proof drawn from a series of accurate measurements of time, space, and mass which can be repeated at will, so that the man of science of to-day is inclined by his traditions and training to set aside as unworthy of consideration all phenomena which are incapable of treatment by the methods of precision and logical proof. Experimental psychology, however, that can measure rates of fatigue of memory, or persistence of association, has been received into the fold of orthodox natural science, and is making great progress towards a better comprehension of the workings of the human brain.

But readers of M. Bergson's book, especially those acquainted with "Matter and Memory," will recall that M. Bergson looks upon the human brain merely as a means of obtaining recollection, *un organe de rappel,* not as the essential phenomenon of human consciousness or of the life of the mind. Thus by the investigations of modern experimental psychology, we learn more about the instrument of communication between the outer and inner worlds—we do not extend our knowledge of those worlds themselves.

M. Bergson suggested that the function of the brain, and indeed of the recognised senses, is to limit rather than to extend the outlook of the mind. They become the organs of attention to life, picking out and preserving ready for use only those impressions and recollections which will be serviceable to the life of the individual or the species. Everything else is masked and put away where, in normal circumstances, it does not distract the attention of the participant from the things which help him to accomplish his mission in the world. But in certain circumstances, such as illness, shock, approaching dissolution of the partnership between mind and body, the limitation may suddenly disappear, the barrier breaks down—perhaps the reason for its existence is removed—and we get produced the phenomena with which the Society for Psychical Research is accustomed to occupy itself, regardless of mathematical theories concerning the nature of proof.

EXPOSURE OF THERMOMETERS FOR THE DETERMINATION OF AIR TEMPERATURE.

THE report of the Prussian Meteorological Institute for 1911 contains the fourth communication by Prof. G. Hellmann upon the above subject. The observations are discussed at considerable length under three principal heads :—(1) Exposure at a north window (formerly the usual method adopted in Germany) and in a Stevenson screen in a meadow (or field) at Potsdam. This section is accompanied by an interesting set of monthly diagrams showing the mean daily range due to both exposures. (2) Comparison of the Stevenson screen with the aspiration thermometer at Potsdam and Grünberg, in Silesia. (3) Comparison of the true air temperature in a meadow and in the north shade of Potsdam Observatory (about half a metre from the wall).

The following shortened summary gives some of the chief results deduced from the four communications :—

(1) The determination of the temperature near the north wall of a building is practically independent of the nature of the window exposure; the thermometer may even be hung freely, so long as it is not exposed to direct or indirect radiation.

(2) An aspiration thermometer installed near the north wall of a building gives results agreeing very closely with those of the usual window exposure; in the summer half-year the latter gives 0·1°–0·2° (C.) higher readings in the afternoon, while in the winter season the morning and evening observation hours give rather too low readings.

(3) A freely exposed Stevenson screen gives in North Germany too high readings at the afternoon observation throughout the year to the extent of 0·1°–0·2° in winter, and 0·2°–0·4° in summer. At the evening reading also it is 0·1°–0·2° too high in summer, and 0·1° too low in the other seasons; at other hours the differences are very small and of varying sign.

(4) The errors of this screen differ in different climates and with varying conditions of weather.

(5) The true temperature in the shade, on the north side of a building, both as regards absolute amount and daily period, is quite different from that obtained in an open field. At the 2h. p.m. reading the excess of temperature in the field is 0·1° in December and 1·0° in July. These differences increase with duration and intensity of sunshine, and decrease with strong winds.

(6) The true daily means in the north shade of a building and in a meadow differ but little from each other; in winter the meadow daily mean is 0·1°–0·3° the lower of the two.

(7) The hourly readings in the two positions are not comparable, but the daily means derived from the hours 7, 2, 9 by Kämtz's formula exhibit relatively small differences.

(8) The daily oscillation of temperature near the house is about 0·3° in December to 1·6° in June less than in the meadow.

(9) The daily maximum is from 0·1 hour in December to 0·9 hour in June later in the shade of the house than in the meadow, but the time of the occurrence of the minimum is the same in both positions.

HYDROGRAPHY IN ITALY.[1]

THE third annual report on the activities of the Italian Hydrographic Department deals with the year 1911, a period which is stated to have been of particular importance in its history, on account of certain drastic changes which were brought about in the administration of the service, through the passing of a law for the better regulation of the work of collecting and classifying data relating to rivers and their mountain basins, to lagoons and to the sea, and for the systematic study of all streams, their sources and outlets.

This new law assigned to the hydrographic service, in addition to the director, four specialist assistants, and has rendered possible the subdivision of the department into four sections, distinguished as fluvial-hydrographical, maritime-hydrographical, meteorological, and geological.

The report deals with the present and proposed fields of operations, and enumerates the various sub-services to be undertaken. These are as follows :—(*a*) Meteorological; (*b*) aërological; (*c*) telegraphic, for forecasting the weather; (*d*) meteorological, for the city of Venice; (*e*) midday signalling for the port of Venice; (*f*) pluviometric; (*g*) nivometric; (*h*) hydrometric; (*i*) stream measurement; (*l*) flood prediction; (*m*) levelling observations; (*n*) maregraphic; (*o*) maregraphic for the city of Venice; and (*p*) maritime lagoon reclamation. Of these services (*b*), (*d*), (*e*), and (*g*) were only inaugurated in 1912.

Within the limits of a brief notice it is not possible to do more than thus indicate in very general terms the extent of ground covered by the report, and those who desire fuller information or who are interested in any way in the extension and development of hydro-

[1] "Terza Relazione Annuale del Direttore dell' Ufficio Idrografico." By Giovanni Magrini. Pp. 71+plates+maps. (Venice: Carlo Ferrari, 1912.)

graphical research can only be referred to the brochure itself, the seventy pages of which contain much useful and instructive data. Included will be found a number of photographs illustrating various stations, and diagrams showing the method of taking observations. In addition there are four relief maps of the north-eastern portion of Italy (Venice and the adjacent provinces), indicating the scope of operations and their localisation. There is an interesting description of the construction of an experimental tank at Stra.

POSITIVE RAYS OF ELECTRICITY.[1]

THE first part of the paper contains a discussion of the evidence afforded by the positive rays as to the nature of the ionisation of the gases in a discharge tube and the properties of atoms. The positive rays consist of:—

(1) Atoms with one positive charge.
(2) Molecules with one positive charge.
(3) Multiply charged atoms.
(4) Atoms with one negative charge.
(5) Molecules with one negative charge.

All the diatomic gaseous elements which have been examined furnish both atoms and molecules with single charges. The proportion of atoms to molecules varies very largely with the conditions of the electric discharge, and evidence is given that the charged atoms and molecules are produced by different processes. It is suggested that the ionisation which gives rise to molecules is due to kathode rays, while the charged atoms are produced by the impact of charged atoms and molecules.

All the elements examined, with the significant exceptions of hydrogen and a substance of atomic weight 3 (X_3), furnish, under certain conditions, atoms with more than one charge. The power of acquiring multiple charges seems to be connected with the atomic weight rather than with the valency or other chemical property of the atom. Thus the atom of mercury, the heaviest atom investigated, can have as many as eight changes, crypton five, argon three, while the lighter atoms, as a rule, have only two. No undoubted case of a doubly-charged *molecule* of an element or compound has yet been discovered.

The negative charge is found on the atoms of some elements, *e.g.* hydrogen, oxygen, carbon, sulphur, chlorine, but not on the atoms of nitrogen, helium, neon, argon, or mercury. It may be regarded as an indication of the chemical activity of the atom, in so far as this depends upon the intensity of the electric field outside the atom. No negatively electrified molecules of compounds have been observed; the only cases of negatively electrified molecules of elements are those of oxygen and carbon, and these only occur when the elements are liberated from special types of compounds.

The second part of the paper deals with the use of these rays as a method of chemical analysis. Several applications of the method are considered. The first of these is to the detection of rare gases in the atmosphere. It is shown that while none of the heavier gases in the atmosphere occurring in quantities comparable with that of xenon have escaped detection, this is not the case with the lighter gases.

"Neon," it is shown, is not a simple gas, but a mixture of two gases, containing a large quantity of a gas of atomic weight about 20, and a much smaller quantity of one with an atomic weight about 22. The "22" gas was first observed in samples of residues of liquid air supplied by Sir James Dewar, and has since been found in every specimen of neon examined, including a specimen supplied by M. Claud, of Paris, and a very carefully purified sample of neon prepared by Mr. Watson. The sample from M. Claud contained a small quantity of a substance with atomic weight 3, the properties of which are discussed later on.

Another application of this method was to the analysis of the gas in a small glass tube in which 30 mg. of radium bromide had been sealed for more than ten years; in addition to helium, the gas contained considerable quantities of "neon" or some element with very nearly the same atomic weight; there was also a trace of argon in the gas, a little more than would have been expected from the volume of air in the tube, although the difference was not very great.

The other application of the method is to the investigation of the properties of a substance for which $m/e=3, X_3$. This gas is given off by most solids when they are bombarded by kathode rays. Reasons are given for concluding that the substance is not the carbon alone with four charges.

The gas has the following properties:—

It can pass through tubes containing red-hot copper oxide, and then over potash without being absorbed.

It is not changed when sparked for a long time with an excess of oxygen, the oxygen being subsequently removed by phosphorus.

It can pass over metallic sodium without being absorbed, nor does it disappear when heated along with sodium vapour.

It is absorbed by charcoal cooled with liquid air, but it can circulate through a glass spiral immersed in liquid air without being condensed.

It combines with mercury vapour when an electric discharge is sent through the mixture; it also combines to some extent with red-hot copper when passed slowly over it. If stored over mercury vapour it seems to diminish, though very slowly. The gas has been detected after it has been stored for several weeks.

The study of the positive-ray photograph indicates that the substance is monatomic, and generally it seems to be similar in its behaviour to the inert gases, although its chemical properties are apparently a little more energetic.

[1] Summary of the Bakerian lecture delivered before the Royal Society on May 22 by Sir J. J. Thomson, O.M., F.R.S.

UNIVERSITY AND EDUCATIONAL INTELLIGENCE.

CAMBRIDGE.—Dr. Shipley, master of Christ's College, has been reappointed representative of the University on the council of the Marine Biological Association.

On June 3 the Rev. S. A. Donaldson, master of Magdalene College, was re-elected Vice-Chancellor of the University for a second year.

It is proposed to confer the degree of Doctor of Letters, *honoris causâ*, upon Commendatore Giacomo Boni, director of the excavations on the Forum and the Palatine.

The registrary reports that the matriculation this term brings the number of new students for the academic year 1912–13 up to 1200. In the last academic year the numbers were 1156.

Mr. R. Assheton, of Trinity College, and Mr. L. Doncaster, of King's College, have been approved by the general board of studies for the degree of Doctor of Science.

OXFORD.—A summer course in advanced practical organic chemistry, with demonstrations, will be held at Queen's College, on August 1–30, by Mr. F. D.