XVIII.—*On the Amount of Carbonic Acid contained in the Atmosphere of Tropical Brazil during the Rainy Season.*

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THE following determinations of the amount of carbonic acid contained in the land air of the tropics were made at Pará. This town is the principal port of entrance to the Amazons, and is situated about eighty miles from the sea on the river Grãm-Pará, in lat. $1^{\circ} 27'$ S., and long. $48^{\circ} 28'$ W.; it is built on the verge of a vast primeval forest extending to the sea-coast, and over which the trade winds of the Atlantic regularly blow during the greater part of the year. These determinations were made by Pettenkofer's method in the manner previously described (p. 192). Hydrochloric acid was substituted for oxalic acid in the titration of the baryta-water, since solutions of the latter acid decompose rapidly in the tropics. The following table gives the results of these determinations.

TABLE V.

No.	Date. 1866.	Hour.	Bar. mm.	Temp. of Air.		Wind, &c.	CO ₂ in 10,000 vols. of Air.		
				Dry.	Wet.		1st Expt.	2nd Expt.	
1	April 3rd	4.20 p.m.	762.0	23.4	23.1	Light air; overcast	3.19	3.14	After 6 hours' heavy and almost incessant rain.
2	" 4th	3.0 p.m.	761.4	29.0	27.5	Little wind; gloomy	3.44	3.35	Immediately previous to a storm.
3	" 16th	11.20 a.m.	766.0	30.1	26.2	N.E. Light breeze	3.47	—	Much rain on previous night, cloudy.
4	" 16th	3.45 p.m.	763.5	25.6	24.7	N.E. Gentle breeze	3.22	3.13	After 1½ hrs. heavy rain.
5	" 18th	9.25 a.m.	766.0	27.2	25.0	N.E. Little wind	3.27	3.12	Cloudy; dull.
6	" 18th	3.5 p.m.	763.5	25.9	25.3	—	3.22	—	After rain.
7	" 19th	2.30 p.m.	762.5	28.9	25.6	N.E. by E. Fine breeze	3.30	3.12	Sunny.
8	" 21st	12.50 p.m.	764.0	33.3	26.6	N.E. Gentle breeze	3.41	3.28	Fi.e.
9	" 23rd	1.20 p.m.	764.5	28.3	25.9	do.	3.12	3.27	Fine and sunny.
10	" 24th	2.35 p.m.	764.0	32.3	25.6	do.	3.16	3.48	Clear.
11	May 4th	2.50 p.m.	763.3	29.6	26.6	N.N.E. Fine breeze	3.32	—	Fine.
12	" 7th	3.30 p.m.	762.0	26.9	24.6	Variable and light	3.07	3.14	Gloomy.
13	" 12th	1.40 p.m.	761.5	27.4	25.6	N.N.E. Fine breeze	3.24	3.35	Gloomy. Immediately before storm of wind and rain.
14	" 18th	12.15	763.5	30.8	25.6	N.E. Gentle breeze	3.32	3.28	
15	" 21st	12.45	762.5	29.8	25.6	N.E.	3.41	3.29	Fine and sunny.
16	" 23rd	11.45	764.5	32.2	27.2	Fine breeze	3.45	3.32	Cloudy.
17	" 26th	1.0	764.5	31.7	25.0	Fresh breeze	3.49	3.30	Little rain for past three days. Fine.

From the above 31 experiments it appears that the mean quantity of carbonic acid contained in the air of tropical Brazil during the months of April and May, 1866, was 3.28 in 10,000 volumes of air—a very marked difference from the mean proportion (4.0 vols. in 10,000 of air) contained in the atmosphere of Europe, and probably due in great measure to the joint action of tropical rain and tropical vegetation in withdrawing this gas from the air. The influence of rain on the amount of atmospheric carbonic acid is well known from the experiments of Saussure and Bousingault. The annual rainfall at Pará is very heavy, amounting, according to observations kindly furnished to me by Drs. Bruno-Cabral and José Abrea, to nearly three metres (118 inches), of which about one-third falls during the months of March, April, and May. The above determinations are consequently interesting as showing the proportion of carbonic acid in the atmosphere of the tropics in the middle of the rainy season of the year. The amount of carbonic acid contained in the atmosphere of the tropics during the different seasons of the year has already been determined by Lewy*. The mean of an extensive series of analyses of the air of Bogota, in New Granada during the wet and dry seasons of the year is as follows:—

* Loc. cit. p. 199.

	During the rainy season.	During the dry season.
Carbonic acid in 10,000 vols. of air	3·822	4·573

In conclusion, I beg to tender my thanks to Professor Roscoe for the valuable advice and assistance he has given me during these investigations.