of concavity of the film." The most simple and satisfactory proofs of the relative efficiency, as well as the *direction*, of the resultant of these capillary forces, are to be found in the well-known contrary movements of small columns of water and of mercury, when introduced into conical capillary glass tubes placed horizontally. In these cases it is evident, that the effective forces are inversely as the radii of curvature of the terminal meniscuses, and are directed toward their respective centres of concavity.

He maintains, that, if the capillary forces were directed toward the centre of concavity of the film, "the tendency of a column of water raised between two floating bodies by surface-tension would be to lift those bodies: similarly, a column of liquid sustained in a fine tube would tend to lift the tube." Simple mechanical considerations are sufficient to show that he is mistaken in supposing that such a result would follow. Indeed, it is obvious that the elastic reaction of the common meniscus, formed when two such floating bodies are brought near to one another, *does not tend to lift them:* for the *vertical* component of the capillary forces, directed toward the centre of concavity, is exactly counterbalanced by the weight of the adhering liquid elevated between them, while the *horizontal* component is free to draw them together.

So, likewise, the column of liquid sustained in a capillary tube can have no tendency to 'lift the tube;' for it is evident that the weight of the liquid elevated must exactly balance the vertical component of the capillary forces acting at the crowning meniscus within the tube: the horizontal component tends to draw the sides of the tube together.

It is freely admitted that my explanation of this class of phenomena may be imperfect, and may be more or less unsatisfactory; but it seems to me that its shortcomings are not to be found in the directions indicated by the objections put on record by the critic. Such elementary facts as have been elicited above could not appropriately find a place in my paper.

After all, however, the simplest method of reducing this class of phenomena to the reaction of elastic films of liquids is the application (as has been done near the close of my paper) of the principle of Gauss; viz., that this reaction "always tends to reduce the surface to the smallest area which can be enclosed by its actual boundary." JOHN LECONTE.

Berkeley, Cal., March 16, 1883.

A new lecture experiment.

It has long been known, that an iron bar may be permanently magnetized by holding it in the direction of the dipping-needle, and striking it a blow with a hammer. The novelty of this experiment, so far as I am aware, consists in indicating the magnetization of the bar at the instant the blow is delivered. I use for the purpose a reflecting galvanometer (Kohlrausch's pattern), a lantern with detached lens for focusing the reflected beam (or, in the day-time, a *porte lumière*), a piece of gas-pipe 80 cm. long and 45 mm. diameter, and a coil of fine wire large enough to slip freely over the gas-pipe. After carefully demagnetizing the gas-pipe, the coil of wire is connected with the galvanometer, and slipped down against the hand, holding the pipe about 30 cm. from the upper end. With the pipe pointing in the direction of the dipping-needle, a ringing blow is struck on its upper end, and the spot of light on the screen moves promptly from two to four feet, according to the distance of the screen from the galvanometer. A second blow produces only a very small movement compared with the first one. Reversing the gas-pipe, and again striking it, the change of magnetism is indicated by another induced current about equal to the first. The direction of the current is the same as is obtained by moving the coil from the end struck toward the middle of the pipe. By moving the coil along the pipe, before the blow and after it, the induced currents indicate that the temporary magnetism of the pipe produced by terrestrial induction is much weaker than the permanent magnetism produced by the blow. H. S. CARHART.

North-western university,
March 20, 1883.

HOUGHTON FARM EXPERIMENTS.

Houghton Farm. Experiments with Indian corn, 1880–81, with a summary of the experiments with wheat for forty years, at Rothamsted. Cambridge, *Riverside pr.*, 1882. 75 p. l. 8°.

——— *Agricultural physics. Series i. Nos. 1, 2. Meteorology and soil-temperatures.* By D. P. PENHALLOW, B.S. Newburgh, *Ritchie & Hull, pr.* [1883.] 57 p., 5 pl. l. 8°.

BESIDES the intrinsic value which these publications have as reports of carefully conducted experiments, they possess additional interest to all who have at heart the advancement of scientific agriculture in this country, because they are the first public reports of what is here a novel undertaking. The proprietor of Houghton Farm, Mr. Lawson Valentine of New York, has, in effect, established upon it an experiment-station devoted to the scientific investigation of agricultural questions. So far as we are aware, this is the first institution of the kind in the country supported by private munificence, and hence untrammelled by the demand for results of immediate practical utility, and by the mass of miscellaneous chemical work which seriously circumscribes the scientific activity of public experiment-stations. The outcome of this form of the 'endowment of research' will therefore be awaited with much interest.

The first of these reports gives an account of the field-experiments with Indian corn, executed by Dr. Manly Miles in 1880 and 1881. These experiments are, in the main, modelled after the famous Rothamsted experiments of Lawes and Gilbert, and are to be continued through a series of years, with the design of doing for Indian corn what the English experiments have done for wheat and barley. The experimental plots having been laid out and drained in the previous year, a crop of corn was grown in 1880 *without manure*, in order to test the uniformity of the soil and establish a basis for subsequent comparisons. This was followed in 1881 by a crop to which various kinds and quantities of manures were applied on the several plots, certain plots being left unmanured for comparison.