

My Dear Marou,

I now send you a part of the information you ask me in your note of yesterday - and shall hasten to send you the remainder in a few days.

The present letter contains the heights of the different places you required for your map, and embraces your queries marked *a. d.* and *b. d. c.* in your note - viz -

Note A	Santiago de Chile	elevation	535 metres
B	Pass of La Cumbre		12532 f. * 3796
C	Mendoza		825.3
D	San Luis		867
	River Desaguadero		787
	San Jose del Moro		1278
D	Cordoba		515
a. c.	Guamaw		767
	Salta	Tupiza	1159
	Tupiza	Salta	1272

I have annexed notes explanatory of the means by which I obtained these several results -

* (measured in 12 fathoms)

Judging from the vegetation of the neighbourhood of Santa Cruz de la Sierra, I cannot suppose its elevation above the sea to exceed 500 toises.

From what I have been able to learn of the region of the climate of Cusco, it must be fully as elevated as Quignama, and little short of 1500 toises!!

In the annexed notes I have stated the mean Atmospheric pressure within the tropics to be 764.10 at 21° 5 centigrade or 760.7 at 0°, as resulting from my Barometrical Observations made at Callao, Arica, & Quilca - and I have employed this difference in the calculation of all the heights which I now send you - it exceeds that resulting from your observations in America, by 2^m - 6 - which if adopted, will necessitate our augmenting those elevations already published by you by nearly 30 metres

Yours very faithfully
& much obliged

Widenerday Evg

W. B. Stewart

Note - A.

- 1 On the mean height of the Barometec at Santiago de Chile, and
 On the elevation of that City deduced therefrom

I visited Santiago in the month of January, 1826, and by two days Observations taken near Midday found the mean Barometrical pressure to be 719.046 at the temperature of 72. ~~Fts~~ or reduced to zero of the centigrade division 716.17

During my residence at Santiago, I became acquainted with a French Gentleman established as a Professor of Mathematics in that city, M. Lories, possessing a good Syphon Barometec by Richee - who kindly undertook a series of Barometrical Observations whilst I observed at Talparaiso, to deduce the elevation of the Capital of Chile - these Observations were made every 3 hours between the 3 and 10 of February. I shall have occasion to recur more particularly to these observations in deducing the elevation of Santiago in the second part of this note, in the mean time it will suffice to state that they give for the mean Atmospheric pressure during this period 719.80, at

temperature of $22^{\circ}.5$ or reduced to 0° - 716.95

I received subsequently from the same gentleman a still more extensive series of Barometrical Observations made 3 times a day during the entire month of June 1826, they give a result scarcely differing from the preceding viz 719.30 at $11^{\circ}.5$ or reduced to 0 717.90

In addition to Mr Lories and my own Observations, Dr Gillies a Scotch Physician established at Mendoza, communicated to me a note of some Barometrical Observations made in Chile, amongst them is one made at Santiago, where he found his Instrument to mark 28.034 English inches the thermometer being 69° Fth. but as in the same note he states that his Barometer on a level of the sea stood at 29.70, it will be necessary to add the quantity which this latter wants of 30 inches the mean pressure on the level of the Ocean to the Observation at Santiago - by this means we find that Dr Gillies Barometer at the temperature of 69° Fth corrected for capillarity & erroneous graduations indicated for the Atmospheric pressure at Santiago 720.35 or at 0° temperature 717.76

Finally Mr Miers in his very interesting work on Chile, has given two Barometrical Observations made at Santiago; the mean of which gives for the Atmospheric pressure at the temperature of $58^{\circ} 5$ Fahrenheit 717.55 . or at 0° Centigrade 715.65

Such are the different Barometrical Observations which have been made in modern times at Santiago de Chile, and which present an extraordinary accordance with each other, when we consider the difference of seasons at which they have been made, of instruments employed &c

Resuming therefore in the form of a table these different Observations, we may deduce the mean Atmospheric pressure as follows.

Name of Observer.	Barometre	Ther cent	Bar. at 0°
Scutland	719.05 ^{mm}	22°	716.17
Lorrie 1 series	719.80	22.5	716.95
Lorrie 2 series	719.30	11.5	717.90
D. Gillies	720.35	20.5	717.70
Mr Miers	717.55	14.6	715.65
Previous mean	719.21	18.2	716.874 ^{mm}

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I shall now proceed to determine the elevation of Santiago from the preceding data.

I have already stated that I observed the Barometer at Valparaiso during seven successive days, near the level of the sea, whilst Monsieur Lorie did the same at Santiago - my Observations from which I propose to deduce the elevation of the capital of Chile were made at midday, as were those of Mr Lorie, and the station of the inferior Barometer was 5 metres above the waters of the Pacific

My Observations give for the mean elevation of the Mercury in the Barometer at the inferior Station 765.20 . $\text{Th } 19^{\circ}.2$ centigrade - whilst as we have already shown Mr Lorie's at Santiago give 720.05 . $\text{Th } 22^{\circ}.5$ -

hence difference of level	metres	<u>532</u>
or elevation of Santiago above the sea		<u>537</u>

If on the other hand we adopt the mean pressure as deduced from the totality of the Observations already cited of the superior station to be - 719.21 . $\text{Th } 19^{\circ}.2$. and the Atmospheric

pressure on the level of the Pacific Ocean to be 764.10
 at the temperature of $21^{\circ}5'$, we will deduce for the
 Absolute elevation of Santiago above the sea 517 metres

I have purposely refrained from citing Mr
 Baug's Barometrical measurement of Santiago
 as it differs so widely from all others, as to induce
 me to believe, that the instrument employed by the
 Spanish Navigator was either very imperfectly graduated
 as the discrepancy which his Observations when com-
 pared with those above cited could not properly
 arise from any error of the Observer - Mr Bauga
 gives for the mean height of his Barometer at
 Santiago, on the 13. 14. 15 & 16 of May. $25\frac{3}{12}$ inches

The Observations upon which this result is founded
 were made near ^{& deduced} to the level of the Pacific at Callao, during
 several successive days with an excellent Barometer
 of Fortin - at the Ports of Quilo (Lat $16^{\circ}42'S$) and of
 Arica (Lat $18^{\circ}28'S$) - and on board His Britannick
 Majesty's Ship Cambridge, whilst at anchor in
 Callao Roads, by means of a good Marine Barometer

The Mean of all these Observations gives for the
 pressure of the Atmosphere on the level of the Ocean

No. 23.5. (corresponding ^{to} 695.75) - Now adopting
this observation, we would deduce for the elevation
of Santiago ⁷⁹⁴ ~~807~~ metres & an excess of 270
on the more accurate valuation -

Taking the mean furnished by all the observa-
tions already cited, excluding however those of
M. Baring, we may adopt for the Elevation
of the Capital of Chile 527 metres or ⁽²⁷⁰⁾ ~~797~~ toises -

764.10. at the temperature of 21.5 Centigrade - or at 0
of the same scale 760.70 - (admitting the relation for
each degree to be, 0.000163) - a result which agrees
very nearly with ^{that} deduced ^{the} for ^{the} tropical zones
from the observations of Bouquier, Torres &
Bousingent & for extratropical countries
from those of Mago, Shuckburg, Lyon. &
&c.

(1) Falways supposes the calculations contained in this letter
that the Barometer on the level of the sea is assumed at 764.10 No. 21.5

for the elevation of the Capital

Note B.

On the Height of the Passage of La Cumbre in the Andes of Chile - between Santiago and Mendoza -

We possess 3 series of Barometrical measurements of this important pass. the first by Mr Baugé the second by Dr. Gillies, and the third by Mr Miers -

Dr. Gillies Barometer when placed on the highest point of the pass marked	Inches 19.232	H. 59. 24
Mr Miers - - - - -	19.125	38

from which by means of Mr Ottmann's tables we deduce for the absolute elevation of the pass

according to Dr. Gillies	3829 metres
Mr Miers - - - - -	3763 -

Moyennum Metres - 3796 -

hence we see that the elevation of this pass does not exceed 4950 toises.

Mr Baugé's Barometrical Measurement of the Summit differs little from this result - On recalculating his Observations by the more recent formulæ - I find that admitting his Barometer on the level of the Pacific to have marked 30 inches at 16.6 as given in his Memoirs, that the height of the pass is 1949 toises - but on ~~then~~ adopting 164.10 H. 21.5 for the height of the instrument on the x

* level of the sea, we will find 1976 toises for the elevation of the Summit -

Note C

On the Elevation of the City of Mendoza, and of some other points of the neighbouring Provinces

D^r Gillies communicated to me, as the mean of his Barometrical Observations, made during a considerable residence there - 27.326 English inches at the temperature of 67 Fath^s. - the greatest variations being 27.150. and 27.428.

W^r Miers gives also two Observations, the mean of which is 27.353 - at a temperature of 67° F^t.

From these Observations I have deduced as follows

Gillies.	metres 827 828. metres
Miers.	828 823 - id

If these two measurements the former is to be preferred as being the result of a greater number of Observations -

I have recalculated W^r Baugot's Barometrical Observations at Mendoza, which give 939. and 962 metres for its elevation, whether we adopt either of the suppositions already noticed, in speaking of his Observations at the Cumbre de Santiago - as to the mean height of the Barometer at the level of the Sea -

In the immense extent of country situated between the Andes and the shores of the Atlantic Ocean, the only points, the elevation of which has been determined are, the River Desaguadero where it is traversed by the road from Mendoza to Buenosayres; the town of San Luis, capital of the Buenosayrean Province of the same name, and the village of San Jose del Moro, situated at the southern border of the system of Granitic Hills which form the Courefort of Cordova.

These several determinations are due to Gillies whose observations I ames, and from which I have deduced the elevations placed opposite to them -

	Bar	^{inches}	H. B.	H. Air	Height above Sea
San Luis	27.220		70	70	867 Metres
Rio del Desaguadero	27.400		59	52	787
San Jose del Moro	25.960		70	70	1278x

obier
for

* These calculations, the Barometer on the level of the sea has been assumed at 76.10 - H. 21.5, as already determined vide supra -!

Note D. Sur la Hauteur de Cordova. & Tucuman

The Observations ~~for~~ which these elevations have been deduced, were made in 1821. by my friend Dr Redhead, a gentleman well versed in Barometrical researches. Without entering into any detail. I shall merely annex the Observations, and the results which I have obtained from them.

	Barometer in English inches	H. of Baro	H. detached	Elevation deduced by Olmstead's Tables
Cordova	28.400	80 Fm.	84	515 metres
Tucuman	27.563	75	..	767
Jujuy				
Salta Tupiza	26.260	60.	60	1159
Salta Tupiza	+ 26.187	74.2	74.7	1222

Means of 17 days Observations, between 24 March & 11 April 1821. The Observations made twice a day, at 10. AM & 4. PM.