correspondence between things. A function or one-to-one correspondence is a classification and cross-classification of the things which correspond. For example, a division of a number of models having different markings into two classes by colour and a cross-classification by shape gives a correspondence of the markings in one colour class to the markings in the other. If each marking in one class corresponds to the same marking in the other, we have the correspondence one. Similarly, various circular functions may be illustrated by models, beginning with transpositions. If things which correspond are called operands, and a correspondence of operands a function, then names seem to be needed to mean a correspondence of functions, and for the still higher correspondences which occur. In the usual school course we practically begin with the correspondences of functions, namely, of the numbers one, two, three, &c. It would seem more natural to begin with the correspondence, first, of operands to operands, and then of operands to functions, and define words as power, product, sum in reference to correspondences of operands illustrated by models. For example, a set of things the correspondence of which to another set is under discussion may be called a quantity. Two quantities which correspond to the same quantity correspond to each other; and their correspondence to each other is the product of the correspondence of one to the intermediate quantity and of the intermediate quantity to the other. In the case of vectors, since a vector is a correspondence of points, this would require the term product to be given to what is generally called the sum.

The properties of permutation, association, distribution should be considered in reference to tables of operands before considering tables of functions such as multiplication and addition tables. Space will not allow of discussing the illustration of addition, rule of signs, two-to-two correspondence, &c. The study of irrational numbers and continuous spaces should be postponed to a later stage.

Oundle. C. ELLIOTT.

An Emanation from Sodium.

DURING the course of some experiments upon the contact potential difference between the alkali metals and glass I noticed that a freshly cut piece of sodium rapidly discharged an electroscope.

Further examination showed that this action occurred only if the gold leaf was charged negatively. Little or no effect was produced if it was positively electrified. The action could be completely stopped by a membrane of celluloid sufficiently thin to give interference colours, and this fact alone points strongly to the discharging action being due to a vapour.

It was found, in fact, that a slight current of air directed so as to carry the supposed gas away from the charged plate of the electroscope enabled the leaf to retain its charge.

The effect is, however, unlike that met with in the case of phosphorus, since the vapour from that substance discharges both positive and negative electricity equally well. It does not, therefore, appear due to the air becoming ionised by a change occurring at the surface of the sodium, but more probably to the emission of an electrified gas. Experiment has shown that the rapid oxidation of the surface has little or nothing to do with the existence of the emanation, and it is very significant that all action ceases after prolonged heating (to melting point) of the metal. After some hours, however, the sodium shows signs of recovering its power to discharge a negatively electrified body.

Since all portions of the same block of sodium do not exhibit the action to the same extent, I am attempting to concentrate those parts which show it most strongly in order to determine whether some new radio-active body is present in the metal or whether there is a radio-active change occurring in the sodium itself.

A slight indication that the emanation is capable of depositing a radio-active layer of matter has been also noticed. The other alkali metals are now being examined and the whole matter fully investigated.

CHARLES E. S. PHILLIPS.

Castle House, Shooters Hill, Kent.

WIND PRESSURE.

THE importance of a correct knowledge of the pressure exerted by the wind, as affecting the stability of modern structures, was brought prominently before the public by the disaster to the Tay Bridge on the night of December 28, 1879. At that time observatories at which wind pressure was directly measured were rare, the usual observed characteristic of the wind being its velocity as given by the Robinson cup anemometer.

At some stations both the Robinson cup anemometer and the Osler recording pressure plate were installed, and it was for this reason that in the report of the Royal Commission which was appointed in 1881 to consider the question, an attempt was made to state the relation between the probable maximum pressure which would be recorded in a gale and the maximum hourly run of the Robinson cups during that period. Also from records of pressure plates which were considered by the Commission to be not due to instrumental error depending upon momentum, but which represented real phenomena, it was decided that, for structures in exposed situations in this country, a maximum wind pressure of 56 lb. per square foot of surface should be allowed for in the design.

It was, however, felt by engineers at the time that this value, assumed uniform over the whole surface of a large structure, was very excessive, for, as the late Sir Benjamin Baker remarked at a discussion on wind pressure at the Institution of Civil Engineers soon after the report of the Commission was published, if such pressure actually obtained there ought not to be a bridge standing in the country. It was on this occasion that Sir Benjamin Baker stated his conclusions as to the nature of the motion of the wind and the pressures resulting from it, which theory was based, not on elaborate experiments, but on close observation of the behaviour of natural objects in the wind. In his words,

"If leaves and other light objects floating in an apparently steady current were watched it would be found that certain leaves would shoot forward at an increased velocity of 25 per cent. and upwards as compared with the mean velocity. Over a width of 20 feet at the centre of a wide and steady current the mean velocity might thus be constant, whilst over some particular width of 1 foot it might be momentarily fully 25 per cent. higher, and in the case of wind pressure 25 per cent. increase of velocity meant more than 50 per cent. increase of pressure. It was quite possible, therefore, that the large pressure boards might register a notably less pressure than the small boards, and might afford a clue to the reason why railway carriages were not upset when traversing lofty and exposed viaducts."

This appears to have been the first recognition of what may be called the variable structure of the wind as a factor of safety in the stability of structures, and it may be mentioned that the variation predicted by Sir Benjamin Baker was found to exist at points distant 11 feet apart in the experiments of Mr. Dines in 1894.

To test the truth of his conclusions Sir Benjamin Baker erected some wind-pressure plates on the site of the Forth Bridge, each provided with an arrangement for measuring the maximum pressures experienced. One of these gauges was 300 square feet in area, and the others $1\frac{1}{2}$ square feet. Taking the mean of the maximum daily readings for two years, the small-gauge indications were found to be 50 per cent. greater than the large-gauge indications, which was the result anticipated.

In experiments of this kind it is interesting to notice that there is one particular case in which with the