The author compares this formula with sixty-two of M. Darcy's experiments, and records the results of this comparison in the last three Tables of his paper.

The paper concludes with an investigation of the rise in the temperature of a liquid flowing through a pipe caused by the resistances which its coaxial films oppose to their motions on one another (or, as it is termed, their *frictions* on one another) and on the internal surface of the pipe. The pipe is in this investigation supposed to be of a perfectly non-conducting substance.

February 9, 1871.

General Sir EDWARD SABINE, K.C.B., President, in the Chair.

The following communications were read:—

I. "On the Effect of Exercise upon the Bodily Temperature." By T. Clifford Allbutt, M.A., M.D. Cantab., F.L.S., Member of the Alpine Club, &c. Communicated by Mr. Busk. Received November 12, 1870.

(Abstract.)

The object of the author in carrying out the experiments recorded in the present paper was to inquire whether the regulating-power of the organism held good under great variations of muscular exertion. For this purpose he made frequent daily examinations of his own temperatures during a short walking tour in Switzerland, and found that the effect of continuous muscular exertion upon himself was to sharpen the curve of daily variation—the culmination being one or two tenths higher than usual, and the evening fall coming on more rapidly and somewhat earlier. Charts of the daily temperatures were handed in with the paper. The author made reference also to some observations of M. Lortet, which differed from his own. These observations, which did not come into Dr. Clifford Allbutt's hands until his own experiments were partially completed, were adduced by M. Lortet to prove that the human body was very defective in regulating-power under the demands of the combustion needed to supply the force expended in muscular exertion. Dr. Clifford Allbutt's results were very decidedly opposed to those of M. Lortet; for only on two occasions did he note the depressions of temperature which M. Lortet regards as constant. It would seem, however, that the body is more or less liable to such depressions when engaged in muscular exertion; but the cause of them is very obscure. Of the two low temperatures noted by the author, one occurred during a very easy ascent of lower slopes, and the second was observed during a descent. The author thinks that they may be due to some accidental deficiency in combustion, and inquires whether the capacity of the chest in different individuals may account for the varying in-

fluence of muscular effort upon them, and perhaps for the earlier or later sense of fatigue. The sphygmographic tracings added by M. Lortet to his temperature-charts seemed to show a great inadequacy of circulation.

II. "Observations of the Eclipse at Oxford, December 22, 1870." By John Phillips, M.A., D.C.L., F.R.S., Professor of Geology in the University of Oxford. Received December 28, 1870.

At my observatory, situated about one third of a mile eastward from the great establishment founded in the name of Dr. Radcliffe, the beginning of the eclipse was obscured by a passing cloud: the end was recorded at $13^h\ 38'\ 38'' = 1^h\ 35'\ 0''{\cdot}9$ Oxford mean time.

The progress of the obscuration was observed at unclouded intervals in the first half of the period, continuously during a clear sky in the latter half. Finding it impracticable to observe and measure with ordinary micrometers in the early part of the phenomenon, I arranged to throw the image on a screen, and make my measures on it.

The driving-clock was affected by the extreme cold, so as to make it difficult to keep the sun's image to one place, and it was convenient for other reasons sometimes to shift the image vertically; the method which I employed, however, was independent of these displacements, and allowed of as many measurements of the cusps as might be desired.

It consisted simply in marking at any moment with pencil the situation of the cusps on the screen, and appending to each dot the time by the sidereal clock. Joining, after the eclipse, these dots by a straight line, and then transferring a parallel line of equal length to meet internally a circle representing the limb of the sun, of the same diameter as the solar image, the chord of the cusps at the given time was obtained, from which, by an easy method, the place of the moon's centre at the moment was derived. The apparent diameters of the sun and moon were obtained by measure of arcs on the screen.

The diagrams exhibit the whole process. In diagram fig. 1, four of the lines are drawn from the dots on the screen, A A, B B, C C, D D.

In fig. 2, equal and parallel lines are transferred to the solar circle, whose centre is S, so as to touch it internally at A′ A′, B′ B′, C′ C′, D′ D′. For each of these lines the centre of the moon's place is marked (A″, B″, C″, D″); thus the line of the motion of the moon's centre is given, and the phase of greatest obscuration determined.

The line of motion of the moon's centre is obtained by ruling through the mid points between A″ and B″, B″ and C″, C″ and D″. The point on this line reached by the moon's centre at the moment of greatest obscuration is found by bisection in M. Drawing through M and S the bisecting line of greatest obscuration, the length of the sagitta *m s* is determined.