

January 25, 1872.

Sir JAMES PAGET, Bart., D.C.L., Vice-President, in the Chair.

The following communications were read :—

- I. "The Absolute Direction and Intensity of the Earth's Magnetic Force at Bombay, and its Secular and Annual Variations."
By CHARLES CHAMBERS, F.R.S., Superintendent of the Colaba Observatory. Received October 26, 1871.

(Abstract.)

The observations discussed in this paper were taken at the Colaba Observatory during the years 1867 to 1870, and consist of observations of Dip, Declination, and Horizontal Intensity. The principal results deduced by the author from these observations are shown in the following statement:—

Magnetic element.	Epoch.	Value at epoch.	Value at common epoch, January 1st, 1869.	Secular change. Per annum.	Semiannual inequality. ——— Excess of April to September over mean of year.	Calculated probable error of a single weekly determination.
Declination	April 1, 1868	0° 46' 47" E.	0° 48' 36" E.	+ 2' 5"	+ 1'	+ 20'
Dip	Oct. 1, 1868	19° 4' 2"	19° 4' 7"	+ 1' 9"	+ 0' 3"	+ 0' 25*
Horizontal Force.	April 1, 1869	8.0591	8.0581	+ .0040	.0000	± .0043*
Total Force	Jan. 1, 1869	8.5264	8.5264	+ .0059	+ .0003

In column 2 is entered the mean epoch to which the mean value of each element, entered in column 3, corresponds.

The absolute observations were taken at a height of 38 feet above the ground; and by comparing them with observations taken with differential instruments at a height of 6 feet above the ground, they are shown to indicate distinctly a diminution of terrestrial magnetic action with increase of height, with respect both to secular variation of Declination and Horizontal Force, and to diurnal inequality of Horizontal Force.

- II. "On the Elimination of Alcohol." By A. DUPRÉ, Ph.D., Lecturer on Chemistry at Westminster Hospital. Communicated by W. ODLING, M.B., F.R.S. Received November 16, 1871.

(Abstract.)

Obviously three results may follow the ingestion of alcohol. All the alcohol may be oxidized and none be eliminated, or a portion only may be

* In English units.

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oxidized and the rest be eliminated unaltered ; or, lastly, all may be eliminated again unaltered. Assuming the last to be the case, it would follow that, if a certain quantity of alcohol be taken daily, the amount eliminated would increase from day to day until, at last, the amount eliminated daily would equal the daily consumption, be this time 5, 10, or more days. If, on the other hand, all the alcohol consumed is either oxidized or eliminated within 24 hours, no increase in the daily elimination will take place in consequence of the continuance of the alcohol diet. Guided by these considerations, the author undertook two series of experiments, in which the amount of alcohol eliminated by both kidneys and lungs was carefully estimated. The analytical processes employed are described in detail.

First series.—After a total abstinence from alcohol for 11 days, the urine and breath were examined, after which, from the 12th to the 24th day, both inclusive, the author took 112 cub. centims. of brandy daily (equal to 48·68 grms. absolute alcohol). The urine and breath were examined on the 12th, the 18th, and the 24th day. The urine was also examined during the 5 days following the cessation of the alcohol diet. The analytical results obtained are given in a Table.

Second series.—After having again abstained from the use of alcohol, in any shape, during 10 days, the author took 56 cub. centims. of brandy (same as above) at 10 A.M. on March the 29th. The urine was collected for every 3 hours up to the 12th, from the 12th to the 24th hour, and during the next succeeding 2 days. The alcohol eliminated in the breath was also estimated during the same intervals. The analytical results are also arranged in a tabular form.

The results of both series may be summed up as follows :—

The amount of alcohol eliminated per day does not increase with the continuance of the alcohol diet ; therefore all the alcohol consumed daily must, of necessity, be disposed of daily ; and as it certainly is not eliminated within that time, it must be destroyed in the system.

The elimination of alcohol following the ingestion of a dose, or doses, of alcohol ceases in from 9 to 24 hours after the last dose has been taken.

The amount of alcohol eliminated, in both breath and urine, is a minute fraction only of the amount of alcohol taken.

In the course of these experiments, the author found that, after six weeks of total abstinence, and even in the case of a teetotaller, a substance is eliminated in the urine, and perhaps also in the breath, which, though apparently not alcohol, gives all the reactions ordinarily used for the detection of traces of alcohol, viz. it passes over with the first portions of the distillate, it yields acetic acid on oxidation, gives the emerald-green reaction with bichromate of potassium and strong sulphuric acid, yields iodoform, and its aqueous solution has a lower specific gravity and a higher vapour tension than pure water. The presence of a substance in human urine and the urine of various animals which yields iodoform, but is not alcohol, had already been discovered by M. Lieben. The quantity pre-

sent in urine is, however, so small that the precise nature of this substance has not as yet been determined.

Finally, the author points out an apparent connexion between this substance and alcohol. It was found that, after the elimination due to the ingestion of alcohol had ceased, the amount of this substance eliminated in a given time at first remained below the quantity normally excreted, and only gradually rose again to the normal standard. A careful study of this connexion may perhaps serve to throw some light upon the physiological action of alcohol.

III. "On the Action of Low Temperatures on Supersaturated Solutions of Glauber's Salt." By CHARLES TOMLINSON, F.R.S.
Received December 4, 1871.

When a solution of the ordinary ten-atom hydrate of sodic sulphate, saturated at about 93° F., its maximum point of solubility, is boiled and filtered into a clean flask, which, being closed, is left to cool to 40° and under, a modified or seven-atom hydrate is formed at the bottom of the solution; this increases in quantity as the temperature falls, and passes into solution as the temperature rises; and, so far, the observation is supposed to be complete.

But if a supersaturated solution of Glauber's salt be reduced from ordinary atmospheric temperatures to low ones by means of a freezing-mixture of snow and salt, the results obtained are so remarkable that I venture to think a short statement of them may be worthy of a place in the 'Proceedings,' by way of addenda to Section II. of my second paper "On Supersaturated Saline Solutions," contained in the Philosophical Transactions for 1871, page 59.

A solution of one part Glauber's salt in one of water was boiled and filtered into a two-ounce flask that had been previously filled with strong nitric acid and well rinsed with clean water. The solution was again boiled in this flask, into which a thermometer was passed, the stem being surrounded by several turns of lamp-cotton, which served to close the flask as soon as it was removed from the source of heat.

Next day the flask was put into a freezing-mixture at about 15° F. The solution slowly sank to 19°, when there was an abundant deposit of crystals of a peculiar opaque white, not like the transparent octahedra that are thrown down when these solutions cool to 40° and under, but very much like the octahedral crystals formed during the cooling of a strong solution of sal-ammoniac. There were tufts of regular octahedra and fern-like crystalline forms. During their formation the thermometer rose to 26°. The flask was now transferred to water at 48°, when the opaque-white crystals broke up into an amorphous woolly mass. As the temperature of the solution rose to 40°, then for the first time the usual transparent octahedra of the anhydrous salt fell down. Next day the