51	4 36	6 53
28	4 51	6 36	4 52	6 34	4 53	6 34	4 53	6 34	4 52	6 34
Nov. 7	5 00	6 27	5 02	6 24	5 05	6 21	5 07	6 19	5 08	6 18
17	5 08	6 21	5 12	6 17	5 17	6 12	5 21	6 07	5 23	6 06
27	5 16	6 18	5 22	6 13	5 28	6 06	5 34	6 00	5 37	5 57
Dec. 7	5 24	6 18	5 31	6 12	5 38	6 04	5 45	5 57	5 48	5 54
17	5 31	6 21	5 38	6 14	5 45	6 06	5 53	5 58	5 57	5 55
27	5 36	6 26	5 43	6 19	5 51	6 11	5 59	6 03	6 02	6 00
Jan. 1	5 38	6 29	5 45	6 22	5 52	6 15	6 00	6 07	6 03	6 04

The above table gives the local mean time of the beginning of morning twilight, and of the ending of evening twilight, for various latitudes. To obtain the corresponding standard time, the method used is the same as for correcting the sunrise and sunset tables, as described on page 10. The entry —— in the above table indicates that at such dates and latitudes, twilight lasts all night. This table, taken from the American Ephemeris, is computed for *astronomical* twilight, i.e., for the time at which the sun is 108° from the zenith (or 18° below the horizon).

TIMES OF MOONRISE AND MOONSET, 1942

Date Jan.	Latitude 40° Moon-rise	Latitude 40° Moon-set	Latitude 45° Moon-rise	Latitude 45° Moon-set	Latitude 50° Moon-rise	Latitude 50° Moon-set	Latitude 52° Moon-rise	Latitude 52° Moon-set
	h m	h m	h m	h m	h m	h m	h m	h m
1	16 21	6 10	16 08	6 24	15 52	6 40	15 44	6 48
2	17 12	7 00	16 59	7 13	16 43	7 29	16 36	7 36
3	18 06	7 45	17 54	7 57	17 39	8 12	17 32	8 19
4	19 03	8 26	18 53	8 38	18 40	8 51	18 35	8 57
5	20 02	9 05	19 54	9 14	19 44	9 25	19 40	9 30
6	21 03	9 41	20 58	9 48	20 51	9 56	20 48	10 00
7	22 05	16 16	22 03	10 19	22 00	10 25	21 58	10 26
8	23 09	17 49	23 10	10 50	23 10	10 52	23 10	10 52
9	.. ..	11 23	.. ..	11 21	.. ..	11 19	.. ..	11 19
10	0 15	11 58	0 18	11 53	0 21	11 48	0 24	11 46
11	1 22	12 36	1 28	12 29	1 35	12 20	1 39	12 16
12	2 30	13 19	2 39	13 09	2 49	12 57	2 55	12 51
13	3 38	14 07	3 50	13 55	4 04	13 40	4 10	13 33
14	4 46	15 01	4 59	14 48	5 15	14 32	5 22	14 24
15	5 49	16 03	6 02	15 49	6 19	15 33	6 27	15 25
16	6 47	17 08	7 00	16 55	7 15	16 40	7 22	17 33
17	7 37	18 15	7 49	18 05	8 02	17 51	8 08	17 45
18	8 21	19 22	8 31	19 14	8 41	19 04	8 47	18 59
19	9 01	20 27	9 07	20 22	9 14	20 16	9 18	20 13
20	9 36	21 30	9 39	21 28	9 44	21 25	9 45	21 24
21	10 08	22 30	10 10	22 31	10 10	22 33	10 11	22 33
22	10 39	23 29	10 38	23 32	10 35	23 37	10 35	23 39
23	11 11	.. ..	11 06	.. ..	11 01	.. ..	10 58	.. ..
24	11 43	0 27	11 35	0 32	11 28	0 40	11 24	0 43
25	12 16	1 23	12 07	1 31	11 56	1 41	11 51	1 46
26	12 52	2 17	12 41	2 29	12 28	2 41	12 22	2 46
27	13 32	3 11	13 20	3 23	13 04	3 38	12 58	3 45
28	14 16	4 03	14 03	4 17	13 47	4 33	13 40	4 40
29	15 05	4 53	14 51	5 07	14 35	5 23	14 28	5 31
30	15 58	5 40	15 45	5 53	15 30	6 09	15 22	6 16
31	16 54	6 24	16 43	6 36	16 30	6 50	16 23	6 57

Date Feb.	Latitude 40° Moon-rise	Latitude 40° Moon-set	Latitude 45° Moon-rise	Latitude 45° Moon-set	Latitude 50° Moon-rise	Latitude 50° Moon-set	Latitude 52° Moon-rise	Latitude 52° Moon-set
	h m	h m	h m	h m	h m	h m	h m	h m
1	17 54	7 05	17 44	7 15	17 34	7 26	17 28	7 32
2	18 55	7 43	18 49	7 50	18 40	7 59	18 38	8 03
3	19 58	8 18	19 54	8 23	19 50	8 29	19 48	8 32
4	21 02	8 53	21 01	8 54	21 01	8 57	21 00	8 58
5	22 07	9 26	22 09	9 25	22 12	9 25	22 13	9 24
6	23 13	10 01	23 19	9 57	23 25	9 53	23 28	9 51
7	.. ..	10 37	.. ..	10 31	.. ..	10 23	.. ..	10 20
8	0 20	11 17	0 28	11 08	0 38	10 58	0 42	10 53
9	1 27	12 02	1 37	11 51	1 51	11 37	1 56	11 31
10	2 32	12 53	2 45	12 39	3 00	12 24	3 07	12 17
11	3 35	13 48	3 48	13 34	4 04	13 19	4 12	13 11
12	4 33	14 50	4 47	14 34	5 03	14 21	5 11	14 13
13	5 26	15 55	5 38	15 43	5 53	15 29	6 00	15 23
14	6 13	17 01	6 22	16 51	6 35	16 40	6 41	16 35
15	6 54	18 07	7 02	18 00	7 11	17 53	7 15	17 49
16	7 31	19 11	7 37	19 08	7 42	19 03	7 45	19 01
17	8 06	20 14	8 08	20 13	8 10	20 12	8 11	20 12
18	8 38	21 14	8 37	21 17	8 36	21 20	8 36	21 21
19	9 09	22 14	9 06	22 18	9 02	22 24	9 00	22 27
20	9 41	23 11	9 35	23 18	9 29	23 27	9 25	23 31
24	10 14	.. ..	10 07	.. ..	9 56	.. ..	9 52	.. ..
22	10 50	0 07	10 40	0 17	10 27	0 28	10 22	0 33
23	11 28	1 01	11 16	1 13	11 02	1 27	10 56	1 33
24	12 10	1 54	11 57	2 07	11 41	2 22	11 34	2 29
25	12 56	2 44	12 43	2 58	12 27	3 14	12 19	3 21
26	13 47	3 33	13 35	3 45	13 19	4 01	13 11	4 09
27	14 42	4 18	14 30	4 30	14 16	4 44	14 09	4 52
28	15 40	4 59	15 30	5 11	15 19	5 23	15 13	5 29

These are local civil times (75th meridian). To obtain Standard Time for any station apply corrections as tabulated on page 10.

TIMES OF MOONRISE AND MOONSET, 1942

Date Mar.	Latitude 40° Moonrise	Latitude 40° Moonset	Latitude 45° Moonrise	Latitude 45° Moonset	Latitude 50° Moonrise	Latitude 50° Moonset	Latitude 52° Moonrise	Latitude 52° Moonset
	h m	h m	h m	h m	h m	h m	h m	h m
1	16 41	5 39	16 34	5 47	16 25	5 58	16 21	6 02
2	17 45	6 16	17 40	6 22	17 35	6 29	17 31	6 32
3	18 50	6 51	18 48	6 55	18 46	6 58	18 45	7 01
4	19 56	7 26	19 58	7 27	19 59	7 27	20 00	7 27
5	21 03	8 02	21 08	7 58	21 13	7 56	21 16	7 54
6	22 11	8 38	22 19	8 32	22 27	8 26	22 32	8 23
7	23 19	9 18	23 30	9 09	23 41	9 00	23 47	8 55
8	.. ..	10 02	.. ..	9 50	.. ..	9 38	.. ..	9 31
9	0 25	10 49	0 38	10 37	0 52	10 21	0 58	10 14
10	1 28	11 43	1 42	11 30	1 58	11 13	2 06	11 06
11	2 27	12 41	2 41	12 27	2 57	12 11	3 05	12 04
12	3 20	13 43	3 33	13 31	3 48	13 16	3 55	13 09
13	4 08	14 47	4 19	14 37	4 32	14 25	4 38	14 19
14	4 50	15 51	4 59	15 44	5 09	15 35	5 14	15 31
15	5 28	16 55	5 34	16 51	5 41	16 45	5 45	16 42
16	6 03	17 59	6 06	17 57	6 10	17 54	6 11	17 53
17	6 36	19 00	6 36	19 01	6 36	19 02	6 37	19 02
18	7 08	20 00	7 06	20 04	7 02	20 08	7 01	20 10
19	7 40	20 59	7 34	21 04	7 29	21 12	7 26	21 15
20	8 12	21 56	8 05	22 04	7 56	22 15	7 53	22 19
21	8 47	22 51	8 37	23 02	8 26	23 15	8 21	23 20
22	9 24	23 45	9 13	23 57	9 00	.. ..	8 53	.. ..
23	10 04	.. ..	9 52	.. ..	9 37	0 12	9 29	0 19
24	10 49	0 36	10 36	0 49	10 20	1 05	10 12	1 12
25	11 37	1 25	11 24	1 39	11 08	1 54	11 01	2 02
26	12 30	2 11	12 17	2 24	12 02	2 38	11 54	2 46
27	13 25	2 53	13 14	3 05	13 01	3 19	12 55	3 25
28	14 25	3 33	14 15	3 43	14 05	3 55	14 00	4 00
29	15 27	4 11	15 21	4 18	15 13	4 26	15 10	4 31
30	16 32	4 47	16 28	4 52	16 24	4 57	16 23	5 00
31	17 38	5 22	17 38	5 24	17 38	5 26	17 38	5 27

Date April	Latitude 40° Moonrise	Latitude 40° Moonset	Latitude 45° Moonrise	Latitude 45° Moonset	Latitude 50° Moonrise	Latitude 50° Moonset	Latitude 52° Moonrise	Latitude 52° Moonset
	h m	h m	h m	h m	h m	h m	h m	h m
1	18 47	5 58	18 49	5 56	18 53	5 54	18 55	5 54
2	19 57	6 34	20 03	6 31	20 10	6 25	20 13	6 22
3	21 07	7 14	21 16	7 07	21 27	6 58	21 32	6 54
4	22 16	7 58	22 27	7 47	22 41	7 35	22 47	7 29
5	23 22	8 45	23 35	8 33	23 50	8 18	23 58	8 12
6	.. ..	9 38	.. ..	9 25	.. ..	9 08	.. ..	9 00
7	0 23	10 35	0 37	10 22	0 53	10 06	1 01	9 58
8	1 18	11 36	1 31	11 23	1 47	11 09	1 55	11 01
9	2 07	12 39	2 19	12 29	2 32	12 15	2 39	12 10
10	2 50	13 43	3 00	13 35	3 11	13 24	3 17	13 20
11	3 29	14 46	3 36	14 41	3 44	14 33	3 48	14 30
12	4 04	15 49	4 08	15 45	4 13	15 42	4 15	15 40
13	4 36	16 49	4 38	16 49	4 39	16 49	4 40	16 49
14	5 07	17 49	5 07	17 52	5 05	17 55	5 05	17 57
15	5 39	18 48	5 35	18 53	5 31	18 59	5 28	19 03
16	6 11	19 46	6 04	19 53	5 58	20 03	5 54	20 07
17	6 45	20 43	6 36	20 53	6 25	21 04	6 21	21 10
18	7 21	21 37	7 11	21 49	6 57	22 03	6 51	22 10
19	8 00	22 29	7 47	22 43	7 33	22 58	7 26	23 05
20	8 43	23 19	8 29	23 33	8 13	23 50	8 06	23 57
21	9 28	.. ..	9 15	.. ..	8 59	.. ..	8 51	.. ..
22	10 19	0 05	10 06	0 19	9 51	0 36	9 43	0 42
23	11 13	0 48	11 01	1 01	10 46	1 16	10 41	1 23
24	12 09	1 29	11 59	1 40	11 48	1 53	11 43	1 59
25	13 09	2 07	13 01	2 15	12 53	2 25	12 48	2 30
26	14 11	2 40	14 07	2 49	14 01	2 56	13 58	2 59
27	15 16	3 17	15 15	3 20	15 12	3 24	15 12	3 26
28	16 24	3 52	16 25	3 52	16 27	3 52	16 27	3 53
29	17 34	4 28	17 38	4 25	17 44	4 21	17 47	4 20
30	18 45	5 06	18 52	5 00	19 02	4 53	19 07	4 50

These are local civil times (75th meridian). To obtain Standard Time for any station apply corrections as tabulated on page 10.

DATE May	Lat. 40° Moon-rise	Lat. 40° Moon-set	Lat. 45° Moon-rise	Lat. 45° Moon-set	Lat. 50° Moon-rise	Lat. 50° Moon-set	Lat. 52° Moon-rise	Lat. 52° Moon-set
	h m	h m	h m	h m	h m	h m	h m	h m
1	19 57	5 48	20 07	5 39	20 20	5 29	20 26	5 24
2	21 07	6 35	21 19	6 23	21 35	6 10	21 42	6 04
3	22 13	7 28	22 27	7 15	22 43	6 59	22 51	6 52
4	23 13	8 25	23 26	8 12	23 43	7 54	23 51	7 47
5	.. ..	9 27	.. ..	9 14	.. ..	8 58	.. ..	8 50
6	0 06	10 32	0 17	10 20	0 33	10 06	0 39	9 59
7	0 51	11 36	1 01	11 27	1 14	11 15	1 19	11 10
8	1 32	12 40	1 39	12 33	1 48	12 24	1 53	12 21
9	2 07	13 42	2 12	13 38	2 19	13 33	2 21	13 31
10	2 40	14 42	2 42	14 42	2 45	14 41	2 47	14 40
11	3 11	15 42	3 11	15 44	3 10	15 46	3 10	15 47
12	3 41	16 41	3 39	16 45	3 35	16 50	3 34	16 53
13	4 13	17 39	4 07	17 45	4 01	17 54	3 57	17 57
14	4 45	18 36	4 38	18 44	4 28	18 56	4 24	19 01
15	5 20	19 30	5 10	19 42	4 58	19 56	4 53	20 02
16	5 57	20 24	5 46	20 37	5 32	20 52	5 26	20 59
17	6 39	21 15	6 26	21 28	6 10	21 45	6 03	21 52
18	7 24	22 03	7 10	22 16	6 54	22 33	6 46	22 40
19	8 13	22 47	7 59	23 00	7 43	23 15	7 35	23 23
20	9 05	23 28	8 52	23 40	8 37	23 53	8 30	.. ..
21	10 00	.. ..	9 48	.. ..	9 36	.. ..	9 29	0 00
22	10 56	0 06	10 48	0 16	10 38	0 27	10 32	0 32
23	11 57	0 41	11 51	0 49	11 43	0 57	11 39	1 01
24	12 58	1 15	12 56	1 20	12 51	1 26	12 49	1 27
25	14 03	1 49	14 03	1 50	14 03	1 53	14 03	1 53
26	15 10	2 23	15 13	2 22	15 17	2 20	15 18	2 20
27	16 20	2 59	16 26	2 54	16 33	2 49	16 37	2 47
29	17 31	3 38	17 41	3 30	17 51	3 22	17 57	3 17
29	18 44	4 22	18 55	4 12	19 10	3 59	19 16	3 54
30	19 54	5 12	20 07	4 59	20 23	4 45	20 31	4 37
31	20 58	6 08	21 12	5 54	21 29	5 38	21 37	5 30

DATE June	Lat. 40° Moon-rise	Lat. 40° Moon-set	Lat. 45° Moon-rise	Lat. 45° Moon-set	Lat. 50° Moon-rise	Lat. 50° Moon-set	Lat. 52° Moon-rise	Lat. 52° Moon-set
	h m	h m	h m	h m	h m	h m	h m	h m
1	21 57	7 10	22 10	6 56	22 26	6 40	22 33	6 32
2	22 47	8 16	22 59	8 03	23 12	7 48	23 19	7 41
3	23 31	9 23	23 40	9 12	23 51	9 00	23 56	8 53
4	.. ..	10 30	.. ..	10 21	.. ..	10 12	.. ..	10 07
5	0 09	11 34	0 15	11 29	0 23	11 22	0 27	11 20
6	0 42	12 36	0 46	12 34	0 50	12 31	0 53	12 30
7	1 15	13 36	1 16	13 37	1 16	13 38	1 17	13 39
8	1 45	14 35	1 44	14 39	1 41	14 43	1 41	14 45
9	2 16	15 33	2 12	15 39	2 06	15 47	2 04	15 49
10	2 48	16 30	2 41	16 38	2 33	16 49	2 29	16 53
11	3 22	17 26	3 12	17 36	3 01	17 49	2 56	17 54
12	3 58	18 20	3 47	18 32	3 33	18 47	3 26	18 54
13	4 37	19 11	4 25	19 25	4 09	19 42	4 02	19 49
14	5 21	20 01	5 08	20 15	4 51	20 31	4 44	20 39
15	6 08	20 47	5 55	21 00	5 39	21 15	5 31	21 23
16	6 59	21 28	6 47	21 41	6 31	21 56	6 23	22 02
17	7 54	22 08	7 42	22 18	7 28	22 30	7 21	22 36
18	8 50	22 43	8 40	22 51	8 29	23 01	8 23	23 06
19	9 48	23 17	9 41	23 22	9 32	23 30	9 28	23 32
20	10 48	23 50	10 43	23 53	10 38	23 56	10 35	23 58
21	11 49	.. ..	11 48	.. ..	11 46	.. ..	11 44	.. ..
22	12 54	0 22	12 54	0 22	12 56	0 23	12 57	0 23
23	13 59	0 56	14 04	0 53	14 10	0 50	14 12	0 49
24	15 08	1 32	15 15	1 26	15 25	1 19	15 29	1 16
25	16 19	2 12	16 29	2 03	16 42	1 53	16 47	1 48
26	17 29	2 57	17 42	2 46	17 57	2 33	18 04	2 26
27	18 37	3 49	18 51	3 36	19 08	3 21	19 16	3 14
28	19 40	4 39	19 54	4 35	20 11	4 18	20 18	4 10
29	20 36	5 54	20 48	5 41	21 03	5 24	21 10	5 16
30	21 25	7 02	21 34	7 51	21 47	6 36	21 53	6 30

These are local civil times (75th meridian). To obtain Standard Time for any station apply corrections as tabulated on page 10.

TIMES OF MOONRISE AND MOONSET, 1942

Date July	Latitude 40° Moon-rise	Latitude 40° Moon-set	Latitude 45° Moon-rise	Latitude 45° Moon-set	Latitude 50° Moon-rise	Latitude 50° Moon-set	Latitude 52° Moon-rise	Latitude 52° Moon-set
	h m	h m	h m	h m	h m	h m	h m	h m
1	22 06	8 11	22 14	8 02	22 23	7 51	22 27	7 46
2	22 43	9 19	22 48	9 12	22 54	9 05	22 56	9 01
3	23 17	10 24	23 19	10 21	23 21	10 17	23 22	10 15
4	23 48	11 27	23 48	11 26	23 46	11 26	23 46	11 26
5	.. ..	12 27	.. ..	12 30	.. ..	12 33	.. ..	12 34
6	0 19	13 26	0 16	13 31	0 11	13 37	0 10	13 41
7	0 51	14 24	0 44	14 31	0 38	14 41	0 34	14 45
8	1 23	15 20	1 16	15 30	1 05	15 41	1 00	15 47
9	1 59	16 14	1 49	16 26	1 36	16 40	1 30	16 47
10	2 37	17 08	2 25	17 20	2 10	17 36	2 03	17 44
11	3 19	17 58	3 06	18 11	2 50	18 28	2 42	18 36
12	4 05	18 45	3 51	18 58	3 35	19 15	3 27	19 22
13	4 55	19 28	4 42	19 41	4 26	19 56	4 18	20 04
14	5 49	20 09	5 36	20 20	5 21	20 33	5 14	20 40
15	6 45	20 46	6 33	20 55	6 21	21 05	6 15	21 11
16	7 42	21 21	7 34	21 27	7 24	21 35	7 20	21 38
17	8 41	21 53	8 36	21 57	8 29	22 01	8 26	22 04
18	9 42	22 25	9 39	22 26	9 36	22 27	9 35	22 29
19	10 44	22 57	10 44	22 55	10 45	22 54	10 45	22 53
20	11 48	23 32	11 51	23 27	11 55	23 21	11 56	23 19
21	12 53	.. ..	13 00	.. ..	13 07	23 52	13 11	23 48
22	14 00	0 08	14 10	0 01	14 20	.. ..	14 26	.. ..
23	15 09	0 50	15 21	0 40	15 34	0 27	15 41	0 22
24	16 17	1 37	16 30	1 25	16 46	1 10	16 53	1 03
25	17 21	2 31	17 34	2 17	17 51	2 01	17 59	1 53
26	18 20	3 32	18 33	3 18	18 49	3 02	18 57	2 53
27	19 13	4 38	19 24	4 26	19 38	4 10	19 44	4 03
28	19 58	5 48	20 07	5 37	20 18	5 24	20 23	5 18
29	20 39	6 57	20 45	6 50	20 52	6 40	20 56	6 35
30	21 15	8 06	21 18	8 01	21 22	7 54	21 23	7 52
31	21 49	9 11	21 49	9 10	21 49	9 07	21 49	9 06

Date Aug.	Latitude 40° Moon-rise	Latitude 40° Moon-set	Latitude 45° Moon-rise	Latitude 45° Moon-set	Latitude 50° Moon-rise	Latitude 50° Moon-set	Latitude 52° Moon-rise	Latitude 52° Moon-set
	h m	h m	h m	h m	h m	h m	h m	h m
1	22 20	10 15	22 18	10 15	22 15	10 17	22 13	10 17
2	22 52	11 15	22 47	11 19	22 41	11 24	22 38	11 26
3	23 25	12 14	23 17	12 21	23 08	12 29	23 04	12 33
4	.. ..	13 12	23 49	13 21	23 38	13 32	23 32	13 37
5	0 00	14 07	.. ..	14 19	.. ..	14 32	.. ..	14 38
6	0 35	15 01	0 25	15 13	0 11	15 29	0 05	15 36
7	1 17	15 52	1 04	16 05	0 48	16 22	0 41	16 29
8	2 01	16 41	1 48	16 54	1 31	17 11	1 24	17 18
9	2 50	17 26	2 37	17 39	2 20	17 54	2 12	18 02
10	3 43	18 08	3 30	18 20	3 14	18 43	3 07	18 40
11	4 38	18 47	4 26	18 56	4 13	19 07	4 07	19 13
12	5 35	19 22	5 26	19 29	5 16	19 38	5 11	19 43
13	6 35	19 56	6 28	20 00	6 21	20 07	6 17	20 09
14	7 36	20 29	7 32	20 30	7 27	20 33	7 26	20 34
15	8 38	21 01	8 37	21 00	8 36	20 59	8 36	20 59
16	9 40	21 34	9 43	21 31	9 46	21 26	9 47	21 24
17	10 45	22 10	10 50	22 03	10 57	21 55	10 59	21 51
18	11 51	22 48	11 59	22 39	12 09	22 28	12 13	22 23
19	12 57	23 32	13 08	23 21	13 21	23 06	13 27	23 00
20	14 03	.. ..	14 16	.. ..	14 31	23 53	14 38	23 45
21	15 07	0 22	15 21	0 08	15 37	.. ..	15 45	.. ..
22	16 07	1 18	16 20	1 04	16 37	0 47	16 45	0 39
23	17 00	2 20	17 13	2 06	17 28	1 50	17 35	2 43
24	17 49	3 26	17 58	3 15	18 12	2 59	18 18	2 54
25	18 31	4 35	18 39	4 26	18 48	4 15	18 52	4 09
26	19 09	5 44	19 14	5 38	19 20	5 30	19 23	5 26
27	19 44	6 52	19 46	6 48	19 49	6 44	19 49	6 42
28	20 18	7 57	20 16	7 56	20 15	7 56	20 14	7 56
29	20 51	9 00	20 46	9 03	20 42	9 06	20 39	9 07
30	21 23	10 00	21 16	10 07	21 09	10 13	21 05	10 16
31	21 58	11 00	21 48	11 08	21 37	11 18	21 32	11 22

These are local civil times (75th meridian). To obtain Standard Time for any station apply corrections as tabulated on page 10.

TIMES OF MOONRISE AND MOONSET, 1942

Date Sep.	Lat. 40° Moonrise	Lat. 40° Moonset	Lat. 45° Moonrise	Lat. 45° Moonset	Lat. 50° Moonrise	Lat. 50° Moonset	Lat. 52° Moonrise	Lat. 52° Moonset
	h m	h m	h m	h m	h m	h m	h m	h m
1	22 34	11 58	22 23	12 08	22 09	12 20	22 04	12 26
2	23 13	12 52	23 00	13 04	22 45	13 19	22 38	13 26
3	23 56	13 45	23 43	13 58	23 26	14 14	23 19	14 22
4	.. ..	14 35	.. ..	14 48	.. ..	15 05	.. ..	15 13
5	0 43	15 21	0 29	15 34	0 13	15 50	0 05	15 57
6	1 34	16 04	1 21	16 16	1 05	16 31	0 58	16 35
7	2 28	16 44	2 16	16 54	2 02	17 07	1 55	17 13
8	3 25	17 21	3 15	17 29	3 03	17 39	2 58	17 44
9	4 24	17 56	4 17	18 01	4 08	18 09	4 04	18 11
10	5 25	18 29	5 21	18 32	5 15	18 36	5 13	18 37
11	6 28	19 02	6 27	19 02	6 25	19 03	6 23	19 03
12	7 32	19 35	7 33	19 33	7 35	19 30	7 35	19 28
13	8 38	20 11	8 41	20 05	8 47	19 58	8 49	19 55
14	9 44	20 48	9 51	20 40	9 59	20 30	10 03	20 26
15	10 50	21 31	11 00	21 20	11 12	21 07	11 17	21 00
16	11 56	22 18	12 08	22 05	12 22	21 50	12 29	21 43
17	12 59	23 11	13 13	22 57	13 29	22 41	13 37	22 33
18	13 59	.. ..	14 13	23 56	14 30	23 40	14 37	23 32
19	14 53	0 10	15 07	.. ..	15 23	.. ..	15 30	.. ..
20	15 42	1 13	15 54	1 00	16 07	0 46	16 14	0 38
21	16 26	2 19	16 35	2 09	16 45	1 56	16 51	1 50
22	17 05	3 26	17 11	3 19	17 18	3 09	17 22	3 05
23	17 41	4 33	17 43	4 28	17 48	4 22	17 49	4 20
24	18 15	5 39	18 14	5 37	18 15	5 35	18 15	5 34
25	18 47	6 43	18 44	6 44	18 41	6 46	18 40	6 47
26	19 20	7 46	19 14	7 49	19 08	7 55	19 05	7 57
27	19 54	8 46	19 46	8 53	19 36	9 02	19 32	9 06
28	20 30	9 45	20 20	9 54	20 07	10 06	20 02	10 11
29	21 08	10 42	20 56	10 54	20 42	11 07	20 35	11 13
30	21 49	11 36	21 37	11 49	21 21	12 04	21 13	12 12

Date Oct.	Lat. 40° Moonrise	Lat. 40° Moonset	Lat. 45° Moonrise	Lat. 45° Moonset	Lat. 50° Moonrise	Lat. 50° Moonset	Lat. 52° Moonrise	Lat. 52° Moonset
	h m	h m	h m	h m	h m	h m	h m	h m
1	22 35	12 27	22 21	12 40	22 05	12 57	21 57	13 05
2	23 24	13 15	23 11	13 28	22 54	13 45	22 46	13 53
3	.. ..	13 59	.. ..	14 11	23 49	14 27	23 41	14 35
4	0 17	14 40	0 04	14 52	.. ..	15 05	.. ..	15 11
5	1 12	15 18	1 01	15 27	0 48	15 38	0 42	15 43
6	2 10	15 53	2 01	16 00	1 52	16 09	1 46	16 12
7	3 11	16 27	3 05	16 31	2 57	16 37	2 54	16 38
8	4 13	17 00	4 10	17 01	4 06	17 03	4 04	17 04
9	5 17	17 34	5 17	17 32	5 17	17 30	5 17	17 29
10	6 23	18 09	6 27	18 04	6 30	17 58	6 32	17 56
11	7 31	18 46	7 37	18 39	7 45	18 30	7 48	18 26
12	8 39	19 28	8 49	19 18	8 59	19 07	9 05	19 00
13	9 48	20 15	9 59	20 02	10 13	19 47	10 20	19 41
14	10 53	21 07	11 06	20 53	11 23	20 37	11 31	20 29
15	11 55	22 04	12 09	21 50	12 26	21 33	12 34	21 25
16	12 51	23 05	13 04	22 53	13 20	22 36	13 29	22 29
17	13 41	.. ..	13 53	23 59	14 07	23 45	14 14	23 39
18	14 25	0 10	14 35	.. ..	14 47	.. ..	14 52	.. ..
19	15 05	1 16	15 12	1 07	15 20	0 57	15 24	0 51
20	15 40	2 22	15 44	2 15	15 50	2 09	15 52	2 05
21	16 14	3 26	16 15	3 23	16 16	3 20	16 17	3 18
22	16 46	4 30	16 44	4 30	16 42	4 29	16 42	4 30
23	17 18	5 32	17 14	5 35	17 09	5 38	17 06	5 40
24	17 51	6 33	17 44	6 39	17 36	6 46	17 32	6 49
25	18 26	7 33	18 16	7 42	18 06	7 51	18 00	7 57
26	19 03	8 31	18 52	8 42	18 39	8 55	18 32	9 01
27	19 44	9 27	19 31	9 40	19 15	9 55	19 08	10 02
28	20 28	10 19	20 14	10 33	19 58	10 50	19 50	10 58
29	21 15	11 09	21 01	11 23	20 45	11 40	20 37	11 48
30	22 06	11 55	21 53	12 08	21 37	12 24	21 30	12 32
31	23 00	12 36	22 48	12 49	22 33	13 03	22 27	13 10

These are local civil times (75th meridian). To obtain Standard Time for any station apply corrections as tabulated on page 10.

TIMES OF MOONRISE AND MOONSET, 1942

Date Nov.	Lat. 40° Moonrise	Lat. 40° Moonset	Lat. 45° Moonrise	Lat. 45° Moonset	Lat. 50° Moonrise	Lat. 50° Moonset	Lat. 52° Moonrise	Lat. 52° Moonset
	h m	h m	h m	h m	h m	h m	h m	h m
1	23 56	13 15	23 46	13 25	23 24	13 38	23 29	13 43
2	.. ..	13 50	.. ..	13 59	.. ..	14 09	.. ..	14 13
3	0 54	14 24	0 47	14 30	0 38	14 37	0 34	14 39
4	1 55	14 57	1 51	15 00	1 45	15 03	1 43	15 05
5	2 58	15 30	2 56	15 29	2 54	15 30	2 53	15 29
6	4 03	16 04	4 05	16 01	4 06	15 57	4 07	15 56
7	5 10	16 40	5 15	16 34	5 21	16 27	5 23	16 23
8	6 20	17 20	6 27	17 11	6 37	17 01	6 41	16 56
9	7 31	18 05	7 41	17 54	7 54	17 40	8 00	17 33
10	8 40	18 57	8 52	18 44	9 09	18 27	9 16	18 20
11	9 46	19 54	10 00	19 40	10 17	19 23	10 25	19 15
12	10 47	20 57	11 00	20 43	11 17	20 26	11 26	20 18
13	11 40	22 02	11 53	21 50	12 08	21 35	12 15	21 28
14	12 26	23 08	12 37	22 58	12 50	22 47	12 56	22 41
15	13 07	.. ..	13 15	.. ..	13 24	23 59	13 29	23 55
16	13 43	0 14	13 48	0 07	13 55	.. ..	13 58	.. ..
17	14 17	1 18	14 19	1 15	14 21	1 10	14 23	1 08
18	14 48	2 22	14 48	2 21	14 47	2 19	14 47	2 19
19	15 20	3 24	15 16	3 25	15 12	3 27	15 11	3 28
20	15 52	4 24	15 45	4 29	15 39	4 35	15 35	4 37
21	16 25	5 23	16 15	5 31	16 06	5 40	16 02	5 45
22	17 01	6 22	16 51	6 32	16 37	6 44	16 31	6 50
23	17 40	7 19	17 27	7 31	17 12	7 45	17 05	7 52
24	18 22	8 13	18 08	8 26	17 52	8 42	17 44	8 50
25	19 08	9 04	18 54	9 18	18 37	9 35	18 29	9 43
26	19 58	9 51	19 44	10 05	19 28	10 22	19 20	10 30
27	20 50	10 34	20 38	10 47	20 23	11 03	20 15	11 11
28	21 45	11 14	21 34	11 25	21 22	11 39	21 15	11 45
29	22 42	11 50	22 33	11 59	22 23	12 10	22 18	12 16
30	23 40	12 24	23 34	12 30	23 27	12 39	23 24	12 43

Date Dec.	Lat. 40° Moonrise	Lat. 40° Moonset	Lat. 45° Moonrise	Lat. 45° Moonset	Lat. 50° Moonrise	Lat. 50° Moonset	Lat. 52° Moonrise	Lat. 52° Moonset
	h m	h m	h m	h m	h m	h m	h m	h m
1	.. ..	12 56	.. ..	13 00	.. ..	13 05	.. ..	13 08
2	0 40	13 27	0 37	13 29	0 33	13 30	0 32	13 31
3	1 42	13 59	1 42	13 58	1 42	13 57	1 42	13 55
4	2 47	14 34	2 51	14 29	2 54	14 24	2 56	14 22
5	3 55	15 10	4 01	15 04	4 08	14 54	4 12	14 51
6	5 05	15 53	5 14	15 43	5 25	15 30	5 30	15 24
7	6 16	16 41	6 28	16 29	6 43	16 13	6 49	16 06
8	7 26	17 37	7 39	17 23	7 56	17 05	8 04	16 58
9	8 32	18 39	8 46	18 25	9 03	18 05	9 11	17 59
10	9 31	19 46	9 46	19 33	10 00	19 17	10 08	19 10
11	10 22	20 55	10 34	20 44	10 48	20 31	10 55	20 25
12	11 06	22 04	11 16	21 56	11 27	21 45	11 33	21 41
13	11 46	23 11	11 52	23 05	12 00	22 59	12 04	22 55
14	12 21	.. ..	12 24	.. ..	12 28	.. ..	12 30	.. ..
15	12 52	0 15	12 53	0 12	12 54	0 10	12 54	0 09
16	13 23	1 17	13 22	1 17	13 19	1 19	13 18	1 19
17	13 55	2 17	13 50	2 22	13 44	2 26	13 41	2 28
18	14 27	3 17	14 19	3 24	14 11	3 31	14 07	3 36
19	15 02	4 16	14 51	4 24	14 40	4 35	14 34	4 41
20	15 38	5 13	15 27	5 24	15 13	5 37	15 06	5 44
21	16 19	6 07	16 07	6 20	15 50	6 36	15 42	6 45
22	17 04	6 59	16 50	7 13	16 33	7 30	16 25	7 38
23	17 53	7 48	17 39	8 02	17 21	8 19	17 14	8 27
24	18 44	8 33	18 31	8 46	18 15	9 03	17 08	9 11
25	19 38	9 14	19 26	9 26	19 12	9 41	19 06	9 48
26	20 34	9 51	20 24	10 02	20 13	10 14	20 07	10 20
27	21 31	10 26	21 24	10 33	21 15	10 43	21 11	10 47
28	22 29	10 57	22 25	11 03	22 20	11 09	22 17	11 13
29	23 29	11 28	23 27	11 32	23 26	11 35	23 25	11 36
30	.. ..	11 59	.. ..	11 59	.. ..	11 59	.. ..	11 59
31	0 30	12 31	0 32	12 28	0 34	12 25	0 35	12 23

These are local civil times (75th meridian). To obtain Standard Time for any station apply corrections as tabulated on page 10.

THE PLANETS FOR 1942

By R. M. Petrie

MERCURY

The planet Mercury, smallest of the solar system, is so far as we know, closer to the sun than any other object. For this reason it always appears near the sun in the day sky and is never seen at night among the stars. Its period of revolution around the sun is only 88 days so it appears now east of the sun (evening star), and now west (morning star), at intervals of only a few weeks. In order to see the planet one must, therefore, know when and where to look. The following table gives the elongations during 1942; the dates, apparent distances from the sun and magnitudes being included. When Mercury is an evening star, at eastern elongation, look for it in the western twilight about one-half hour after sunset. When it is a morning star search the eastern twilight about one-half hour before sunrise.

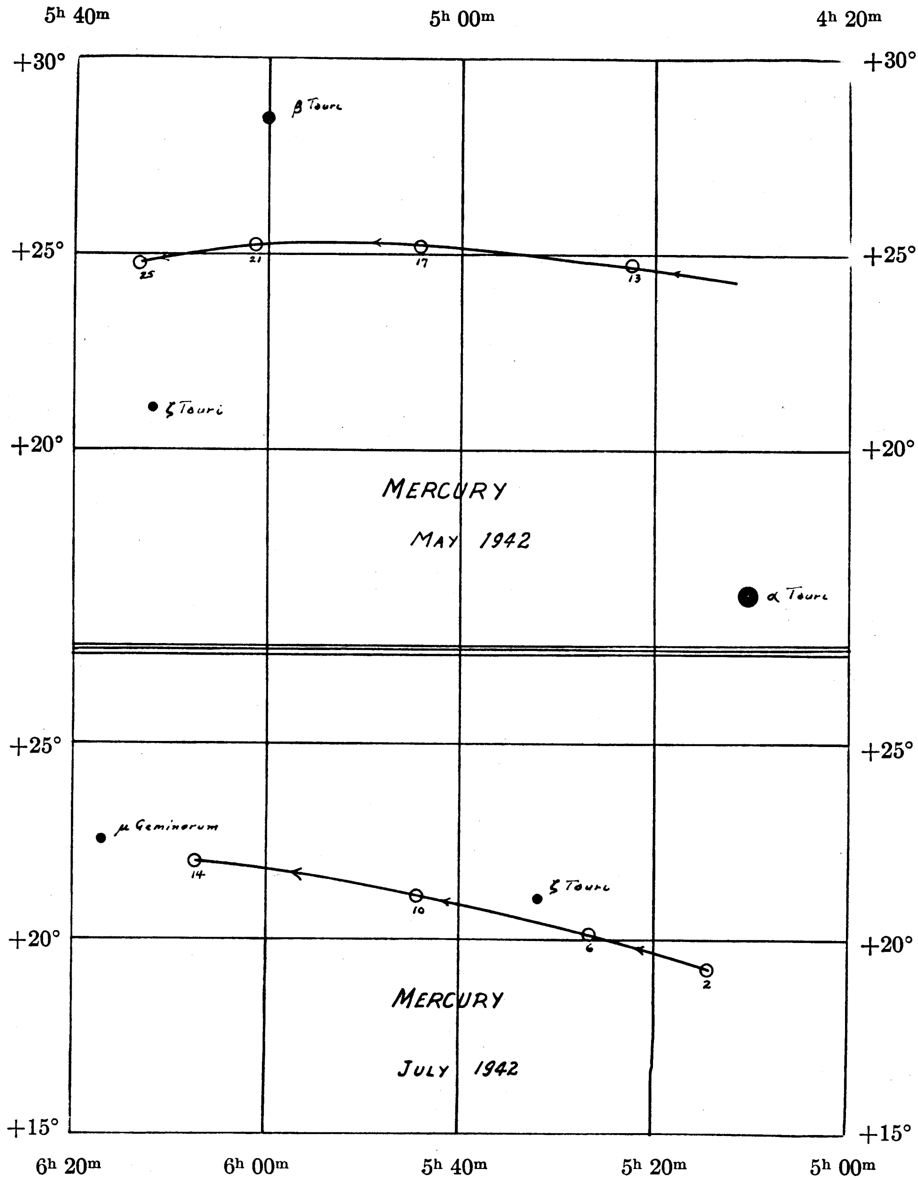
Elongations of Mercury in 1942

Evening Star			Morning Star		
Date	Distance	Mag.	Date	Distance	Mag.
May 18	22°.2	-0.4	Mar. 7	27°.4	+0.4
Jan. 25	18°.5	+0.6	July 6	21°.4	+0.6
Sept. 15	26°.7	+0.3	Oct. 26	18°.5	-0.2

The two most favourable elongations occur on May 18, when Mercury is an evening star, and on July 6, when it is a morning star. If looked for faithfully about those dates one should be rewarded with a glimpse of this elusive planet. In order to facilitate this, the accompanying maps show the paths of the planet for a few days before and after elongations. At the May elongation, Mercury is moving toward and between the bright stars β and ζ *Tauri.* On July 6 the planet is quite close to ζ *Tauri* and moves toward μ *Geminorum.* On May 18 the planet is 79,000,000 miles from the earth; on July 6 it is 78,000,000 away.

VENUS

The planet Venus requires no aid for recognition since it is the most brilliant of all the planets and stars; so bright indeed, that near elongation, it can be seen by the unaided eye in full daylight. The planet revolves in an orbit lying between Mercury and the earth, and, like Mercury, is seen either as an evening or morning star, although straying farther from the sun so that it is sometimes seen in a dark sky.



The Paths of Mercury Near Two Favourable Elongations in 1942. The upper half represents the eastern elongation of May 18, when Mercury is an evening star; the lower, that of July 6, when the planet is a morning star.

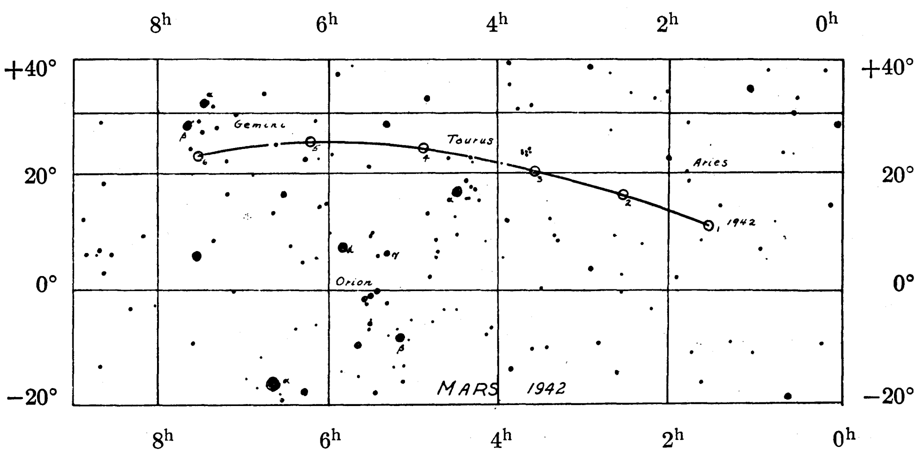
Venus is similar to the earth in size and mass. It is covered with a dense and extensive atmosphere which reflects a large part of the incident sunlight and gives the planet its dazzling white brilliance. Unlike the earth, Venus possesses no moon.

Venus is an evening star at the beginning of the year and is near maximum brilliance, being of stellar magnitude –4.4. The planet will move rapidly toward the sun and will soon be lost in the evening twilight. On February 2, inferior conjunction takes place, the planet then being closest to the earth, some 25,110,000 miles away. Passing to the west of the sun Venus then becomes a morning star, rapidly increasing in brilliance and distance from the sun. Greatest brilliance as a morning star occurs on March 9, and greatest elongation on April 13, when Venus will be 46° from the sun, of stellar magnitude –4.0, some 25″ in diameter, and exhibiting a half disc similar to the moon at last quarter. The planet will remain a morning star, slowly approaching the sun, during spring and summer, and will pass behind the sun, at superior conjunction on November 16, when its distance from the earth reaches its maximum value of 158,000,000 miles. At the end of the year Venus will again be an evening star but will be too close to the sun for ready observation.

MARS

Mars is the fourth planet in order of distance from the sun. Since its orbit lies outside that of the earth the planet is well situated for observation when it is "opposite" the sun and approaches us closely in the night sky. Due to its small size, however, one can distinguish surface features only under favourable conditions.

At the beginning of 1942 Mars will be a fairly prominent object in the

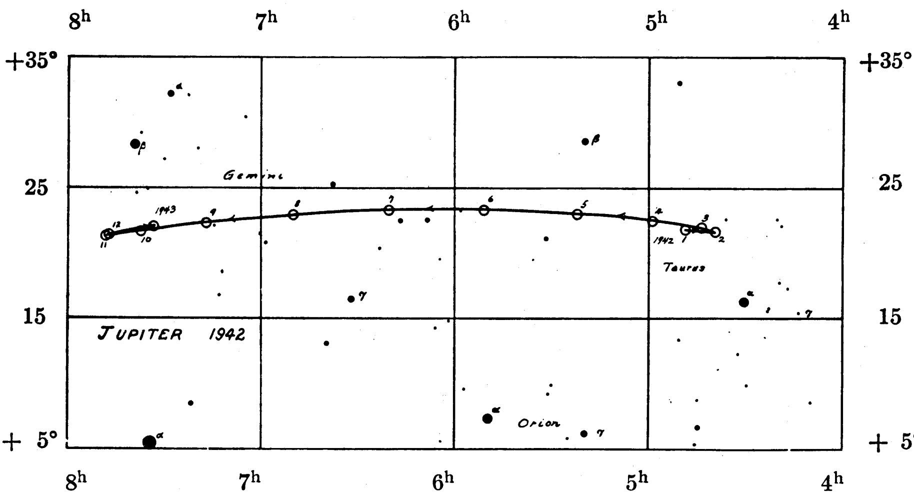


The Path of Mars Among the Stars During January-June, 1942. The position of the planet is indicated, for the first of each month, by an open circle.

evening sky. At the end of January it is ninety degrees east of the sun and, consequently, sets about midnight. At this time Mars is of magnitude 0.6 and its distance from the earth is 110,000,000 miles. During the spring and summer Mars will gradually become fainter and move into the evening twilight as it is overtaken and passed by the sun in his annual eastward motion. Conjunction with the sun occurs on October 5 after which Mars will become a morning star. Except for the first few months of the year Mars will be poorly situated for observation and will not be a conspicuous planet. The accompanying chart shows the path of the planet among the stars during the first part of the year.

JUPITER

Jupiter is the largest and most massive planet of the solar system. It is also, deservedly, a favourite object for observation because of its brightness,



The Path of Jupiter Among the Stars During 1942.

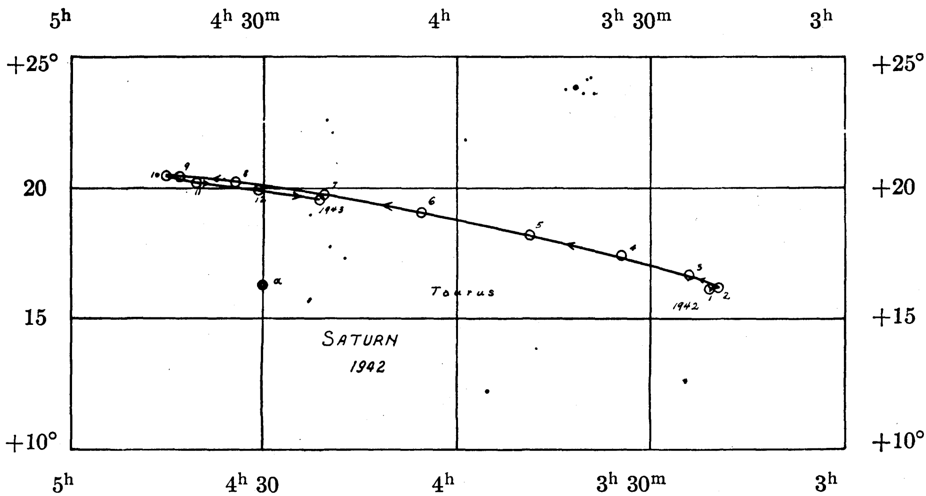
size, variety of surface markings, and interesting satellite system. Its surface markings and four of the eleven moons may be seen to advantage in a small telescope or pair of field glasses.

Jupiter is a conspicuous and splendid object in 1942. During the first four months of the year it is a brilliant evening star in the constellation *Taurus*, just a little northeast of its lucida, *Aldebaran*. The sun overtakes the planet on June 25, when conjunction occurs after which Jupiter becomes a morning star. On October 18 western quadrature occurs so that the planet will be a brilliant morning star during the fall. At the end of the year, Jupiter is approaching opposition and may be seen all during the night in the constellation *Gemini*. Its least distance from the earth during 1942 occurs on January 1, when it will be

389,000,000 miles from the earth. At this time Jupiter will have a stellar magnitude –2.3 and his disc will have an apparent polar diameter of 44″. The path of Jupiter, among the stars, during 1942 is given on the accompanying map.

SATURN

Saturn is the next planet beyond Jupiter and the most remote known to the ancients. Its beautiful ring system renders it a fine telescope object and the delicate markings and shades on the disc repay observation. During 1942 Saturn is well placed for observation from the northern hemisphere and the ring system is seen to good effect, the distortion due to projection being near its minimum. The satellites are also interesting to watch, although they are much fainter than those of Jupiter.



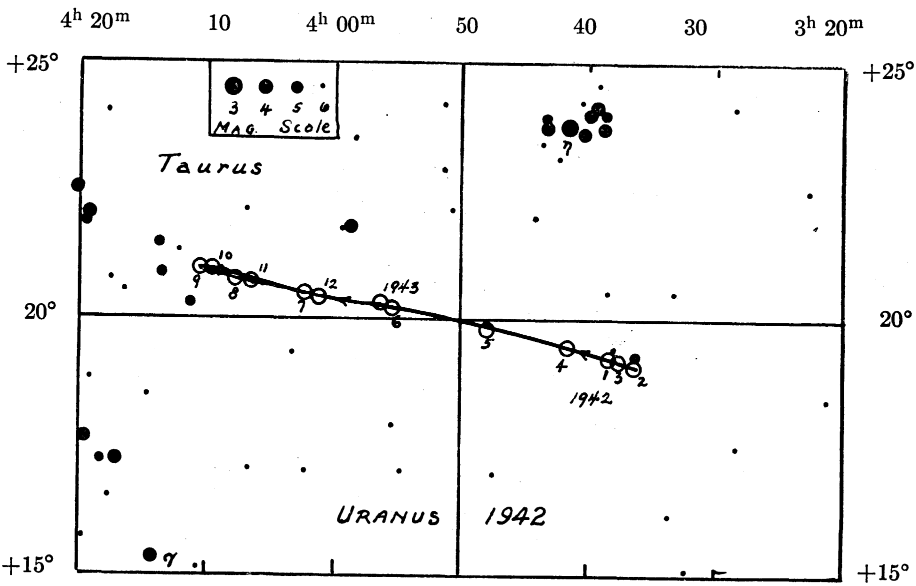
The Path of Saturn Among the Stars During 1942.

Saturn will be an evening star during the first part of the year and will be found in the constellation *Taurus*, west and a little south of Jupiter. The sun overtakes Saturn in May and conjunction occurs on May 23, after which the planet becomes a morning object. Toward the end of summer it will be a conspicuous object in the morning sky, still in the contellation *Taurus*, and will rise earlier each night until it is visible all night throughout December. Opposition occurs on December 1, when the planet is of stellar magnitude –0.2 and its distance from the earth is a minimum of some 750,000,000 miles. At this time the planet is about one-sixth the brightness of Jupiter and its disc appears to be about one-half the diameter of that of Jupiter. The accompanying map shows the path of Saturn among the stars during 1942. The planet remains in *Taurus* throughout the year, moving eastward from February to October and westward or "retrograde" the rest of the time.

URANUS

Uranus was the first planet to be discovered in modern times, being found and recognized by Sir Wm. Herschel in 1781. The planet is faint and just beyond the reach of unaided vision under ordinary circumstances. It can, however, be easily recognized with field glasses if one studies the accompanying map carefully. On this chart all stars brighter than magnitude 6.50 have been plotted so that the planet may be identified with certainty.

Uranus is in the constellation *Taurus* throughout the year 1942 passing between the *Pleiades* and the bright star *Aldebaran*. During the early part of

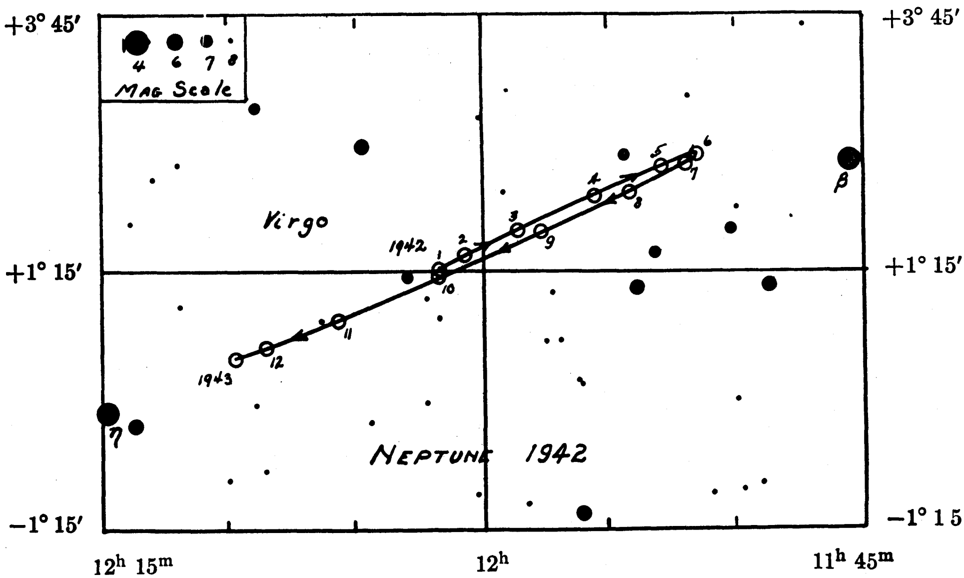


The Path of Uranus Among the Stars During 1942.

the year the planet is in the evening sky and conjunction with the sun occurs on May 22. During the fall Uranus will be visible throughout the night. Opposition occurs on November 25 when the planet will be at its closest approach to the earth of some 1,700,000,000 miles and has the stellar magnitude 5.9. At this distance a large telescope is required to see the disc of the planet and also the very faint satellites, of which there are four.

NEPTUNE

Neptune, the most remote planet visible in moderate telescopes, was discovered in 1846 from calculations based upon the perturbations of Uranus. Its



The Path of Neptune Among the Stars During 1942.

great distance from the sun renders it too faint to be seen without optical aid but it is readily visible in a small telescope since its stellar magnitude at opposition is 7.7. At that time it is some 2,700,000,000 miles from the sun and appears star-like except in the largest telescopes which are also required to show its single satellite.

Neptune remains in the constellation *Virgo* during 1942, moving slowly between the stars β and η. It is in opposition to the sun on March 19, and may best be seen for a month or two before and after that date. The accompanying chart will serve to identify the planet since all stars brighter than magnitude 8.5 have been plotted. A small telescope or a pair of powerful field glasses will enable the observer to see Neptune. It will be approximately twice as bright as the faintest stars shown on the chart.

PLUTO

Pluto, discovered in March 1930, by the Lowell Observatory is the farthest planet from the sun. Because of its great distance from the sun and its small size, it can be observed only with the largest telescopes and by comparison with good star maps of the region. During 1942 Pluto is a yellowish 15th magnitude star in the constellation Cancer.

ECLIPSES DURING 1942

There will be five eclipses in 1942, three of the sun and two of the moon. The three solar eclipses are partial while both the lunar eclipses are total.

The solar eclipses occur on March 16, August 12, and September 10. The first two are invisible in Canada and can be seen only in the southern hemisphere. The eclipse of September 10, will be visible briefly in the northernmost part of Canada north of latitude +60°. These partial solar eclipses are, therefore, of slight interest to observers in Canada.

The Lunar Eclipses are as follows:

1. *A Total Lunar Eclipse* on March 2, 1942. The beginning visible generally in Asia except the extreme eastern part, the Indian Ocean, Europe, Africa, the Atlantic Ocean, eastern and central South America, and the extreme northeastern part of North America; the ending visible generally in Western Asia, Europe, Africa, the western part of the Indian Ocean, North America except the extreme northwestern part, the Atlantic Ocean, South America, and the eastern part of the Pacific Ocean.

The Circumstances of this Eclipse are (75th Meridian Civil Time):

Moon enters penumbra	March 2 d. 16 h. 27.6 m.
Moon enters umbra	March 2 d. 17 h. 31.3 m.
Total eclipse begins	March 2 d. 18 h. 33.2 m.
Middle of eclipse	March 2 d. 19 h. 21.5 m.
Total eclipse ends	March 2 d. 20 h. 09.8 m.
Moon leaves umbra	March 2 d. 21 h. 11.5 m.
Moon leaves penumbra	March 2 d. 22 h. 15.0 m.

2. *A Total Eclipse of the Moon* on August 26, 1942. The beginning visible generally in southwestern Asia, the western part of the Indian Ocean, Europe, Africa, the Atlantic Ocean, North America except the northwestern and extreme western part, South America, and the southeastern part of the Pacific Ocean; the ending visible generally in southwestern Europe and part of the British Isles, the western part of Africa, the Atlantic Ocean, North America except the extreme northwestern part, South America and the eastern part of the Pacific Ocean.

The Circumstances of the Eclipse are (75th Meridian Time):

Moon enters penumbra	August 25 d. 20 h. 01.7 m.
Moon enters umbra	August 25 d. 21 h. 00.5 m.
Total eclipse begins	August 25 d. 22 h. 00.9 m.
Middle of eclipse	August 25 d. 22 h. 48.0 m.
Total eclipse ends	August 25 d. 23 h. 35.0 m.
Moon leaves umbra	August 26 d. 00 h. 35.3 m.
Moon leaves penumbra	August 26 d. 01 h. 34.0 m.

THE SKY MONTH BY MONTH

By W. F. M. Buscombe

THE SKY FOR JANUARY, 1942

The times of transit are given in local mean time, 0h at midnight; to change to Standard Time, see p. 10. Altitudes are for an observer in latitude 45° N.

The Sun—During January the sun's R.A. increases from 18h 43m to 20h 56m and its Decl. changes from 23° 04′ S. to 17° 20′ S. The equation of time (see p. 7) changes from –03m 14s to –13m 34s. Owing to this rapid drop in value, the length of the forenoon as indicated by our clocks remains almost constant for the first ten days of the month. For changes in the length of the day, see p. 11. The sun enters Aquarius, the second winter sign of the zodiac, on the 20th of the month. Due to the precession of the vernal equinox, the sign Aquarius now corresponds in the main with the stars of the constellation Capricornus. The earth is in perihelion, or nearest the sun, on January 2.

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

Mercury on the 15th is in R.A. 20h 47m, Decl. 19° 45′ S. and transits at 13.13. It reaches greatest elongation east of the sun in the evening sky on the 25th, when it sets about an hour and a half after the sun. However, as the planet is far south, it is not favourably placed for observation at this time, being only 9° above the horizon at sunset. Its stellar magnitude at elongation is –0.4.

Venus on the 15th is in R.A. 21h 29m, Decl. 11° 09′ S. and transits at 13.50. It is rapidly approaching the sun in the evening sky, but during the first half of the month sets more than two hours after sunset. It is a bright star of magnitude –4.3. To telescopic observers it appears crescent-shaped.

Mars on the 15th is in R.A. 01h 56m, Decl. 12° 58′ N. and transits at 18.19. The planet is gradually fading in the evening sky. Its stellar magnitude is +0.3. It sets soon after midnight.

Jupiter on the 15th is in R.A. 04h 43m, Decl. 21° 43′ N. and transits at 21.03. During the month it retrogrades or moves west among the stars. It is visible most of the night, setting about three hours before sunrise. After Venus has set it is the most conspicuous object in the sky, for it is of stellar magnitude –2.2. For the configurations of Jupiter's satellites see opposite page, and for their eclipses, etc., see p. 56.

Saturn on the 15th is in R.A. 03h 19m, Decl. 16° 05′ N. and transits at 19.40. It appears as a yellowish star of magnitude +0.2 in the evening sky, setting about three hours after midnight. During the month it moves slowly westward among the stars of the constellation Taurus until it reaches a stationary point on the 23rd. The rings are in a fairly open position, as the line of sight is inclined to their plane by 22°. They are seen from the south side.

Uranus on the 15th is in R.A. 03h 37m, Decl. 19° 11′ N. and transits at 19.58.

Neptune on the 15th is in R.A. 12h 01m, Decl. 01° 17′ N. and transits at 04.25.

Pluto—For information in regard to this planet, see p. 30.

ASTRONOMICAL PHENOMENA MONTH BY MONTH

By Ruth J. Northcott

JANUARY

75th Meridian Civil Time

	d	h m		Phenomenon	Min. of Algol h m	Config. of Jupiter's Sat. 23h 15m
Thu.	1	21	♆	Stationary in R.A.	20 55	4302*
Fri.	2	10 42	○	Full Moon		d4310
		14	⊕	in Perihelion. Dist. from ☉, 91,341,000 mi.		
Sat.	3			Quadrantid Meteors, p. 58		43201
Sun.	4				17 45	4102*
Mon.	5					40123
Tue.	6	7	☿	Greatest Hel. Lat. S.		21043
Wed.	7				14 34	20134
Thu.	8	14 34	☌♆☾	♆ 0° 00′		3024*
Fri.	9					31024
Sat.	10	1 05	☾	Last Quarter	11 23	32014
		21	♀	Stationary in R.A.		
Sun.	11					13024
Mon.	12					01234
Tue.	13				08 12	21043
Wed.	14	17		Moon in Perigee. Dist. from ⊕, 225,200 mi.		20413
Thu.	15					43102
Fri.	16	16 32	●	New Moon	05 02	d4302
Sat.	17	23 51	☌☿☾	☿ 4° 04′ S.		43201
Sun.	18	8 06	☌♀☾	♀ 2° 23′ N.		4130*
Mon.	19				01 51	40123
Tue.	20	20	☌☿♀	☿ 6° 15′ S.		41203
Wed.	21				22 40	42013
Thu.	22					41302
Fri.	23	18	♄	Stationary in R.A.		30124
Sat.	24	1 35	☽	First Quarter	19 29	3204*
		3 22	☌♂☾	♂ 5° 26′ N.		
Sun.	25	7	☿	Greatest elongation E., 18° 31′		3104*
		7	☿	in ☊		
		12 23	☌♄☾	♄ 2° 43′ N.		
		21 07	☌♅☾	♅ 4° 50′ N.		
Mon.	26	12		Moon in Apogee. Dist. from ⊕, 251,600 mi.		01324
Tue.	27	4 44	☌♃☾	♃ 4° 43′ N.	16 19	12034
Wed.	28					20134
Thu.	29	14	□♂☉			d1024
		23	☿	in Perihelion		
Fri.	30				13 08	30124
Sat.	31	7	☿	Stationary in R.A.		3240*
		22	♀	in Perihelion		

Explanation of symbols and abbreviations on p. 4, of time on p. 8.

THE SKY FOR FEBRUARY, 1942

The times of transit are given in local mean time, 0h at midnight; to change to Standard Time, see p. 10. Estimates of altitude are for an observer in latitude 45° N.

The Sun—During February the sun's R.A. increases from 20h 56m to 22h 45m and its Decl. changes from 17° 20′ S. to 07° 54′ S. The equation of time decreases from –13m 34s to a minimum of –14m 20s on the 12th, and then increases to –12m 38s at the end of the month (see p. 7). For changes in the length of the day, see p. 11. The sun enters Pisces, the third winter sign of the zodiac, on the 19th.

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

Mercury on the 15th is in R.A. 21h 06m, Decl. 12° 58′ S. and transits at 12.24. The planet is too near the sun for observation this month, reaching inferior conjunction with the sun on the 9th when it passes into the morning sky.

Venus on the 15th is in R.A. 20h 29m, Decl. 10° 43′ S. and transits at 10.48. It is in inferior conjunction with the sun on the 2nd, but later in the month rapidly separates from the sun in the morning sky. By the 20th it is a brilliant object of stellar magnitude –4.1 and rises one hour and a half before sunrise. On the 2nd, at its closest approach to the earth for the year, its distance is only 25,110,000 miles.

Mars on the 15th is in R.A. 03h 02m, Decl. 18° 32′ N. and transits at 17.23. It appears as a star of first magnitude in Aries, gradually approaching the sun in the evening sky. It sets just after midnight.

Jupiter on the 15th is in R.A. 04h 40m, Decl. 21° 45′ N. and transits at 18.59. It is the brightest object in the evening sky, and is of magnitude –2.0. It sets about two and a half hours after midnight. It reaches a stationary point in its orbit on the 5th, and then commences to move eastward again among the stars. For the configurations of Jupiter's satellites see opposite page, and for their eclipses, etc., see p. 56.

Saturn on the 15th is in R.A. 03h 21m, Decl. 16° 20′ N. and transits at 17.40. Saturn is now moving eastward among the stars and sets just after midnight. Its stellar magnitude is +0.4.

Uranus on the 15th is in R.A. 03h 37m, Decl. 19° 10′ N. and transits at 17.56.

Neptune on the 15th is in R.A. 12h 00m, Decl. 01° 29′ N. and transits at 02.21.

Pluto—For information in regard to this planet, see p. 30.

FEBRUARY

75th Meridian Civil Time

	d	h	m			Min. of Algol h	m	Config. of Jupiter's Sat. 22h 30m
Sun.	1	4	12	○	Full Moon			43210
Mon.	2	12		☌ ♀ ☉	Inferior	09	57	40132
Tue.	3	10		♅	Stationary in R.A.			41203
Wed.	4	19	25	☌ ♆ ☾	♆ 0° 07′ S.			42013
Thu.	5	8		♃	Stationary in R.A.	06	47	41032
Fri.	6							43012
Sat.	7							34210
Sun.	8	9	52	☾	Last Quarter	03	36	d3240
Mon.	9	5		☿	Greatest Hel. Lat. N			042**
		18		☌ ☿ ☉	Inferior			
Tue.	10							d1034
Wed.	11	3		□ ♄ ☉		00	25	20134
		7		Moon in Perigee.	Dist. from ⊕, 228,600 mi.			
Thu.	12							10234
Fri.	13	18	37	☌ ♀ ☾	♀ 5° 06′ N.	21	15	30124
Sat.	14	10	04	☌ ☿ ☾	☿ 1° 06′ N.			32104
Sun.	15	5	02	●	New Moon			32014
		12		□ ♅ ☉				
Mon.	16					18	04	0342*
Tue.	17							41023
Wed.	18							42013
Thu.	19					14	53	4103*
Fri.	20							43012
Sat.	21	18		☿	Stationary in R.A.			43120
		19	50	☌ ♂ ☾	♂ 6° 27′ N.			
		22	03	☌ ♄ ☾	♄ 3° 00′ N.			
Sun.	22	5	24	☌ ♅ ☾	♅ 4° 58′ N.	11	43	43201
		9		♀	Stationary in R.A.			
		18		♀	Greatest Hel. Lat. N.			
		22	40	☽	First Quarter			
Mon.	23	9		Moon in Apogee.	Dist from ⊕, 251,300 mi.			41302
		13	36	☌ ♃ ☾	♃ 4° 55′ N.			
		21		☌ ♂ ♄	♂ 3° 28′ N.			
Tue.	24							41023
Wed.	25					08	32	20413
Thu.	26							1034*
Fri.	27							30124
Sat.	28					05	21	31204

Explanation of symbols and abbreviations on p. 4, of time on p. 8.

THE SKY FOR MARCH, 1942

The times of transit are given in local mean time, 0h at midnight; to change to Standard Time, see p. 10. Estimates of altitude are for an observer in latitude 45° N.

The Sun—During March the sun's R.A. increases from 22h 45m to 00h 39m and its Decl. changes from 07° 54′ S. to 04° 13′ N. The equation of time increases steadily from –12m 38s to –04m 12s (see p. 7). For changes in the length of the day, see p. 11. The sun is at the vernal equinox at 01h 11m E.S.T. March 21. At this time the sun crosses the equator travelling north, enters the sign of Aries, and spring commences. There is a partial eclipse of the sun on March 16. For details see p. 31.

The Moon—For its phases, perigee and apogee times and distances, and its conjunctions with the planets, see opposite page. There is a total eclipse of the moon on March 2. For details see p. 31.

Mercury on the 15th is in R.A. 22h 01m, Decl. 13° 47′ S. and transits at 10.33. It reaches its greatest apparent distance from the sun in the morning sky on the 7th, but can only be seen by those who have a clear south-eastern horizon. On this date it rises about an hour before the sun and reaches an altitude of 9° by sunrise. Look for a reddish object of stellar magnitude +0.4.

Venus on the 15th is in R.A. 20h 53m, Decl. 12° 47′ S. and transits at 09.25. The planet is very brilliant in the morning sky, being now of magnitude –4.3. As it rises about two hours before the sun it should be possible to follow it into the daylight sky. It can also be located at meridian passage by looking due south, 32° above the horizon, at the time of transit. On the 13th it is only 2° north of the moon.

Mars on the 15th is in R.A. 04h 09m, Decl. 22° 27′ N. and transits at 16.40. It appears as a bright object in Taurus, passing north-west of Aldebaran which is slightly brighter than the planet at this time. It sets about six hours after the sun.

Jupiter on the 15th is in R.A. 04h 49m, Decl. 22° 06′ N. and transits at 17.18. It is of magnitude –1.8, and sets almost an hour after midnight. For the configurations of Jupiter's satellites see opposite page, and for their eclipses, etc., see p. 56.

Saturn on the 15th is in R.A. 03h 28m, Decl. 16° 54′ N. and transits at 15.57. It is now approaching nearer the sun in the evening sky, and sets north of the west point about five hours after sunset.

Uranus on the 15th is in R.A. 03h 39m, Decl. 19° 19′ N. and transits at 16.08.

Neptune on the 15th is in R.A. 11h 57m, Decl. 01° 47′ N. and transits at 00.28.

Pluto—For information in regard to this planet, see p. 30.

	d	h	m	MARCH 75th Meridian Civil Time	Min. of Algol h m	Config. of Jupiter's Sat. 22h 00m
Sun.	1			....		32O14
Mon.	2	2		☌♂♅ ♂ 1° 37′ N..................		13O24
		19	20	🌕 Full Moon............................		
				Total eclipse of ☾, see p. 31.................		
Tue.	3	13		□♃☉	02 11	O1234
Wed.	4	1	29	☌♆☾ ♆ 0° 04′ S..................		2O43*
		16		☿ in ☋................................		
Thu.	5			....	23 00	12O43
Fri.	6			....		43O12
Sat.	7	19		☿ Greatest elongation W., 27° 21′.........		d431O
Sun.	8	6		Moon in Perigee. Dist. from ⊕, 229,700 mi....	19 49	432O1
Mon.	9	2		♀ Greatest brilliancy.....................		431O2
		17	00	☾ Last Quarter.........................		
Tue.	10			....		4O123
Wed.	11			....	16 38	42O3*
Thu.	12			....		421O3
Fri.	13	10	22	☌♀☾ ♀ 1° 58′ N..................		d4O12
Sat.	14	17	15	☌☿☾ ☿ 3° 03′ S..................	13 28	31O24
		22		☿ in Aphelion..........................		
Sun.	15			....		32O14
Mon.	16			Partial eclipse of ☉, see p. 31................		31O24
		18	50	🌑 New Moon............................		
Tue.	17			....	10 17	O1324
Wed.	18			....		21O34
Thu.	19	13		☍♆☉ Dist. from ⊕, 2,717,000,000 mi.		d2O34
Fri.	20			....	07 06	O3124
Sat.	21	1	11	☉ enters ♈, Spring commences. Long. of ☉, 0°.		31O24
		10	28	☌♄☾ ♄ 3° 10′ N..................		
		15	13	☌♅☾ ♅ 4° 58′ N..................		
Sun.	22	15	26	☌♂☾ ♂ 6° 45′ N..................		324O1
Mon.	23	3	29	☌♃☾ ♃ 4° 58′ N..................	03 56	431O*
		5		Moon in Apogee. Dist. from ⊕, 251,400 mi....		
Tue.	24	19	01	☽ First Quarter.........................		4O12*
Wed.	25			....		421O3
Thu.	26			....	00 45	42O13
Fri.	27			....		4O32*
Sat.	28			....	21 34	431O2
Sun.	29			....		342O1
Mon.	30			....		314O*
Tue.	31	9	30	☌♆☾ ♆ 0° 00′....................	18 23	O142*

Explanation of symbols and abbreviations on p. 4, of time on p. 8.

THE SKY FOR APRIL, 1942

The times of transit are given in local mean time, 0h at midnight; to change to Standard Time, see p. 10. Estimates of altitude are for an observer in latitude 45° N.

The Sun—During April the sun's R.A. increases from 00h 39m to 02h 30m and its Decl. changes from 04° 13′ N. to 14° 49′ N. The equation of time changes from -04m 12s to +02m 51s (see p. 7). For changes in the length of the day, see p. 11. The sun enters Taurus, the second spring sign of the zodiac, on the 20th.

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

Mercury on the 15th is in R.A. 01h 10m, Decl. 06° 00′ N. and transits at 11.42. It is too near the sun to be well seen, as it is in superior conjunction with the sun on the 20th and passes into the evening sky.

Venus on the 15th is in R.A. 22h 38m, Decl. 08° 05′ S. and transits at 09.08. It continues to be the most brilliant object of the morning sky, and reaches greatest elongation west of the sun on the 13th, at which time it rises nearly two hours before the sun and is of stellar magnitude -4.0. It is now at the last quarter phase, as half the disk is illuminated. On the 11th the moon passes so close to it that a daytime occultation is visible to observers in the tropics.

Mars on the 15th is in R.A. 05h 30m, Decl. 24° 43′ and transits at 15.59. It continues to fade in the evening sky, and is of stellar magnitude +1.6. It now sets about five hours after sunset.

Jupiter on the 15th is in R.A. 05h 09m, Decl. 22° 40′ N. and transits at 15.36. It is a very bright object of magnitude -1.6, setting almost five hours after the sun. For the configurations of Jupiter's satellites see opposite page, and for their eclipses, etc., see p. 56.

Saturn on the 15th is in R.A. 03h 41m, Decl. 17° 45′ N. and transits at 14.08. It is now becoming rather close to the sun to be well seen, but may be glimpsed in the evening sky during the first half of the month. On the 15th it is about 28° above the horizon at sunset.

Uranus on the 15th is in R.A. 03h 45m, Decl. 19° 37′ N. and transits at 14.11.

Neptune on the 15th is in R.A. 11h 54m, Decl. 02° 06′ N. and transits at 22.19.

Pluto—For information in regard to this planet, see p. 30.

				APRIL 75th Meridian Civil Time		Min. of Algol		Config. of Jupiter's Sat. 21h 45m
	d	h	m			h	m	
Wed.	1	7	32	🌕	Full Moon			12O34
Thu.	2							2O134
Fri.	3	23		☌ ♂ ♃	♂ 1° 44′ N.	15	12	1O234
Sat.	4	1			Moon in Perigee. Dist. from ⊕, 226,700 mi.			31O24
		6		☿	Greatest Hel. Lat. S.			
Sun.	5							32O14
Mon.	6					12	02	312O4
Tue.	7	23	43	☾	Last Quarter			3O142
Wed.	8							d14O3
Thu.	9					08	51	42O13
Fri.	10							41O23
Sat.	11	11	03	☌ ♀ ☾	♀ 0° 07′ N.			d43O2
Sun.	12					05	40	432O1
Mon.	13	15		♀	Greatest elongation W., 46° 19′.			4321O
Tue.	14	19	47	☌ ☿ ☾	☿ 1° 45′ N.			43O12
Wed.	15	9	33	🌑	New Moon	02	29	41O23
Thu.	16							24O13
Fri.	17					23	18	1O243
Sat.	18	0	04	☌ ♄ ☾	♄ 3° 13′ N.			3O124
		1	26	☌ ♅ ☾	♅ 4° 54′ N.			
Sun.	19	20		♀	in ☋			32O4*
		20	26	☌ ♃ ☾	♃ 4° 52′ N.			
		23			Moon in Apogee. Dist. from ⊕, 251,900 mi.			
Mon.	20	5		☌ ☿ ☉	Superior	20	07	321O4
		11	59	☌ ♂ ☾	♂ 6° 25′ N.			
Tue.	21				Lyrid Meteors, p. 58			3O124
Wed.	22							1O234
Thu.	23	7		☿	in ☊	16	57	2O134
		13	10	☽	First Quarter			
Fri.	24							1O43*
Sat.	25							4O312
Sun.	26					13	45	4321O
Mon.	27	18	32	☌ ♆ ☾	♆ 0° 01′ S.			4321O
		22		☿	in Perihelion			
Tue.	28	4		☌ ♄ ♅	♄ 1° 39′ S.			43O12
Wed.	29					10	35	41O32
Thu.	30	16	59	🌕	Full Moon			42O13

Explanation of symbols and abbreviations on p. 4, of time on p. 8.

THE SKY FOR MAY, 1942

The times of transit are given in local mean time, 0h at midnight; to change to Standard Time, see p. 10. Estimates of altitude are for an observer in latitude 45° N.

The Sun—During May the sun's R.A. increases from 02h 30m to 04h 33m and its Decl. changes from 14° 49′ N. to 21° 56′ N. The equation of time increases from +02m 51s to a maximum of +03m 47s on the 15th, and then decreases to +02m 29s (see p. 7). For changes in the length of the day, see p. 11. The sun enters Gemini, the third spring sign of the zodiac, on the 21st.

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

Mercury on the 15th is in R.A. 04h 54m, Decl. 25° 02′ N. and transits at 13.27. It reaches greatest elongation east of the sun on the 18th, and should be easy to locate as this is the most favourable time of the year to observe the planet in the evening sky. It sets about one hour and a half after the sun, and is about 19° above the horizon at sunset. Look for a reddish object of stellar magnitude +0.6 in the north-western sky.

Venus on the 15th is in R.A. 00h 38m, Decl. 02° 18′ N. and transits at 09.10. It remains a prominent object in morning twilight, having stellar magnitude -3.7 and being 17° above the eastern horizon at sunrise.

Mars on the 15th is in R.A. 06h 50m, Decl. 24° 21′ N. and transits at 15.21. It appears as a red star of magnitude +1.8 in the north-western twilight sky. It is in the constellation Gemini, and sets about four hours after sunset.

Jupiter on the 15th is in R.A. 05h 35m, Decl. 23° 07′ N. and transits at 14.04. It is rapidly becoming closer to the sun in the evening sky but can still be seen about 24° above the horizon at sunset, of stellar magnitude -1.5. For the configurations of Jupiter's satellites see opposite page, and for their eclipses, etc., see p. 56.

Saturn on the 15th is in R.A. 03h 56m, Decl. 18° 36′ N. and transits at 12.25. Conjunction with the sun occurs on the 23rd, so the planet cannot be seen this month.

Uranus on the 15th is in R.A. 03h 51m, Decl. 19° 59′ N. and transits at 12.20.

Neptune on the 15th is in R.A. 11h 52m, Decl. 02° 19′ N. and transits at 20.19.

Pluto—For information in regard to this planet, see p. 30.

				MAY 75th Meridian Civil Time	Min. of Algol	Config. of Jupiter's Sat. 21h 15m
	d	h	m		h m	
Fri.	1			....		41203
Sat.	2	2		Moon in Perigee. Dist. from ⊕, 223,700 mi....	07 24	40312
Sun.	3			....		31240
Mon.	4	22		☌☿♅ ☿ 2° 07′ N..................		32014
				Eta Aquarid Meteors, p. 58		
Tue.	5	4		☌☿♄ ☿ 3° 46′ N..................	04 13	3024*
Wed.	6			....		1024*
Thu.	7	7	13	☾ Last Quarter..........................		20134
Fri.	8	4		☿ Greatest Hel. Lat. N..................	01 02	12034
Sat.	9			....		01324
Sun.	10			....	21 51	d3104
Mon.	11	1	50	☌♀☾ ♀ 0° 37′ N..................		32014
Tue.	12			....		3402*
Wed.	13			....	18 40	4102*
Thu.	14			....		42013
Fri.	15	0	45	● New Moon..........................		41203
		11	14	☌♅☾ ♅ 4° 51′ N..................		
		13	42	☌♄☾ ♄ 3° 15′ N..................		
Sat.	16	23	18	☌☿☾ ☿ 7° 23′ N..................	15 29	40132
Sun.	17	10		Moon in Apogee. Dist. from ⊕, 252,500 mi....		41302
		14	50	☌♃☾ ♃ 4° 40′ N..................		
Mon.	18	15		☿ Greatest elongation E., 22° 11′..........		43201
Tue.	19	7	49	☌♂☾ ♂ 5° 32′ N..................	12 17	34102
Wed.	20			....		d3042
Thu.	21	22		☌♅☉		20134
Fri.	22			....	09 06	21034
Sat.	23	4	11	☽ First Quarter..........................		01234
		12		☌♄☉		
Sun.	24	4		♀ in Aphelion..........................		13024
Mon.	25	3	08	☌♆☾ ♆ 0° 13′ S..................	05 55	32014
Tue.	26			....		3104*
Wed.	27			....		30124
Thu.	28			....	02 44	2043*
Fri.	29			....		24103
Sat.	30	0	29	○ Full Moon..........................	23 33	40123
		11		Moon in Perigee. Dist. from ⊕, 222,000 mi....		
Sun.	31	14		☿ Stationary in R.A.....................		d4102
		15		☿ in ♉		

Explanation of symbols and abbreviations on p. 4, of time on p. 8.

THE SKY FOR JUNE, 1942

The times of transit are given in local mean time, 0h at midnight; to change to Standard Time, see p. 10. Estimates of altitude are for an observer in latitude 45° N.

The Sun—During June the sun's R.A. increases from 04h 33m to 06h 37m and its Decl. changes from 21° 56′ N. to a maximum of 23° 27′ N. on the 22nd, and then decreases to 23° 10′ N. The equation of time changes from +02m 29s to -03m 29s (see p. 7). For changes in the length of the day, see p. 11. The sun reaches its most northerly position at 20h 17m E.S.T. on June 21, when summer begins. During the last half of June the days are longest in the northern hemisphere and the duration of daylight changes little. The local mean time of sunset is almost constant due to the decrease of the equation of time.

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

Mercury on the 15th is in R.A. 05h 18m, Decl. 19° 21′ N. and transits at 11.43. It is too near the sun to be well seen this month, as inferior conjunction with the sun occurs on the 12th. However, the planet may possibly be glimpsed in the north-eastern sky before sunrise on the last few mornings of June.

Venus on the 15th is in R.A. 02h 52m, Decl. 14° 17′ N. and transits at 09.22. The planet is dimming slightly, and getting closer to the sun. It rises about two hours before sunrise.

Mars on the 15th is in R.A. 08h 12m, Decl. 21° 19′ N. and transits at 14.41. It is the most conspicuous object in the evening twilight sky, and is of second magnitude. It is about 25° above the north-western horizon at sunset.

Jupiter on the 15th is in R.A. 06h 05m, Decl. 23° 18′ N. and transits at 12.32. As the planet reaches conjunction with the sun on the 25th it cannot be seen this month except for occasional glimpses at sunset in the north-west, on the first few evenings of the month.

Saturn on the 15th is in R.A. 04h 13m, Decl. 19° 23′ N. and transits at 10.39. The planet has now passed into the morning sky but is still too close to the sun to be seen until the last few days of the month. By the 30th it rises about two hours before the sun.

Uranus on the 15th is in R.A. 03h 59m, Decl. 20° 21′ N. and transits at 10.26.

Neptune on the 15th is in R.A. 11h 51m, Decl. 02° 22′ N. and transits at 18.17.

Pluto—For information in regard to this planet, see p. 30.

JUNE

75th Meridian Civil Time

	d	h	m			Min. of Algol h	m
Mon.	1						
Tue.	2					20	22
Wed.	3						
Thu.	4						
Fri.	5	16	26	☾	Last Quarter	17	11
Sat.	6						
Sun.	7	15		♂	Greatest Hel. Lat. N		
Mon.	8	18		♆	Stationary in R.A.	13	59
Tue.	9						
Wed.	10	0	28	☌ ♀ ☾	♀ 2° 19′ N.		
		21		☿	in Aphelion		
Thu.	11	20	26	☌ ♅ ☾	♅ 4° 54′ N.	10	48
Fri.	12	2	55	☌ ♄ ☾	♄ 3° 19′ N.		
		16		☌ ☿ ☉	Inferior		
Sat.	13	12	53	☌ ☿ ☾	☿ 1° 24′ N.		
		14			Moon in Apogee. Dist. from ⊕, 252,700 mi.		
		16	02	●	New Moon		
Sun.	14	9	49	☌ ♃ ☾	♃ 4° 27′ N.	07	37
Mon.	15	16		♀	Greatest Hel. Lat. S.		
Tue.	16						
Wed.	17	2	06	☌ ♂ ☾	♂ 4° 13′ N.	04	26
Thu.	18	20		□ ♆ ☉			
Fri.	19						
Sat.	20					01	15
Sun.	21	10	29	☌ ♆ ☾	♆ 0° 29′ S.		
		15	44	☽	First Quarter		
		20	17		☉ enters ♋, Summer commences. Long. of ☉, 90°		
Mon.	22					22	03
Tue.	23						
Wed.	24	12		☿	Stationary in R.A.		
Thu.	25	12		☌ ♃ ☉		18	52
Fri.	26						
Sat.	27	20			Moon in Perigee. Dist. from ⊕, 222,000 mi.		
Sun.	28	7	09	○	Full Moon	15	41
Mon.	29	15		☌ ♀ ♅	♀ 1° 41′ S.		
Tue.	30						

Explanation of symbols and abbreviations on p. 4, of time on p. 8. Jupiter being near the sun, phenomena of the satellites are not given from June 1 to July 16.

THE SKY FOR JULY, 1942

The times of transit are given in local mean time, 0h at midnight; to change to Standard Time, see p. 10. Estimates of altitude are for an observer in latitude 45° N.

The Sun—During July the sun's R.A. increases from 06h 37m to 08h 42m and its Decl. changes from 23° 10′ N. to 18° 14′ N. The equation of time decreases from –03m 29s to a minimum of –06m 24s on the 27th, and then increases to –06m 16s by the end of the month (see p. 7). For changes in the length of the day, see p. 11. The sun enters Leo, the second summer sign of the zodiac, on the 23rd. The earth is in aphelion, the point in its orbit farthest from the sun, on July 5.

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

Mercury on the 15th is in R.A. 06h 14m, Decl. 22° 14′ N. and transits at 10.47. It reaches its greatest apparent distance from the sun in the morning sky on the 6th and should be easy to locate during the first half of the month. It rises almost one and a half hours before the sun, reaching an altitude of 15° at sunrise. Its stellar magnitude is +0.6. Toward the end of the month it rapidly approaches superior conjunction with the sun, which occurs on August 2.

Venus on the 15th is in R.A. 05h 18m, Decl. 21° 50′ N. and transits at 09.49. It is a brilliant star of magnitude –3.4, about 23° above the horizon at sunrise.

Mars on the 15th is in R.A. 09h 28m, Decl. 16° 13′ N. and transits at 13.58. It is rapidly fading as it approaches the sun in the evening sky, and for the remainder of the year will be very difficult to see.

Jupiter on the 15th is in R.A. 06h 34m, Decl. 23° 07′ N. and transits at 11.03. The planet is too close to the sun in the morning sky to be well seen until the last few days of the month when it rises about two hours before the sun. For the configurations of Jupiter's satellites see opposite page, and for their eclipses, etc., see p. 56.

Saturn on the 15th is in R.A. 04h 27m, Decl. 19° 58′ N. and transits at 08.56. It is separating from the sun in the morning sky, rising in the north-east about three hours before the sun.

Uranus on the 15th is in R.A. 04h 05m, Decl. 20° 39′ N. and transits at 08.34.

Neptune on the 15th is in R.A. 11h 53m, Decl. 02° 13′ N. and transits at 16.20.

Pluto—For information in regard to this planet, see p. 30.

JULY

75th Meridian Civil Time

	d	h m		Min. of Algol h m	Config. of Jupiter's Sat. 4h 45m
Wed.	1	05	☿ Greatest Hel. Lat. S.	12 29	
Thu.	2				
Fri.	3	18	☌ ♀ ♄ ♀ 0° 04′ N.		
Sat.	4			09 18	
Sun.	5	3 58	☾ Last Quarter		
		19	⊕ in Aphelion. Dist. from ☉, 99,448,000 mi.		
Mon.	6	5	☿ Greatest elongation W., 21° 23′		
Tue.	7			06 07	
Wed.	8				
Thu.	9	5 18	☌ ♅ ☾ ♅ 5° 02′ N.		
		15 39	☌ ♄ ☾ ♄ 3° 25′ N.		
Fri.	10	6 13	☌ ♀ ☾ ♀ 3° 38′ N.	02 55	
		19	Moon in Apogee. Dist. from ⊕, 252,500 mi.		
Sat.	11	10 30	☌ ☿ ☾ ☿ 2° 48′ N.		
Sun.	12	5 01	☌ ♃ ☾ ♃ 4° 14′ N.	23 44	
Mon.	13	7 03	● New Moon		
		23	♂ in Aphelion		
Tue.	14				
Wed.	15	18 46	☌ ♂ ☾ ♂ 2° 35′ N.	20 33	
Thu.	16				
Fri.	17				31O24
Sat.	18	3	☌ ☿ ♃ ☿ 0° 22′ S.	17 21	2O143
		16 53	☌ ♆ ☾ ♆ 0° 45′ S.		
Sun.	19				4O3**
Mon.	20	6	☿ in ☊		41O23
Tue.	21	0 13	☽ First Quarter	14 10	d42O1
Wed.	22				4321O
Thu.	23				43O21
Fri.	24	21	☿ in Perihelion	10 58	431O2
Sat.	25				42O13
Sun.	26	4	Moon in Perigee. Dist. from ⊕, 223,800 mi.		421O3
Mon.	27	14 14	○ Full Moon	07 47	d4O23
Tue.	28		Delta Aquarid Meteors, p. 58		dO314
Wed.	29				321O4
Thu.	30			04 36	3O214
Fri.	31				31O24

Explanation of symbols and abbreviation on p. 4, of time on p.8.

THE SKY FOR AUGUST, 1942

The times of transit are given in local mean time, 0h at midnight; to change to Standard Time, see p. 10. Estimates of altitude are for an observer in latitude 45° N.

The Sun—During August the sun's R.A. increases from 08h 42m to 10h 38m and its Decl. changes from 18° 14′ N. to 08° 36′ N. The equation of time increases steadily from –06m 16s to –00m 16s (see p. 7). For changes in the length of the day, see p. 11. The sun enters Virgo, the third summer sign of the zodiac, on the 23rd. There is a partial eclipse of the sun on August 11. For details, see p. 31.

The Moon—For its phases, perigee and apogee times and distances, and its conjunctions with the planets, see opposite page. There is a total eclipse of the moon on August 25. For details see p. 31.

Mercury on the 15th is in R.A. 10h 24m, Decl. 11° 31′ N. and transits at 12.55. The planet is not favourably placed for observation this month, being too near the sun in the evening sky. However, it may be possible to catch sight of it in the west after sunset on the last few days of the month, as it is approaching maximum eastern elongation.

Venus on the 15th is in R.A. 07h 58m, Decl. 20° 51′ N. and transits at 10.28. It remains a conspicuous object in the morning sky but is gradually approaching the sun.

Mars on the 15th is in R.A. 10h 42m, Decl. 09° 18′ N. and transits at 13.11. It is too near the sun to be observed this month.

Jupiter on the 15th is in R.A. 07h 03m, Decl. 22° 37′ N. and transits at 09.30. It is rapidly moving away from the sun in the morning sky and now is of stellar magnitude –1.5. It is about 32° above the horizon at sunrise. For the configurations of Jupiter's satellites see opposite page, and for their eclipses, etc., see p. 56.

Saturn on the 15th is in R.A. 04h 39m, Decl. 20° 19′ N. and transits at 07.06. It is now plainly visible in the morning sky, rising just before midnight as a yellowish body of magnitude +0.3.

Uranus on the 15th is in R.A. 04h 09m, Decl. 20° 51′ N. and transits at 06.36.

Neptune on the 15th is in R.A. 11h 56m, Decl. 01° 53′ N. and transits at 14.21.

Pluto—For information in regard to this planet, see p. 30.

AUGUST

75th Meridian Civil Time

Day	d	h	m	Phenomenon	Min. of Algol h	Min. of Algol m	Config. of Jupiter's Sat. 4h 30m
Sat.	1	23		☌♀♃ ♀ 0° 21′ S.			2O314
Sun.	2	17		☌☿☉ Superior	01	24	21O34
Mon.	3	18	04	☾ Last Quarter			O1234
Tue.	4	3		☿ Greatest Hel. Lat. N	22	13	O243*
Wed.	5	14	08	☌♅☾ ♅ 5° 10′ N.			2341O
Thu.	6	3	49	☌♄☾ ♄ 3° 28′ N.			34O21
Fri.	7	8		Moon in Apogee. Dist. from ⊕, 251,900 mi.	19	01	431O2
Sat.	8						42O1*
Sun.	9	0	11	☌♃☾ ♃ 4° 02′ N.			421O3
		16	16	☌♀☾ ♀ 3° 32′ N.			
Mon.	10	23		♀ in ♌	15	50	4O123
Tue.	11	21	28	● New Moon			4O23*
				Partial eclipse of ☉, see p. 31			
Wed.	12			Perseid Meteors, p. 58			2431O
		20	27	☌☿☾ ☿ 1° 59′ N.			
Thu.	13	10	27	☌♂☾ ♂ 0° 44′ N.	12	38	3O41*
Fri.	14	23	36	☌♆☾ ♆ 0° 54′ S.			31O24
Sat.	15						2O14*
Sun.	16				09	27	21O34
Mon.	17						O1234
Tue.	18						1O234
Wed.	19	6	30	☽ First Quarter	06	16	d23O4
		8		☌☿♂ ☿ 0° 00′.			
Thu.	20						3O14*
Fri.	21						31O42
Sat.	22				03	04	432O1
Sun.	23	4		Moon in Perigee. Dist. from ⊕, 226,700 mi.			421O3
Mon.	24				23	53	4O213
Tue.	25			Total eclpse of ☾, see p. 31			41O23
		22	46	○ Full Moon			
Wed.	26						d42O1
Thu.	27	14		☿ in ♍	20	41	432O*
Fri.	28	6		□♅☉			431O2
Sat.	29						d43O1
Sun.	30	19		☌☿♆ ☿ 1° 53′ S.	17	30	21O43
Mon.	31						O2143

Explanation of symbols and abbreviations on p. 4, of time on p. 8.

THE SKY FOR SEPTEMBER, 1942

The times of transit are given in local mean time, 0h at midnight; to change to Standard Time, see p. 10. Estimates of altitude are for an observer in latitude 45° N.

The Sun—During September the sun's R.A. increases from 10h 38m to 12h 26m and its Decl. changes from 08° 36′ N. to 02° 51′ S. The equation of time changes from -00m 16s to +10m 00s (see p. 7). For changes in the length of the day, see p. 11. The sun is at the autumnal equinox at 11h 17m E.S.T. on September 23. This is the beginning of autumn as the sun enters Libra. The length of day and night are approximately equal all over the world. There is a partial eclipse of the sun on September 10. For details see p. 31.

The Moon—For its phases, perigee and apogee times and distances, and its conjunctions with the planets, see opposite page. When at the full phase in September, the moon is most conspicuous in the northern hemisphere. Due to the inclination of its orbital plane to that of the earth, it rises more nearly at the same hour on successive nights than at any other time of year.

Mercury on the 15th is in R.A. 13h 03m, Decl. 09° 27′ S. and transits at 13.29. It reaches its greatest apparent separation from the sun in the evening sky on the 15th when it sets less than an hour after the sun. At sunset it appears as a reddish object, of stellar magnitude +0.3, about 7° above the western horizon.

Venus on the 15th is in R.A. 10h 31m, Decl. 10° 41′ N. and transits at 10.58. It can be observed only by those who have a clear eastern horizon. It rises about an hour and a half before the sun. Small telescopes will show a disk near the full phase whose diameter is about 10 seconds of arc.

Mars on the 15th is in R.A. 11h 56m, Decl. 01° 23′ N. and transits at 12.21. It reaches conjunction with the sun on October 5 and hence cannot be observed. On the 18th it is at its greatest distance from the earth, 245,300,000 miles.

Jupiter on the 15th is in R.A. 07h 27m, Decl. 21° 56′ N. and transits at 07.52. It is brightening a little and is of magnitude -1.6, about the brightness of Sirius. It rises more than five hours before the sun. For the configurations of Jupiter's satellites see opposite page, and for their eclipses, etc., see p. 56.

Saturn on the 15th is in R.A. 04h 45m, Decl. 20° 27′ N. and transits at 05.10. It is now becoming a prominent object in the morning sky, being near the meridian at sunrise. At this time the plane of the rings makes an angle of 26° to the line of sight.

Uranus on the 15th in is R.A. 04h 11m, Decl. 20° 54′ N. and transits at 04.36.

Neptune on the 15th is in R.A. 12h 00m, Decl. 01° 27′ N. and transits at 12.23.

Pluto—For information in regard to this planet, see p. 30.

						SEPTEMBER 75th Meridian Civil Time	Min. of Algol		Config. of Jupiter's Sat. 4h 0m
	d	h	m				h	m	
Tue.	1	22	50	☌ ⛢ ☾	⛢	5° 13′ N.			10234
Wed.	2	10	42	☾	Last Quarter		14	18	20314
		14	54	☌ ♄ ☾	♄	3° 26′ N.			
Thu.	3								3204*
Fri.	4	1		Moon in Apogee. Dist. from ⊕, 251,300 mi.					d3024
Sat.	5	4		□ ♄ ☉			11	07	30214
		18	42	☌ ♃ ☾	♃	3° 48′ N.			
Sun.	6	21		☿	in Aphelion				21034
Mon.	7								02413
Tue.	8						07	56	41023
Wed.	9	0	24	☌ ♀ ☾	♀	1° 43′ N.			42031
		11		♃	in ☊				
Thu.	10			Partial eclipse of ☉, see p. 31					43210
		4		⛢	Stationary in R.A.				
		10	53	●	New Moon				
Fri.	11	2	04	☌ ♂ ☾	♂	1° 09′ S.	04	44	43012
		7	53	☌ ♆ ☾	♆	0° 59′ S.			
Sat.	12	9	52	☌ ☿ ☾	☿	6° 01′ S.			43012
Sun.	13	11		♀	in Perihelion				42103
Mon.	14						01	33	4013*
Tue.	15	12		☿	Greatest elongation E., 26° 40′				14023
Wed.	16	13		☌ ♂ ♆	♂	0° 30′ S.	22	21	20413
Thu.	17	11	56	☽	First Quarter				23104
Fri.	18	22		Moon in Perigee. Dist. from ⊕, 229,600 mi.					30124
Sat.	19						19	10	3024*
Sun.	20								21304
Mon.	21								20134
Tue.	22						15	59	10234
Wed.	23	2		☌ ♆ ☉					20134
		11	17	☉ enters ♎, Autumn commences. Long. of ☉, 180°					
Thu.	24	9	34	○	Full Moon				d2130
Fri.	25	4		♄	Stationary in R.A.		12	47	34012
Sat.	26								43102
Sun.	27	5		☿	Greatest Hel. Lat. S.				d420*
Mon.	28	11		☿	Stationary in R.A.		09	36	42013
Tue.	29	6	57	☌ ⛢ ☾	⛢	5° 08′ N.			41023
Wed.	30	0	01	☌ ♄ ☾	♄	3° 17′ N.			d4013

Explanation of symbols and abbreviations on p. 4, of time on p. 8.

THE SKY FOR OCTOBER, 1942

The times of transit are given in local mean time, 0h at midnight; to change to Standard Time, see p. 10. Estimates of altitude are for an observer in latitude 45° N.

The Sun—During October the sun's R.A. increases from 12h 26m to 14h 22m and its Decl. changes from 02° 51′ S. to 14° 09′ S. The equation of time increases steadily from +10m 00s to +16m 20s (see p. 7), so that the sun crosses the meridian a few seconds earlier each day. For changes in the length of the day, see p. 11. On the 24th the sun enters Scorpio, the second autumnal sign of the zodiac.

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

Mercury on the 15th is in R.A. 12h 47m, Decl. 05° 32′ S. and transits at 11.11. The planet will be difficult to see during this month as it is in inferior conjunction with the sun on the 10th. Passing into the morning sky, it reaches greatest western elongation from the sun on the 26th, appearing at sunrise as a bright star of magnitude -0.2, about 18° above the eastern horizon. It rises less than two hours before the sun.

Venus on the 15th is in R.A. 12h 49m, Decl. 03° 45′ S. and transits at 11.18. The planet is very difficult to observe, being quite close to the sun in the morning sky. It is only 7° above the horizon at sunrise.

Mars on the 15th is in R.A. 13h 08m, Decl. 06° 30′ S. and transits at 11.35. It is now in the morning sky but cannot be seen as it rises only a few minutes before the sun.

Jupiter on the 15th is in R.A. 07h 43m, Decl. 21° 24′ N. and transits at 06.10. It now dominates the morning sky and is near the meridian at sunrise, with stellar magnitude -1.8. For the configurations of Jupiter's satellites see opposite page, and for their eclipses, etc., see p. 56.

Saturn on the 15th is in R.A. 04h 44m, Decl. 20° 21′ N. and transits at 03.11. The planet is bright most of the night, rising two hours after sunset.

Uranus on the 15th is in R.A. 04h 09m, Decl. 20° 49′ N. and transits at 02.36.

Neptune on the 15th is in R.A. 12h 04m, Decl. 01° 01′ N. and transits at 10.29.

Pluto—For information in regard to this planet, see p. 30.

OCTOBER

75th Meridian Civil Time

Day	d	h	m	Phenomenon			Min. of Algol h m	Config. of Jupiter's Sat. 3h 30m
Thu.	1	20		Moon in Apogee. Dist. from ⊕, 251,200 mi.			06 25	4213O
Fri.	2	5	27	☾	Last Quarter			34O21
Sat.	3	11	13	☌♃☾	♃	3° 28′ N.		31O42
Sun.	4	13		☌♀♆	♀	0° 11′ N.	03 13	32O14
Mon.	5	11		♀	Greatest Hel. Lat. N.			2O34*
		19		☌♂☉				
Tue.	6							1O234
Wed.	7						00 02	O2134
Thu.	8	18	08	☌♆☾	♆	1° 04′ S.		d21O4
Fri.	9	3	44	☌♀☾	♀	1° 22′ S.	20 51	3O14*
		18	34	☌♂☾	♂	2° 53′ S.		
		22	32	☌☿☾	☿	6° 01′ S.		
		23	06	●	New Moon			
Sat.	10	20		☌☿☉	Inferior			31O42
Sun.	11	6		☌☿♂	☿	2° 32′ S.		324O1
Mon.	12						17 39	42O3*
Tue.	13							41O23
Wed.	14	0		Moon in Perigee. Dist. from ⊕, 228,700 mi.				4O123
		11		☌☿♀	☿	2° 09′ S.		
Thu.	15						14 28	421O3
Fri.	16	5		☿	in ☊			43O1*
		17	58	☽	First Quarter			
Sat.	17							431O2
Sun.	18	0		□♃☉			11 17	432O1
Mon.	19	5		☿	Stationary in R.A.			214O3
Tue.	20	20		☿	in Perihelion			dO243
Wed.	21						08 06	O1234
Thu.	22			Orionid Meteors, p. 58				21O34
Fri.	23	8		☌♀♂	♀	0° 45′ N.		32O14
		23	05	○	Full Moon			
Sat.	24						04 54	31O24
Sun.	25							32O14
Mon.	26	10		☿	Greatest elongation W., 18° 28′			21O4*
		13	46	☌♅☾	♅	4° 59′ N.		
Tue.	27	6	20	☌♄☾	♄	3° 05′ N.	01 43	O1243
Wed.	28							4O23*
Thu.	29	16		Moon in Apogee. Dist. from ⊕, 251,600 mi.			22 32	421O3
Fri.	30	23	49	☌♃☾	♃	3° 10′ N.		432O1
Sat.	31	3		☿	Greatest Hel. Lat. N.			431O2

Explanation of symbols and abbreviations on p. 4, of time on p. 8.

THE SKY FOR NOVEMBER, 1942

The times of transit are given in local mean time, 0h at midnight; to change to Standard Time, see p. 10. Estimates of altitude are for an observer in latitude 45° N.

The Sun—During November the sun's R.A. increases from 14h 22m to 16h 26m and its Decl. changes from 14° 09′ S. to 21° 40′ S. The equation of time increases from +16m 20s to a maximum of +16m 23s on the 4th, and then decreases to +11m 16s at the end of the month (see p. 7). For changes in the length of the day, see p. 11. On the 22nd the sun enters Sagittarius, the third autumnal sign of the zodiac.

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

Mercury on the 15th is in R.A. 14h 42m, Decl. 14° 42′ S. and transits at 11.10. It may possibly be glimpsed in the east just before sunrise on the first few mornings of November, but is otherwise too near the sun to be seen.

Venus on the 15th is in R.A. 15h 17m, Decl. 17° 35′ S. and transits at 11.44. On the 16th it reaches superior conjunction and passes into the evening sky. It is too near the sun to be well seen this month.

Mars on the 15th is in R.A. 14h 26m, Decl. 14° 06′ S. and transits at 10.52. It is gradually becoming farther from the sun in the morning sky, but is still too close to the sun to be conspicuous.

Jupiter on the 15th is in R.A. 07h 49m, Decl. 21° 14′ N. and transits at 04.14. As a star of magnitude -2.0 it rises more than three hours before midnight. On the 12th it commences to retrograde, or move westward among the stars. For the configurations of Jupiter's satellites see opposite page, and for their eclipses, etc., see p. 56.

Saturn on the 15th is in R.A. 04h 36m, Decl. 20° 04′ N. and transits at 01.01. Opposition with the sun occurs on December 1, when the planet rises at sunset and is visible all night. For the elongations of Saturn's satellites, at sunset and is visible all night.

Uranus on the 15th is in R.A. 04h 04m, Decl. 20° 36′ N. and transits at 00.29.

Neptune on the 15th in is R.A. 12h 07m, Decl. 00° 39′ N. and transits at 08.31.

Pluto—For information in regard to this planet, see p. 30.

				NOVEMBER 75th Meridian Civil Time		Min. of Algol	Config. of Jupiter's Sat. 3h 00m
	d	h	m			h m	
Sun.	1	1	18	☾	Last Quarter	19 21	43O21
Mon.	2						421З0
Tue.	3						4O213
Wed.	4					16 10	4O23*
Thu.	5	5	28	☌♆☾	♆ 1° 15′ S.		d2O3*
Fri.	6						23O14
Sat.	7	8	07	☌☿☾	☿ 2° 43′ S.	12 58	31O24
		12	36	☌♂☾	♂ 4° 13′ S.		
Sun.	8	4	34	☌♀☾	♀ 4° 06′ S.		3O214
		10	19	●	New Moon		
Mon.	9						213O4
Tue.	10	5		☌☿♂	☿ 1° 08′ N.	09 47	O134*
		12		Moon in Perigee.	Dist. from ⊕, 225,300 mi.		
Wed.	11						1O234
Thu.	12	12		♃	Stationary in R.A.		d2O34
Fri.	13					06 36	23O14
Sat.	14						341O2
Sun.	15	1	56	☽	First Quarter		43O21
Mon.	16			Leonid Meteors, p. 58		03 25	4213O
		7		☌♀☉	Superior		
Tue.	17						4O13*
Wed.	18						41O23
Thu.	19					00 14	42O13
Fri.	20						d42O*
Sat.	21					21 03	341O2
Sun.	22	15	24	○	Full Moon		3O412
		18	56	☌♅☾	♅ 4° 55′ N.		
Mon.	23	9	50	☌♄☾	♄ 3° 00′ N.		231O4
		14		☿	in ☋		
Tue.	24					17 52	2O314
Wed.	25	6		☍♅☉	Dist. from ⊕, 1,713,000,000 mi.		1O234
Thu.	26	9		Moon in Apogee.	Dist. from ⊕, 252,200 mi.		2O134
Fri.	27	6	49	☌♃☾	♃ 2° 59′ N.	14 41	2O34*
Sat.	28						d3O24
Sun.	29						3O124
Mon.	30	13		♀	in ☋	11 30	d321O
		20	37	☾	Last Quarter		
		21		☌☿☉	Superior		

Explanation of symbols and abbreviations on p. 4, of time on p. 8.

THE SKY FOR DECEMBER, 1942

The times of transit are given in local mean time, 0h at midnight; to change to Standard Time, see p. 10. Estimates of altitude are for an observer in latitude 45° N.

The Sun—During December the sun's R.A. increases from 16h 26m to 18h 42m and its Decl. changes from 21° 40′ S. to a minimum of 23° 27′ S. on the 22nd and then increases to 23° 05′ S. at the end of the month. The equation of time changes from +11m 16s to -03m 06s (see p. 7). At 06h 40m E.S.T. on December 22 winter commences as the sun reaches its most southerly position and enters Capricornus. The days are then shortest in the northern hemisphere, but the length of the day changes very little at this time (see p. 11).

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

Mercury on the 15th is in R.A. 18h 00m, Decl. 25° 23′ S. and transits at 12.31. As it passes farthest from the earth in superior conjunction with the sun on November 30, the planet is not suitably placed for observation this month.

Venus on the 15th is in R.A. 17h 57m, Decl. 24° 00′ S. and transits at 12.26. It is gradually moving away from the sun in the evening sky, but is still hard to observe.

Mars on the 15th is in R.A. 15h 49m, Decl. 19° 58′ S. and transits at 10.17. It can now be glimpsed in the south-east, about 15° above the horizon at sunrise, an object between third and fourth magnitudes.

Jupiter on the 15th is in R.A. 07h 42m, Decl. 21° 36′ N. and transits at 02.08. Rising about two hours after sunset, of stellar magnitude -2.2, it is the brightest object of the night sky. It continues to move slowly westward among the stars. For the configurations of Jupiter's satellites see opposite page, and for their eclipses, etc., see p. 56.

Saturn on the 15th is in R.A. 04h 26m, Decl. 19° 45′ N. and transits at 22.49. The planet is now visible most of the night and sets about two hours before sunrise.

Uranus on the 15th is in R.A. 03h 59m, Decl. 20° 22′ N. and transits at 22.22.

Neptune on the 15th is in R.A. 12h 09m, Decl. 00° 27′ N. and transits at 06.35.

Pluto—For information in regard to this planet, see p. 30.

				DECEMBER 75th Meridian Civil Time	Min. of Algol		Config. of Jupiter's Sat. 2h 15m
	d	h	m		h	m	
Tue.	1	15		☍♄☉ Dist. from ⊕, 751,000,000 mi.			42O31
Wed.	2	16	04	☌♆☾ ♆ 1° 31′ S.			41O23
Thu.	3	20		☿ in Aphelion	08	19	d4O13
Fri.	4						421O3
Sat.	5						43O12
Sun.	6	8	16	☌♂☾ ♂ 5° 00′ S.	05	08	43O12
Mon.	7	20	59	🌑 New Moon			4321O
Tue.	8	2	58	☌☿☾ ☿ 6° 11′ S.			2O13*
		5	30	☌♀☾ ♀ 4° 57′ S.			
		19		Moon in Perigee. Dist. from ⊕, 222,600 mi.			
Wed.	9				01	57	1O423
Thu.	10						O2134
Fri.	11				22	46	21O34
Sat.	12	11		☌☿♀ ☿ 1° 19′ S.			3O214
				Geminid Meteors, p. 58			
Sun.	13						3O24*
Mon.	14	12	47	☽ First Quarter	19	35	321O4
Tue.	15						2O14*
Wed.	16						1O423
Thu.	17				16	25	4O213
Fri.	18						421O3
Sat.	19	22	53	☌♅☾ ♅ 5° 00′ N.			43O1*
Sun.	20	11	43	☌♄☾ ♄ 3° 07′ N.	13	14	431O2
Mon.	21						d432O
Tue.	22	6	40	☉ enters ♑, Winter commences. Long. of ☉, 270°			423O1
		8		♂ in ☋			
		10	03	🌕 Full Moon			
Wed.	23	18		Moon in Apogee. Dist. from ⊕, 252,500 mi.	10	03	41O23
Thu.	24	4		☿ Greatest Hel. Lat. S.			4O213
		6		□♆☉			
		8	22	☌♃☾ ♃ 3° 05′ N.			
Fri.	25						21O43
Sat.	26				06	52	32O14
Sun.	27						31O24
Mon.	28						32O14
Tue.	29				03	41	23O14
Wed.	30	0	18	☌♆☾ ♆ 1° 47′ S.			1O234
		13	37	☾ Last Quarter			
Thu.	31						O1234

Explanation of symbols and abbreviations on p. 4, of time on p. 8.

PHENOMENA OF JUPITER'S SATELLITES, 1942

E—eclipse, O—occultation, T—transit, S—shadow, D—disappearance, R—reappearance, I—ingress, e—egress. The Roman numerals denote the satellites. 75th Meridian Civil Time. (For other times see p. 8).

JANUARY

d	h	m	Sat.	Phen.	d	h	m	Sat.	Phen.
1	00	08	I	TI	15	03	40	I	TI
	00	42	I	SI		17	50	III	SI
	02	18	I	Te		20	29	III	Se
	02	18	II	OD	16	00	56	I	OD
	02	54	I	Se		22	07	I	TI
	21	22	I	OD		23	00	I	SI
2	00	12	I	ER	17	00	17	I	Te
	18	34	I	TI		01	12	I	Se
	19	11	I	SI		01	44	II	TI
	20	45	I	Te		03	35	II	SI
	21	03	II	TI		19	23	I	OD
	21	22	I	Se		22	32	I	ER
	22	19	II	SI	18	18	44	I	Te
	23	42	II	Te		19	41	I	Se
3	01	00	II	Se		20	04	II	OD
	18	41	I	ER	19	00	36	II	ER
4	19	25	II	ER	20	19	36	II	Se
	21	09	III	OD	22	17	48	III	TI
	23	38	III	OR		20	19	III	Te
	23	49	III	ED		21	50	III	SI
5	02	27	III	ER	23	00	30	III	Se
8	01	53	I	TI		02	44	I	OD
	02	37	I	SI		23	55	I	TI
	04	04	I	Te	24	00	55	I	SI
	23	08	I	OD		02	05	I	Te
9	02	07	I	ER		03	07	I	Se
	20	20	I	TI		21	11	I	OD
	21	06	I	SI	25	00	27	I	ER
	22	30	I	Te		18	22	I	TI
	23	17	I	Se		19	24	I	SI
	23	22	II	TI		20	33	I	Te
10	00	57	II	SI		21	36	I	Se
	02	02	II	Te		22	26	II	OD
	03	39	II	Se	26	18	56	I	ER
	17	35	I	OD	27	19	33	II	SI
	20	36	I	ER		20	01	II	Te
11	17	44	II	OD		22	14	II	Se
	17	46	I	Se	29	21	24	III	TI
	22	00	II	ER		23	56	III	Te
12	00	33	III	OD	30	01	51	III	SI
	03	04	III	OR	31	01	44	I	TI
	03	50	III	ED		02	50	I	SI
						23	01	I	OD

FEBRUARY

d	h	m	Sat.	Phen.	d	h	m	Sat.	Phen.
1	02	23	I	ER	9	22	36	III	ER
	20	12	I	TI		22	47	I	ER
	21	19	I	SI	10	18	41	I	Te
	22	22	I	Te		19	55	I	Se
	23	31	I	Se		22	19	II	TI
2	00	51	II	OD	11	00	49	II	SI
	18	35	III	ER		00	59	II	Te
	20	52	I	ER	12	21	43	II	ER
3	19	49	II	TI	15	23	55	I	TI
	22	11	II	SI	16	01	10	I	SI
	22	29	II	Te		18	46	III	OD
4	00	52	II	Se		21	13	I	OD
5	19	07	II	ER		21	24	III	OR
6	01	04	III	TI		23	53	III	ED
8	00	52	I	OD	17	00	43	I	ER
	22	03	I	TI		18	23	I	TI
	23	14	I	SI		19	39	I	SI
9	00	13	I	Te		20	34	I	Te
	01	26	I	Se		21	50	I	Se
	19	20	I	OD	18	00	52	II	TI
	19	52	III	ED		19	12	I	ER

FEBRUARY—*Cont.*

d	h	m	Sat.	Phen.	d	h	m	Sat.	Phen.
19	19	04	II	OD	24	22	28	I	Te
20	00	20	II	ER		23	45	I	Se
21	19	26	II	Se	25	21	08	I	ER
23	22	39	III	OD	26	21	37	II	OD
	23	07	I	OD	27	20	38	III	Se
24	01	19	III	OR	28	19	23	II	SI
	20	17	I	TI		19	24	II	Te
	21	34	I	SI		22	03	II	Se

MARCH

d	h	m	Sat.	Phen.	d	h	m	Sat.	Phen
3	22	11	I	TI	13	19	28	I	ER
	23	29	I	SI		20	40	III	TI
4	00	23	I	Te		23	22	III	Te
	19	31	I	OD	14	22	01	II	TI
	23	03	I	ER	16	21	29	II	ER
5	18	51	I	Te	18	23	24	I	OD
	20	10	I	Se	19	20	33	I	TI
6	00	13	II	OD		21	49	I	SI
	19	17	III	Te		22	45	I	Te
	21	54	III	SI	20	21	23	I	ER
7	00	40	III	Se	24	19	57	III	ED
	19	22	II	TI		22	47	III	ER
	22	00	II	SI	25	19	14	II	Se
	22	02	II	Te	26	22	31	I	TI
9	18	52	II	ER	27	19	51	I	OD
11	00	07	I	TI		23	18	I	ER
	21	27	I	OD	28	19	12	I	Te
12	19	53	I	SI		20	25	I	Se
	20	48	I	Te	30	21	34	II	OD
	22	05	I	Se	31	19	06	III	OD
						21	54	III	OR

APRIL

d	h	m	Sat.	Phen.	d	h	m	Sat.	Phen.
1	19	10	II	SI	11	22	04	I	SI
	19	29	II	Te	12	21	38	I	ER
	21	51	II	Se	15	22	16	II	TI
3	21	50	I	OD	17	21	17	II	ER
4	20	08	I	SI	18	20	39	III	Te
	21	11	I	Te		21	58	III	SI
	22	21	I	Se	19	20	19	I	OD
5	19	43	I	ER	20	19	41	I	Te
8	19	31	II	TI		20	41	I	Se
	21	46	II	SI	27	19	29	I	TI
	22	12	II	Te		20	23	I	SI
11	20	48	III	Se		21	42	I	Te
	20	58	I	TI	28	19	57	I	ER

MAY

d	h	m	Sat.	Phen.	d	h	m	Sat.	Phen.
3	19	55	II	Te	13	20	15	I	Te
	21	35	II	Se		20	56	I	Se
4	21	29	I	TI	20	20	03	I	TI
6	19	41	III	OR		20	38	I	SI
	19	58	III	ED	21	20	10	I	ER
10	20	00	II	TI	26	19	59	II	OD
12	20	51	I	OD					

Jupiter being near the Sun, phenomena of the Satellites are not given from June 1 to July 16.

JULY

d	h	m	Sat.	Phen
28	04	33	II	Se

AUGUST

d	h	m	Sat.	Phen.	d	h	m	Sat.	Phen.
4	04	22	II	SI	20	03	18	I	OR
6	03	23	II	OR		04	25	II	ED
11	03	49	I	ED	21	04	16	IV	SI
12	03	21	I	Se	22	03	19	II	Te
	04	07	I	Te	26	04	55	I	SI
13	03	27	IV	OR		04	58	III	Te
15	03	48	III	ED	28	02	36	I	Te
19	03	00	I	SI	29	03	17	II	TI
	03	52	I	TI		04	06	II	Se

SEPTEMBER

d	h	m	Sat.	Phen.	d	h	m	Sat.	Phen.
2	05	04	III	Se		03	00	I	Te
3	03	58	I	ED		04	29	III	OD
4	02	20	I	TI	21	04	07	II	ED
	03	32	I	Se	23	01	06	II	Se
	04	35	I	Te		03	32	II	Te
5	03	55	II	SI	24	03	09	IV	TI
7	03	56	II	OR	26	04	06	I	ED
11	03	11	I	SI	27	01	28	I	SI
	04	18	I	TI		02	41	I	TI
12	03	43	I	OR		03	39	III	ED
13	03	37	III	OR		03	42	I	Se
14	01	31	II	ED		04	56	I	Te
18	05	05	I	SI	28	02	05	I	OR
19	02	13	I	ED	30	00	55	II	SI
20	01	48	I	Se		03	24	II	TI
	02	55	III	ER		03	41	II	Se

OCTOBER

d	h	m	Sat.	Phen.	d	h	m	Sat.	Phen.
1	02	13	III	Te	19	00	12	III	OR
2	01	23	II	OR		04	15	I	ED
	02	23	IV	ER	20	01	37	I	SI
4	03	21	I	SI		02	54	I	TI
	04	37	I	TI		03	51	I	Se
5	00	28	I	ED		05	08	I	Te
	04	01	I	OR	21	02	17	I	OR
6	01	21	I	Te		23	37	I	Te
7	03	29	II	SI	22	05	44	III	SI
8	01	01	III	Se	23	03	46	II	ED
	02	56	III	TI	25	00	29	II	TI
9	04	01	II	OR		00	42	II	Se
11	00	56	IV	Te		03	18	II	Te
	05	15	I	SI	26	00	41	III	OD
12	02	21	I	ED		04	08	III	OR
	23	43	I	SI	27	03	30	I	SI
13	01	00	I	TI		03	56	IV	SI
	01	58	I	Se		04	46	I	TI
	03	15	I	Te		05	45	I	Se
14	00	24	I	OR	28	00	36	I	ED
15	01	45	III	SI		04	10	I	OR
	05	00	III	Se		23	14	I	TI
16	01	11	II	ED	29	00	13	I	Se
18	00	44	II	Te		01	29	I	Te

NOVEMBER

d	h	m	Sat.	Phen.	d	h	m	Sat.	Phen.
1	00	30	II	SI		02	07	I	Se
	03	01	II	TI		03	02	IV	OR
	03	17	II	Se		03	20	I	Te
	05	50	II	Te	6	00	29	I	OR
	23	30	III	ED	8	03	05	II	SI
2	02	50	III	ER		05	30	II	TI
	04	32	III	OD		05	53	II	Se
3	00	57	II	OR	9	03	29	III	ED
	05	24	I	SI		22	12	II	ED
4	02	30	I	ED	10	03	25	II	OR
	06	01	I	OR	11	04	24	I	ED
	23	34	IV	OD	12	01	45	I	SI
	23	52	I	SI		02	55	I	TI
5	01	05	I	TI		04	00	I	Se

NOVEMBER—*Cont.*

d	h	m	Sat.	Phen.	d	h	m	Sat.	Phen.
	05	10	I	Te		01	26	I	Te
	21	52	IV	SI		05	58	IV	ED
	22	19	III	TI		22	35	I	OR
	22	52	I	ED	24	03	21	II	ED
13	00	42	IV	Se	25	21	33	II	SI
	01	44	III	Te		23	34	II	TI
	02	19	I	OR	26	00	22	II	Se
	22	28	I	Se		02	24	II	Te
	23	37	I	Te		05	32	I	SI
15	05	40	II	SI		06	31	I	TI
17	00	47	II	ED	27	01	35	III	SI
	05	51	II	OR		02	40	I	ED
18	06	17	I	ED		04	56	III	Se
	21	46	II	Se		05	32	III	TI
19	00	00	II	Te		05	56	I	OR
	03	39	I	SI		21	24	II	OR
	04	44	I	TI	28	00	01	I	SI
	05	54	I	Se		00	58	I	TI
	21	36	III	SI		02	15	I	Se
20	00	46	I	ED		03	13	I	Te
	00	56	III	Se		21	08	I	ED
	01	58	III	TI	29	00	23	I	OR
	04	08	I	OR		20	44	I	Se
	05	23	III	Te		21	40	I	Te
	22	07	I	SI	30	00	21	IV	TI
	23	11	I	TI		03	52	IV	Te
21	00	22	I	Se		22	36	III	OR

DECEMBER

d	h	m	Sat.	Phen.	d	h	m	Sat.	Phen
1	05	55	II	ED		06	34	II	TI
3	00	09	II	SI	19	00	21	II	ED
	01	56	II	TI		04	17	II	OR
	02	58	II	Se		05	41	I	SI
	04	46	II	Te		06	14	I	TI
4	04	33	I	ED	20	02	50	I	ED
	05	33	III	SI		05	39	I	OR
	23	44	II	OR		19	42	II	TI
5	01	54	I	SI		21	29	II	Se
	02	44	I	TI		22	33	II	Te
	04	09	I	Se	21	00	09	I	SI
	05	00	I	Te		00	40	I	TI
	23	02	I	ED		02	25	I	Se
6	02	09	I	OR		02	56	I	Te
	20	22	I	SI		21	18	I	ED
	21	11	I	TI	22	00	06	I	OR
	22	37	I	Se		03	20	III	ED
	23	26	I	Te		20	53	I	Se
7	20	36	I	OR		21	22	I	Te
	23	58	IV	ED	24	21	17	IV	ER
8	02	03	III	OR		21	57	IV	OD
	03	06	IV	ER	25	01	32	IV	OR
10	02	44	II	SI		19	06	III	TI
	04	16	II	TI		20	53	III	Se
	05	34	II	Se		22	33	III	Te
11	06	27	I	ED	26	02	55	II	ED
	21	47	II	ED		06	32	II	OR
12	02	01	II	OR	27	04	44	I	ED
	03	47	I	SI		21	15	II	SI
	04	30	I	TI		21	58	II	TI
	06	03	I	Se	28	00	05	II	Se
	06	45	I	Te		00	49	II	Te
13	00	56	I	ED		02	03	I	SI
	03	54	I	OR		02	24	I	TI
	20	16	II	Te		04	19	I	Se
	22	16	I	SI		04	40	I	Te
	22	56	I	TI		23	13	I	ED
14	00	31	I	Se	29	01	50	I	OR
	01	11	I	Te		19	38	II	OR
	22	21	I	OR		20	31	I	SI
	23	21	III	ED		20	50	I	TI
15	05	26	III	OR		22	47	I	Se
	19	38	I	Te		23	05	I	Te
17	05	20	II	SI	30	20	16	I	OR

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 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. The following table lists the chief meteoric showers of the year. The material was collected from different sources, including the publications of Denning and Olivier.

The Chief Annual Meteor Showers for the Northern Hemisphere.

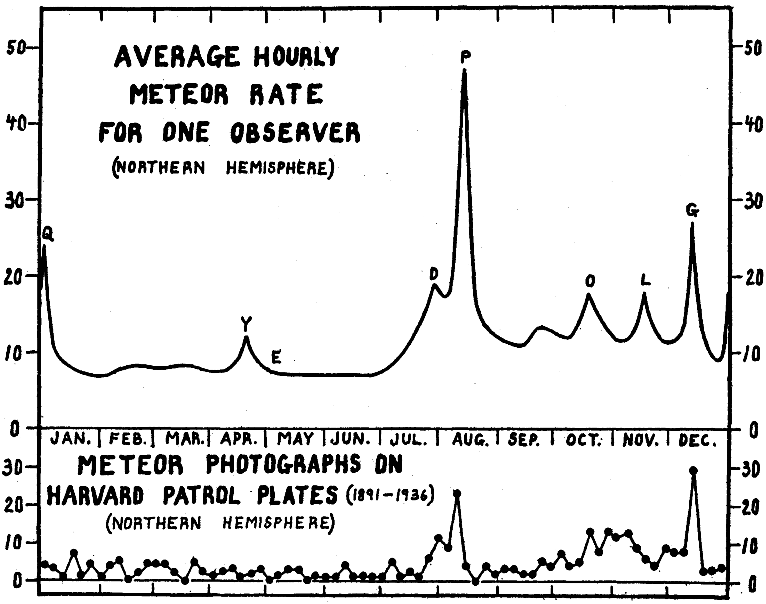
Shower	Approx. Radiant		Maximum Date	Hourly No. (all meteors)	Duration (in days)	Abbre-viation
	α	δ				
Quadrantids	232°	+52°	Jan. 3	20	4	Q
Lyrids	280	+37	Apr. 21	10	4	Y
Eta Aquarids	336	− 1	May 4	10	8	E
Delta Aquarids	340	−17	July 28	20	3	D
Perseids	47	+57	Aug. 12	50	25	P
Orionids	96	+15	Oct. 22	20	14	O
Leonids	152	+22	Nov. 16	20	14	L
Geminids	110	+33	Dec. 12	30	14	G

The date of maximum given above applies to either morning or evening and is approximate only, as local irregularities in the showers in addition to the effect of leap year may shift it by a day or more. With the exception of the Geminids, all the showers listed are most active well after midnight. It should be noted that large numbers of meteors appeared on June 28, 1916, and on Oct. 9, 1933, and there is the possibility of a return of these showers.

A meteor observer should make as complete a record as he can with efficiency. The most important information to note includes the number of meteors per hour, their magnitudes and positions in the sky, evidences of enduring trains and, where several stations are co-operating, the exact time of the appearance of each meteor. Magnitudes of meteors are generally determined by comparison with stars and the positions of meteor trails may most conveniently be recorded by plotting them as straight lines on gnomonic star maps. The observer should also make sure that the record sheet contains his name, the exact place of observation, the night when the observations were made given as a double date (e.g. the evening of May 4 or the morning of May 5 would be recorded as May 4-5), and finally, a note on the weather conditions.

The first curve shown in the figure below gives the expected hourly rate of meteors for a single observer at different times of the year. It has been drawn from data published by Denning, Olivier, and Hoffmeister. This curve varies somewhat from year to year. The corresponding curve for the southern hemisphere, which is not plotted, lacks the high maximum at P, has its highest maxima at E and D, and best general rates from April through July.

The second curve gives the number of meteor photographs found on all Harvard patrol plates up to Oct. 15, 1936, for each five-day interval throughout the year, taken from a catalogue of meteor photographs published by Miss Hoffleit. Since these plates were exposed on a uniform system the curve gives some indication of the favourable periods for meteor photography. The high photographic efficiency of the Geminid shower is a marked feature.



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. Maps and instructions for meteor observations may be secured from the writer at the Dunlap Observatory, Richmond Hill, Ont., the Canadian headquarters for the collection of meteor data.

For more complete instructions concerning the visual observation of meteors see the JOURNAL of the Royal Astronomical Society of Canada, vol. 31, p. 255, 1937; and for meteor photography volume 31, p. 295, 1937.

PRINCIPAL ELEMENTS OF THE SOLAR SYSTEM

ORBITAL ELEMENTS (Jan. 1, 0^h, 1938)

Planet	Mean Distance from Sun (a) $\oplus=1$	millions of miles	Period (P)	Eccentricity (e)	Inclination (i)	Long. of Node (☊)	Long. of Perihelion (π)	Long. of Planet
					°	°	°	°
Mercury	.387	36.0	88.0days	.206	7.0	47.6	76.5	96.3
Venus	.723	67.2	224.7	.007	3.4	76.1	130.7	259.3
Earth	1.000	92.9	365.3	.017	....	.....	101.9	99.5
Mars	1.524	141.5	687.0	.093	1.9	49.1	334.9	7.3
Jupiter	5.203	483.3	11.86yrs.	.048	1.3	99.8	13.3	311.8
Saturn	9.54	886.	29.46	.056	2.5	113.1	91.8	11.5
Uranus	19.19	1783.	84.0	.047	0.8	73.7	169.7	46.7
Neptune	30.07	2793.	164.8	.009	1.8	131.1	44.1	168.6
Pluto	39.46	3666.	247.7	.249	17.1	109.5	223.4	148.0

PHYSICAL ELEMENTS

Object	Symbol	Mean Diameter miles	Mass $\oplus=1$	Density water $=1$	Axial Rotation	Mean Surface Gravity $\oplus=1$	Albedo Bond's	Magnitude at Opposition or Elongation
Sun	☉	864,000	332,000	1.4	$24^d.7$ (equatorial)	27.9		− 26.7
Moon	☾	2,160	.0123	3.3	$27^d\ 7.7^h$	.16	.07	− 12.6
Mercury	☿	3,010	.056	3.8	88^d	.27	.07	0±
Venus	♀	7,580	.82	4.9	30^d ?	.85	.59	− 4±
Earth	⊕	7,918	1.00	5.5	$23^h\ 56^m$	1.00	.29	
Mars	♂	4,220	.108	4.0	$24^h\ 37^m$	.38	.15	− 2±
Jupiter	♃	87,000	318.	1.3	$9^h\ 50^m\pm$	2.6	.56?	− 2±
Saturn	♄	72,000	95.	.7	$10^h 15^m\pm$	1.2	.63?	0±
Uranus	♅	31,000	14.6	1.3	$10^h.8\pm$	.9	.63?	+ 5.7
Neptune	♆	33,000	17.2	1.3	16^h ?	1.0	.73?	+ 7.6
Pluto	♇	4,000?	<.1					+ 14

SATELLITES OF THE SOLAR SYSTEM

Name	Stellar Mag.	Mean Dist. from Planet ″ *	Mean Dist. from Planet Miles	Revolution Period d	h	m	Diameter Miles	Discoverer
Satellite of the Earth								
Moon	−12.6	530	238,857	27	07	43	2160	
Satellites of Mars								
Phobos	12	8	5,800	0	07	39	10?	Hall, 1877
Deimos	13	21	14,600	1	06	18	5?	Hall, 1877
Satellites of Jupiter								
V	13	48	112,600	0	11	57	100?	Barnard, 1892
Io	5	112	261,800	1	18	28	2300	Galileo, 1610
Europa	6	178	416,600	3	13	14	2000	Galileo, 1610
Ganymede	5	284	664,200	7	03	43	3200	Galileo, 1610
Callisto	6	499	1,169,000	16	16	32	3200	Galileo, 1610
VI	14	3037	7,114,000	250	16		100?	Perrine, 1904
VII	16	3113	7,292,000	260	01		40?	Perrine, 1905
X	18	3116	7,300,000	260			15?	Nicholson, 1938
XI	18	5990	14,000,000	692			15?	Nicholson, 1938
VIII	16	6240	14,600,000	739			40?	Melotte, 1908
IX	17	6360	14,900,000	758			20?	Nicholson, 1914
Satellites of Saturn								
Mimas	12	27	115,000	0	22	37	400?	W. Herschel, 1789
Enceladus	12	34	148,000	1	08	53	500?	W. Herschel, 1789
Tethys	11	43	183,000	1	21	18	800?	G. Cassini, 1684
Dione	11	55	234,000	2	17	41	700?	G. Cassini, 1684
Rhea	10	76	327,000	4	12	25	1100?	G. Cassini, 1672
Titan	8	177	759,000	15	22	41	2600?	Huygens, 1655
Hyperion	13	214	920,000	21	06	38	300?	G. Bond, 1848
Iapetus	11	515	2,210,000	79	07	56	1000?	G. Cassini, 1671
Phoebe	14	1870	8,034,000	550			200?	W. Pickering, 1898
Satellites of Uranus								
Ariel	16	14	119,000	2	12	29	600?	Lassell, 1851
Umbriel	16	19	166,000	4	03	28	400?	Lassell, 1851
Titania	14	32	272,000	8	16	56	1000?	W. Herschel, 1787
Oberon	14	42	364,000	13	11	07	900?	W. Herschel, 1787
Satellite of Neptune								
(Triton)	13	16	220,000	5	21	03	3000?	Lassell, 1846

*As seen from the sun.

Satellites Io, Europa, Ganymede, Callisto are usually denoted I, II, III, IV, respectively, in order of distance from the planet.

DOUBLE AND MULTIPLE STARS

By Frank S. Hogg

A number of the stars which appear as single to the unaided eye may be separated into two or more components by field glasses or a small telescope. Such objects are spoken of as *double* or *multiple stars.* With larger telescopes pairs which are still closer together may be resolved, and it is found that, up to the limits of modern telescopes, over ten per cent. of all the stars down to the ninth magnitude are members of double stars.

The possibility of resolving a double star of any given separation depends on the diameter of the telescope objective. Dawes' simple formula for this relation is $d''=4.5/A$, where d is the separation, in seconds of arc, of a double star that can be just resolved, and A is the diameter of the objective in inches. Thus a one-inch telescope should resolve a double star with a distance of $4''.5$ between its components, while a ten-inch telescope should resolve a pair $0''.45$ apart. It should be noted that this applies only to stars of comparable brightness. If one star is markedly brighter than its companion, the glare from the brighter makes it impossible to separate stars as close as the formula indicates. This formula may be applied to the observation of double stars to test the quality of the seeing and telescope.

It is obvious that a star may appear double in one of two ways. If the components are at quite different distances from the observer, and merely appear close together in the sky the stars form an *optical* double. If, however, they are in the same region of space, and have common proper motion, or orbital motion about one another, they form a *physical* double. An examination of the probability of stars being situated sufficiently close together in the sky to appear as double shows immediately that almost all double stars must be physical rather than optical.

Double stars which show orbital motion are of great astrophysical importance, in that a careful determination of their elliptical orbits and parallaxes furnishes a measure of the gravitational attraction between the two components, and hence the mass of the system.

In the case of many unresolvable close doubles, the orbital motion may be determined by means of the spectroscope. In still other doubles, the observer is situated in the orbital plane of the binary, and the orbital motion is shown by the fluctuations in light due to the periodic eclipsing of the components. Such doubles are designated as *spectroscopic* binaries and *eclipsing* variables.

The accompanying table provides a list of double stars, selected on account of their brightness, suitability for small telescopes, or particular astrophysical interest. The data are taken chiefly from Aitken's *New General Catalogue of Double Stars,* and from the Yale *Catalogue of Bright Stars.* Successive columns give the star, its 1900 equatorial coordinates, the magnitudes and spectral classes of its components, their separation, in seconds of arc, and the approximate distance of the double star in light years. The last column gives, for binary stars of well determined orbits, the period in years, and the mean separation of the components in astronomical units. For stars sufficiently bright to show colour differences in the telescope used, the spectral classes furnish an indication of the colour. Thus O and B stars are bluish white, A and F white, G yellow, K orange and M stars reddish.

A good reference work in the historical, general, and mathematical study of double stars is Aitken's *The Binary Stars.*

REPRESENTATIVE DOUBLE STARS

Star		α 1900	δ	Mag. and Spect.	d	D	Remarks
		h m	° ′		″	L.Y.	
π	And	00 31.5	+33 10	4.4B3; 8.5	36	410	†
π	Cas	00 43.0	+57 17	3.6F8; 7.2M0	8	18	479y; 66AU
α	UMi	01 22.6	+88 46	var. F8; 8.8	19	270	Polaris
γ	Ari	01 48.1	+18 48	4.8A0; 4.8A0	8.3	200	
α	Pis	01 56.9	+02 17	5.2A2; 4.3A2	2.4	162	††
γ	And	01 57.8	+41 51	2.3K0; 5.4A0; 6.6	10, 0.7	220	5.5y; 23AU
6	Tri	02 06.6	+29 50	5.4G4; 7.0F3	3.6	270	††
η	Per	02 43.4	+55 29	3.9K0; 8.5	28	360	
32	Eri	03 49.3	−03 15	5.0A; 6.3G5	6.7	330	
β	Ori	05 09.7	−08 19	0.3B8; 7.0	9	540	†
θ	Ori	05 30.4	−05 27	5.4;6.8; 6.8; 7.9; O	13, 17	1100	Trapezium
β	Mon	06 24.0	−06 58	4.7B2; 5.2; 5.6	7, 25	330	†
12	Lyn	06 37.4	+59 33	5.3A2; 6.2; 7.4	1.7, 8	190	
α	CMa	06 40.7	−16 35	−1.6A0; 8.5F	11	9	50y; 20AU
δ	Gem	07 14.2	+22 10	3.5F0; 8.0M0	6.8	58	†
α	Gem	07 28.2	+32 06	2.0A0; 2.8A0; 9M10	4, 70	44	340y; 79AU
ζ	Cnc	08 06.5	+17 57	5.6G0; 6.0; 6.2	1, 5	71	60y; 21AU
γ	Leo	10 14.5	+20 21	2.6K0; 3.8G5	4	140	
ξ	UMa	11 12.9	+32 06	4.4G0; 4.9G0	2	23	††60y; 20AU
ι	Leo	11 18.7	+11 05	4.1F3; 6.8F3	2	57	
γ	Vir	12 36.6	−00 54	3.6F0; 3.7F0	6	38	178y; 42AU
α	CVn	12 51.4	+38 51	2.9A0; 5.4A0	20	130	††
ζ	UMa	13 19.9	+55 27	2.4A2; 4.0A2	14	76	††
π	Boo	14 36.0	+16 51	4.9A0; 5.1A0	6	200	†
ε	Boo	14 40.6	+27 30	2.7K0; 5.1A0	3	180	
ξ	Boo	14 46.8	+19 31	4.8G5; 6.7	3	21	151y; 31AU
δ	Ser	15 30.0	+10 52	4.2F0; 5.2F0	4	130	
ξ	Sco	15 58.9	−11 06	5.1F3; 4.8; 7G7	1, 7	86	44.7y; 19AU
α	Her	17 10.1	+14 30	var.M5; 5.4G	5	470	†
δ	Her	17 10.9	+24 57	3.2A0; 8.1G2	11	91	† Optical
ε	Lyr	18 41.0	+39 32	5.1, 6.0A3; 5.1, 5.4A5	3, 2	230	Pairs 207″
β	Cyg	19 26.7	+27 45	3.2K0; 5.4B9	34	220	†
α	Cap	20 12.3	−12 50	3.8G5; 4.6G0	376		Optical
γ	Del	20 42.0	+15 46	4.5G5; 5.5F8	10	96	
61	Cyg	21 02.4	+38 15	5.6K5; 6.3K5	23	11	
β	Cep	21 27.4	+70 07	var.B1; 8.0A3	14	410	†
ζ	Aqr	22 23.7	−00 32	4.4F2; 4.6F1	3	120	
δ	Cep	22 25.5	+57 54	var.G0; 7.5A0	41	650	
8	Lac	22 31.4	+39 07	5.8B3; 6.5B5	22		†
σ	Cas	23 53.9	+55 12	5.1B2; 7.2B3	3	650	

† or ††, one, or two of the components are themselves very close visual double or, more generally, spectroscopic binaries.

THE BRIGHTEST STARS

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

By W. E. HARPER

The accompanying table contains the principal facts regarding 259 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 48 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 20 stars variable in light this fourth column shows their maximum and minimum magnitudes. The 19 first magnitude 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 this may not necessarily be correct to the third decimal place.

The parallaxes are taken from the Yale Catalogue of Stellar Parallaxes 1935, the mean of the trigonometric and spectroscopic being adopted. The few negative trigonometric parallaxes were adjusted by Dyson's tables before being combined with the spectroscopic. The distance is given also in light years in the eighth column as to the lay mind that seems a fitting unit. 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 258 stars or star systems here listed 146 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, 74; 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 in 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 98 velocities are starred, indicating that 38 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 Andr........	0 3	+28 32	2.2	A1	.217	.034	96	−0.1	−13.0*
β Cass.........	4	+58 36	2.4	F2	.561	.080	41	1.9	+11.4
γ Pegs.........	8	+14 38	2.9	B2	.015	.005	652	−3.6	+ 5.0*
β Hydi........	20	−77 49	2.9	G0	2.243	.162	21	4.0	+22.8
α Phoe.........	21	−42 51	2.4	G5	.448	.040	81	0.4	+74.6*
δ Andr.........	34	+30 19	3.5	K3	.167	.026	125	0.6	− 7.1*
α Cass.........	35	+55 50	2.2–2.8	G8	.062	.018	181	−1.5	− 3.8
β Ceti.........	39	−18 32	2.2	G7	.233	.052	63	0.8	+13.1
‖γ Cass.........	51	+60 11	2.2	B0e	.031	.035	93	−0.1	− 6.8
‖β Phoe.........	1 2	−47 15	3.4	G4	.043	.020	163	−0.1	− 1.2
β Andr.........	4	+35 5	2.4	M0	.219	.041	79	0.5	+ 0.1
δ Cass.........	19	+59 43	2.8–2.9	A3	.308	.050	65	1.3	+ 6.8
‖α U. Min......	23	+88 46	2.3–2.4	F7	.043	.008	407	−3.4	−17.4*
γ Phoe.........	24	−43 50	3.4	M1	.223	.008	407	−2.1	+25.7*
α **Erid**.........	34	−57 44	0.6	B9	.093	.046	71	−1.1	+19.
ε Cass.........	47	+63 11	3.4	B5	.043	.011	296	−1.4	− 8.1
β Arie.........	49	+20 19	2.7	A3	.150	.066	49	1.8	− 0.6*
α Hydi........	56	−62 3	3.0	A7	.255	.080	41	2.5	+ 7.0*
‖γ Andr.........	58	+41 51	2.3	K0	.073	.020	163	−1.2	−11.7
α Arie.........	2 2	+22 59	2.2	K2	.242	.045	72	0.5	−14.3
β Tria.........	4	+34 31	3.1	A6	.161	.029	112	0.4	+10.4*
‖o Ceti.........	14	− 3 26	1.7–9.6	M6e	.239	.013	251	−2.7	+57.8*
‖θ Erid.........	54	−40 42	3.4	A2	.068	.032	102	0.9	+11.9*
α Ceti.........	57	+ 3 42	2.8	M1	.080	.018	181	−0.9	−25.7
γ Pers.........	58	+53 7	3.1	F9	.012	.017	192	−0.7	+ 1.0*
ρ Pers.........	59	+38 27	3.3–4.1	M6	.176	.024	136	0.3	+28.2
β Pers.........	3 2	+40 34	2.1–3.2	B8	.011	.033	99	−0.3	+ 5.7*
α Pers.........	17	+49 30	1.9	F4	.041	.017	192	−2.0	− 2.4
δ Pers.........	36	+47 28	3.1	B5	.047	.012	272	−1.5	−10. *
‖η Taur.........	41	+23 48	3.0	B5p	.053	.014	233	−1.3	+10.3
ζ Pers.........	48	+31 35	2.9	B1	.023	.008	407	−2.6	+20.9
γ Hydi.........	49	−74 33	3.2	M3	.124	.008	407	−2.3	+16.0
‖ε Pers.........	51	+39 43	3.0	B2	.041	.006	543	−3.1	− 6 *
γ Erid.........	53	−13 47	3.2	M0	.133	.012	272	−1.6	+61.7
λ Taur.........	55	+12 12	3.8–4.2	B3	.015	.008	407	−2.2	+13.0*
α Reti.........	4 13	−62 43	3.4	G5	.070	.016	204	−0.6	+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 **Taur**.......	4 30	+16 18	1.1	K8	.205	.060	54	0.0	+54.1
α Dora.......	32	−55 15	3.5	A0p	......	.....	.....	......	+25.6
π^3 Orio........	44	+ 6 47	3.3	F5	.474	.124	26	3.8	+24.6
ι Auri........	50	+33 0	2.9	K4	.030	.020	163	−0.6	+17.6
ε Auri........	55	+43 41	3.1–3.8	F2	.015	.006	543	−2.7	−4.1 *
η Auri........	5 0	+41 6	3.3	B3	.082	013	251	−1.1	+ 7.8
ε Leps........	1	−22 30	3.3	K5	.074	.016	204	−0.7	+ 1.0
β Erid........	3	− 5 13	2.9	A1	.117	.055	59	1.6	− 7
μ Leps........	8	−16 19	3.3	A0p	.053	.020	163	−0.2	+27.7
||α **Auri**........	9	+45 54	0.2	G1	.439	.078	42	−0.3	+30.2
||β **Orio**........	10	− 8 19	0.3	B8p	.005	.006	543	−5.8	+23.6*
||η Orio........	19	− 2 29	3.4	B0	.009	.006	543	−2.7	+19.5*
γ Orio........	20	+ 6 16	1.7	B2	.019	.015	217	−2.4	+18.0
β Taur........	20	+28 31	1.8	B8	.180	.028	116	−1.0	+ 8.0
β Leps........	24	−20 50	3.0	G2	.095	.018	181	−0.7	−13.5
||δ Orio........	27	− 0 22	2.4–2.5	B0	.006	.007	466	−3.4	+19.9*
α Leps........	28	−17 54	2.7	F6	.006	.012	272	−2.1	+24.7
ι Orio........	31	− 5 59	2.9	O8	.007	.021	155	−0.5	+21.5*
ε Orio........	31	− 1 16	1.8	B0	.004	.008	407	−3.7	+25.8
ζ Taur........	32	+21 5	3.0	B3e	.028	.010	326	−2.0	+16.4*
||ζ Orio........	36	− 2 0	1.8	B0	.012	.011	296	−3.0	+18.8
α Colm.......	36	−34 8	2.8	B8	.036	.022	148	−0.6	+34.6
κ Orio........	43	− 9 42	2.2	B0	.009	.006	543	−3.9	+20.1
β Colm.......	47	−35 48	3.2	K0	.397	.026	125	0.3	+89.4
α **Orio**........	50	+ 7 23	0.5–1.1	M2	.032	.012	272	−4.1	+21.0*
β Auri........	52	+44 56	2.1–2.2	A0p	.046	.052	63	0.7	−18.1*
||θ Auri........	53	+37 12	2.7	A1	.106	.029	112	0.0	+28.6
η Gemi.......	6 9	+22 32	3.2–4.2	M2	.062	.014	233	−1.1	+21.4*
ζ C Maj......	16	−30 01	3.7	B3	.012	.013	251	−0.7	+33.1*
μ Gemi.......	17	+22 34	3.2	M3	.129	.016	204	−0.8	+54.8
β C Maj......	18	−17 54	2.0	B1	.003	.014	233	−2.3	+34.4*
α **Cari**........	22	−52 38	−0.9	F0	.022	.005	652	−7.4	+20.5
γ Gemi.......	32	+16 29	1.9	A2	.066	.050	65	0.4	−11.3*
ν Pupp.......	35	−43 6	3.2	B8	.021	.023	148	0.0	+28.2*
ε Gemi.......	38	+25 14	3.2	G9	.020	.009	362	−2.0	+ 9.9
ξ Gemi.......	40	+13 0	3.4	F5	.230	.054	60	2.1	+25.1
||α **C Maj**......	41	−16 35	−1.6	A2	1.315	.386	8	1.3	− 7.5*
α Pict........	47	−61 50	3.3	A5	.271	.....	.....	......	+20.6

Star	R.A. 1900	Decl. 1900	Mag.	Type	Ann. Proper Motion	Parallax	Distance in Light Years	Abs. Mag.	Rad. Vel.
	h m	° ′			″	″			km./sec.
τ Pupp.......	6 47	−50 30	2.8	G8	.091	.025	130	−0.2	+36.4*
‖ε C Maj......	55	−28 50	1.6	B1	.005	.010	326	−3.4	+27.4
ζ Gemi.......	58	+20 43	3.7–4.3	G0p	.007	.005	652	−2.8	+ 6.7*
o^2 C Maj......	59	−23 41	3.1	B5p	.006	.007	466	−2.7	+48.6
δ C Maj......	7 4	−26 14	2.0	G4p	.003	.006	543	−4.1	+34.3*
L^2 Pupp.......	10	−44 29	3.4–6.2	M5e	.332	.018	181	−0.3	+53.0
π Pupp.......	14	−36 55	2.7	K5	.004	.018	181	−1.0	+15.8
η C Maj......	20	−29 6	2.4	B5p	.007	.012	272	−2.2	+40.4
β C Min......	22	+ 8 29	3.1	B8	.063	.022	148	−0.2	+23 *
σ Pupp.......	26	−43 6	3.3	M0	.191	.016	204	−0.7	+88.1*
α_2 Gemi.......	28	+32 6	2.0	A2	.201	.074	44	1.4	+ 6.0*
α_1 Gemi.......	28	+32 6	2.8	A0	.209	.074	44	2.2	− 1.2*
‖α **C Min**......	34	+ 5 29	0.5	F5	1.242	.316	10	3.0	− 3.0*
β **Gemi**.......	39	+28 16	1.2	G9	.623	.105	31	1.3	+ 3.3
ξ Pupp.......	45	−24 37	3.5	K1	.004	.006	543	−2.6	+ 3.7*
ζ Pupp.......	8 0	−39 43	2.3	O8	.032	.004	815	−4.7	−24.
ρ Pupp.......	3	−24 1	2.9	F6	.097	.025	130	−0.1	+46.6
‖γ Velr.........	6	−47 3	2.2	OW9	.002	.....	.....	......	+ 3.5
‖ε Cari........	20	−59 11	1.7	K0	.030	.010	326	−3.3	+11.5
o U Maj......	22	+61 3	3.5	G2	.166	.014	283	−0.8	+19.8
‖ε Hyda.......	41	+ 6 47	3.5	F9	.193	.012	272	−1.1	+36.8*
‖δ Velr........	42	−54 21	2.0	A0	.093	.030	109	−0.6	+ 2.2
ζ Hyda.......	50	+ 6 20	3.3	G7	.101	.026	125	0.3	+22.6
‖ι U Maj......	52	+48 26	3.1	A4	.500	.060	54	2.0	+12.6
λ Velr........	9 4	−43 2	2.2	K4	.024	.016	204	−1.8	+18.4
β Cari........	12	−69 18	1.8	A0	.192	.....	.....	......	− 5.
ι Cari........	14	−58 51	2.2	F0	.023	.....	.....	......	+13.3
α Lync.......	15	+34 49	3.3	K8	.214	.022	148	0.0	+37.4
κ Velr........	19	−54 35	2.6	B3	.017	.017	192	−1.2	+21.7*
α Hyda.......	23	− 8 14	2.2	K4	.036	.018	181	−1.5	− 4.4
θ U Maj......	26	+52 8	3.3	F7	1.096	.072	45	2.6	+15.8
N Velr........	28	−56 36	3.4–4.2	K5	.038	.022	148	0.1	−13.9
ε Leon........	40	+24 14	3.1	G0	.045	.009	362	−2.1	+ 5.1
‖υ Cari........	45	−64 36	3.1	F0	.019	.....	.....	......	+13.6
α **Leon**.......	10 3	+12 27	1.3	B6	.244	.046	71	−0.4	+ 2.6
q Cari........	14	−60 50	3.4	K5	.043	.014	233	−0.9	+ 8.6

Star	R.A. 1900	Decl. 1900	Mag.	Type	Ann. Proper Motion	Parallax	Distance in Light Years	Abs. Mag.	Rad. Vel.
	h m	° '				"	"		km./sec.
‖γ Leo.........	10 14	+20 21	2.3	G8	.347	.024	136	−0.8	−36.8
μ U Maj......	16	+42 0	3.2	K4	.082	.031	105	0.7	−20.3*
θ Cari........	39	−63 52	3.0	B0	.022	.007	466	−2.8	+24. *
η Cari........	41	−59 10	1.0–7.4	Pec	.007	.....	.....	......	−25.0
‖μ Velr........	42	−48 54	2.8	G5	.079	.033	99	0.4	+ 6.9
ν Hyda.......	45	−15 40	3.3	K3	.218	.020	163	−0.2	− 1.0
β U Maj......	56	+56 55	2.4	A3	.089	.045	72	0.7	−12.1*
α U Maj......	58	+62 17	2.0	G5	.137	.036	91	−0.2	− 8.6*
ψ U Maj......	11 4	+45 2	3.2	K0	.067	.035	93	0.9	− 3.6
δ Leon........	9	+21 4	2.6	A2	.208	.058	56	1.4	−23.2
θ Leon........	9	+15 59	3.4	A2	.103	.025	130	0.4	+ 7.8
λ Cent........	31	−62 28	3.3	B9	.045	.031	105	0.8	+ 7.9
β Leon........	44	+15 8	2.2	A2	.507	.084	39	1.8	− 2.3
γ U Maj......	49	+54 15	2.5	A0	.095	.035	93	0.2	−11.1
δ Cent........	12 3	−50 10	2.9	B3e	.040	.015	217	−1.2	+ 9.
ε Corv........	5	−22 4	3.2	K2	.063	.024	136	0.1	+ 4.9
δ Cruc........	10	−58 12	3.1	B3	.045	.017	192	−0.7	+26.4
δ U Maj......	10	+57 35	3.4	A0	.113	.050	65	1.9	−12.
γ Corv........	11	−16 59	2.8	B8	.159	.024	136	−0.3	− 4.2*
α¹ Cruc........	21	−62 33	1.6	B1	.048	.022	148	−1.7	−12.2*
α² Cruc........	21	−62 32	2.1	B3	.048	.022	148	−1.2	+ 0.3*
‖δ Corv........	25	−15 58	3.1	A0	.249	.026	125	0.2	+ 8.7
γ Cruc........	26	−56 33	1.5	M4	.270	.....	.....	......	+21.3
β Corv........	29	−22 51	2.8	G5	.059	.027	121	0.0	− 7.7
α Musc.......	31	−68 35	2.9	B5	.040	.015	217	−1.2	+18.
‖γ Cent........	36	−48 24	2.4	A0	.200	.032	102	−0.1	− 7.5
‖γ Virg........	36	− 0 54	2.9	F0	.561	.080	41	2.4	−19.6
‖β Musc.......	40	−67 34	3.3	B3	.039	.011	296	−1.5	+42. *
β Cruc........	42	−59 9	1.5	B1	.054	.007	466	−4.3	−20. *
ε U Maj......	50	+56 30	1.7	A2	.117	.067	49	0.8	−11.9*
‖α² C. Ven......	51	+38 51	2.8	A1	.233	.030	109	0.2	− 3.5
ε Virg........	57	+11 30	3.0	G6	.270	.037	88	0.8	−14.0
γ Hyda.......	13 13	−22 39	3.3	G7	.085	.028	116	0.5	− 5.4
ι Cent........	15	−36 11	2.9	A2	.351	.049	67	1.4	+ 0.1
‖ζ¹ U. Maj......	20	+55 27	2.4	A2p	.131	.042	78	0.5	− 9.9*
α **Virg**........	20	−10 38	1.2	B2	.051	.018	181	−2.5	+ 1.6*
ζ Virg........	30	− 0 5	3.4	A2	.285	.038	86	1.3	−13.1

Star	R.A. 1900	Decl. 1900	Mag.	Type	Ann. Proper Motion	Parallax	Distance in Light Years	Abs. Mag.	Red. Vel.
	h m	° ′			″	″			km./sec.
ε Cent.	13 34	−52 57	2.6	B2	.039	.012	272	−2.0	− 5.6
η U. Maj	44	+49 49	1.9	B3	.116	.015	217	−2.2	−10.9
μ Cent.	44	−41 59	3.3	B3e	.026	.009	362	−1.9	+12.6
ζ Cent.	49	−46 48	3.1	B3	.080	.013	251	−1.3	*
η Boot.	50	+18 54	2.8	G1	.370	.100	33	2.8	− 0.2*
β **Cent.**	57	−59 53	0.9	B3	.039	.026	125	−2.0	−12. *
π Hyda	14 1	−26 12	3.5	K3	.164	.037	88	1.3	+27.2
θ Cent.	1	−35 53	2.3	G8	.745	.056	58	1.0	+ 1.3
α **Boot.**	11	+19 42	0.2	K0	2.287	.102	32	0.2	− 5.1
γ Boot.	28	+38 45	3.0	A3	.182	.063	52	2.0	−35.5
η Cent.	29	−41 43	2.6	B3	.046	.012	272	−2.0	− 0.2*
||α **Cent.**	33	−60 25	0.1	G0	3.682	.768	4	4.5	−22.2*
α Circ.	34	−64 32	3.4	F0	.308	.063	52	2.4	+ 7.4
α Lupi.	35	−46 58	2.9	B2	.033	.009	362	−2.3	+ 7.3*
||ε Boot.	41	+27 30	2.7	G8	.045	.019	172	−0.9	−16.4
||α^2 Libr.	45	−15 38	2.9	F1	.128	.056	58	1.6	−10. *
β U. Min.	51	+74 34	2.2	K4	.028	.030	109	−0.4	+16.9
β Lupi.	52	−42 44	2.8	B3	.067	.012	272	−1.8	− 0.3*
κ Cent.	53	−41 42	3.4	B2	.034	.011	296	−1.4	+ 9.1*
σ Libr.	58	−24 53	3.4	M4	.091	.020	163	−0.1	− 4.3
ζ Lupi.	15 5	−51 43	3.5	G5	.125	.027	121	0.7	− 9.7
γ Tr. Au.	10	−68 19	3.1	A0	.064	.....	.....	.....	0.
β Libr.	12	− 9 1	2.7	B8	.100	.015	217	−1.4	−37. *
δ Lupi.	15	−40 17	3.4	B3	.031	.012	272	−1.2	+ 1.6
γ U. Min.	21	+72 11	3.1	A2	.016	.022	148	−0.2	− 3.9*
ι Drac.	23	+59 19	3.5	K3	.010	.030	109	0.9	−11.1
||γ Lupi.	28	−40 50	3.0	B3	.038	.013	251	−1.4	+ 6.
α Cor. B.	30	+27 3	2.3	A0	.160	.054	60	1.0	+ 1.0*
α Serp.	39	+ 6 44	2.8	K3	.142	.043	76	1.0	+ 3.0
β Tr. Au.	46	−63 7	3.0	F0	.436	.096	34	2.9	− 0.3
π Scor.	53	−25 50	3.0	B3	.037	.012	272	−1.6	− 3.0*
δ Scor.	54	−22 20	2.5	B1	.039	.011	296	−2.3	−16. *
||β Scor.	16 0	−19 32	2.8	B3	.029	.016	204	−1.2	− 9.3*
δ Ophi.	9	− 3 26	3.3	K8	.159	.030	109	0.7	−19.8
ε Ophi.	13	− 4 27	3.3	G9	.088	.031	105	0.8	−10.3
||σ Scor.	15	−25 21	3.1	B1	.033	.009	362	−2.1	− 0.4*
||η Drac.	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 **Scor**........	16 23	−26 12	1.2	M1	.032	.019	172	−2.4	− 3.2*
β Herc........	26	+21 42	2.8	G4	.104	.020	163	−0.7	−25.8*
τ Scor........	30	−28 1	2.9	B1	.037	.009	362	−2.3	+ 0.6
ζ Ophi........	32	−10 22	2.7	B0	.023	.008	407	−2.8	−19. *
||ζ Herc........	38	+31 47	3.0	G0	.601	.105	31	3.1	−70.8*
α Tr. Au......	38	−68 51	1.9	K5	.031	.025	130	−1.1	− 3.7
ε Scor........	44	−34 7	2.4	G9	.665	.038	86	0.3	− 2.5
μ¹ Scor........	45	−37 53	3.1	B3p	.030	.011	296	−1.7	*
ζ Arae........	50	−55 50	3.1	K5	.046	.028	116	0.3	− 6.0
κ Ophi........	53	+ 9 32	3.1–4.0	K3	.290	.042	78	1.2	−55.6
||η Ophi........	17 5	−15 36	2.6	A2	.095	.047	69	1.0	− 1.0
η Scor........	5	−43 6	3.4	A7	.294	.066	49	2.5	−28.4
ζ Drac........	8	+65 50	3.2	B8	.023	.028	116	0.4	−14.1
||α¹ Herc........	10	+14 30	3.1–3.9	M7	.030	.008	407	−2.4	−32.5
δ Herc........	11	+24 57	3.2	A2	.164	.036	91	1.0	−39. *
π Herc........	12	+36 55	3.4	K3	.021	.018	181	−0.3	−25.7
θ Ophi........	16	−24 54	3.4	B2	.031	.008	407	−2.1	− 3.6
β Arae........	17	−55 26	2.8	K1	.036	.023	142	−0.4	− 0.4
υ Scor........	24	−37 13	2.8	B3	.042	.010	326	−2.2	+18. *
α Arae........	24	−49 48	3.0	B3e	.090	.015	217	−1.1	− 2.2
λ Scor........	27	−37 2	1.7	B2	.036	.016	204	−2.3	0. *
β Drac........	28	+52 23	3.0	G0	.012	.007	466	−2.8	−20.1
θ Scor........	30	−42 56	2.0	F0	.012	.024	136	−1.1	+ 1.4
α Ophi........	30	+12 38	2.1	A0	.264	.060	54	1.0	+15. *
κ Scor........	36	−38 58	2.5	B3	.028	.009	362	−2.7	−10. *
β Ophi........	38	+ 4 37	2.9	K2	.157	.030	109	0.3	−11.9
ι¹ Scor........	41	−40 5	3.1	F8	.004	.008	407	−2.4	−27.6*
||μ Herc........	43	+27 47	3.5	G5	.817	.114	28	3.8	−16.1
G Scor........	43	−37 1	3.2	K2	.069	.029	112	0.5	+24.7
ν Ophi........	54	− 9 46	3.5	G7	.118	.022	148	0.2	+12.4
γ Drac........	54	+51 30	2.4	K5	.026	.026	125	−0.5	−27.8
γ Sgtr........	59	−30 26	3.1	K0	.202	.030	109	0.5	+22.3*
η Sgtr........	18 11	−36 48	3.2	M4	.216	.030	109	0.6	+ 0.5
δ Sgtr........	15	−29 52	2.8	K4	.052	.033	99	0.4	−20.0
η Serp........	16	− 2 55	3.4	G9	.898	.050	65	1.9	+ 8.9
ε Sgtr........	18	−34 26	2.0	A0	.139	.020	163	−1.5	−10.8
λ Sgtr........	22	−25 29	2.9	K1	.196	.036	91	0.7	−43.3
α **Lyra**.......	34	+38 41	0.1	A1	.348	.140	23	0.8	−13.8

Star	R.A. 1900	Decl. 1900	Mag.	Type	Ann. Proper Motion	Parallax	Distance in Light Years	Abs. Mag.	Red. Vel.
	h m	° ′			″	″			km./sec.
φ Sgtr........	18 39	−27 6	3.3	B8	.150	.015	217	−0.8	+21.5*
‖β Lyra........	46	+33 15	3.4–4.1	B2p	.011	.006	543	−2.7	−19.0*
σ Sgtr........	49	−26 25	2.1	B3	.067	.021	155	−1.3	−10.7
γ Lyra........	55	+32 33	3.3	B9p	.008	.016	204	−0.7	−21.5*
‖ζ Sgtr........	56	−30 1	2.7	A2	.019	.035	93	0.4	+22.1
τ Sgtr........	19 1	−27 49	3.4	K0	.268	.036	91	1.2	+45.4*
ζ Aqil........	1	+13 43	3.0	A0	.103	.038	86	0.9	−25. *
π Sgtr........	4	−21 11	3.0	F2	.041	.017	192	−0.8	− 9.8
δ Drac........	13	+67 29	3.2	G8	.135	.028	116	0.4	+24.8
δ Aqil........	21	+ 2 55	3.4	A3	.267	.052	63	2.0	−32.3*
‖β¹ Cygn.......	27	+27 45	3.2	K0	.010	.010	326	−1.8	−23.9*
γ Agil........	42	+10 22	2.8	K3	.018	.018	181	−0.9	− 2.0
‖δ Cygn.......	42	+44 53	3.0	A1	.067	.023	116	0.2	−20.
α **Aqil**........	46	+ 8 36	0.9	A2	.659	.184	18	2.2	−26.1
θ Aqil........	20 6	− 1 7	3.4	A0	.035	.018	181	−0.3	−28.6*
‖β Capr........	15	−15 6	3.2	F8	.042	.022	148	−0.1	−19.0*
α Pavo.......	18	−57 3	2.1	B3	.087	.014	233	−2.2	+ 1.8*
γ Cygn.......	19	+39 56	2.3	F8	.006	.008	407	−3.2	− 7.6
α Indi........	31	−47 38	3.2	G2	.072	.034	96	0.9	− 1.1
α **Cygn**.......	38	+44 55	1.3	A2p	.004	.002	1630	−7.2	− 6.3*
ε Cygn.......	42	+33 36	2.6	G7	.485	.040	81	0.6	−10.5*
ζ Cygn.......	21 9	+29 49	3.4	G6	.061	.018	181	−0.3	+16.9*
α Ceph.......	16	+62 10	2.6	A2	.163	.076	43	2.0	− 8.
β Aqar........	26	− 6 1	3.1	G1	.020	.008	407	−2.4	+ 6.7
β Ceph.......	27	+70 7	3.3–3.4	B1	.013	.006	543	−2.8	− 7.2
ε Pegs........	39	+ 9 25	2.5	K2	.028	.014	233	−1.8	+ 5.2
δ Capr........	42	−16 35	3.0	A3	.395	.062	53	2.0	− 6.4*
γ Grus........	48	−37 50	3.2	B8	.114	.020	163	−0.3	− 2.1
α Aqar........	22 1	− 0 48	3.2	G0	.019	.006	543	−2.9	+ 7.6
α Grus........	2	−47 27	2.2	B5	.202	.036	91	0.0	+11.8
α Tucn.......	12	−60 45	2.9	K5	.088	.019	172	−0.7	+42.2*
β Grus........	37	−47 24	2.2	M6	.131	.010	326	−2.8	+ 1.6
η Pegs........	38	+29 42	3.1	G1	.039	.016	204	−0.9	+ 4.4*
α **Psc. A**......	52	−30 9	1.3	A3	.367	.118	28	1.7	+ 6.5
β Pegs........	59	+27 32	2.6	M3	.235	.020	163	−0.9	+ 8.6
α Pegs........	59	+14 40	2.6	A0	.077	.033	99	0.2	− 4. *
γ Ceph.......	23 35	+77 4	3.4	K1	.167	.062	53	2.4	−42.0

STAR CLUSTERS AND NEBULAE

Prepared by J. F. HEARD

The amateur who possesses a telescope will find great interest in the observation and identification of star clusters and nebulae. Such objects, of course, have been extensively catalogued and classified. The most frequently quoted catalogue is Dreyer's New General Catalogue (N.G.C.) containing 7,840 objects, extended by the Index Catalogue (I.C.) containing 5,386 more. The most interesting catalogue historically, however, and one which is still quoted for reference to the more conspicuous objects is Messier's Catalogue (M) which contains 103 objects. It was drawn up in 1781 by Charles Messier for his own convenience in identifying comets.

Messier's Catalogue as given below is adapted from a publication by Shapley and Davis (Pub. A.S.P., XXIX, 178, 1917). It includes the Messier number, the N.G.C. number, the 1900 position, the classification of the object and, under remarks, the name of the object (if any).

The classification is not that of Messier; it is the new classification based on modern knowledge of these objects. The clusters are classified as open clusters, which are loose irregular aggregates usually of a few scores of stars, or as globular clusters which are compact aggregates of probably hundreds of thousands of stars in spherical formation. The nebulae are classified as diffuse, planetary or spiral. The diffuse nebulae are great clouds of gas and "star-dust" rendered luminous by nearby stars and the planetaries are compact atmospheres of the same materials surrounding a single star. The spirals, on the other hand, are self-luminous and quite outside our stellar system and must be thought of as island universes or other galaxies like our own.

MESSIER'S CATALOGUE OF CLUSTERS AND NEBULAE

Messier	N.G.C.	R.A. (1900)	Dec. (1900)	Type of Object	Remarks
		h m	° ′		
1	1952	5 28.5	+21 57	Diffuse nebula	The Crab nebula in Taurus
2	7089	21 28.3	− 1 16	Globular cluster	
3	5272	13 37.6	+28 53	Globular cluster	
4	6121	16 17.5	−26 17	Globular cluster	
5	5904	15 13.5	+ 2 27	Globular cluster	
6	6405	17 33.5	−32 9	Open cluster	
7	6475	17 47.3	−34 47	Open cluster	
8	6523	17 57.6	−24 23	Diffuse nebula	The Lagoon nebula —very large
9	6333	17 13.3	−18 25	Globular cluster	
10	6254	16 51.9	− 3 57	Globular cluster	
11	6705	18 45.7	− 6 23	Open cluster	
12	6218	16 42.0	− 1 46	Globular cluster	
13	6205	16 38.1	+36 39	Globular cluster	The Hercules cluster —best example

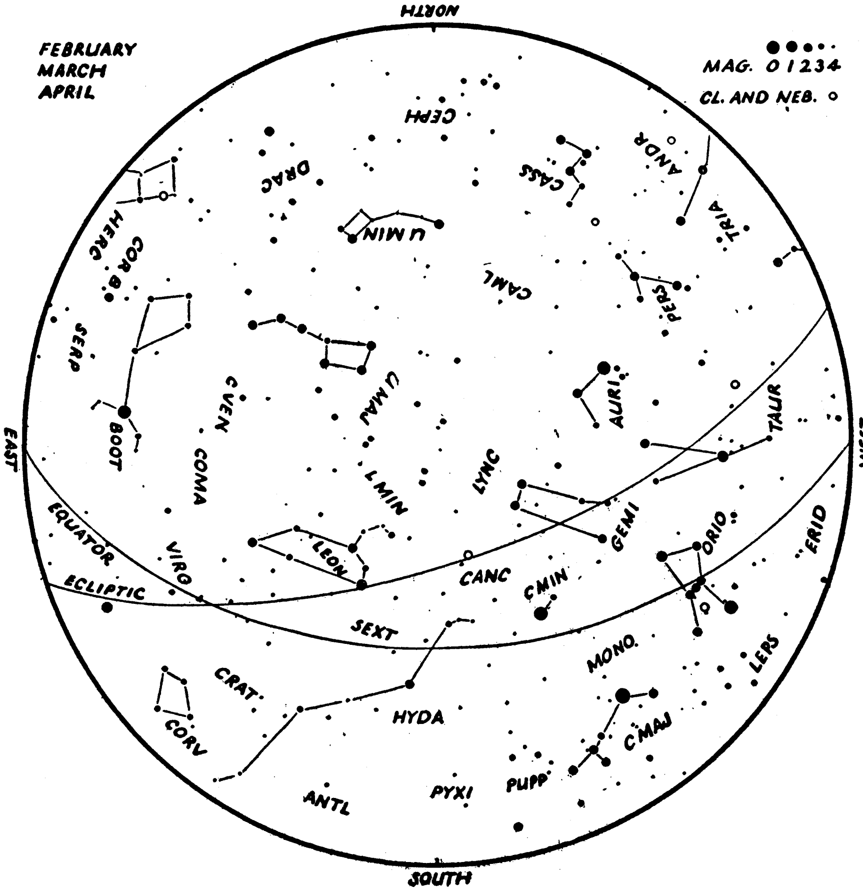
MESSIER'S CATALOGUE OF CLUSTERS AND NEBULAE—*continued*

Messier	N.G.C.	R.A. (1900)	Dec. (1900)	Type of Object	Remarks
		h m	° ′		
14	6402	17 32.4	− 3 11	Globular cluster	
15	7078	21 25.2	+11 44	Globular cluster	
16	6611	18 13.2	−13 49	Open cluster	
17	6618	18 15.0	−16 13	Diffuse nebula	The Horseshoe or Omega nebula—bright
18	6613	18 14.1	−17 10	Open cluster	
19	6273	16 56.4	−26 7	Globular cluster	
20	6514	17 56.3	−23 2	Diffuse nebula	The Trifid nebula—bright
21	6531	17 58.6	−22 30	Open cluster	
22	6656	18 30.3	−23 59	Globular cluster	
23	6494	17 51.0	−19 0	Open cluster	
24	6603	18 12.6	−18 27	Open cluster	
25	I.C. 4725	18 25.8	−19 19	Open cluster	
26	6694	18 39.8	− 9 30	Open cluster	
27	6853	19 55.3	+22 27	Planetary nebula	The Dumb-bell nebula
28	6626	18 18.4	−24 55	Globular cluster	
29	6913	20 20.3	+38 12	Open cluster	
30	7099	21 34.7	−23 38	Globular cluster	
31	224	0 37.3	+40 43	Spiral nebula	The Andromeda nebula—largest spiral
32	221	0 37.2	+40 19	Spiral nebula	Very close to M31 much smaller
33	598	1 28.2	+30 9	Spiral nebula	
34	1039	2 35.6	+42 21	Open cluster	
35	2168	6 2.7	+24 21	Open cluster	
36	1960	5 29.5	+34 4	Open cluster	
37	2099	5 45.8	+32 31	Open cluster	
38	1912	5 22.0	+35 45	Open cluster	
39	7092	21 28.6	+48 0	Open cluster	
40	....	12 17.4	+58 40	....	Two faint stars mistaken for a nebula by Messier
41	2287	6 42.7	−20 38	Open cluster	
42	1976	5 30.4	− 5 27	Diffuse nebula	The Orion nebula—very bright
43	1982	5 30.6	− 5 20	Diffuse nebula	
44	2632	8 34.3	+20 20	Open cluster	Praesepe or the Beehive cluster
45	....	3 41.5	+23 48	Open cluster	The Pleiades
46	2437	7 37.2	−14 35	Open cluster	
47	2478	7 50.2	−15 9	Open cluster	
48	....	8 9.0	− 1 39	Open cluster	
49	4472	12 24.7	+ 8 33	Spiral nebula	
50	2323	6 58.2	− 8 12	Open cluster	
51	5194	13 25.7	+47 43	Spiral nebula	The Whirlpool nebula
52	7654	23 19.8	+61 3	Open cluster	
53	5024	13 8.0	+18 42	Globular cluster	
54	6715	18 48.7	−30 36	Globular cluster	

MESSIER'S CATALOGUE OF CLUSTERS AND NEBULAE—*continued*

Messier	N.G.C.	R.A. (1900)	Dec. (1900)	Type of Object	Remarks
		h m	° ′		
55	6809	19 33.7	−31 10	Globular cluster	
56	6779	19 12.7	+30 0	Globular cluster	
57	6720	18 49.9	+32 54	Planetary nebula	The Ring nebula in Lyra
58	4579	12 32.7	+12 22	Spiral nebula	
59	4621	12 37.0	+12 12	Spiral nebula	
60	4649	12 38.6	+12 6	Spiral nebula	
61	4303	12 16.8	+ 5 2	Spiral nebula	
62	6266	16 54.8	−29 58	Globular cluster	
63	5055	13 11.3	+42 34	Spiral nebula	
64	4826	12 51.8	+22 13	Spiral nebula	
65	3623	11 13.7	+13 38	Spiral nebula	
66	3627	11 15.0	+13 32	Spiral nebula	
67	2682	8 45.8	+12 11	Open cluster	
68	4590	12 34.2	−26 12	Globular cluster	
69	6637	18 24.8	−32 25	Globular cluster	
70	6681	18 36.7	−32 23	Globular cluster	
71	6838	19 49.3	+18 31	Open cluster	
72	6981	20 48.0	−12 55	Globular cluster	
73	6994	20 53.5	−13 1	Open cluster	
74	628	1 31.3	+15 16	Spiral nebula	
75	6864	20 0.2	−22 12	Globular cluster	
76	650	1 36.0	+51 4	Planetary nebula	
77	1068	2 37.6	− 0 26	Spiral nebula	
78	2068	5 41.6	+ 0 1	Diffuse nebula	
79	1904	5 20.1	−24 37	Globular cluster	
80	6093	16 11.1	−22 44	Globular cluster	
81	3031	9 47.3	+69 32	Spiral nebula	
82	3034	9 47.5	+70 10	Spiral nebula	
83	5236	13 31.4	−29 21	Spiral nebula	
84	4374	12 20.0	+13 26	Spiral nebula	
85	4382	12 20.4	+18 45	Spiral nebula	
86	4406	12 21.1	+13 30	Spiral nebula	
87	4486	12 25.8	+12 57	Spiral nebula	
88	4501	12 26.9	+14 58	Spiral nebula	
89	4552	12 30.6	+13 6	Spiral nebula	
90	4569	12 31.8	+13 43	Spiral nebula	
91	....	12 36.0	+13 50	....	Not confirmed—probably comet
92	6341	17 14.1	+43 15	Globular cluster	
93	2447	7 40.5	−23 38	Open cluster	
94	4736	12 46.2	+41 40	Spiral nebula	
95	3351	10 38.7	+12 14	Spiral nebula	
96	3368	10 41.5	+12 21	Spiral nebula	
97	3587	11 9.0	+55 34	Planetary nebula	The Owl nebula
98	4192	12 8.7	+15 27	Spiral nebula	
99	4254	12 13.8	+14 58	Spiral nebula	
100	4321	12 17.9	+16 23	Spiral nebula	
101	5457	13 59.6	+54 50	Spiral nebula	
102	5866?	15 3.8	+56 9	Spiral nebula	
103	581	1 26.6	+60 11	Open cluster	

STAR MAP I

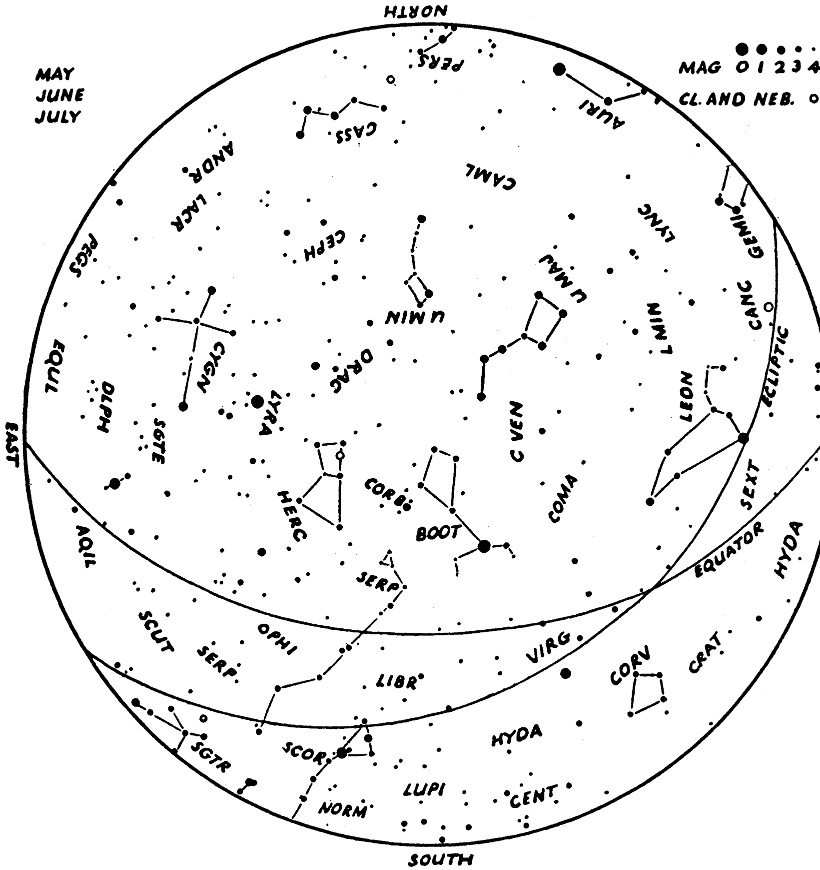


The above map represents the evening sky at

Midnight	.... Feb.	6
11 p.m.	.... "	21
10 "	.... Mar.	7
9 "	.... "	22
8 "	.... Apr.	6
7 "	.... "	21

The centre of the map is the zenith, the circumference the horizon. To identify the stars hold the map so that the part of the horizon you are facing is down.

STAR MAP 2

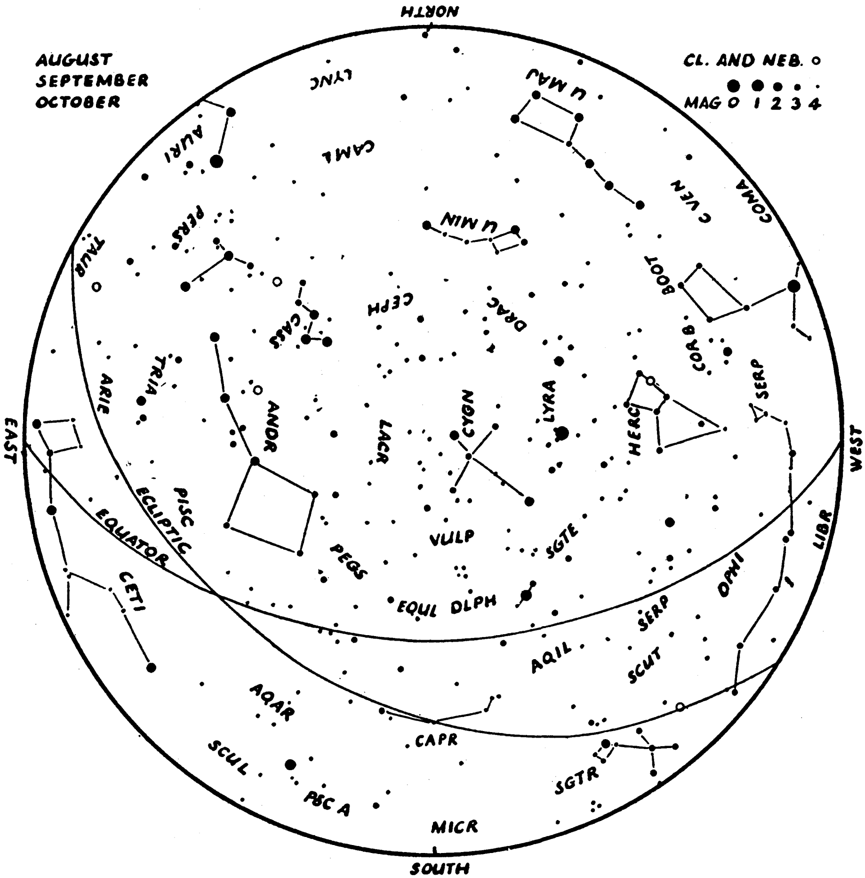


The above map represents the evening sky at

Midnight...........	May 8
11 p.m.............	" 24
10 "	June 7
9 "	" 22
8 "	July 6

The centre of the map is the zenith, the circumference the horizon. To identify the stars hold the map so that the part of the horizon you are facing is down.

STAR MAP 3

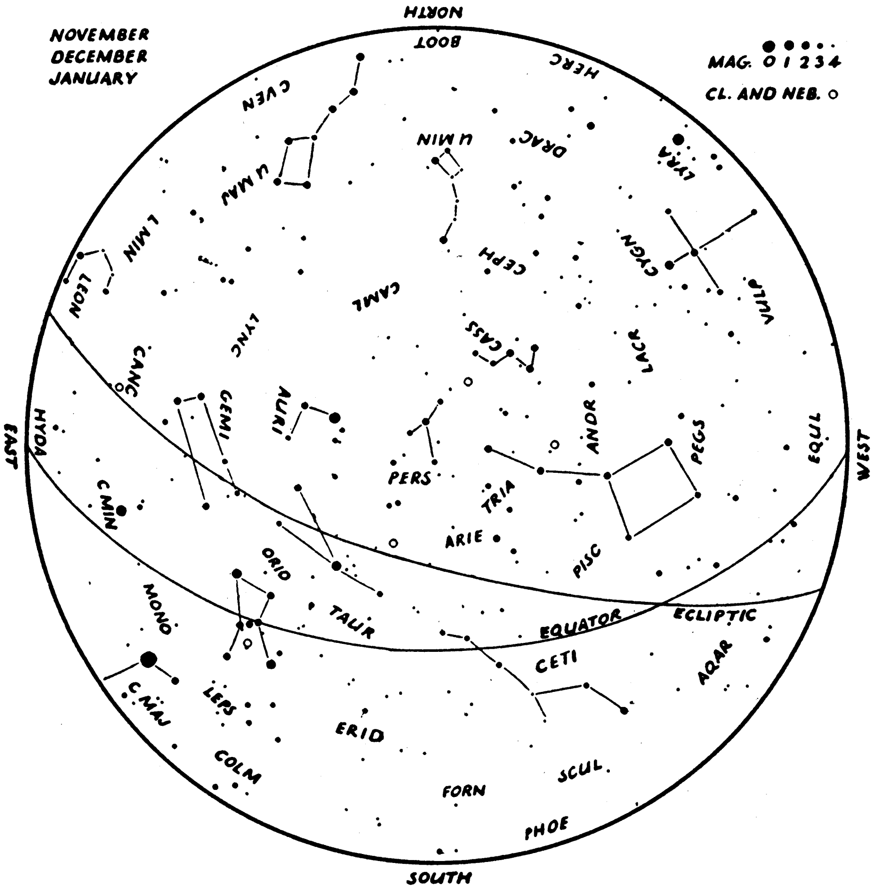


The above map represents the evening sky at

Midnight	.... Aug.	5
11 p.m.	.... "	21
10 "	.... Sept.	7
9 "	.... "	23
8 "	.... Oct.	10
7 "	.... "	26
6 "	.... Nov.	6
5 "	.... "	21

The centre of the map is the zenith, the circumference the horizon. To identify the stars hold the map so that the part of the horizon you are facing is down.

STAR MAP 4



The above map represents the evening sky at

Midnight	Nov. 6
11 p.m.	" 21
10 "	Dec. 6
9 "	" 21
8 "	Jan. 5
7 "	" 20
6 "	Feb. 6

The centre of the map is the zenith, the circumference the horizon. To identify the stars hold the map so that the part of the horizon you are facing is down.

CHIEF STARS USED IN AERIAL NAVIGATION

No.	Name	Pronunciation	Constellation Name	Mag.	R.A. 1900 h m	Dec. ° ′
1	Achernar	ā′ker-när	α Eridani	0.6	01 34	S 57 44
2	Acrux	ă′krŭks	α Crucis	1.1	12 21	S 62 33
3	Aldebaran	ăl-dĕb′ä-răn	α Tauri	1.1	04 30	N 16 18
4	Alpheratz	ăl-fē′răts	α Andromedae	2.2	00 03	N 28 32
5	Altair	ăl-tä′ĭr	α Aquilae	0.9	19 46	N 08 36
6	Antares	ăn-ta′rēz	α Scorpii	1.2	16 23	S 26 12
7	Arcturus	ärk-tŭ′rŭs	α Bootis	0.2	14 11	N 19 42
8	Betelgeuse	bĕt-ĕl-gûz′	α Orionis	0.8*	05 50	N 07 23
9	Canopus	ka-nō′-pûs	α Argus	−0.9	06 22	S 52 38
10	Capella	kä-pĕl′ä	α Aurigae	0.2	05 09	N 45 54
11	Deneb	dĕn′ĕb	α Cygni	1.3	20 38	N 44 55
12	Dubhe	dōōb′hĕ	α Ursae Majoris	2.0	10 58	N 62 17
13	Fomalhaut	fō′măl-hôt	α Piscis Australis	1.3	23 52	S 30 09
14	Peacock	pē′kŏk	α Pavonis	2.1	20 18	S 57 03
15	Pollux	pŏl′ŭks	β Gemini	1.2	07 39	N 28 16
16	Procyon	prō′sĭ-ŏn	α Canis Minoris	0.5	07 34	N 05 29
17	Regulus	rĕg′ū-lŭs	α Leonis	1.3	10 03	N 12 27
18	Rigel	rī′gĕl, rī′jĕl	β Orionis	0.3	05 10	S 08 19
19	Rigil Kent.	r. kĕn-tô′rŭs	α Centauri	0.1	14 33	S 60 25
20	Sirius	sĭr′ĭ-ŭs	α Canis Majoris	−1.6	06 41	S 16 35
21	Spica	spī′kä	α Virginis	1.2	13 20	S 10 38
22	Vega	vē′gä	α Lyrae	0.1	18 34	N 38 41
47	Polaris	pō-lā′rĭs	α Ursae Minoris	2.3	01 23	N 88 46

*No. 8. Magnitude varies from 0.5 to 1.1

PRONUNCIATION KEY

ā as in fate	ē as in we	ī as in ice	ō as in go	ū as in unite
ă " fat	ĕ " met	ĭ " ill	ŏ " odd	ŭ " up
ä " arm	ë " water	....	ô " orb	û " urn
....	....	....	ōō " food	....

Temperature and Precipitation at Canadian and United States Stations

Prepared by Andrew Thomson.

Station.	Jan.	Feb.	Ma.	Ap.	May	Ju.	Jul.	Aug.	Sep.	Oc.	No.	De.	Average Annual. M	H	L
	Mean Temperature, Fahrenheit.														
Victoria, B.C.	39	40	44	49	53	57	60	60	56	51	45	41	49	86	19
Vancouver, B.C.	36	39	43	48	53	60	63	63	57	50	43	38	50	86	13
Edmonton, Alta.	6	12	22	40	51	57	62	59	50	41	26	14	37	89	−41
Calgary, Alta.	11	14	25	40	49	56	61	59	50	42	26	20	38	91	−34
Regina, Sask.	−4	−2	14	37	50	59	64	61	51	39	21	8	33	94	−40
Winnipeg, Man.	−3	2	16	38	52	62	62	64	54	41	22	6	35	94	−38
Toronto, Ont.	23	22	30	42	53	63	69	67	60	48	37	27	45	92	−12
Ottawa, Ont.	12	13	25	42	55	65	69	66	59	46	33	17	42	93	−24
Montreal, Que.	14	15	26	41	55	65	70	67	59	47	33	20	43	90	−18
Halifax, N.S.	23	23	30	39	49	58	65	64	58	49	39	28	44	89	−9
Churchill, Man.	−19	−17	−6	15	29	42	53	52	41	26	7	−10	18	81	−46
Aklavik, N.W.T.	−18	−16	−12	8	31	49	56	50	38	19	−4	−14	16	83	−52
St. John's, Nfld.	23	22	28	35	43	51	59	60	54	45	37	29	41	83	−6
New York, N.Y.	31	31	37	49	60	68	73	73	56	56	44	35	52	95	2
Washington, D.C.	33	35	42	53	64	72	76	75	68	57	45	36	55	98	4
Chicago, Ill.	25	28	36	48	59	68	74	73	66	55	41	30	50	95	−10
Denver, Colo.	29	32	39	47	57	67	72	71	63	51	39	32	50	97	−13
San Francisco	50	51	53	54	56	57	57	58	60	59	55	51	55	91	37

M, *H* and *L* are the mean and the averages of the highest and of the lowest temperatures each year at the station, over the total time since the station was installed.

Station	Jan.	Feb.	Ma.	Ap.	May	Ju.	Jul.	Aug.	Sep.	Oc.	No.	De.	Year. M	W	D
	Mean Precipitation. (Unit = one tenth of an inch)														
Victoria, B.C.	45	30	23	12	10	9	4	6	15	28	43	47	271	510	173
Vancouver, B.C.	88	57	52	32	28	23	13	16	38	58	85	86	575	676	378
Edmonton, Alta.	9	7	7	9	17	31	33	24	13	7	7	8	171	278	82
Calgary, Alta.	5	6	7	7	24	32	26	27	13	6	7	5	164	346	79
Regina, Sask.	4	3	5	7	20	32	25	19	12	7	5	4	141	272	101
Winnipeg, Man.	9	8	11	13	22	31	31	23	23	15	11	9	206	302	102
Toronto, Ont.	28	25	25	25	29	27	30	29	30	24	28	26	325	436	176
Ottawa, Ont.	30	25	26	22	28	32	33	30	27	28	25	29	335	444	232
Montreal, Que.	37	32	35	25	30	35	37	35	35	33	35	37	407	530	292
Halifax, N.S.	56	45	50	45	42	37	39	45	36	53	54	54	555	678	388
Churchill, Man.	6	10	11	10	10	20	18	25	26	13	12	9	168		
Aklavik, N.W.T.	7	8	6	7	8	7	16	14	10	8	10	5	105	150	98
St. John's, Nfld.	54	51	45	42	36	36	37	36	38	54	61	49	538	691	427
New York, N.Y.	36	41	35	33	32	34	42	43	34	35	30	35	430	587	331
Washington, D.C.	35	35	37	33	36	42	46	39	33	28	24	32	422	614	307
Chicago, Ill.	19	23	26	28	35	34	33	32	32	25	24	20	327	461	244
Denver, Colo.	4	6	10	21	22	14	17	14	10	11	6	7	141	228	79
San Francisco	44	42	31	17	8	2	0	0	4	11	24	39	220	390	91

M, *W* and *D* indicate the mean, the greatest and the least total precipitation in one year from Jan. 1 to Dec. 31 recorded at a station, records being available for varying periods from 30 to 50 years.

Temperature and Precipitation at European and Asiatic Stations

Prepared by Andrew Thomson

The weather plays such a large role in modern warfare that accurate data on average weather conditions prevailing in the war zone will be of interest during the coming year. The climatological averages in the following tables are based on from 30 to 100 years' observations:

Temperatures in Degrees Fahrenheit

	Jan.	Feb.	Mar.	Apr.	May	June	July	Aug.	Sep.	Oct.	Nov.	Dec.	Average
Bergen	34	34	36	42	49	55	58	57	52	46	39	35	45
Oslo	25	26	30	40	51	60	63	60	52	42	33	26	42
London	39	40	42	47	53	59	62	62	57	50	44	40	50
Berlin	32	34	39	47	57	63	66	64	58	48	40	34	48
Paris	37	39	43	49	56	62	65	64	58	50	42	38	50
Vienna	29	33	40	50	59	65	68	67	60	50	39	32	49
Bucharest	26	30	41	52	62	69	73	72	64	53	40	31	51
Warsaw	26	28	35	46	57	63	66	64	56	46	36	30	46
Leningrad	18	18	24	36	48	58	63	60	51	40	30	22	39
Moscow	12	16	23	38	53	60	64	60	50	39	27	18	38
Kiev	21	24	31	44	58	63	67	65	56	45	33	26	44
Odessa	26	29	36	47	60	68	73	71	62	52	40	32	50
Tripoli	54	56	60	65	69	74	79	80	78	74	65	57	68
*Godthaab	14	14	18	25	33	40	44	43	38	30	24	18	28
†Stykkisholm	29	28	29	34	41	48	51	50	46	39	33	30	38
Vladivostok	7	14	26	40	49	57	64	69	62	49	31	15	40
Hong Kong	60	59	63	70	77	81	82	82	80	76	69	63	72
Tokyo	37	39	44	54	62	69	76	78	71	60	50	41	57

Precipitation in Inches

	Jan.	Feb.	Mar.	Apr.	May	June	July	Aug.	Sep.	Oct.	Nov.	Dec.	Total
Bergen	6.61	5.24	4.76	3.78	3.50	3.50	4.65	6.26	7.64	8.07	7.01	7.13	68.15
Oslo	1.26	1.10	1.22	1.26	1.50	1.89	2.68	3.23	2.36	2.40	1.73	1.57	22.21
London	1.89	1.54	1.61	1.61	1.85	2.01	2.40	2.32	2.09	2.68	2.24	2.01	24.25
Berlin	1.65	1.42	1.61	1.54	1.89	2.32	2.95	2.28	1.69	1.73	1.65	1.93	22.68
Paris	1.50	1.38	1.61	1.73	1.89	2.13	2.20	2.09	1.93	2.28	1.89	2.05	22.68
Vienna	1.46	1.30	1.81	2.05	2.80	2.72	3.11	2.72	1.97	1.85	1.77	1.81	25.35
Bucharest	1.34	1.10	1.65	1.73	2.48	3.46	2.68	2.01	1.57	1.69	1.89	1.57	23.19
Warsaw	1.34	0.94	1.26	1.57	1.97	2.40	3.42	2.59	1.77	1.61	1.46	1.42	21.77
Leningrad	1.06	0.98	0.90	1.22	1.61	2.13	2.32	3.27	2.36	1.81	1.42	1.30	20.39
Moscow	1.34	1.22	1.38	1.38	1.77	2.64	3.19	3.07	2.16	2.09	1.73	1.57	23.54
Kiev	1.38	1.18	1.73	1.73	2.01	2.95	3.19	2.24	1.81	1.93	1.61	1.54	23.31
Odessa	1.14	0.87	1.06	0.94	1.14	2.24	1.73	1.38	1.22	1.46	1.06	1.[illegible]8	15.43
Tripoli	3.23	1.84	0.94	0.47	0.28	0.04	0.00	0.04	0.39	1.54	2.91	3.98	15.71
*Godthaab	1.46	1.81	1.77	1.10	1.65	1.30	2.32	3.11	3.27	2.48	1.89	1.57	23.74
†Stykkisholm	2.80	2.60	1.97	1.50	1.38	1.54	1.50	1.61	2.72	3.07	2.52	2.52	25.67
Valdivostok	0.29	0.35	0.63	1.22	1.97	2.76	3.03	4.33	4.41	1.81	1.14	0.51	22.44
Hong Kong	1.30	1.61	2.71	5.35	11.65	15.94	13.82	22.01	9.84	4.88	1.85	1.14	82.12
Tokyo	2.20	2.80	4.41	4.92	5.67	6.50	5.32	5.75	8.70	7.36	4.25	2.13	59.99

*Greenland †Iceland

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