

The numbers in columns headed intervals in mean time, are the intervals of time which elapse between the culmination of the corresponding stars: hence if the time of culmination of any star be known, the time when any later star culminates will be found by adding all the intermediate intervals to the time of transit of the first star. If the time of

culmination of an earlier star be required, the sum of all the intermediate intervals must be *subtracted* from the time of the given transit.

*Example.*—Sirius passes the meridian at 10h. 4m. 15s.; Find the time of transit (1) of  $\alpha$  Canis Minoris and (2) of  $\alpha$  Orionis.

(1)	Transit of XXII.....	<i>h. m. s.</i>	10 4 15	(2)	Transit of XXII.....	<i>h. m. s.</i>	10 4 15
	Interval between XXII & XXIII		14 3		Interval between XXII & XXI		9 9
	XXIII XIV		32 45		XXI XX		15 4
	XXIV XXV		6 9		XX XIX		16 56
							41 9
	Transit of (XXV) $\alpha$ Canis Minoris		10 57 12		Transit of (XIX) $\alpha$ Orionis		9 23 6

In table III are given, for every evening of the year, the bright star from the table II which passes the meridian first after 7 p. m., together with time of passage.

If the time of transit of any other star be required, it may be found in the manner just explained.

If it be required to find what star first passes the meridian after any *other* hour later than 7 p. m., proceed as follows:

(1) Write down the time at which the first transit occurs after 7 p. m., and add to it the

interval between the transits of that star and the next; and to the sum add the second interval, and so on till a time is found next later than the proposed hour.

If the proposed hour be *earlier* than 7 p. m., the intervals must be subtracted.

The number of additions or subtractions will indicate the required star and the result of the additions or subtractions will be the time of its transit.

*Example.*—Req. to find what stars pass the meridian first after the following dates, 1872.

(1)	Aug. 12, 9 30 P. M.	(2)	Dec. 18, 6 20 P. M.	(3)	Dec. 4, 6 30 P. M.
	<i>h. m. s.</i>		<i>h. m. s.</i>		<i>h. m. s.</i>
	Interval LIII — LIV		Interval V — IV		Interval I — LXIX
	LIV — LV				
	LV — LVI				
	LVI — LVII				
	LVII — LVIII				
	7 9 20		7 25 48		7 5 12
	50 56		40 21		1 1 36
	1 23		6 45 27		6 3 36
	24 34		3 53		
	38 52		6 41 34		
	26 52				
	9 32 2				

Hence for (1) Req. Star is LVIII  $\zeta$  Aquilæ and its transit occurs at. *h. m. s.* 9 32 2  
 (2) ..... III  $\alpha$  Cassiopeæ..... 6 41 34  
 (3) ..... I  $\alpha$  Andromedæ..... 7 5 12

In the last case no star on the list culminates between 6h. 30m. and 7h.

TO FIND THE LATITUDE OF THE PLACE BY A MERIDIAN ALTITUDE OF THE SUN.

The mean time at which the sun crosses the meridian is given for every day in the year in the calendar, under the heading "Sun on the Meridian."

*Rule* (1) From table I take out the sun's declination and correct it for longitude in the manner already explained, and take out the semi-diameter of the sun from table VIII.

(2) Correct the observed altitude of the sun's limb for the index error of the instrument; (*a*) subtract the correction for refraction given in table IV, and, if great accuracy is attempted, add the correction for parallax from table VI. Add or subtract the sun's semi-diameter according as the altitude of the lower or upper limb is observed, and the result will be the true altitude of the sun's centre.

(1)	Sun's declination Gr. Noon	$^{\circ}$	'	"
	May 10.....	17	46	35 N
	diff. in 1 hour.....			38.85
	corr. for long.....		3	53 N
	Corrected Declin.....	17	50	28 N

Subtract the true altitude from 90° and thus obtain the true zenith distance.

(3) If the declination of the sun be subtracted from or added to the true zenith distance, according as the declination is N. or S., the sum or difference will be the latitude of the place.\*

*Examples* (1).—May 10, 1872, in long. 90° W. nearly, the observed meridian altitude of the sun's lower limb, measured from a lake horizon, was 60° 18' 30"; the index correction was + 3' 50" and the height of the eye 35 feet; required the latitude.

(2) Oct. 5, 1872 in long. 75° W. nearly, the observed meridian alt. of the sun's L.L. by sextant and artificial horizon was 40° 2' 0", and the index corr. was - 3' 0". Required the latitude.

(2)	Sun's declination Gr. Noon	$^{\circ}$	'	"
	Oct. 5.....	4	57	27 S
	diff. in 1 hour.....			57 75
	corr. for long.....		4	49 S
	Corrected Declin.....	5	2	16 S

(*a*) If the altitude of the sun or of any heavenly body be measured from the sea or lake horizon, a correction for *Dip* is required, which depends on the height of the eye above the level of the water. This correction which is always to be *subtracted*, should be applied immediately after that for index error. The values of the dip corrections for different heights of the eye are given in table V. When the altitude is measured with sextant and artificial horizon, or with a theodolite, the dip correction must not be applied.

\* These and some other rules in this article would need modification if they were required to be used in intertropical or southern latitudes.