February 6, 1896.

Sir JOSEPH LISTER, Bart., President, in the Chair.

A List of the Presents received was laid on the table, and thanks ordered for them.

The following Papers were read:—

I. "Impact with a Liquid Surface, studied by means of Instantaneous Photography." By A. M. Worthington, M.A., F.R.S., and R. S. Cole, M.A. Received September 25, 1895.

(Abstract.)

This communication is the first instalment of a review by the aid of instantaneous photography of the ground covered by three previous papers ('Roy. Soc. Proc.,' vol. 25, pp. 261 and 498, 1877, and *ibid.*, vol. 34, p. 217, 1882), in which the phenomena that accompany various kinds of splashes are described. The advance made lies in the unquestionable accuracy and fulness of detail of the information now afforded.

The photographs which illustrate the paper are 158 in number, and were taken by means of a suitably timed Leyden-jar spark, whose duration was less than 3/1,000,000 of a second. In the earlier parts of a splash, when the changes of form are most rapid, the interval between the consecutive stages photographed was made less than 2/1000 or even less than 1/1000 second. Each photograph was taken from a separate splash.

Interesting information is obtained as to the manner in which the concentric outward-spreading ripples originate in the case of impacts of small velocity (low falls), and as to the mode in which, with higher falls, the crater thrown up closes and forms a bubble. Specially remarkable is the difference in the disturbance set up by the impact of a solid sphere, according as its surface is smooth, or, on the other hand, rough or wet. A very smooth sphere becomes sheathed with a thin film of liquid, before it is completely immersed, but makes no immediate visible disturbance of the general flatness of the surface, the level of which rises simultaneously, even at quite distant places; from this flat surface, however, there subsequently emerges a very considerable column, not to be accounted for by the subsidence of any neighbouring wave, and which must be due to the

flow set up below the surface. With a solid sphere that is rough or wet, the phenomena are quite different from the earliest moments of contact, and very similar to those produced by a liquid sphere.

Although a few theoretical or conjectural points are touched on, the authors prefer to abstain at present from even general explanations, and to put forward the photographs simply as a record of facts of fluid motion, hoping that the puzzling nature of some of the phenomena may evoke attention and interest among those most competent to explain them.

II. "A New Method of Determining Freezing Points." By MEYER WILDERMANN, Ph.D. Communicated by LORD KELVIN, F.R.S. Received January 13, 1896.

(Abstract.)

The subject of this paper is the best means of determining freezing points in dilute as well as in concentrated solutions. Two things have to be considered: the proper arrangement of equilibrium in the heterogeneous system, and the proper treatment of the instrument used for measuring temperature.

A. *Arrangement of Equilibrium.*—I begin with the statement that the equilibrium between the solid and liquid solvents in the heterogeneous system (ice and water) is a "perfect" one, and this is characterised by the fact that, at the slightest change of the temperature of equilibrium, one of the two parts of the heterogeneous system disappears; above freezing temperature, the solid, below it, the liquid. In carrying out an experiment the heterogeneous system is simultaneously cooled down or warmed by the arrangements of the experiment (air bath, &c.), and the velocity with which the given liquid is cooled down must also come into consideration. This isolated process must be expressed by Newton's equation, $dt/dz = c(t_g - t)$, in which c is inversely proportional to the quantity of liquid and to the heat capacity, and directly proportional to the surface of the whole volume of the liquid, and t_g is the convergence temperature of the liquid if no ice be present, and can be above or below the freezing temperature. If the convergence temperature be *above* the freezing temperature, the liquid is, at the freezing temperature, continuously warmed by the experimental arrangements to a higher than the freezing temperature t_0, and the process of ice melting takes place. If the convergence temperature be *below* the freezing temperature, the liquid is, at the freezing temperature, continuously cooled to a lower temperature, and the process of ice separation takes place. The velocity of *ice melting* has been found to be expressed by the