THE Observer's Handbook for 1919

Published By

The Royal Astronomical Society of Canada

EDITED BY C. A. CHANT



ELEVENTH YEAR OF PUBLICATION

TORONTO

198 COLLEGE STREET PRINTED FOR THE SOCIETY 1919

CALENDAR 1919

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PREFACE

The HANDBOOK for 1919 contains the same amount of matter as that for 1918, and is thus of rather less than half its usual size. The reduction was accomplished by omitting those portions which are not much altered from year to year, namely :—

> Symbols and abbreviations. Explanation of solar and sidereal time. Times of sunrise and sunset. Meteors and shooting stars. Elements and satellites of the solar system. List of double and variable stars. The stars, their magnitudes, velocities, etc. Maps and descriptions of the constellations.

These were given in volumes for past years, and any member who has not a copy containing them may obtain one free by addressing the Librarian, 198 College Street, Toronto.

Included in them are maps of the constellations, and it is suggested that the positions of the planets given at the head of pages 6, 8..., be marked on the maps, thus giving the paths of the planets amongst the stars.

The war is now happily over, and it is proposed to issue the HANDBOOK for 1920 in its former or even greater size; and those who use it will confer a favor by sending (in writing) suggestions as to improvements in the substance or arrangement of its contents.

The Editor wishes again to express his obligation to Mr. J. P. Henderson, M.A., his assistant in Astronomy at the University of Toronto, for material assistance in **p**reparing this volume.

THE EDITOR.

Toronto, December, 1918.

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ANNIVERSARIES AND FESTIVALS, 1919

New Year's Day Wed., Jan. 1	Pentecost (Whit Sunday) June 8
Epiphany Mon., Jan. 6	Trinity Sunday June 15
Septuagesima Sunday Feb. 16	Corpus Christi Thur., June 19
St. David Sat., Mar. 1	St. John Baptist Tues., June 24
Quinquagesima (Shrove Sunday) Mar. 2	Dominion Day Tues., July 1
Ash Wednesday Mar. 5	Labor Day Mon., Sept. 1
St. Patrick Mon., Mar. 17	St. Michael (Michaelmas Day)
Palm Sunday Apr. 13	Mon., Sept. 29
Good Friday Apr. 18	All Saints Day Sat., Nov. 1
Easter Sunday Apr. 20	St. Andrew
St. George Wed., Apr. 23	First Sunday in Advent. Nov. 30
Victoria Day Sat., May 24	Conception Day Mon., Dec. 8
Rogation Sunday May 25	St. Thomas Day Sun., Dec. 21
Ascension Day (Holy Thursday) May 29	Christmas Day Thur., Dec. 25
King George V., born June 3, 1	865; began to reign May 6, 1910.

Queen Mary, born May 26, 1867.

Prince of Wales, born June 23, 1894.

OCCULTATIONS OF STARS BY THE MOON, 1919

PREPARED BY R. M. MOTHERWELL

The following predictions were prepared for Ottawa by the graphic method of W. F. Rigge and include all stars down to magnitude 4.5. Observers should bear in mind that the predictions were made only for Ottawa and that the times will vary according to the latitude and longitude of the observer.

It will be noticed that some occultations occurring in the day-time are given, the observation of which may prove interesting. Attention is also directed to the fact that the hours are numbered astronomically, that is, beginning at noon.

Date		Star	Man	*T	nersion	* 17-	•	Position	Angle
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February	10	v Geminorum	4'1	13	54.0	14	07.0	182	207
March	12	a Cancri	4'3	14	04.6	14	23.1	42	8
April	5	Tauri	3.0	2	29.2	3	33.7	122	237
July	23	č Tauri	3.0	16	29.1	17	07.6	35	316
September	10	a Cancri	4.3	16	14.5	18	42.5	42	358
October	Ĩ	4 Sagittarii	4.0	2	18.4	3	28.7	62	297
November	27	B Capricorni	3.2	7	41.0	7	52.2	349	331
November	28	v Aquarii	4.5	6	59.8	8	01.8	32	276

*Eastern Standard Astronomical Time (Hours numbered from noon).

1919, EPHEMERIS OF SUN. AT GREENWICH MEAN NOON.

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1919, EPHEMERIS OF SUN.

AT GREENWICH MEAN NOON.

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Oct. I " 4 " 7 " 10 " 13 " 16 " 19 " 22 " 25 " 28	12 26 39 12 37 32 12 48 27	$ \begin{array}{cccccccccccccccccccccccccccccccccccc$	4 2 40 5 12 2 6 20 48 7 28 50 8 35 56 9 41 58 10 46 45 11 50 4	<pre>'' 6 '' 9 '' 12 '' 15 '' 15 '' 18 '' 21 '' 24 '' 27</pre>	16 47 40 17 0 47 17 13 58 17 27 12 17 40 29 17 53 48 18 7 8 18 20 28	$\begin{bmatrix} 7 & 5^{6} \cdot 1 \\ \forall & 6 & 34^{\cdot 8} \\ 8 & 5 & 10^{\cdot 0} \\ 3 & 42^{\cdot 4} \\ 2 & 13^{\cdot 1} \\ - & 0 & 43^{\cdot 0} \\ + & 0 & 46^{\cdot 7} \end{bmatrix}$	22 24 25 22 45 0 23 1 34 23 14 2 23 22 20 23 26 25 23 26 16

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

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

THE SKY FOR JANUARY

POSITION OF PLANETS ON THE 15TH.

	<u>8</u> Mercury	♀ Venus	7 Mars	94 Jupiter	þ Saturn	∂ Uranus	Ψ Neptune
R. A.	18h 9m	20h 39m	21h 33m	6h 39.m	9h 59m 13° 49' N.	21h 53m	8h 43m
Decl.	22° 49' S.	19° 54' S.	15° 41' S.	23° 12' N.	13° 49' N.	13° 34' S.	18° 6' N.
Transit	10,34	13.03	:3:57	23.01		14.12	1.08

The position is given for Greenwich Mean Noon. The time of transit is in Local Mean Time, hours numbering from midnight.

The Sun.—During the month the sun's R. A. increases from 18h 44m to 20h 52m, and its Decl. changes from 23° 4' to 17° 36' S. The equation of time (given on page 4) increases from 3m 19s to 13m 29s so rapidly that it causes the time of mean noon (expressed by our clocks) to remain at the same interval from sunrise. or, in other words, our forenoons appear to be of the same length for about the first ten days of the month. The earth is nearest the sun on the 3rd, the distance being 91,350,000 miles.

The Moon.—Its phases and conjunctions with the planets are given on the page opposite.

On January 26 at 7 55 a.m. the moon occults & Scorpii (see p. 3).

Mercury has its greatest elongation west on the 7th, when it is $23^{\circ} 13'$ away from the sun. It rises nearly 2 hours before the sun on this date, but it is so far south that it is scarcely 15° above the horizon at sunrise. It should be visible for at least a week before and after this date, about 18° to the southward of the point where the sun is to appear. Field glasses and a good horizon will easily locate it.

Venus is an evening star during the month, but quite low in the sky. Its stellar magnitude is -3.4, its phase is like a full moon, but it is in the farther part of its orbit and is not so conspicuous as some months later.

Mars is an evening star this month, about 20° above the horizon at sunset, and in the constellation Capricornus. It is 203 million miles from the earth on the 15th.

Jupiter on the 15th rises about an hour before sunset and sets just before sunrise. It is very prominent all night, stellar magnitude -2.2, completely outshining Castor and Pollux, the two Twins nearby. The configurations of its satellites are given on the next page, and their eclipses, etc., on page 30.

Saturn rises nearly 3 hours after sunset and is visible the rest of the night. It is very close to Regulus, slightly over a degree to the north, but is retrograding and is moving away from it. Any magnification will show the saucer-like appearance the rings give the planet, and a good telescope should show them very distinctly. They are inclined at an angle of 11° with our line of sight, and we are looking at their southern face.

Uranus during the year is in Aquarius, moving from the border of Capricornus. It may be observed in the evening heavens in January and again towards the end of the year, or in the morning sky from April on. It reaches the meridian at midnight on Aug. 24th, when it is 1,770 million miles from the earth. Its position should be charted on a star map from data given for each month at the top of the page, and reference stars should be selected as guides in locating it in the sky.

Neptune in 1919 is in Cancer moving toward Leo. It is visible as an evening star until July, and as a morning star from September on. It reaches the meridian at midnight on Jan. 29th, and is 2,700,000,000 miles from the earth on that day. Its position should be located in a similar manner as above.

JANUARYASTRONOMICAL PHENOMENA(75th Meridian Time, Hours Numbering from Midnight)Wed.1 $(75th Meridian Time, Hours Numbering from Midnight)hWed.1(75th Meridian Time, Hours Numbering from Midnight)hWed.1(75th Meridian Time, Hours Numbering from Midnight)Wed.1(75th Meridian Time, Hours Numbering from Night(75th Meridian Time, Hours Numbering from Midnight)Wed.2(75th Meridian Time, Hours Numbering from Night(75th Meridian Time, Hours Numbering from Midnight)(75th Meridian Time, Hours Numbering from Midnight)(75th Meridian Time, Hours Numbering from Night(75th Meridian Time, Hours Numbering from Night(75th Meridian Time, Signt)(75th Meridian Time, Signt)$		0.000000	JANUARY	of		on of tel- r5m.
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Thur. 30 13h 4m \mathcal{O} \mathcal{D} (C, \mathcal{D} 4° 48' S.; 21h \mathcal{O} \mathcal{D} \mathcal{D} , \mathcal{D} 0° 52' S. 7 5021U3						
		29	$3^n \neq \text{Greatest Hel. Lat. 5.; } 21^n \neq \text{ in Aphelion.}$	L	 -	
W Fri. 31 100 7000 New Moon;. 242014		30	$13n 4m \circ \varphi (C, \varphi 4^{\circ} 4\delta S; 21n \circ \varphi \circ, \varphi \circ 52 S)$	7	-50	
	WFri.	31	18n 7m O New Moon;.	1		242014
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Key to Symbols. $-\mathcal{O}$ Conjunction; \mathcal{O} Opposition; \square Quadrature; Ω Ascending Node; \mathfrak{O} Descending Node; \mathfrak{O} Sun; \mathfrak{P} Mercury; \mathfrak{P} Venus; \oplus Earth; \mathcal{J} Mars; \mathfrak{A} Jupiter; \mathfrak{H} Saturn; \mathfrak{O} Uranus; Ψ Neptune. For Jupiter's satellites the circle \mathcal{O} represents the disc of the planet; \mathfrak{A} signifies that the satellite is on the disc; \mathfrak{O} signifies that the satellite is behind the disc or in the shadow. Configurations are for an inverting telescope.

THE SKY FOR FEBRUARY

	<u>8</u>	ပ	o ⁷	94	b	ô	Ψ
	Mercury	Venus	Mars	Jupiter	Saturn	Uranus	Neptun e
Decl.	17° 3' S	23h/ 9m 6' 57' S. 13'32	23h 6m 6 ⁴ 43' S.	6u 27m 23° 26' N	9h 50m 14° 40' N.	22h om 12° 59' S	^{Sh} 39 ^m 18° 20' N.

POSITION OF PLANETS ON THE 15TH.

The position is given for Greenwich Mean Noon. The time of transit is in Local Mean Time, hours numbering from midnight.

The Sun.—During the month the sun's R.A. increases from 20h 56m to 22h 44m and its Decl. changes from 17° 19' to 8° 15' S.; the equation of time reaches a maximum on the 12th, when it is 14m 24s, (see page 4).

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

On February 11 at 1.54 a.m. the moon occults v Geminorum (see p. 3).

Mercury is in superior conjunction with the sun on the 23rd and too close for convenient observation during the month.

Venus is improving in position as an evening star during the month. It has a close conjunction with Mars on the 13th, when it is only 35' south of Mars. Its stellar magnitude is -3.3 and increasing.

Mars is still an evening star this month, and although approaching the sun is only slightly lower in the sky at sunset than last month, due to the changing angle at which the ecliptic cuts the horizon from month to month. It is 212 million miles from the earth on the 15th.

Jupiter is 45° above the horizon at sunset and is visible until 3 hours before sunrise. The planet is retrograding, but its position among the stars is only slightly changed from that a month ago. Although in a portion of the heavens containing strikingly bright stars, it shines out 1.6 times as bright as Sirius, the brighest of them all. Its stellar magnitude is -2.1, nearly as bright as last month. The configurations of its satellites are given on the opposite page and their eclipses, etc., on page 30.

Saturn on the 15th rises at sunset and sets at sunrise. It is retrograding, being in opposition to the sun on the 14th, when it is 764 million miles from us. It is in its very best position for observation, the rings being inclined to us at about 12° and we are looking at their southern face.

The positions of Uranus and Neptune are given above. See note for January.

	FEBRUARY Astronomical phenomena	ima of	Algol	Configuration of Jupiter's Satel- lites at 22h 45m
(7	5th Meridian Time, Hours Numbering from Midnight)	Min	¥ .	Config Jupiter lites at
Tues. Wed. Thur. Fri. Sat. Sun. Mon. Tues. Wed. Thur. Fri. (CSat. Sun. Mon.	¹ ² ¹ ² ¹ ² ¹ ² ¹ ¹ ¹ ¹ ¹ ¹ ¹ ¹	1 22 19 15 12 9	40 20 10 50 40 30 20	31024 30214 23104 910234 21043 20431 34102 43210 40230 42230 42103 42231 34102 32104 20314 0234 20314 20314 20314 20314 31024 30124 31024 32104 31024 31024 32104 31024 31024 32104 31024 31024 32104 31024 32104 31024 32104 31024 32104 31024 32104 31024 32104 31024 32104 31024 32104 31024 32104 31024 32104 31024 32104 31024 32104 31024 32104 31024 32104 31024 32104 31024 32104 31024 31024 32104 31024 3
Wed. Thur.	25 26 27 28	0		41O23 942O3 42O13

Key to Symbols.— \bigcirc Conjunction; \bigcirc Opposition; \square Quadrature; \bigcirc Ascending Node; \circlearrowright Descending Node; m Sun; \div Mercury; \heartsuit Venus; \bigoplus Earth; \Huge{mass} Mars; \oiint Jupiter; \Huge{mass} Saturn; \Huge{mass} Uranus; \oiint Neptune. For Jupiter's satellites the circle \bigcirc represents the disc of the planet; \oiint signifies that the satellite is on the disc; mass signifies that the satellite is behind the disc or in the shadow. Configurations are for an inverting telescope.

THE SKY FOR MARCH

	<u>ध</u>	우	∂	94	h	ð	Ψ
	Mercury	Venus	Mars	Jupiter	Saturn	Uranus	Neptune
Decl.	5° 8' N.	.7° 26' N.	oh 26m 2° 7' N. 12.57	23° 29' N	15° 22' N.	12° 26' S	18° 29' N.

POSITION OF PLANETS ON THE 15TH.

The position is given for Greenwich Mean Noon. The time of transit is in Local Mean Time, hours numbering from midnight.

The Sun.—On March 1st the sun's R.A. is 22h 46m and its Decl. is 7° 53' S. it crosses the equator on the 21st, the spring equinox, and by the 31st its R.A. is 0h 36m and its Decl. 3° 51' N. During the month the equation of time decreases from 12m 39s to 4m 29s (see page 4).

The Moon:—Its phases and conjunctions with the planets are given on the opposite page.

On March 13 at 2 05 a.m. the moon occults a Cancri (see p. 3).

Mcrcury is at greatest elongation east on the 21st. This is the best time of the year to observe an eastern elongation, since it is 18° directly above the setting sun, in spite of the fact that it is only 18° 35' from the sun. There should be no difficulty in locating it if the horizon is at all clear. Look for it from about the 10th until the end of the month. Its stellar magnitude is about 0. It is in rather close conjunction with Mars on the 11th, but both planets are quite low down at sunset.

Venus is a fine evening star all month, stellar magnitude -3.4 and very slowly increasing in brightness. It is 136 million miles from the earth on the 15th and approaching us rapidly.

Mars is too low down in the sky at sunset this month for convenient observation. On the 15th it is 219 million miles from the earth, on the side of its orbit most remote from us.

Jupiter is ag in to be found in practically the same relative position among the stars, but the sun makes a difference again of two hours in its evening location. It is an hour to the eastward of the meridian at sunset, and therefore visible for the first half of the night. Its stellar magnitude is -1.9. For the configurations of its satellites, see next page; for their eclipses, etc., see page 30.

Saturn is about 30° up from the horizon at sunset and is visible until an hour before s mrise. It is still retrograding, and well placed for observation. Its stellar magnitude is ± 0.3 . Its great ring system is inclined 13° from our line of sight. See note for January.

The positions of *Uranus* and *Neptune* are given in the above table. See note for Jaruary.

Sat.11 3h 5m \mathcal{T} \oplus \mathbb{C} , \oplus \oplus \oplus 3' S.nSun.2 $6h 11m'4$ New Moon; 11h \mathfrak{Q} Stationary; $.2 \downarrow h 4m \mathcal{T}$ \mathfrak{P} 20 $4043 \mathbb{C} 12$ Mon.31 3h 28m \mathcal{T} \mathbb{C} , \mathcal{T} \mathfrak{S}° 51' S.34210Tues43h 46m \mathcal{T} \mathfrak{Q} \mathbb{C} , \mathcal{T} \mathfrak{S}° 51' S.34210Wed.51730 10423Thur.6717Sat.822h 14m 1 Moon's First Quarter.14Sun.9 \mathcal{O} \mathbb{C} , \mathcal{D} \mathfrak{S}° 51' N.11Mon.106h \mathfrak{P} in \mathfrak{O} ; 6h 46m \mathcal{T} \mathfrak{Q} \mathfrak{Q} , \mathfrak{Q} 2° 35' N.11Tues.1114h \mathfrak{Q} \mathfrak{P} \mathfrak{O} , \mathfrak{P} \mathfrak{O}° 59' N.11Tues.1114h \mathfrak{Q} \mathfrak{P} \mathfrak{O} , \mathfrak{P} \mathfrak{O}° 47' N.; 20h \mathfrak{P} in Perihelion.Sat.151516Mon.1717Tues.1810Mon.1714Mon.17Tues.18Mon.17Tues.18Mon.17Tues.18Mon.17Tues.18Mon.17Tues.18Mon.17Tues.18Mon.19 \mathfrak{O} Sat.22Sat.22Sat.233434343434343536373839<	(7	MARCH ASTRONOMICAL PHENOMENA 75th Meridian Time, Hours Numbering from Midnight)	Minima of	Algol	Configuration of Jupiter's satel- lites at 22h .15m.
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Sat. 22 $30 \ 234$ Sun. 23 $30 \ 24$ $30 \ 24$ C Mon. 24 15h 33m 9 Moon's Last Quarter. $30 \ 124$ Tues. 25 3h 8 Greatest Hel. Lat N. 19 20 32C14 Wed. 26 10h $9 \ in \Omega$. $1^{\circ}224$ Thur. 27 $1^{\circ}24$ Fri. 28 9h 210° 210° Sat. 29 0h 3° 5° C, 5° 6° 11' S. Sun. 30 $3^{\circ}2^{\circ}$					
Sun.233 $C124$ C Mon.2415h 33m'9 Moon's Last Quarter.3 $C124$ Tues.253h & Greatest Hel. Lat N.19Wed.2610h Q in Q .1024Thur.27Fri.28Fri.289h Q QL D.Sat.290h Q Stationary; 2h 13m O O C, O 6° 11' S.Sun.30	Sat.		22	30	210340
$ \begin{array}{c} \mathbb{C} Mon. \ 24 \ 15h \ 33m^{\circ}9 \ Moon's \ Last \ Quarter. \\ Tues. \ 25 \ 3h \ \& \ Greatest \ Hel. \ Lat \ N. \\ Wed. \ 26 \ 1oh \ Q \ in \ Q. \\ Thur. \ 27 \ Fri. \ 28 \ 9h \ Ql \ @b. \\ Sat. \ 29 \ oh \ \& \ Stationary; \ 2h \ 13m \ O \ \& \ C, \ \& \ 6^{\circ} \ 11' \ S. \\ Sun. \ 30 \end{array} $		23	1		
Tues. 25 $3h$ § Greatest Hel. Lat N. 19 20 32 C 14 Wed. "26 10h Q in \bigcirc . 1° 24 1° 24 Thur. 27 12 1° 24 1° 24 Fri. 28 $2h \bigcirc 21$ $10h$ $21 @$. Sat. 29 $2h $ § Stationary; $2h $ $13m $ \bigcirc \bigcirc \bigcirc \bigcirc \bigcirc \bigcirc $\%$ $11'$ S. Sun. 30 30	CMon.				
Wed. $[26]$ Toh Q in Q . Thur. 27 Fri. 28 9h \square $Q1$ \textcircled{m} . Sat. 29 9h \mathring{Q} Stationary; $2h 13m ? \textcircled{C}$, \textcircled{C} , \textcircled{C} 6° 11' S. Sun. 30 [10234] 16 1021043 20143 3402	· · · · ·		10		
Thur. 27 27 01234 Fri. 28 9h 210 . 910 . 01234 Sat. 29 0h 3 Stationary; 2h 13m 7 $(20, 2)$ $(20, 3)$ 16 1021 234 Sun. 30 3402	Wed.		1.		
Fri. 28 $9h \square$ $91 \square$ $1021 \bigcirc 43$ Sat. 29 $oh \notin$ $$Stationary; 2h 13m \checkmark \textcircled{C}, \textcircled{C}, \textcircled{C}, \textcircled{C}^{\circ} 6^{\circ} 11' S.$ 16 $1021 \bigcirc 43$ Sun. 30 $34 \bigcirc 2$ $34 \bigcirc 2$					01234
Sat. 29 6h $\stackrel{\circ}{Y}$ Stationary; 2h 13m $\stackrel{\circ}{O}$ $\stackrel{\circ}{\odot}$ \mathbb{C} , $\stackrel{\circ}{\odot}$ 6° 11' S. 20143 Sun. 30 3402			16		
Sun. 30 3402•					
	Mon.	31 16h 4m·9 New Moon.	12		

Key to Symbols.— \checkmark Conjunction; \bigcirc Opposition; \square Quadrature; \bigcirc Ascending Node; \circlearrowright Descending Node; \bigoplus Sun; \updownarrow Mercury; \heartsuit Venus; \oplus Earth; \Huge{d} Mars; \image Jupiter; \Huge{b} Saturn; \Huge{b} Uranus; \Downarrow Neptune. For Jupiter's satellites the circle \bigcirc represents the disc of the planet; \Huge{l} signifies that the satellite is on the disc; o signifies that the satellite is behind the disc or in the shadow. Configurations are for an inverting telescope.

THE SKY FOR APRIL

	<u>8</u> Mercury		ر Mars	1 1	b Saturn		
R. A.	Oh 45 ^m	3h 41m	1h 53m	6h 38m	9h 37m	22h* 12m	8h 36m
Decl.	5° 28' N.	20° 40' N.	11° 18' N.	23° 23' N.	15° 46' N.	11° 56' S.	18° 34' N.
Transit	11'13	14.11	12'22	17.06	20'04	8'41	19'03

POSITION OF PLANETS ON THE 15TH.

The position is given for Greenwich Mean Noon. The time of transit is in Local Mean Time, hours numbering from midnight.

The Sun.—Luring the month the sun moves in R.A. from 0h 39m to 2h 27m and in Decl. from 4° 14' to 14° 32' N. Due to it moving northward so rapidly the days increase in length very fast. The equation of time is given on page 4.

The Moon.- Its phases and conjunctions with the planets are given on the next page.

On April 5 at 2.29 p.m. the moon occults ζ Tauri (see p. 3).

Mercury is in exceedingly close conjunction with the moon on the 1st, when it is only .3' south of the center of the moon's disc as viewed from the center of the earth. Location of the observer geographically will alter this. However, both are so low in the evening sky that an extra good horizon will be 1 ecessary to observe it. On the 8th it is again in conjunction with the sun, but it will not be nearest the earth till the 11th, when it is 54 million miles distant.

Venus is a builliant evening star all month. Careful observation should demonstrate that it is moon shaped, about 4/5 full. Stellar magnitude -3.4.

Mars is 226 million miles from us on the 15th and is too close to the sun for observation this month. Its motion in the sky is very slow with reference to the sun, because it and the earth are on opposite sides of the sun, and the earth is not moving so very much faster than Mars.

Jupiter is still just entering the constellation of Gemini and is visible the first half of the night. Its stellar magnitude is -1.7. The configurations of its satellites are given on the next page, and their eclipses, etc., on page 30.

Saturn on the 15th sets about $2\frac{1}{2}$ hours before sunrise. It is retrograding till the 24th and is in Leo, near the boundary of Gemini. Its stellar magnitude is +0.5.

The positions of *Uranus* and *Neptune* are given in the above table. See note for January.

(*	7511	APRIL ASTRONOMICAL PHENOMENA Meridian Time, Hours Numbering from Midnight)	Minima of	Algol	Configuration of Jupiter's satel- lites at 21h 45m.	
Tues.	I	10h 3 ^m \bigcirc \overrightarrow{A} (C, \bigcirc 4 17' S.; 10h 24 ^m \bigcirc $\textcircled{2}$ (C, $\textcircled{2}$ o ^c [13' S.; 15h \bigcirc $\textcircled{2}$ \overrightarrow{A} (C, $\textcircled{2}$ $\textcircled{2}$ \overbrace{A})	h	m	4 32 O1	
Wed. Thur. Fri. Sac.	3	$\begin{bmatrix} 13' \text{ S.}; 15^{\text{h}} \text{ of } & 2 \\ 2^{1\text{h}} & 3^{\text{m}} \text{ of } & 2 \\ \end{bmatrix} \begin{pmatrix} 13' \text{ S.}; 15^{\text{h}} \text{ of } & 2 \\ (\mathbb{C}, \mathbb{Q}, \mathbb{Q}, \mathbb{Q}) \\ 1^{\circ} & 36' \text{ S.} \\ \end{bmatrix}$	9	40	41032 40123 42103	
Sat. Sun. Mon. Tues.	7	16h 5m ♂ 24 C, 24 3° o' N. 7h 38m 8 Moou's First Quarter. 2h ♂ \$ I Therior; 22h 2m ♂ ¥ C, ¥ 4° 39' N.	6	30	42013 4310 2 31024	
Wed. Thur. Fri.	9	2^{h} $\bigcirc \ \ \ \ \ \ \ \ \ \ \ \ \ \ \ \ \ \ $	3	20	32C14 13O24 01234	
Sat. Sun.	12 13		0		21C34 2O134 31O24	
Mon. Tues Wed.	14 15 16	3 ^h 25 ^m ·I Full Moon.	20	50	943024 3204● 4130●	
Thur. Fri. Sat.	17 18 19	14h § in); 18h Ψ Stationary.	17	U	40132 41203 42013	
Sun. Mon. Tues.	20 21 22	12h & Stationary.	14	40	413○2 43○12 432○●	
CWed. Thur. Fri.	23 24 25	6h 21m 1 Moon's Last Quarter; 22h h Stationary. 13h 57m ♂ 念 C, 念 6° 23' S.	11	20	4310● C4132 12C43	
Sat. Sun. Mon.	26 27 28	16h $\square \Psi \textcircled{0}$; 20h \S in Aphelion. 11h om $\forall \S \textcircled{0}$, \S 6° 47' S.; 21h \Im in Perihelion.	8		12043 20134 2⊈1024 30124	
Tues.	29	oh 30m·4 New Moon; $5h 25m \circ 3^{\circ}$ C, $3^{\circ} 2^{\circ} 12^{\circ}$ S.	5	o	30124 32104 QL3204	

Key to Symbols. — \checkmark Conjunction; \circlearrowright Opposition; \square Quadrature; \circlearrowright Ascending Node; \circlearrowright Descending Node; \bigoplus Sun; \S Mercury; \heartsuit Venus; \oplus Earths \urcorner Mars; \mathfrak{A} Jupiter; \mathfrak{H} Saturn; \mathfrak{B} Uranus; \Downarrow Neptune. For Jupiter's satellite; the circle \bigcirc represents the disc of the planet; \mathfrak{A} signifies that the satellite is on the disc; \blacklozenge signifies that the satellite is behind the disc or in the shadow. Configurations are for an inverting telescope.

THE SKY FOR MAY

	<u>8</u> Mercury		7 Mars	51	þ Saturn		
R. A.	1h 53m	6h 14m	3h 19m	6h 58m	9h 38m	22h 15m	8h 36m
Decl.	8° 23' N.	25° 36' N.	18° 22' N.	23° 2' N.	15° 37' N.	11° 38' S.	18° 32' N
Transit	10°24	14.46	11.50	15 [.] 28	18'08	6'46	17.06

POSITION OF PLANETS ON THE 15TH.

The position is given for Greenwich Mean Noon. The time of transit is in Local Mean Time, hours numbering from midnight.

The Sun.—Luring the month its R.A. increases from 2h 31m to 4h 29m and its Decl. northward from 14° 50' to 21° 48'. The equation of time changes only slightly during the month, reaching a small maximum of 3m 49s on the 15th (see page 4). On the 28th there is a total eclipse of the sun visible in South America, the southern Atlantic Ocean, and South Africa, but invisible in Canada (see page 32).

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

Mercury on the 6th is at greatest elongation W., 26° 36'. This is a large elongation, but as the planet is 5° 33' south of the ecliptic it is only 10° high at sunrise. With the aid of field glasses it may be located over a good horizon, about 25° south of the point where the sun will appear.

Venus is an evening star of stellar magnitude -3.6, and is increasing in apparent diameter as it approaches us. It now appears in a telescope like our moon nearly $\frac{3}{4}$ full.

Mars is in conjunction with the sun on the 9th and too close for observation during the month. It is 231 million miles from the earth on the 15th, not quite as far as next month.

Jupiter has not moved far among the stars as yet and is visible for the first $3\frac{1}{2}$ hours of the night. It is a conspicuous evening star of stellar magnitude -1.5. The configurations of its satellites are given on the next page and their eclipses, etc., on page 30.

Saturn is moving forward again, but very slowly as yet. It is about $\frac{34}{4}$ hour past the meridian at sunset on the 15th, and is visible till an hour past midnight, apparent time. Its stellar magnitude is +0.7.

The positions of *Uranus* and *Neptune* are given in the above table. See note for January.

The minima of Algol are given on the opposite page.

MAY ASTRONOMICAL PHENOMENA (75th Meridian Time, Hours Numbering from Midnight)	Minima of	Algol	Configuration of Jupiter's Satel- lites at 21h 15m
	h	m	
Thur. I			01324
Fri. 2 15h 16m $\bigcirc \varphi$ (C, φ 3° 5' N.	I	50	Q1043
Sat. 3			24013
Sun. 4 $6h 42m 0' 24 $ C, 24 $3^{\circ} 29'$ N.	22	40	41032
Mon. 5			43012
Tues. $\overrightarrow{6}$ 2h $\overrightarrow{2}$ Greatest elong. W. 26° 36'; 4h 44m $\overrightarrow{4}$ $\overrightarrow{\Psi}$ $\overrightarrow{\mathbb{C}}$,		43210
Wed. 7 Ioh 16m \checkmark b (C, b 7° o' N			
Wed. 7 Ioh 16m \mathcal{O} \mathfrak{h} \mathbb{C} , \mathfrak{h} 7° o' N Thur. 8	19	30	43201
			40200
	1.6		41023
	16	20	24013
Sun. 11 $3h \partial in \otimes d$			1043
	1.0		30124
	13	10	32104
	1 .		32014
Thur. 15 Fri. 16	1.0	_	C24
	10	U	10234
Sat. 17 Sun. 18 5h & Greatest Hel. Lat. S.			20134
	6		1034
Mon. 19 Tues. 20 22h & Greatest Hel. Lat. N.	10	40	34012 34120
Wed. 21 \forall Greatest Her. Lat. N.	1		3412O 432OI
CThur. 22 17h 3m·9 Moon's Last Quarter; 22h 45m of \bigcirc C	, 3	20	43201
Fri. 23 15 ^h \bigcirc \textcircled{O} .		30	43102 214023
	•		42013
Sat. 24 Sun. 25 $18h \land 9 \ 91, 9 \ 2^{\circ} 7' \ N.$	0	20	41203
Mon. 26 Mon. 26		20	41203
Tues- 27	21	10	31420
Wed. 28 6h 36m \heartsuit $\&$ $(C, \& 2^{\circ} 50' S)$.	21	10	31420
Weth 28 on 30 \oplus ϕ (ζ, ϕ) 2 50 S. Thur. 29 oh 3m ϕ (ζ, ϕ) 0° 1' N.; 8h 11m 9 New Moon			31024
Total eclipse invisible in Canada, (see p. 32.	י 1		51024
Fri. 30	18	~	01234
Sat. 31	10	. 0	2C34●
Sat. 31	1.		2~34

Key to Symbols.— \bigcirc Conjunction; \bigcirc Opposition; \square Quadrature; \bigcirc Ascending Node; \circlearrowright Descending Node; m Sun; \clubsuit Mercury; \heartsuit Venus; \bigoplus Earth; \bigcirc Mars; \mathfrak{A} Jupiter; \biguplus Saturn; m Uranus; \oiint Neptune. For Jupiter's satellites the circle \bigcirc represents the disc of the planet; \mathfrak{A} signifies that the satellite is on the disc; m signifies that the satellite is behind the disc or in the shadow. Configurations are for an inverting telescope.

THE SKY FOR JUNE

	<u>ध</u>	Q	o	94	þ	ð	¥
	Mercury	Venus	Mars	Jupiter	Saturn	Uranus	Neptune
R. A. Decl. Transit	24° 50' N.	8h 42m 20° 27' N. 1512	4 ^h 51 ^m 22 ^o 52' N.	7 ⁱⁿ 24m 22° 19' N	9h 46m 14° 57' N. 16°14	22h 16m 11° 36' S	8h 39m 18° 22' N. 15°07

POSITION OF PLANETS ON THE 15TH.

The position is given for Greenwich Mean Noon. The time of transit is in Local Mean Time, hours numbering from midnight.

The Sun.—During the month the sun's R.A. changes from 4h 33m to 6h 33m and its Decl. rises slowly from 21° 57' N. to a maximum of 23° 27' on the 22nd, the summer solstice when our days are longest, then falls to 23° 14'. The equation of time reaches zero on the 15th and rises to 3m 15s by the 30th (see page 4). The increase in the equation of time, taken with the decreasing length of the day, causes the time of sunset, stated in mean time, to appear constant for several days at the end of June and the beginning of July.

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

Mercury is in conjunction with the sun on the 11th and too close for convenient observation during the month.

Venus is nearing its best position for observation as an evening star. Its stellar magnitude is -3.8 and still increasing. By the end of the month it appears in a telescope like our moon's first quarter.

Mars has become a morning star, but is too close to the sun as yet for convenient observation. It is 233 million miles from the earth on the 15th, or at its greatest distance at this conjunction, which takes place this month in place of last because of the relative positions of the elliptical orbits of Mars and the earth.

Jupiter is still in the constellation Gemini and is visible less than two hours in the evening. Its stellar magnitude is -1.4. By the 27th the sum is too close and the configurations of its satellites, and their eclipses are not given from this date on.

Saturn is visible for nearly $3\frac{1}{2}$ hours after sunset. It is approaching Regulus, but the sun will be quite near them by the time they are together. Its stellar magnitude is ± 0.8 .

The positions of *Uranus* and *Neptune* are given in the above table. See note for January.

('	75t1	JUNE ASTRONOMICAL PHENOMENA h Meridian Time, Hours Numbering from Midnight)	Min	Algol	Configuration of Jupiter's satel- lites at 20h 45m.
Sun. Mon. Tues.	1 2 3	$ \begin{array}{c} {}_{1h} \ {}_{16m} & \oslash \ \mathfrak{Q} \ \mathbb{C}, \ \mathfrak{Q} \ \mathfrak{z}^{\circ} \ 55' \ \mathrm{N}, ; & {}_{12h} \ \mathfrak{38m} \ \mathfrak{O} \ \mathfrak{Q} \ \mathbb{C}, \ \mathfrak{Q} \\ {}_{14h} \ \mathfrak{om} \ \mathfrak{O} \ \Psi \ \mathbb{C}, \ \Psi \ \mathfrak{4}^{\circ} \ 52' \ \mathrm{N}, & [6^{\circ} \ 32' \ \mathrm{N}, \\ {}_{20h} \ \mathfrak{17m} \ \mathfrak{O} \ \ \mathfrak{h} \ \mathbb{C}, \ \mathfrak{h} \ 7^{\circ} \ \mathfrak{2}' \ \mathrm{N}. \end{array} $	h 14	50	21034 210124 213104
Wed.) Thur. Fri	4 5 0	7h 21m·9 Moon's First Quarter; $20h \circ 27$, $2 \circ 21'S$. 5h 2 in \Re ; 23h \Im Stationary.	II	40	32014 31402 40132
Sat, Sun, Mon. Tues,	7 8 9	20h g in Perihelion.	8	30	42103 94203 40312 43102
Wed. Thur.	10 11 12 13	$9h \sigma' \notin \bigoplus$ Superior. 11h 28m 2 Full Moon.	5	20	43102 43201 4310● 40312
Sat. Sun. Mon.	14 15 16	$1 3h \circ \varphi \Psi, \varphi 2^{\circ} 19' N.$	2	10	21043 21043 912034 01324
Tues. Wed. Thur.	17 18	4h 39m ♂ ♂ ♂ (°, ♂ 6° 26' S.	19	0	31○24 32○14 31○4●
Fri. ©Sat. Sun.	20 21	[Lat. N. oh 32m·9 Moon's Last Quarter; 2h § Greatest Hel. 6h 54m (1) enters Cancer, Summer commences.	16		C124● 12O43 24O13
Mon Tues. Wed.	24 25		13	20	4○23● 431○2 432○1
Thur. Fri. Sat.	28	18h 14m \mathcal{O} \mathcal{O} $(\mathbb{C}, \mathcal{J} 2^{\circ} 7' \mathbb{N}, 2h \mathcal{O} \notin \mathcal{Q}, \mathcal{J} \notin \mathcal{O} $ 2h $\mathcal{O} \notin \mathcal{Q}, \mathcal{Q} \notin \mathcal{O} $ 21h 44m $\mathcal{O} + \mathcal{Q} (\mathbb{C}, \mathcal{Q} 4^{\circ} 20' \mathbb{N}, 20' \mathbb{N}, 2h \mathcal{O} \times O$	10	10	4312O Halisible
Sun. Mon.		$ \begin{array}{cccccccccccccccccccccccccccccccccccc$			Invi

Key to Symbols.— \mathcal{O} Conjunction; \mathcal{O} Opposition; \Box Quadrature; \bigcirc Ascending Node; \circlearrowright Descending Node; \bigoplus Sun; \Leftrightarrow Mercury; \heartsuit Venus; \oplus Earth; \mathcal{J} Mars; \mathfrak{A} Jupiter; \mathfrak{h} Saturn; \diamondsuit Uranus; \Downarrow Neptune. For Jupiter's satellites the circle \bigcirc represents the disc of the planet; \mathfrak{A} signifies that the satellite is on the disc; \odot signifies that the satellite is behind the disc or in the shadow. Configurations are for an inverting telescope.

THE SKY FOR JULY

,	<u>ڳ</u>	♀	්	94	þ	0	Ψ
	Meŗcury	Venus	Mars	Jupiter	Saturn	Uranus	Neptune
R. A.	9 ^h 23 ^m	9° 1′ N.	6h 20m	7h 52m	9h 57m	22h 14m	^{8h} 43 ^m
Decl.	15° 10' N.		24° 1' N.	21° 16'N.	13° 57' N.	11° 48' S.	18° 7' N.
Transit	13 54		10'51	12°23	14°27	2°45	13.07

FOSITION OF PLANETS ON THE 15TH.

The position is given for Greenwich Mean Noon. The time of transit is in Local Mean Time, hours numbering from midnight.

The Sun.—During the month the sun moves in R.A. from 6h 37m to 8h 38m and in Decl. from 23° 10' to 18° 28' N. The earth is 94,450,000 miles, or at its greatest distance from the sun, on July 3rd. The equation of time is given on page 4.

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

On July 24 at 4 29 a.m. the moon occults ζ Tauri (see p. 3).

Mercury has a maximum elongation on the 18th of $26^{\circ} 47'$ E. It is then an evening star about 11° high and about 22° S. of the sunset point. Field glasses should be used to locate it, but it may be easily seen for some days before and after this date if the horizon is clear. Its stellar magnitude is +0.7. This is not as good a time of the year to observe an eastern elongation as in February, Mar., or Apr.

Venus on the 5th is at greatest elongation E. 45° 28', but is not quite so high in the sky at sunset this month, due to the inclination of the ecliptic at this point. It is 65 million miles from the earth on that day. It is moving towards us very rapidly and is only 57 million miles distant by the 15th. Its stellar magnitude is -4.0 and increasing.

Mars is scarcely yet high enough at sunrise for convenient observation. On the 15th it is 232 million miles from the earth.

Jupiter is in conjunction with the sun on the 20th and is invisible during the month.

Saturn is visible $1\frac{1}{2}$ hours after sunset on the 15th. It is less than a degree north of Regulus on the 31st, but the sun has also nearly caught up. Its stellar magnitude is ± 0.9 and it is not at all conspicuous.

The positions of *Uranus* and *Neptune* are given in the above table. See note for January.

ASTRONOMIC	JULY CAL PHENOMENA Durs Numbering from Midnight)		Algol	Configuration of Jupiter's satel- lites
Tues. i $7h 25m \circ \varphi \mathbb{C}$, Wed. 2 $16h \circ \varphi \mathbb{D}$, $\varphi \circ Q$ Thur. 3 $5h \oplus$ in Aphelion.	♀ 6° 53′ N.; 9 ^h 35 ^m ♂ ♭ ℃, ♭ 6° ° 10′ S. [58′ N.	h 7	m O	
	First Quarter. ng. E. 45° 28'.	3	50	н
Mon. 7 Tues. 8		0	40	·
Wed. 9 Thur. 10 Fri. 11		21	30	to su
Sat. 12 (*)Sun. 13 1h 2m 2 Full Moo Mon. 14 13h & in 89.	n.	18	20	oximity
Tues. 15 23h \bigcirc in \bigcirc . Wed. 16 9h 7m \bigcirc \bigcirc \bigcirc , \bigcirc	6° 18' S.	15	0	of pr
Fri. 18 12h & Greatest el Sat. 19	ong. E. 26° 47′. ast Quarter; 21h ♂ ቧ 卿.	II	50	cceunt
Mon. 21 Tues. 22	asi Quarter; 21" () 24 @.	8	40	invisible on acceunt of proximity to sun
Wed. 23 Thur. 24 19h § in Aphelio Fri. 25 12h 2 ^m ♂ ♂ ℂ, Sat. 26 18h 13 ^m ♂ ♀ ℂ,	3' 4 0' N.	5	30	Invisibl
@Sun. 27 oh 21m.4 New Mo	on; 12h 24m $\mathcal{O} \ \Psi \ \mathbb{C}, \ \Psi \ 49' \ N.$	2	20	
$\begin{array}{c ccccccccccccccccccccccccccccccccccc$	\mathcal{P} 3° 7′ N.	23	10	

Key to Symbols. — \mathcal{O} Conjunction; \mathcal{O} Opposition; \square Quadrature; \mathcal{O} Ascending Node; \mathcal{O} Descending Node; \bigoplus Sun; \mathfrak{F} Mercury; \mathcal{O} Venus; \oplus Earth; \mathcal{O} Mars; \mathfrak{A} Jupiter; \mathfrak{H} Saturn; \mathfrak{F} Uranus; Ψ Neptune. For Jupiter's satellites the circle \bigcirc represents the disc of the planet; \mathfrak{A} signifies that the satellite is on the disc; \bullet signifies that the satellite is behind the disc or in the shadow. Configurations are for an inverting telescope.

THE SKY FOR AUGUST

धू	Q	o	94	þ	ô	¥
Mercury	Venus	Mars	Jupit er	Saturn	Uranus	Neptun e
9° 54' N.	2° 50' S.	7h 48m 22° 3' N. 10°17	19° 53' N.	12° 39' N.	12° 12' S.	

POSITION OF PLANETS ON THE 15TH.

The position is given for Greenwich Mean Noon. The time of transit is in Local Mean Time, hours numbering from midnight.

The Sun.—During the month the sun's R.A. increases from 8h 42m to 10h 35m, and its Decl. changes from 18° 14' to 8° 56' N. The equation of time falls from 6m 13s to 0m 32s (see page 4).

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

Mercury on the 15th is in inferior conjunction with the sun and is too close for convenient observation till the last week of the month, when it is becoming nearly its best as a morning star. It then rises about 7° south of the sunrise point and is fairly high before the sun "extinguishes" it.

Venus is at greatestb rilliancy on the 7th, its stellar magnitude being -4.2. This is the time to pick it up during the daytime. It is better to try locating it earlier and earlier each evening till some day it can be picked up in broad sunlight, especially with the aid of field glasses at first. It appears in a small telescope like our new moon, whose crescent is rapidly narrowing, at the same time that its apparent diameter is increasing. On the 7th it is 41 million miles from the earth, on the 15th 36 million, and on the 31st, when it is nearest, only 28,600,000 miles distant. On the 20th it starts to retrograde.

Mars on the 15th is 226 million miles from the earth, and is about 20° above the horizon at sunrise. It is almost on a line with Castor and Pollux, southward, but moving rapidly eastward from Gemini.

Jupiter is now in Cancer and rises less than 2 hours before the sun. The configurations of its satellites are given on the next page, their eclipses, etc., on page 30.

Saturn is in conjunction with the sun on the 25th and invisible all month.

The positions of *Uranus* and *Neptune* are given in the above table. See note for January.

AUGUST ASTRONOMICAL PHENOMENA (75th Meridian Time, Hours Numbering from Midnight)	Minima of	Algol	Configuration of Jupiter's satel- lites at 4h 30m.
Fri. t	h 20	m O	Ì
Sat. $25b \checkmark \Psi$ (1).		Ĩ	f
Sun, 3 15h 11m 5 Moon's First Quarter.			
Mon. 4	16	50	nn
Tues. 5 Wed. 6			22.0
Thur. 7 20h Q Greatest Brilliancy.	13	40	k a
Fri. 8	1.3	40	l Bit
Sat. 9			Invisible on account of proximity to sun.
Sun. 10	10	20	sib
@Mon. II 12h 39m'5 Full Moon.	1.1		ivi
Tues. 12 14h 8m \circ \odot $(C, \odot 6^{\circ} 12' S. Wed. 13]$			
Thur. 14 4h & Greatest Hel. Lat. S.	7	. 10	43200
Fri. $15 8h \sigma g \oplus Inferior.$	1.1		43210
Sat. $ 10 $	4		43012
Sun. 17			4 1○2●
CMon. 18 10h 56m 1 Moon's Last Quarter.	· · · .		42013
Tues. 19 7h Q in Aphelion.	0		41203
Wed. 20 10h Q Stationary. Thur. 21	21		40132 243104
Fri. 22	21		243104
Sat. 23 5^{h} 15m $\bigcirc \bigcirc \bigcirc \bigcirc \bigcirc \bigcirc \bigcirc \odot $, o J .	11	30124
Sun. 24 9h 28m of § C, § 2° 29' N.; 12h § Stationary.	18	30	13024
(Mon 25 10h 37m 1 New Moon; $15h 38m \circ f_{0}$ C, $f_{0} 6^{\circ} 51' N$ [$19h \circ f_{0}$].	.;		20134
Tues. 26			12034
Wed. $277h 34m \circ \varphi \subset , \varphi 2^{\circ} 47' S.$	15	20	C1234
Thur. 28			13024
Fri. 29 Sat. 30	1.2		32401
	12		34∪2● 431O2
Sun. 31			+J -

Key to Symbols. $- \circ$ Conjunction: \circ Opposition; \Box Quadrature; \circ Ascending Node; \circ Descending Node; \bigoplus Sun; \circ Mercury; \circ Venus; \oplus Earth; \circ Mars; 2 Jupiter; β Saturn; \circ Uranus; Ψ Neptune. For Jupiter's satellites the circle \circ represents the disc of the planet; 2 signifies that the satellite is on the disc; \bullet signifies that the satellite is behind the disc or in the shadow. Configurations are for an inverting telescope.

THE SKY FOR SEPTEMBER

POSITION OF PLANETS ON THE 15TH.

	<u>धू</u>	♀	o	94	þ	ð	Ψ
	Mercury	Venus	Mars	Jupiter	Saturn	Uranus	Neptune
Decl.	9° 1'N.	3° 9′ S.	17° 32' N.	18° 22' N	10h 27m 11° 17' N. 10.53	12° 37' S	^{8h} 52 ^m 17° 33' N. 9°18

The position is given for Greenwich Mean Noon. The time of transit is in Local Mean Time, hours numbering from midnight.

The Sun.—The sun's R.A. increases during the month from 10h 39m to 12h 23m, and moves southward in Decl. from 8° 35' N. to 2° 30' S., crossing the equator on the 24th, the autumn equinox. The equation of time is given on page 5.

The Moon.—Its phases and conjunctions with the planets are given on the opposite page.

On September 20 at 6.14 a.m. the moon occults a Cancri (see p. 3).

Mercury is at greatest elongation, 18° 8' W., on the 1st, and although this is not a large elongation it is worth most, so to speak in apparent altitude at this time of the year in the morning, since it is 16° high and only 7° south of the sunrise point. There should be little difficulty in locating it if the horizon is clear at this point. Its stellar magnitude is 0.0. It has a very close conjunction with Saturn on the 11th, being only 7' north. On the 27th it is again in conjunction with the sun.

Venus is in inferior conjunction with the sun on the 12th, this being the exact date on which it changes from an evening to a morning star, although being too near the sun for a couple of weeks before and after this date for convenient observation. However, its stellar magnitude is -3.3, which is a great aid in locating it even in the dawn or the twilight.

Mars on the 15th is 215 million miles from the earth. It is approaching Regulus in the sky and rises about $3\frac{1}{2}$ hours before sunrise. On the 2nd it is in close conjunction with Jupiter, being only 41' N.

Jupiter is now a prominent morning star, being visible for nearly 4 hours before sunrise. Its stellar magnitude is -1.4. The configurations of satellites are given on the next page, their eclipses, etc., on page 30.

Saturn by the 30th is up above the horizon nearly 30° when the sun rises. It is very nearly vertically above the rising sun.

The positions of *Uranus* and *Neptune* are given in the above table. See note for January.

SEPTEMBER ASTRONOMICAL PHENOMENA (75th Meridian Time, Hours Numbering from Midnight)	Minima of	Algol	Configuration of Jupiter's Satel- lites at 4h om
	1		
Mon. 1 15h & Greatest elong. W. 18°, 8'.	Į h	m	42013
Tues. $2 4h \notin in \otimes; 4h \subset d' 2h, d' o' 41' N; 9h 21m.$			42103
Wed. 3 [Moon's First Quarter	99	· · ·	40123
Thur. 4			41032
Fri. 5	5	40	43201
Sat. 6 19h & in Perihelion.	3	40	31400
Sun. 7 19h $\sigma' \sigma' \Psi, \sigma' 1^\circ 12' N.$			213042
Mon. 8 20h 57m \bigcirc \textcircled{O} \textcircled{C} , \textcircled{O} 6° 12' S.	2	20	20134
\mathfrak{F} Tues. 9 22h 54m ² 3 Full Moon.	1.	3.0	21034
Wed. 10 20h Q Greatest Hel. Lat. S.	23	20	C1234
Thur. II $3h \sigma' \not\in b, \not\in o^{\circ} \not\in N$.	-5		10324
Fri. 12 22h of Q Inferior.			32014
Sat. 13	20	10	31204
Sun. 14			30142
Mon. 15			42013
CTues. 16 4h g 登 오, 登 11° :7' N.; 16h 31m 7 Moon's Las	t 17	o	42103
Wed. 17 2h & Greatest Hel. Lat .N. [Quarter			40213
Thur. 18			41032
Fri. 19	13	50	423Ŏ1
Sat. 20 5h 58m of 94 C, 94 5° 33' N.; 6h 45m of \$\$\$\$ C, \$\$\$\$ 58m of 94 C, \$\$\$\$\$\$\$\$\$ 21h 33m of \$	9		43120
Sun. 21			43012
Mon. 22 5h 23m \mathcal{O} h \mathbb{C} , h 6° 55' N; 14h 29m \mathcal{O} \mathcal{Q} \mathbb{C} , s [3° 18' S.; 23h \mathcal{O} \mathfrak{Y} \mathfrak{Y} , \mathfrak{Y} 0° 32' N.		40	24 ○●
●Tues. 23 21h 36m			2103●
Wed. 24			02143
Thur. 25	.7	30	10324
Fri. 26			23014
Sat. 27 3h 🗸 😫 🌐 Superior.			32104
Sun. 28	4	20	30124
Mon. 29	1		1024
Tues. 30			942°34

Key to Symbols.— & Conjunction; & Opposition; Quadrature; & Ascending Node; & Descending Node; Sun; & Mercury; & Venus; & Earth; Mars; Q Jupiter; & Saturn; & Uranus; W Neptune. For Jupiter's satellites the circle O represents the disc of the planet; Q 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 SKY FOR OCTOBER

POSITION OF PLANETS ON THE 15TH.

धू	Q	o ⁷	94	þ	∂	Ψ
Mercury	Venus	Mars	Jupiter	Saturn	Uranus	Neptune
14 ^h 4 ^m 13° 11 S. 12°32					22h 2m 12° 54' S. 20°29	

The position is given for Greenwich Mean Noon. The time of transit is in Local Mean Time, hours numbering from midnight.

The Sun.—The sun's R.A. increases during October from 12h 27m to 14h 19m, and its Decl. changes from 2° 53' to 13° 52' S. The equation of time rises from 10m 1s to 16m 15s, to be subtracted from apparent time. For fuller details see page 5.

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

On October 1 at 2 18 p.m. the moon occults μ Sagittarii (see p. 3).

Mercury during the month is not well placed for observation. It is very low in the evening sky, and although it improves slightly towards the end of the month it will be very difficult to locate during this elongation. On the morning of the 25th it is in conjunction with the moon, being 1° 3' to the south and very low in the sky. If any aid would locate it, that fact would on the evening of the 24th.

Venus ceases to retrograde on the 2nd. It improves in position for observation and becomes a very prominent morning star, reaching its greatest brilliancy on the 20th, when its stellar magnitude is -4.3, or slightly greater than that in August, being only 40 million miles distant. At this time it is interesting to watch it more or less continuously at intervals after daybreak to see how late in the day it can still be picked up. The crescent is like our moon a few days before new, and is widening.

Mars on the 15th is 199 million miles from the earth and rises about 4 hours before the sun. It is slightly less than 1° north of Regulus on the 7th, and has a very close conjunction with Saturn on the 24th, when it is only 5' to the south. Its stellar magnitude is +1.8 and increasing slowly.

Jupiter rises $\frac{1}{2}$ hour after midnight (apparent time) and shines brightly the rest of the night. Its stellar magnitude is -1.6. The configurations of its satellites are given on the next page and their eclipses, etc., on page 31.

Saturn by the 15th is about 45° high in the sky when the sun rises, very suitably situated for observation for nearly 4 hours before sunrise.

The positions of Uranus and Neptune are given in the above table.

OCTOBER ASTRONOMICAL PHENOMENA (75th Meridian Time, Hours Numbering from Midnight)	Minima of	Algol	Configuration of Jupiter's satel- lites at 3h 45m.
Wed. 1 C Thur. 2 Fri. 3 Sat. 4	h 1 21		02143 41023 42301 43210
Sun. 5 Mon. 6 $5^{h} 27^{m} \circ \ \textcircled{C}, \ \textcircled{C} 6^{\circ} 19' S.$ Tues 7 Wed. 8	18	Ċ	43012 43102 42013 40300
Fri. 10 13h 8 in 80 Sat. 11 Sun. 12 Sat. 12 Sun. 12	15	•	41023 942041 32104 30124
Mon. 13 Tues. 14 Wed. 15	9		31024 20134 2034●
Fri. 17 13h 24m \mathcal{O} Ψ C, Ψ 5° 15' N.; 19h 54m \mathcal{O} Ψ C, Ω Sat. 18 Sun to 12h 38m \mathcal{O} C, \mathcal{O} 7°0' N.; 17h 14m \mathcal{O} b C, b 7° 3' N	6	0	10234 20314 32104 34021
Mon. 20 Ih φ Greatest Brilliancy; 4h 4m γ φ (C, φ 2° 27' N. 19h φ in Aphelion. Tue: 21 Wed, 22	2	50	431O2 42O31 421C3
Thur, 23 15h 39 ^m 5 New Moon. Fri. 24 7h $\bigcirc \bigcirc ^{A}$ b, $\bigcirc \bigcirc \circ \circ \circ 5'$ S. Sat. 25 5h 11 ^m $\bigcirc & \& \mathbb{C}, & \& 1^{\circ} & 3'$ S. Sun. 26	23 20		94023 944013 42310 34021
Mon. 27 Tues. 28 Wed. 29	17	10	31042 2014 9 21034
DFri. 30 31 20h 43m 2 Moon's First Quarter.			O1234 O234●

Key to Symbols.— \checkmark Conjunction; \bigcirc Opposition; \square Quadrature; \bigcirc Ascending Node; \circlearrowright Descending Node; \bigoplus Sun; \oiint Mercury; \heartsuit Venus; \bigoplus Earth; \Huge{J} Mars; \image Jupiter; \Huge{h} Saturn; \circlearrowright Uranus; \oiint Neptune. For Jupiter's satellites the circle \bigcirc represents the disc of the planet; \image signifies that the satellite is on the disc; \bigcirc signifies that the satellite is behind the disc or in the shadow. Configurations are for an inverting telescope.

THE SKY FOR NOVEMBER

	월	Ç	්	24	þ	⊕	Ψ
	Mercury	Venus	Mars	Jupiter	Saturn	Uranus	Neptune
Decl.	25° 9 S.	1° 18' S.	4° 50' N.	16° 11' N	9º 10' N.	22h 1 ^m 12° 57' S. 18°25	17° 17' N.

POSITION OF PLANETS ON THE 15TH.

The position is given for Greenwich Mean Noon. The time of transit is in Local Mean Time, hours numbering from midnight.

The Sun.—The sun's R.A. during the month increases from 14h 23m to 16h 22m, and its Decl. changes from 14° 11' to 21° 32' S. The equation of time rises to a maximum, 16m 21s on the 4th, the true sun crossing the meridian this much earlier than the mean sun (see page 5). On the 22nd there is an annular eclipse of the sun, visible in southern central United States, Cuba, middle Atlantic, and western north Africa, and as a partial eclipse in all except the western part of Canada. See page 32.

The Moon.—For its phases and conjunctions with the planets see opposite page. On the 7th there is a partial eclipse of the moon partly visible in Canada except in the extreme west. See page 32.

On November 27 at 7.41 p.m. the moon occults & Capricorni (see p. 3).

On November 28 at 7 00 p.m. the moon occults v Aquarii (see p. 3).

Mercury is at greatest elongation E. 22° 48' on the 12th, but is quite unsuitably placed for observation, being 20° S. of the setting sun and only 8° high. However, if field glasses are used over a clear horizon it should be possible to locate it. Toward the end of the month it again approaches the sun.

Venus is in conjunction with the moon on the 18th, but is 5° 26' N. On the 23rd it is at greatest elongation W., being 63 million miles from us, and appears through a small telescope like our moon about at last quarter. Its stellar magnitude is -4.1, a very prominent morning star.

Mars on the 15th is 177 million miles from us and is about an hour east of the meridian at sunrise. Its stellar magnitude is +1.7.

Jupiter on the 15th rises an hour before midnight and is very bright the rest of the night. It is entering the constellation Leo, heading towards Regulus. Its stellar magnitude is -1.8. The configurations of its satellites are given on the next page, their eclipses, etc., on page 31.

Saturn has nearly reached the meridian when the sun rises on the 15th. It is in the constellation Leo yet, but approaching Virgo. Its stellar magnitude is +1.1.

The positions of *Uranus* and *Neptune* are given in the above table. See note for January.

The minima of Algol are given on the opposite page.

(7	Minima of	Algol	Configuration of Jupiter's satel- lites at 3h 15m.	
Sat.	1	h 14	m O	231C4
Sun.	$\begin{array}{c} 2 \\ \mathbf{14^{h}} \\ \mathbf{21m} \\ 0' \\ \mathbf{\hat{\odot}} \\ \mathbf{\hat{C}}, \\ \mathbf{\hat{\odot}} \\ \mathbf{6^{o}} \\ \mathbf{25'} \\ \mathbf{S}. \end{array}$			30140
Mon.	3			31024
Tues.	4 19 ^h □ Ψ	10	50	<u>9</u> 2301
Wed.	5		-	42103
Thur.	$6_{3h} \varphi \text{ in } \Omega.$			40123
Tri.	7 18h 35m 2 Full Moon; C Partial eclipse visible in	7	40	4O23 O
Sat.	8 2h 🕤 Stationary. [Canada, (see p. 32).			24230
Sun.	9			4301
Mon.	10 3h & Greatest Hel. Lat. S.; 10h 🗌 21 🛞.	4		43102
				42C1
	12 7h & Greatest Hel. Lat. N.; 16h & Greatest elong. E.			2103
	¹³ 20h Im \mathcal{O} Ψ \mathbb{C} , Ψ 5° 22' N. [22° 48'.	I	20	01243
CFri.	14 7h 17m of 24 (C, 24 6° 11' N.; 10h 40m.5 Moon's			10234
Sat.	[Last Quarter; 19th \$\Psi Stationary.		- 0	
	¹⁶ 3h 17m or h C, h 7° 11' N.	22	10	23014 32014
	$\frac{17}{2h} \frac{19m}{19m} \circ \circ$	1.1		31024
Tues.	18 8h $_{28m}$ $^{\circ}$ $^{\circ}$ $^{\circ}$ $^{\circ}$ $^{\circ}$ $^{\circ}$ $^{\circ}$ $^{\circ}$ 26' N.	tg	0	<u>31024</u> <u>91</u> 3014
	19	19	Ŭ	21034
	20	1.1		02143
	21 oh □ ô .	15	50	14023
	22 10h 19m.7 New Moon; (Annular eclipse visible as		J.	24201
	[partial in Canada (see p. 32).			-+
Sun.	23 17h Q Greatest elong. W. 46° 44'; '19h & Stationary;			432℃●
	$[23h 34m 0' \& C, \& 3^{\circ} 33' S.$	12	30	43102
	25		5-	24301
	26			4210;
	27	9	20	40213
	28	Í		41023
Sat.	29 3h & in Ω ; 22h 26m σ $\stackrel{\circ}{\odot}$ \mathbb{C} , $\stackrel{\circ}{\odot}$ 6° 25' S.			24031
	30 11h 46m 9 Moon's First Quarter.	6	10	32C4
-				[
}				t i

Key to Symbols. $- \circ$ Conjunction; \circ Opposition; \Box Quadrature; \circ Ascending Node; \circ Descending Node; m Sun; \Leftrightarrow Mercury; \diamond Venus; \oplus Earth; \circ Mars; \mathfrak{A} Jupiter; \mathfrak{h} Saturn; \diamond Uranus; \Downarrow Neptune. For Jupiter's satellites the circle O represents the disc of the planet; \mathfrak{A} signifies that the satellite is on the disc; \bullet signifies that the satellite is behind the disc or in the shadow. Configurations are for an inverting telescope.

THE SKY FOR DECEMBER

	段 Mercury		5.	þ Saturn		
Decl.	16h 4m 17° 58' S. 10 31	12h 33m 1° 32' S. 7.00	16° 9' N.	10h 55m 8° 48' N. 5°23	12° 44' S.	8h 55m 17 ³ 22' N: 15 ² 23

FOSITION OF PLANETS ON THE 15TH.

The position is given for Greenwich Mean Noon. The time of transit is in Local Mean Time, hours numbering from midnight.

The Sun.—During December the sun's R.A. increases from 16h 26m to 18h 38m. Its southward Decl. changes slowly from 21° 41' till it reaches a maximum of 23° 27' on the 22nd, the winter solstice. By the 31st the sun has climbed back to 23° 9' S. The equation of time is given on page 5.

The Moon.—Its phases and conjunctions with the planets are given on the opposite page.

Mercury becomes a morning star after the 2nd, when it is in conjunction with the sun. Its greatest elongation is on the 21st, when it is 21° 47' W, and is rather well placed for observation. It is about 15° high and about 15° S. of where the sun rises. Its conjunction with the moon on the 20th, when it is about twice the moon's diameter to the north, should make. locating it exceedingly easy on that morning. Its stellar magnitude is 0.0.

Venus is getting rather far south, although still quite a fine morning star. It is in conjunction with the moon on the 18th. Stellar magnitude -3.8, about 2/3 of the disc as we see it is illuminated.

Mars crosses the meridian about 20m before sunrise on the 15th and is well situated for observation the latter half of the night. Its stellar magnitude is ± 1.4 and it is 152 million miles from us on the 15th.

Jupiter rises about 4 hours after sunset and is visible the remainder of the night. It started to retrograde on the 5th and will not approach nearer to Regulus for the present. Its stellar magnitude is -2.0 and increasing. The configurations of its satellites are given on the next page, their eclipses, etc., on page 31.

Saturn is visible from about 10.30, apparent time, on for the rest of the night. Its stellar magnitude is +1.0, or about 3 times as bright as Deneb, which is 12° to the northeast of it.

The positions of *Uranus* and *Neptune* are given in the above table. See note for January.

(1	Minima of	Algol	Configuration of Jupiter's Satel- lites at 2h 30m	
1		h	n.	
Mon.	I			Q13024
Tues.	2 18h of § D Inferior.			30124
Wed.	3 18h & in Perihelion.	3		21034
Thur.	4 Sh _ h .			0134
Fri.		23		10234
Sat.	0			20314
@Sun.	7 5h 3m 5 Full Moon.	• •		32104
Mon.	0	20		34012 4302●
Tues.	9 19h Q in Perihelion.			4302 0 4210 0
Wed.	10 1 m (ttt @ ttt = 9 2 N - + 6 arm (01 @ 01 69			4210 • 4013 •
Thur.	11 4h 5m \mathcal{C} Ψ \mathbb{C} , Ψ 5° 19' N.; 16h 29m \mathcal{C} 24 \mathbb{C} , 24 6° 11 6' N.	17		41023
Fri.				41023
Sat.	13 12h 15m of h C, h 7° 13' N.			42310
CSun.	14 1h $_{2m}$ 4 Moon's Last Quarter; 1h $\frac{8}{2}$ Greatest Hel. 14 1h $_{2m}$ 4 $_{2m}$ $(C, C, S', S', N, Lat. N.)$	14		34012
Mon.				3042●
Tues.	16	11		21○42●
Wed.	1/		10	20134
Thur.	18 Ih \mathcal{J} in Aphelion; $4^{h} 27^{m} \mathcal{J} \oplus \mathbb{C}$, $\mathcal{Q} = 4^{\circ} \circ' \mathbb{N}$.			10234
Fri.	19 (harmar 8 (2) 8 18 16' N	8	0	20134
Sat.	20 6h.29m of & C, & 1° 16' N. 21 10h & Greatest elong. W. 21° 47'.	0		213C4
Sun.	22 5h 55m 2 New Moon; 16h 27m (1) enters Capricornus,			30124
Mon.	[Winter commences.			54
Tues.		4	10	31024
Wed.		т		212304
				42013
Thur. Fri.	25	I		41023
Sat.	$\begin{array}{cccccccccccccccccccccccccccccccccccc$	-	J-	914013
Sat. Sun.	$\frac{27}{5}$ $\frac{51}{45}$ $\frac{45}{10}$ $\frac{10}{10}$ $\frac{10}$	22	20	42130
Mon.	20			43021
DTues.	30 oh 25m o Moon's First Quarter.			43102
	30 bit 25 if 0 involus 1 list Qualter. $31 \text{ [15h } \widehat{\varphi} \text{ Greatest Hel. Lat. N.}$	19	10	42301
weu.	2. 1.3 + . orgatobt tron. and	1		
				1

Key to Symbols. $-\sigma$ Conjunction; σ Opposition; \Box Quadrature; Ω Ascending Node; \Im Descending Node; m Sun; \natural Mercury; Υ Venus; \oplus Earth; σ Mars; \Im Jupiter; h Saturn; \Im Uranus; \Downarrow Neptune. For Jupiter's satellites the circle \bigcirc represents the disc of the planet; \Im signifies that the satellite is behind the disc or in the shadow. Configurations are for an inverting telescope.

PHENOMENA OF JUPITER'S SATELLITES

$$\begin{split} & E = eclipse, \ O = occultation, \ T = transit, \ S = shadow, \ D = disappearance, \ R = re-appearance, \\ & I = ingress, \ e = egress. \ The numbers in the fifth column denote the satellites. \\ & Eastern \ Standard \ Time, \ Hours \ numbering \ from \ Midnight. \end{split}$$

	- N		JANUARY			FE	BRU	ARY(Continue	(d)	
d	hm	**	dhm			d hm ·		dhm		
2	$15 \\ 15$	II II	TI 17 17 49 SI 19 23	III III	SI Te	$\begin{smallmatrix}6&18&25\\8&2&22\end{smallmatrix}$	I III	Sel19 2 53.7	III	ER
	3 47	II	Te 21 1	iff	Se	10 1 42	II	TI 3 32.9 TI 21 41	II	ER OD
	3 48	<u>II</u>	Se 18 0 26	II	OD	3 30	п	SI 20 1 0.5	I I	\mathbf{ER}
	6 37 6 38	I	TI 3 55.3 SI 4 31	II I	ER TI	$ 11 1 25 \\ 19 5 $	I III	OD 18 57 OR 19 28	I II	TI SI
3	3 45	I	OD 4 55	T	SI	19 35.6	ш	OR 19 28 ED 19 59	Î	SI
	62.9 1959	I II	$\begin{array}{cccc} \mathbf{ER} & 19 & 1 & 39 \\ \mathbf{OD} & 4 & 21.5 \end{array}$	Î	OD	20 27	11	OD 20 1	'II	Te
	22 45.7	ÎÌ	OD 4 21.5 ER 18 43	II I	ER	22 42 22 52.6	III	TI 21 11 ER 22 12	I II	Te Se
4	1 3	Ī	TI 19 38	II	TI SI	23 36	Ι	SI 22 14	T	Se
	·1 6 3 18	I I	SI 21 26 Te 22 21	II	Te		I	Te 21 19 29.5	Ĩ	ER
	3 21	I	Sel 22 57	II I	Se TI	$\begin{smallmatrix}&0&57.8\\1&51\end{smallmatrix}$	I	ER 24 21 22 Se 23 44	IV IV	TI Te
-	22 11	Ĩ	OD 23 24	Т	SI	19 52	I	OD 25 23 5	III	OD
5	0 31.6 19 29	I I	ER 20 1 11 TI 1 38	Ī I	Te	$\begin{array}{cccc} 23 & 5.0 \\ 13 & 19 & 23 \end{array}$	I	ER 26 1 13 Tel 2 16	II III	OD OR
	19 35	I	SI 20 6	I	OD	19 23	1I	Te 2 16 Se 2 19	Î	TI
	$ \begin{array}{cccc} 21 & 44 \\ 21 & 50 \end{array} $	I	Tel 22 50.3	I.	ER	20 19	I	Sei 23 31	I	OD
6	0 37	iv	Se 21 5 39 TI 17 52	III I	OD SI	16 22 11.0 17 0 57.8	ÎV IV	ED 27 2 56.1 ER 19 47	I II	ER TI
	1 34	IV	SI 19 38	I	SI Te	18 3 13	I	OD 20 47	I	ŤÎ
	2 49 3 49	IV IV	Tej 20 7 Sej22 19 32	I	Se SI	$\begin{array}{ccc} 19 & 27 \\ 22 & 38 \end{array}$	щ	OD 21 54	I	SI
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-	23 6	III	OD 24 19 33	III	TI TI	23 35.8	III	ED 23 1	I	Те
.7	2 48.6 3 20	III II	ER 21 48 TI 22 42	III III		$\begin{array}{rrrr}19&0&30\\&1&31\end{array}$	I	TI 28 0 9 SI 0 50	I II	Se
·	3 42	11	SI 25 1 2	III	Te Se OD	2 44	Î	Te 21 25.1	I .	Se ER
	62 625	II II	Te 2 41 Se 26 3 25	II I	OD OD			MARCH		
10	5 29	I	OD 21 1	İI	TI	1 18 37	I	Se 16 0 36.3	II	ER
11	22 12 1 20.5	II	OD 22 15	II	SI	19 25.7	II	ER 146	III	SI
11	2 47	II I	ER 23 43 T1 27 0 42	II I	Te TI	$\begin{array}{ccc} 21 & 3 \\ 5 & 19.12.3 \end{array}$	iii IV	Se 19 45.2 ER 17 19 25	I II	ER SE
	3 1	I	SI 0 58	II	SE	6 1 22	Ι	OD 19 18 57.1	III	ER
	51 516	I	Te 1 18 Se 2 56	I	SI Te	$\begin{array}{ccc} 22 & 17 \\ 22 & 38 \end{array}$	II.	TI 21 22 9 TI 23 37	IV I	OD
	23 55	I ·	OD 3 33	I I	Se	23 49	I	TI 23 37 SI 22 0 42	iv	OD OR
12		I	ER 21 51	Ĩ	OD ER	7 0 44	п	SI 20 52	I	TI
	19 9 19 43	II II	Te 28 0 45.5 Se 19 8	I	TI	052	I	TE 21 56 Te 22 8	II I	OD SI
	21 13	Ι	TI 19 47	I	SI	2 3	I	Sel 23 6	I	Te
	21 29 23 27	I I	SI 19 47.7 Tei 21 23	П 1	ER Te	19 50 23 20.7	I	OD 23 0 22	I	Se
	23 44	I	Se 22 1	î	Se	8 19 20	Î	ER 0 37 Te 21 40.9	III I	TI ER
13	18 21	Ī	OD 29 19 14.2	I	ER	20 3	III	Te 24 19 19	Π	SI
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ECLIPSES IN 1919

PREPARED BY R. M. MOTHERWELL

There will be three eclipses, two of the sun and one of the moon.

1. A Total Eclipse of the Sun on May 29, 1919, invisible in North America. The path of totality begins just west of Chili, crosses Brazil and the Atlantic Ocean, enters Africa at the equator, and ends near Madagascar.

2. A Partial Eclipse of the Moon, Nov. 7, 1919, visible in a portion of Canada; the beginning visible generally in Asia except the eastern portion, Europe, Africa, the eastern part of North America, and South America, except the extreme western part; the ending visible generally in western Asia, Europe, Africa, South America, and North America except the extreme western part.

Circumstances of the	Eclipse :—
Moon enter penumbra	Nov. 7th 16h 33.6m (E.S.T., hours from midnight)
Moon enters umbra	" 7th 17h 58.3m
Middle of the eclipse	" 7th 18h 44.1m
Moon leaves umbra	" 7th 19h 29.9m
Moon leaves penumbra	" 7th 20h 55.0m
Magnitude of the eclipse	0.184 (Moon's diameter 1.0).

3. An Annular Eclipse of the Sun, Nov. 22, 1919, visible in a portion of Canada as a partial eclipse. The central path of eclipse begins in Texas, passes over Cuba, skirts the shores of Guiana, crosses the Atlantic Ocean, enters Africa in Senegal, and ends near Timbuktu. Hayana, Cuba, is near the centre of the line.

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ECLIPSES IN 1919

PREPARED BY R. M. MOTHERWELL

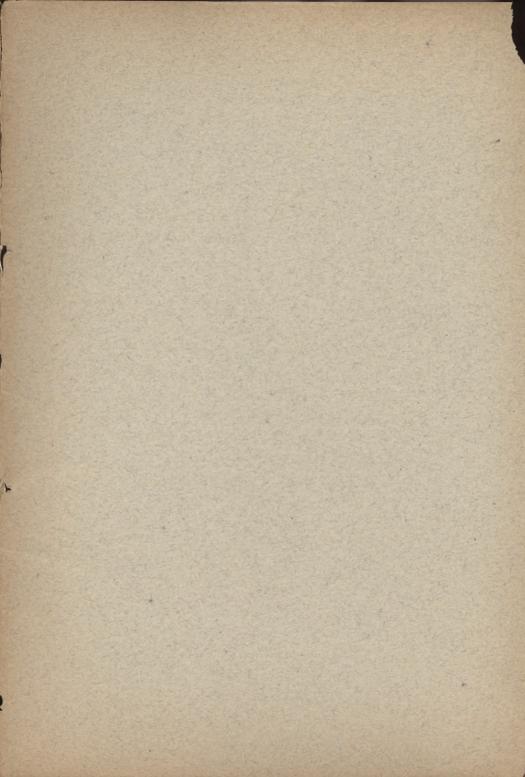
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