week. Up to August 17, 1867, the observations commenced with either end (A or B) of the needle dipping, and without remagnetizing the needle; *i. e.* the magnetization for the latter half of one observation was made to serve for the first half of the next observation with the same needle, the two needles having been kept during the interval with contrary poles adjacent in a zinc box; but after August 17, 1867, the needle was always remagnetized, so as to make the end A dip during the first half of the observation. The effect of this change of practice was to produce a marked increase in the accordance of successive observations. Tables are given containing every complete observation made up to the end of 1868, and showing, as well as the mean dip, the partial results in each position of the circle, and with each end of the needle dipping, and also the mean weekly and mean monthly values. The mean dip obtained for the months April to December 1867 was 19° 2′·00, and for the year 1868 was 19° 3′·87. The period embraced by the observations is too limited to allow of an exact determination of the rate of secular change; nevertheless the observations show distinctly that the dip is increasing. The author takes +1′·3 as the rate of annual change.

For the probable error of a single weekly determination, including the effect of actual magnetic disturbance of an irregular character, the author obtains for the period from April 29 to August 16, 1867, 0′·67; from August 23 to December 31, 1867, 0′·26; from January 1 to December 31, 1868, 0′·24. Notwithstanding the extreme smallness of these probable errors, the indications of needle No. 2 exceeded those of needle No. 1 by quantities ranging, in the means of periods of a few months, from about 0 to +5′·0. An endeavour is made in another communication to explain a possible cause of these differences.

III. "On the Uneliminated Instrumental Error in the Observations of Magnetic Dip." By Charles Chambers, Esq., Superintendent of the Government Observatory, Bombay. Communicated by Lieut.-General Sabine, R.A., President. Received April 15, 1869.

(Abstract.)

A single reading of one end of a dipping-needle placed in a dip-circle provided with microscopes for observing is liable to a variety of instrumental errors, which are eliminated by taking the mean of the sixteen readings of the two ends in the eight different positions included in a complete observation. Nevertheless it is found that with the best modern instruments a mean value results from these sixteen observations different for each different needle, and that the difference between the results obtained with two different needles is not the same at all times.

The irregularities in the values of the dip observed at Bombay with two needles of excellent character made by Barrow of London, led the author

to investigate the effect of a hypothetical irregularity in the shape of the axle of the needle, such that a section of the axle by a plane perpendicular to its axis would be elliptical instead of circular in form. Another source of error, which was brought to the notice of the Royal Society many years ago in a paper published in the Proceedings, is the displacement of the centre of gravity of the needle from the centre of the axle, combined with inequality in the magnetization of the needle when the poles are direct and reversed. Experience has led the author to the conclusion that the usual method of magnetization, by a definite number of passes of the same pair of bar-magnets, communicates magnetism to the needle very unequally when the one end of the needle is made north and when the other end is made north. Consequently it is advisable to investigate the effects of ellipticity of the axle and of displacement of the centre of gravity at the same time, which the author proceeds to do.

As each of these errors depends upon two independent unknown quantities, suppose the excentricity and the azimuth of the major axis of the elliptic section of the axle for the first, and the two coordinates of the centre of gravity, referred to axes in the plane of motion of the needle and passing through the centre of the axle, for the second, the equation connecting the true and apparent dip, in any one position of the needle and of the face of the dip-circle, will involve four unknown quantities depending on the above errors. If we suppose the instrumental errors small, so that the apparent dip does not much differ from the true dip, these four unknown quantities will appear as coefficients respectively of the sine and of the cosine of twice the dip for the elliptic error, and of the sine and the cosine of the dip for the error of excentricity of the centre of gravity, and will be divided in each case by the magnetic moment of the needle. On taking the mean of the apparent dips in the four usual positions of the needle and of the dip-circle before the magnetism of the needle is reversed, two of the terms, one for each error, disappear, and there results for the difference between the true dip θ and the mean of the four apparent dips (θ') an equation of the form

$$n'(\mathrm{A}-\mathrm{B})=(\theta')-\theta, \quad . \quad . \quad . \quad . \quad . \quad . \quad . \quad . \quad (1)$$

where n' is the reciprocal of the magnetic moment of the needle, and A and B are the constants depending on the errors of the pivot and of the centre of gravity respectively. These two quantities are constant only for the same place, the first involving as a factor the sine of twice the dip divided by the total force, the second the cosine of the dip divided by the total force.

Now let the poles be reversed in the usual way, and let n'' be the reciprocal of the magnetic moment, and (θ'') the mean apparent dip in the four positions after remagnetization; then

$$n''(\mathrm{A}+\mathrm{B})=(\theta'')-\theta. \quad . \quad . \quad . \quad . \quad . \quad . \quad . \quad (2)$$

The equations (1), (2) contain three unknown quantities A, B, θ; but if we repeat the observations with the difference that this time the needle is

magnetized as weakly as is consistent with the condition that the apparent shall not greatly differ from the true dip, we shall obtain two more equations of the form

$$n'''(A-B)=(\theta''')-\theta,$$
$$n''''(A+B)=(\theta'''')-\theta;$$

and these four equations, when suitably combined, will determine the values of the three unknown quantities A, B, θ.

The magnetic moments involved in these equations may be determined with little trouble, and with sufficient accuracy, by placing the needle as a deflector on a unifilar magnetometer, and observing the angle of deflection produced thereby upon the suspended magnet.

A series of observations has been commenced by the author with the view of testing whether the true dip can be determined exactly with a single needle by the method above described, the results of which he hopes to communicate to the Royal Society hereafter.

The Society then adjourned over the Whitsuntide Recess to Thursday, May 27.

May 27, 1869.

Lieut.-General SABINE, President, in the Chair.

The following communications were read:—

I. "On the Laws and Principles concerned in the Aggregation of Blood-corpuscles both within and without the vessels." By Richard Norris, M.D., Professor of Physiology, Queen's College, Birmingham. Communicated by Dr. Sharpey. Received April 29, 1869.

(Abstract.)

In 1827, or forty-one years ago, the phenomenon which forms the subject of this paper was first observed by Mr. Joseph Jackson Lister and the late Dr. Hodgkin.

To these observers the microscope revealed the fact that if a minute drop of human blood is placed between two plates of glass, the red corpuscles apply themselves to each other by their concave surfaces in such a manner as to form long cylindrical masses, which resemble piles of coin, and that very frequently these piles are so arranged as to form with each other a complete network of rouleaux with clear intervening spaces occupied by liquor sanguinis.

Simple as this observation may appear, its importance in a pathological point of view can scarcely be overrated; for upon its correct interpretation depends our knowledge of the real nature of one of the most marked characteristics of inflammation, viz. the phenomenon of inflammatory or homogeneous stasis.

During the forty years which have elapsed since the discovery of this