OBSERVATIONS *made for determining the Geographical position of the Magnetic Observatory at Hobart Town, Van Diemen's Land.* *By* Commander KAY, R.N., F.R.S. &c. [*Read 8th December,* 1852.]

IN connection with the Trigonometrical Survey now in course of operation in this Island, I have considered that a correct knowledge of the geographical position of the Observatory might be interesting to this Society, from its being the only spot in the Colony where such a series of careful observations are likely to be carried on, (at least for some time to come), as are necessary to determine a geographical position with exactness.

I have, for a considerable period, been accumulating observations for this purpose,—as, partly from a want of instruments, but principally from the want of leisure, in many members of this Society, whose tastes would otherwise incline them to pursue investigations of this nature, it has appeared to me to be not unlikely that some years might yet elapse before it could be undertaken by some more competent person. One well-defined spot, like the Observatory, connected with the net work of triangulation, which embraces the whole area of the Island, and which, under the able field operations of Mr. Sprent, will soon be accomplished, will therefore serve as a starting point for determining the geographical position of any other spot in the Island with equal accuracy, and we shall then no longer have the disgrace upon us of having our principal head-lands (on the only chart of Tasmania which at present exists), laid down *miles in error* in latitude, to say nothing of their error in longitude.

I propose to lay before the Society the various methods of observation which have been pursued, and the results which have been obtained, and although the details must necessarily partake of a technical character, I trust the object in view will be deemed of general interest.

The method of determining the difference of longitude between any two given points on the earth's surface has always been considered to be one of the most difficult problems in practical astronomy, and has long engaged the attention of the most eminent astronomers and mathematicians. Where the distance between any two given points is not very great, their difference of meridian may be determined with considerable accuracy by means of chronometers conveyed from one place to another; and I have availed myself of the well-ascertained position of the Observatory at Paramatta, in New South Wales, by Sir Thomas Brisbane, for determining the longitude of the Hobart Town Observatory by this method.

The other modes of observation of celestial phænomena, to which recourse must be had for the solution of the problem, are—

1st. Meridional Transits of the Moon, compared with certain Stars previously agreed on, and called "Moon Culminating Stars."
2nd. Eclipses of the Sun.
3rd. Eclipses of the Moon.
4th. Eclipses of the Satellites of Jupiter.
5th. Occultations of the Fixed Stars by the Moon.
6th. Lunar Distances.

Of these six methods I have employed four, *viz.*, the 1st, 2nd, 4th, and 6th; but Eclipses of the Sun are of so rare occurrence, and so limited in extent, that, during the last

ten years, only four solar eclipses have been visible in Van Diemen's Island, two of which were obtained and carefully observed. They are, however, tolerably certain in their deductions, when observed under favourable circumstances.

Eclipses of the Moon afford but unsatisfactory results, on account of the indistinctness of the border of the earth's shadow; and there are so many practical difficulties in the way of obtaining the occultations of the fixed stars by the Moon, arising from the long and tedious calculations requisite to ascertain whether a certain star will be occulted or not, that neither has been employed.

In the observations of the "Moon Culminating Stars," an excellent Transit instrument, by Troughton and Simms, of 30 inches focal length and 3 inches aperture, was employed, fixed upon a solid pedestal of stone, well imbedded. The stand of the instrument, which supports the Y's, is of cast iron, and is in itself so weighty, that great steadiness was obtained, and the adjustments for azimuth and inclination required to be rarely made. Whenever the Moon's transit was obtained, observations for the deviation were made with pairs of high and low stars, taken principally from the Ast. Soc. Catalogue. The error in collimation was inappreciable, and four stars were always observed with the Moon, when practicable; and the indications of the riding level (which is graduated to 1·″0) were read in every case with the observations, when the altitude was low enough for the level to be placed on the pivots of the axis, without disturbing the position of the telescope.

The observations of the eclipses of Jupiter's Satellites and the Sun were made with a telescope by Jones, having a focal length of 43 inches and an aperture of 2·75 in. The eye-piece employed with the Sun was a direct one—with Jupiter's Satellites an inverted one—of much greater power

than the former; but I have not been able to ascertain the amount of their power.

The lunar observations were made with an excellent sextant, by Dolland, of 8 inches radius, divided on platina, to 10″. I am not able at present to communicate the resulting longitude, as they will shortly be in the hands of Mr. Riddle, the Head Mathematical Master of the Nautical School at Greenwich, for calculation by the first-class boys at that school, under his superintendence. The results will be communicated hereafter.

The determination of the latitude of any place is a much simpler problem, and for the present all the latitudes given in this paper have been the result of observations made with the above-mentioned sextant by the method of circum-meridional altitudes of the Sun and Stars. In their reduction I have employed Mr. Baily's Tables and Formulæ of reduction to the meridian, and Mr. Ivory's Tables of Refraction, with their corrections for pressure and temperature.

The Sun's declination was obtained by interpolating for second differences, and the Stars which have been employed being "Greenwich Stars," their declinations were obtained from the Nautical Almanac.

Should I remain at the Observatory through the ensuing winter, I propose to investigate the latitude in a more rigorous manner, by the employment of the Altitude and Azimuth Instrument by Troughton, with which Mr. Sprent conducts his field operations in the Trigonometrical Survey during the summer months, and for which permission I am indebted to His Excellency the Lieutenant-Governor; but from the numerous observations made at various times with the sextant, I do not think that the latitude assigned to the Observatory can be much in error, although future observations, with *better means* than I have

at command, will fix the position with more decided accuracy.

I.—Moon Culminating Star Observations.

These observations were made in the years 1843, 1844, and 1846. In order to obtain the corresponding observations made at the principal Observatories in England, I forwarded them, when completed, to my friend Captain Shadwell, R.N., who kindly undertook their reduction, and subsequently drew up a paper upon the longitude of the Hobart Town Observatory, deduced from these observations, for the Astronomical Society. It is matter of regret to me, that out of 41 sets of both limbs of the Moon, observed at Hobart Town, so few corresponding observations were obtained in England, particularly of the Moon's second limb.

In the introductory remarks, Captain Shadwell observes: "In taking the means for the final results, it is assumed "that the value of each individual result is directly pro- "portional to the square root of the number of stars "observed with the Moon; and also to the velocity of the "Moon's motion in right ascension in an hour of longitude, "in the interval of her transits over the two meridians, "140 s. is assumed arbitrarily as the mean value of this "hourly motion, which shall be represented by unity, and "if n be the actual number of seconds in the Moon's "actual motion, and M the number of stars observed with "the Moon, to find the weight in the annexed columns, "we have

$$W = \frac{n}{140}\sqrt{M}$$

"the sum of the products of the individual results of each "observation, multiplied into its weight, divided by the

" sum of the weights, give the final result, as the deduction " from all the observations."

HOBART TOWN AND GREENWICH.

DATE.	Number of Stars observed.	Moon's Limb.	Hobart Town East of Greenwich.	Moon's Mean Hourly Variation in Right Ascension in an Hour of Longitude.	WEIGHT.
1843.			H. M. S.	S.	
December 8	1	II	9· 49· 27·4	138·755	0·991
1844,					
February 1	1	I	,, ,, 34·4	140·791	1·006
March 6 ...	2	II	,, ,, 10·2	144·389	1·453
1846,					
April 5.....	1	I	,, ,, 28·5	121·683	0·869
— 6.....	2	I	,, ,, 21·	118·629	1·194
May 7	4	I	,, ,, 27·6	122·663	1·752
— 11.....	2	II	,, ,, 13·3	149·861	1·510
June 3	1	I	,, ,, 26·2	119·167	0·851
— 6.....	2	I	,, ,, 32·9	138·368	1·393
July 4	3	I	,, ,, 25·5	140·120	1·731
September 1	2	I	,, ,, 18·3	156·484	1·576
— 2	2	I	,, ,, 23·5	156·659	1·578

Whence we obtain— H. M. S.

By nine observations, Moon's 1st limb ...9· 49· 26·03

By three ditto, Moon's 2nd limb ...9· 49· 15·68

HOBART TOWN AND EDINBURGH.

DATE.	Number of Stars observed.	Moon's Limb.	Hobart Town East of Edinburgh.	Moon's Mean Hourly Variation in Right Ascension in an Hour of Longitude.	WEIGHT.
1843.			h. m. s.	s.	
December 8	3	II	10· 1· 68·2	138·749	1·714
1844.					
January 29	1	I	,, ,, 64·4	135·298	0·966
— 31	4	I	,, ,, 76·8	140·109	2·002
February 28	1	I	,, ,, 68·0	138·644	0·990
March 2 ...	1	I	,, ,, 77·2	136·698	0·976
— 4 ...	2	I&II	,, ,, 77·7	137·279	1·382
— 5 —	1	II	,, ,, 62·8	142·023	1·014
1846.					
April 3.....	1	I	,, ,, 59·4	129·072	0·922
— 6	2	I	,, ,, 67·9	118·624	1·194
May 8	3	I	,, ,, 78·6	128·084	1·583
June 3.....	2	I	,, ,, 65·1	119·184	1·120
— 10	2	II	,, ,, 60·8	160·942	1·621
July 4.....	3	I	,, ,, 67·6	140·161	1·732
August 31 ..	1	I	,, ,, 49·3	155·409	1·110
September 2	1	I	,, ,, 58·2	156·658	1·119
— 9	1	II	,, ,, 70·2	143·008	1·021

Whence we obtain—

	H.	M.	S.
By eleven observations, Moon's 1st limb	10·	2·	7·72
By four ditto, Moon's 2nd limb	10·	2·	5·32

The observation of March 4th, 1844, being neglected, because the first limb was observed at Hobart Town and the second limb at Edinburgh.

HOBART TOWN AND CAMBRIDGE.

DATE.	Number of Stars observed.	Moon's Limb	Hobart Town East of Cambridge.	Moon's Mean Hourly Variation in Right Ascension in an Hour of Longitude.	Weight	REMARKS.
1843.			H. M. S.	S.		
December 8	4	II	9· 48· 64·1	138·755	1·982	The Moon
1844.						was not
January 31	4	I	,, ,, 70·8	140·099	2·002	observed at
February 1	3	I	,, ,, 70·2	140·791	1·740	Cambridge
— 3	1	I	,, ,, 60·2	137·402	0·981	during the
March 2.....	1	I	,, ,, 68·5	136·703	0·976	year 1846.
— 6.....	2	II	,, ,, 46·6	144·389	1·454	

Hence we obtain— H. M. S.

By four observations, Moon's 1st limb ... 9· 48· 68·4

By two ditto, Moon's 2nd limb ... 9· 48· 56·7

HOBART TOWN AND OXFORD.

DATE.	Number of Stars observed.	Moon's Limb.	Hobart Town East of Oxford.	Moon's Mean Hourly Variation in Right Ascension in an Hour of Longitude.	Weight.	REMARKS.
1844.			H. M. S.	S.		
February 1	3	I	9· 54· 30·2	140·789	1·740	No obser-
— 3	1	I	,, ,, 29·7	137·398	0·981	vation of
March 2 ...	1	I	,, ,, 39·7	137·193	0·980	theMoon's
1846.						second
September 1	2	I	,, ,, 20·2	156·486	1·576	limb at
— 2	2	I	,, ,, 26·2	156·657	1·578	Oxford.

Hence we obtain— H. M. S.

By five observations, Moon's first limb 9· 54· 28·27

To reduce these several results to the meridian of Greenwich, we assume the following differences of longitude from Greenwich—

		M.	S.
Edinburgh.....	+	12·	43·60
Cambridge.....	—	0·	23·54
Oxford	+	5·	2·60

and these being applied to the means, we obtain for the longitude of the Hobart Town Observatory as follows:—

Observations at Hobart Town compared with	MOON'S FIRST LIMB.		MOON'S SECOND LIMB.	
	Number of Observations	Longitude.	Number of Observations.	Longitude.
		H. M. S.		H. M. S.
Greenwich...	9	9· 49· 26·03	3	9· 49· 15·68
Edinburgh...	11	9· 49· 24·12	4	9· 49· 21·72
Cambridge...	4	9· 49· 31·94	2	9· 49· 20·24
Oxford	5	9· 49· 25·67		

Giving to each result a weight proportionate to the number of observations, we obtain—

	H.	M.	S.
From twenty-nine observations of the Moon's 1st limb.....	9·	49·	26·06
From nine ditto, Moon's 2nd limb,	9·	49·	19·38

Or, as the final result—

H. M. S.
9· 49· 22·72

for the longitude of the Hobart Town Observatory east of Greenwich.

II.—Eclipses of the Sun.

Eclipses of the Sun, visible to a spectator in Van Diemen's Land, occurred in the years 1844, 1845, 1847, and 1851. The two following were observed—

June 15*th*, 1844.	Mean Solar Time. H. M. S.
The beginning took place *approximately* at	19· 58·
The ending took place (good observation) at	22· 41· 39·5
Resulting longitude by observation at ending	9· 49· 37· east.

February 1*st*, 1851.	H. M. S.
The beginning took place (a good observation) at	3· 30· 09·
The ending	6· 02· 40·
Resulting longitude by observation at beginning	9· 49· 25· east.
Ditto ditto ending	9· 49· 18· east.

In the eclipse of June 15th, 1844, the Sun was surrounded with a dense haze at the beginning of the eclipse, and therefore the contact of the limbs was only *approximately* obtained.

In the eclipse of February 1st, 1851, the Sun was too near the horizon at the ending of the eclipse to depend upon the result with the same degree of confidence as upon the observation at the beginning, which was obtained under very favourable circumstances. In both cases, the results have been verified by the independent calculations of Capt. P. P. King, R.N., and Mr. Tyers.

III.—Eclipses of Jupiter's Satellites.

No.	DATE. 1852.	Which Satellite.	Emersion or Immersion.	Mean Time at Van Diemen's Land.	Mean Time at Greenwich by the Nautical Almanac.	Resulting Longitude East of Greenwich.
				D. H. M. S.	D. H. M. S.	H. M. S.
1	May 15th	II	Emersion	15· 12· 33· 52·4	15· 2· 44· 25·4	9· 49· 27·
2	May 26th	I	Emersion	26· 14· 17 23·7	26· 4· 27· 49·8	9· 49· 33·9
3	May 28th	I	Emersion	28· 8 46· 00·	27· 22· 56· 26·	9· 49· 34·
4	June 4th	I	Emersion	4· 10· 40· 23·3	4· 00· 50· 49·5	9· 49· 33·8
5	June 11th	I	Emersion	11· 12· 34· 46·6	11· 2· 45· 17·7	9· 49· 28·9
6	June 13th	I	Emersion	13· 7· 03· 29·2	12· 21· 13· 53·7	9· 49· 35·5
7	June 16th	II	Emersion	16· 12· 15· 50·7	16· 2· 26· 09·2	9· 49· 41·5
8	June 20th	I	Emersion	20· 8· 57· 54·1	19· 23· 8· 26·9	9· 49· 27·2
9	June 27th	I	Emersion	27· 10· 52· 24·8	27· 1· 3· 3·8	9· 49· 21·
10	July 4th	II	Emersion	4 6· 47· 13·4	3· 20· 57· 31·8	9· 49· 41·6

Whence we have— H. M. S.

By seven emersions of the 1st Satellite.... 9· 49· 30·6

By three ditto 2nd Satellite.... 9· 49· 36·7

Mean .... 9· 49· 33·65

With reference to observations upon the eclipses of Jupiter's Satellites, the Nautical Almanac says:—"Inde- "pendent of defects in the Tables, there are difficulties "attending the observation of these phenomena which "unfit them for *accurate* determinations of longitude. "Different telescopes give different results, and care should "be taken to have recourse to those corresponding obser- "vations which have been made under circumstances the "most similar, and particularly with telescopes of the same "quality and power."

I have employed the same telescope and an eye-piece of the same power throughout, and although bowing of course to the indisputable opinion of the Nautical Almanac upon such points, I still think that, when a sufficient number of these observations are carefully made, with a due atten- tion to the clearness of the atmosphere and steadiness of

the telescope, that a very tolerable mean result will be obtained. I have rejected several of my own observations; but it was always perceptible to me at the time that they were likely to be rejected, from the wavy, dancing appearance of the atmosphere surrounding the planet, as viewed through the telescope.

IV.—Lunar Distances.

The result of these observations will be communicated hereafter.

V.—Chronometric Difference of Meridians.

The meridian distance between the Observatory at Hobart Town and the following places has been measured by chronometers.

1. Paramatta Observatory, in N. S. W.
2. Tahlee, Port Stephen, in N. S. W.
3. Fort Macquarie, in Sydney Harbour.
4. Portland, Victoria.

H. M. S.

Paramatta is given in the Nautical Almanac as 10· 4· 6·25 east of Greenwich, which is Sir Thomas Brisbane's determination.—*Philos. Trans.*, 1829. *Part III.*

H. M. S.

Tahlee, in Port Stephen, is 10· 8· 11· east of Greenwich, by Captain P. P. King's independent determination.—*See Capt. P. P. King's Astronomical Observations*, 1843-1848.

H. M. S.

Fort Macquarie is 10· 4· 59·3 east of Greenwich by a mean of several authorities, which are given at the end of this paper.

Portland was determined by an able surveyor; and an excellent observer, Mr. Tyers, now Commissioner of Crown

Lands in New South Wales, and who was especially selected by the late Sir George Gipps to ascertain the true geographical position of the mouth of the Glenelg, the eastern boundary of the colony of South Australia. I am indebted both to Capt. P. P. King and to Mr. Tyers for much valuable information and assistance in placing their data at my disposal. Mr. Tyers decided Henty's Flagstaff at Portland to be

H. M. S.
9· 26· 32·1 east of Greenwich.

Chronometric Difference of Meridians employed in determining the Longitude of the Hobart Town Observatory, with the Authorities for the same.

HOBART TOWN OBSERVATORY TO PARAMATTA OBSERVATORY.

Hobart Town to Garden Island, Sydney Harbour.*

	H.	M.	S.
Capt. Sir James Ross, R.N., in H.M.S. "Erebus and Terror," 29 chronometers....	0·	15·	31 10
Capt. Stokes, R.N., in H.M.S. "Beagle," 15 chronometers	0·	15·	33·37
Capt. Blackwood, R.N., in H.M.S. "Fly," 21 chronometers	0·	15·	34·04
Capt. Stanley, R.N., in H.M.S. "Rattlesnake," 11 chronometers	0·	15·	34·03
Garden Island, east of the Hobart Town Observatory, (mean by weight)	0·	15·	33·83
Garden Island east of Paramatta Observatory†	0·	00·	55·71
Paramatta, east of Hobart Town Observatory	0·	14·	38·12

* Garden Island is the established place of observation for all the Officers of H.M. ships that visit Sydney.

† See longitude of Fort Macquarie, Sydney Harbour.

Hobart Town Observatory to Tahlee, Port Stephen.

	H.	M.	S.
Tahlee, east of Paramatta, Captain P. P. King, R.N.	0·	4·	01.50
Paramatta Observatory, east of Hobart Town Observatory	0·	14·	38·12
Tahlee, east of Hobart Town Observatory	0·	18·	39·62

Hobart Town Observatory to Henty's Flagstaff, Portland.

	H.	M.	S.
Fort Mulgrave, Hobart Town, east of Henty's Flagstaff, Portland, by Capt. Stokes, R.N., in H.M.S. "Beagle"	0·	22·	55·
Fort Mulgrave, Hobart Town, east of the Hobart Town Observatory	0·	00·	1·28
Portland, west of Hobart Town Observatory	0·	22·	53·72

Hobart Town Observatory and Fort Macquarie, Sydney Harbour.

	H.	M.	S.
Garden Island, east of Hobart Town Observatory	0·	15·	33·83
Garden Island, east of Fort Macquarie*	0·	00·	2·84
Fort Macquarie, Sydney Harbour, east of Hobart Town Observatory	0·	15·	30·99

* See longitude of Fort Macquarie, Sydney Harbour.

Hobart Town Observatory and Fort Mulgrave, Hobart Town.

	H.	M.	S.
Commander Kay, R.N., by a triangulation made in 1846, the Observatory bearing from Fort Mulgrave N. 11° W., 7300 feet	0·	0·	1·24
Captain Stokes, R.N., H.M.S. "Beagle," in 1843.—*See Discoveries in Australia, vol. ii. p.* 411.	0·	0·	1·33
Fort Mulgrave, Hobart Town, east of Hobart Town Observatory	0·	0·	1·28

Results obtained for the Longitude of the Magnetic Observatory, Hobart Town, East of Greenwich.

Authority.	In Time. H. M. S.	In Space. ° ′ ″
Commander Kay, moon culminating star, observations made in 1843, 1844, 1846.....	9· 49· 22·7	147· 20· 40·
Commander Kay, eclipse of Sun, June 15, 1844, observation at ending only	9· 49· 37·	147· 24· 15.
Commander Kay, eclipse of Sun, Feb. 1, 1851, observation at beginning only	9· 49· 25·4	147· 21· 21.
Commander Kay, eclipses of Jupiter's Satellites, 1852	9· 49 33··6	147· 23· 24·
By chronometric difference of meridians, Hobart Town Observatory and Paramatta Observatory	9· 49· 28.1	147· 22· 02·
By chronometric difference of meridians, Hobart Town Observatory and Tahlee.....	9· 49· 31.4	147· 22· 51·
By chronometric difference of meridians, Hobart Town Observatory and Fort Macquarie.....	9· 49· 28·3	147· 22· 24·
By chronometric difference of meridians, Hobart Town Observatory and Portland...	9· 49· 25·8	147· 21· 27·
Hobart Town Observatory, east of Greenwich	9· 49· 29·04	147· 22· 18·
The same, rejecting Jupiter's Satellites	9· 49· 28.39	147· 22· 09·

H. M. S. ° ′ ″

Preferred..... 9· 49· 28·4=147· 22· 06· East of Greenwich.

Note.—I subjoin the difference of meridians between Hobart Town and the Cape of Good Hope, supplied in a memorandum from Mr. Tyers, and measured on four separate occasions; of course, from the length of the voyage, the measurements are not entitled to much confidence for an accurate determination, but the accordance is satisfactory:—

Symon's Bay, Cape of Good Hope and Hobart Town, (Fort Mulgrave.)

	H. M. S.
By H.M.S. *Beagle* in 1838...	8· 35· 34·
H.M.S. *Alligator* in 1838	8· 35· 30.
H,M.S. *Beagle* in 1836...	8· 35· 54.
H.M.S. *Fly* in 1842	8· 36· 07.

° ′ ″

Mean of all ..... 8· 35· 46·2=128· 56· 33· { Hobart Town, east of Symon's Bay.

	H. M. S.
Longitude of the Cape Observatory, (Mem. Astro. Soc.) east of Greenwich	1· 13· 55
Symon's Bay, west of the Observatory, (Captain Stokes, R.N.)	0· 00· 11·3
Symon's Bay, east of Greenwich . . .	1· 13· 43·7
Hobart Town, (Fort Mulgrave), east of Symon's Bay, .	8· 35· 46·2
Hobart Town, east of Greenwich . . .	9· 49· 29·9
Observatory, Hobart Town, west of Fort Mulgrave, Hobart Town	0· 0· 1·3
Hobart Town Observatory, east of Greenwich, measured from the Cape of Good Hope	9· 49· 28·6 = ° ′ ″ 147· 22· 09·

RESULTS obtained for the Latitude of the Hobart Town Observatory, by Circum-meridional Altitudes of the Sun, North of the Zenith.

DATE.	Upper or Lower Limb.	No. of Observations.	LATITUDE SOUTH.
			° ′ ″
1841.			
March 15	L.	14	42· 52· 15·3
— 17	L.	10	,, 52· 18 9
— 18	L.	14	,, 52· 14·1
— 25	L.	10	,, 52· 12·
May 22	L.	14	,, 52· 17·7
June 5	L.	12	,, 52· 14·7
1842.			
March 8	L.	5	,, 52· 14·
— 26	L.	10	,, 52· 12·8
June 13	L.	13	,, 52· 17·7
— 28	L.	12	,, 52· 14·9
July 23	L.	10	,, 52· 10·7
August 3	L.	11	,, 52· 12·8
— 9	L.	12	,, 52· 16·3
1843.			
April 8	L.	11	,, 52· 09·9
May 4	L.	12	,, 52· 12 1
— 10	L.	10	,, 52· 13·
— 19	L.	10	,, 52 08·
— 20	L.	10	,, 52· 12·6
1844.			
May 11	U.	10	,, 52· 16·9
— 22	U.	13	,, 52· 13·7
— 23	U.	12	,, 52· 12·6
— 24	U.	11	,, 52· 13·6
June 8	U.	11	,, 52· 15·3
— 15	L.	11	,, 52· 11·4
— 19	U.	12	,, 52. 08·
July 4	U.	13	,, 52· 14·7
— 27	L.	11	,, 52· 12·6
August 12	L.	5	,, 52· 12·1
— 29	L.	10	,, 52· 08·
1845.			
July 11	U.	10	,, 52· 14·7
— 12	U.	11	,, 52· 15·8
— 26	U.	10	,, 52· 12·7

Hence we have— ° ′ ″

By 22 sets of observations of the Sun's L.L.....42· 52· 13·3

By 10 ditto ditto U.L.....42· 52· 13·8

RESULTS obtained for the Latitude by Circum-meridional Altitudes of Stars, North and South of the Zenith.

DATE, 1852.	Name of Star.	Number of Observations.	LATITUDE SOUTH.	
			* North of Zenith.	* South of Zenith.
			° ′ ″	
February 21.....	Procyon	11	42· 52· 13·	
— 22.....	Procyon	13	,, 52· 12·9	
— —	Betelguese	11	,, 52· 16·4	
— 23.....	Procyon	3	,, 52· 13·	
— 26.....	Procyon	12	,, 52· 13·	
— 29.....	Procyon	10	,, 52· 14·2	
March 10.....	Procyon	11	,, 52· 11·9	
— 14.....	Regulus	12	,, 52· 14·2	° ′ ″ *
November 22.....	*B.* Centauri (sub polo)	8	. . .	42· 52· 15·3
— —	A^2 Centauri (sub polo)	10	. . .	,, 52· 16·
December 3.....	*B.* Centauri (sub polo)	11	. . .	,, 52· 14·6
— —	A^2 Centauri (sub polo)	11	. . .	,, 52· 13·3
— 7.....	*B.* Centauri (sub polo)	10	. . .	,, 52· 11·8
— —	A^2 Centauri (sub polo)	12	. . .	,, 52· 13·8

		°	′	″
Mean latitude by	*S. north of Zenith....	42·	52·	13·6
Ditto	*S. South ditto	,,	52·	14·1
Ditto	Suns U. & L. limb	,,	52·	13·5
	Mean of all	42·	52·	13·7 South

and the result of all the observations made for determining the geographical position of the Hobart Town Observatory places it, *at present*, in

°	′	″	
42·	52·	13·7	South latitude
147·	22·	06·	East longitude.

* (*Note.*)—There are but few of the southern Stars of any magnitude available for determining a latitude with the Sextant in this parallel. η Argus, δ Crucis, α^2 and *B* Centauri are the most suitable, but their

As Fort Mulgrave, in Sullivan's Cove, is the spot where ships resorting to the Port of Hobart Town usually take their observations for rating their chronometers and obtaining their error upon Greenwich mean time, it may be of service to assign to it a correct geographical position, obtained from the foregoing determination of the Observatory.

Employing the royal salute fired at the Prince of Wales's Battery, (Fort Mulgrave), in 1846, for the measurement of a base line, I ascertain the Observatory to bear from Fort Mulgrave N. 11° W. 7300 feet, which, with an assumed ellipticity $= \frac{1}{304}$ gives

′	″	
1·	18·	diff. of latitude.
	s.	
0·	18· (or 1·20)	diff. of longitude

between them.

This would place Fort Mulgrave in

°	′	″	
42·	53·	32·	South latitude.
h.	m.	s.	
9·	49·	29·6	
or °	′	″	East longitude.
147·	22·	24·	

Before concluding this paper I think it very desirable to furnish the result of data, which I have been able to collect, for the determination of the longitude of Fort Macquarie, in Sydney Harbour, which, as the centre of a vastly increasing trade, and the resort of hundreds of vessels, is daily becoming of more importance. As before

meridional altitudes at the upper transit are too great, and 'sub polo,' their altitudes are so low, that it is only on rare and chosen occasions of an unusually clear atmosphere that satisfactory observations can be obtained. The true meridional altitude of *B* Centauri 'sub polo' is only 12° 31′.—Achernar and Canopus, which are both brilliant stars, are too low, being respectively only 10° 50′ and 5° 29′.

mentioned, I am indebted to Capt. P. P. King, R.N., and Mr. Tyers, for much of the necessary data.

Longitude of Fort Macquarie, in Sydney Harbour.

Authorities.	E. of Greenwich. ° ′ ″
Mr. Raper, from occultations observed at Paramatta, between 1812 and 1828, and reduced to Fort Macquarie	151· 14· 19
Sir Thomas Brisbane's longitude of Paramatta reduced to Fort Macquarie	,, 14· 47
Mr. Rumker on the longitude of Paramatta, Mem. Astr. Soc., vol. 6. p. 213, reduced to Fort Macquarie	,, 15· 01
Captain Owen Stanley, R.N., H.M.S. "Rattlesnake," 1849, occultation of *y* Virginis	,, 14· 14
Captain Blackwood, R.N., H.M.S. "Fly"*	,, 14· 54
Captain P. P. King, R.N., Moon culminating star observations, made at Tahlee, Port Stephen, and reduced to Fort Macquarie	,, 15· 35
Captain P. P. King, R.N., eclipses of the Sun and Jupiter's Satellites, and occultations observed at Tahlee, Port Stephen, and reduced to Fort Macquarie	,, 16· 15
Captain Owen Stanley, R.N., Moon culminating star observations, made at Port Essington, using his own meridian distance to Fort Macquarie	,, 15· 56

* I have not been able to obtain the method of observation pursued by Captain Blackwood in this determination. It is from a paper by the late lamented Captain Owen Stanley, R.N., on the longitude of Fort Macquarie, that it has been obtained.

Mr. Tyer's eighteen sets of lunar observations, Moon and Stars, Moon and Sun, made at Port Essington, and using his own meridian distance to Fort Macquarie	151°	15′	14
Mr. Tyer's twelve sets of lunar observations, Moon and Stars, Moon and Sun, made at Portland, reduced to Fort Macquarie	,,	14′	55
Commander Kay's Moon culminating star, observations made at the Hobart Town Observatory in 1843, 1844, and 1846, reduced to Fort Macquarie	,,	13′	26
Commander Kay's eclipse of the Sun, February 1st, 1851, observed at the Hobart Town Observatory, and reduced to Fort Macquarie. By observation at beginning only	,,	14′	06
Captain P. P. King's eclipse of the Sun, February 1st, 1851, observed at Paramatta, and reduced to Fort Macquarie. By observation at beginning only	,,	13′	46
Eclipse of the Sun, February 1st, 1851, observed at Melbourne,* at the foot of Batman's Hill, and reduced to Fort Macquarie. By observation at beginning only	,,	15′	01
Mean result for the longitude of Fort Macquarie, Sydney Harbour, east of Greenwich	151°	14′	49

H.	M.	S.
10°	4′	59·27

* By Messrs. P. Robertson, George Groves, Dalgarno and Sutherland. *Vide* Port Phillip *Government Gazette*, February 5th, 1851.

CHRONOMETRIC Difference of Meridians employed in the Determination of the Longitude of Fort Macquarie, Sydney Harbour, with the Authorities for the same.

Fort Macquarie and Paramatta Observatory.

	H.	M.	S.
Captain Owen Stanley, H.M.S. "Rattlesnake," ten chronometers, both ways, in a boat towed by a steam vessel	0·	00·	52·87
Fort Macquarie, east of Paramatta Observatory			

Paramatta Observatory and Garden Island, Sydney Harbour.

By Chronometers. Captain P. P. King, R.N.	0·	00·	55·57
By Rockets. Captain Sir James Ross, R.N. *Vide* Voyage of "Erebus" and "Terror;" vol. ii. p. 46	0·	00·	55.85
Paramatta Observatory, west of Garden Island	0·	00·	55·71

Fort Macquarie and Garden Island.

Paramatta Observatory, west of Garden Island	0·	00·	55·71
Ditto ditto, west of Fort Macquarie	0·	00·	52·87
Fort Macquarie, west of Garden Island	0·	00·	02·84

Fort Macquarie and Captain King's Observatory at Tahlee, Port Stephen.

Tahlee, east of Paramatta Observatory, by thirty-four satisfactory chronometric measurements. Captain P. P. King, R.N.....	0· 04· 01·50
Fort Macquarie, east of Paramatta Observatory.....	0· 00· 52·87
	0· 03· 08·63
The same, measured by Commander Yule, in 1849, with ten chronometers, and short intervals.....	0· 03· 08·99
Fort Macquarie, west of Tahlee, Port Stephen	0· 03· 08·81

Fort Macquarie and Batman's Hill, Melbourne.

Batman's Hill, west of Fort Macquarie, measured by chronometers by Mr. Tyers, in 1839	0· 25· 04·93
Ditto ditto by Mr. Tyers in 1840	0· 25· 03·60
Ditto ditto by Captain Stokes, R.N., H.M.S. "Beagle".....	0· 25· 05·33
Fort Macquarie, east of Batman's Hill.....	0· 25· 04·62

Fort Macquarie, and Henty's Flag-staff, Portland.

Measured chronometrically by Mr. Tyers, in 1840	0· 38· 29·93
Ditto by Captain Stokes, R.N., H.M.S. "Beagle," in 1841	0 38· 25·33
Fort Macquarie, east of Portland	0· 38· 27·63

Fort Macquarie and Victoria, Port Essington.

Mr. Tyers, by chronometers, from Fort Macquarie to Port Essington, in 1838.... Ditto ditto back to Fort Macquarie, in 1839	1· 16· 11·1
Captain Harding, R.N., H.M.S. "Pelorus," in 1838	1· 16· 16
Captain Stokes, R.N., H.M.S. "Beagle," in 1839	1· 16· 17
Captain Stanley, R.N., H.M.S. "Rattlesnake," in 1849, (16 chronometers)	1· 16· 19·1
Fort Macquarie, east of Victoria, Port Essington	1· 16· 15·8

Fort Macquarie and Captain King's Place of Observation at Paramatta.

The place of observation, east of Paramatta Observatory, by Captain P. P. King	0· 00· 04·89
Fort Macquarie, east of Paramatta Observatory	0· 00· 52·87
Captain King's place of observation during the Solar Eclipse of February the 1st, 1851, west of Fort Macquarie	0· 00· 47·98