lines of tracks and many points and crossings, the equipment of a single-phase locomotive costs more and weighs more than that on any other system, and, last but not least, there is a great risk of serious disturbance to telephone and telegraph lines in the neighbourhood due to both electrostatic and electromagnetic induction.

In three-phase working, as used on most of the Italian electric railways, the second of these three disadvantages does not obtain, but the first disadvantage is accentuated owing to the need of two live conductors for each line of track, and the possible effect on the telegraph and telephone lines is the same. The high-tension continuous-current system is growing in favour, therefore, but it suffers from other disadvantages, although it would certainly appear to fulfil most completely the conditions required in a large number of cases. Standardisation is, of course, desirable for railway working, owing to the through traffic from one line to another, and many suburban lines are already equipped on the medium-pressure third-rail system. In the full discussion of the subject in Paris, the relative values of these and other technical points were weighed.

Among the other papers read at the Paris meeting was one by Mr. W. Slingo, engineer-in-chief of the British Post Office, on certain auxiliary apparatus in telephone exchanges. He described a class of apparatus, originally evolved in connection with automatic telephone exchanges, which is now being applied by the Post Office in some of the manual exchanges in London to assist in the distribution of traffic. In ordinary exchange working, when a subscriber removes his telephone from the hook, a lamp corresponding to his number glows, being actuated through a relay, and the operator to which this number is allotted, or one of the operators on either side of her, places a plug in the subscriber's answering jack immediately by the lamp, and makes the necessary connection. In spite of there being three operators who can attend to any subscriber in the busy hours of the day, there is nevertheless a certain amount of time in which each operator is not fully engaged. In the new "Avenue" exchange, an endeavour to level the work of the operators was made by using "ancillary" jacks for each subscriber, multipled over two other sections of the board, so that any one of nine disengaged operators could take any call. In the new system, however, this distributing of the calls to a free operator is made absolutely automatic. The allotment of groups of subscribers to definite operators is discontinued. As soon as a subscriber lifts his telephone from the hook, an automatic switch at the exchange end of his line selects a line leading to any operator who is idle for the moment, the calling lamp at her position glows, and she immediately answers the call.

Two lectures were given on the closing day of the meeting, one, by M. Georges Claude, on the neon light, and the other, by Commandant Ferrié, on the Eiffel Tower time signals. A discharge in a tube of neon gas gives a very pleasant red or orange-red light, which is, however, absolutely devoid of blue rays. M. Claude proposes to combine the use of these tubes with mercury-vapour tubes, and as the latter are rich in blue rays and devoid of red, a more or less white light is obtainable. A difficulty arises in the fact that while the neon tube requires high-tension alternating-current for the luminescent discharge, the mercury-vapour tube requires low-pressure continuous current. It appears, however, that M. Claude uses in his "correcting" tubes both neon and mercury, which, he said, renders them suitable for alternating current (the exact physical explanation of this was not given in the lecture), so that both tubes can be connected to the same circuit. He gave the efficiency of the combination at about 0·8 to 0·9 per candle.

Commandant Ferrié's lecture on the Eiffel Tower time signals was extremely interesting, but as this subject was described in detail in NATURE of March 13, it is unnecessary to do more than mention it briefly now. The time signals at present are sent out twice daily, from 10.44 to 10.49 a.m., and from 11.44 to 11.49 p.m. From July onwards there will be some alteration in the times for sending out these signals and also in the character and sequence of the warning signals. The times for the exact time signals will then be altered to 10 a.m. and midnight. To enable the greatest possible accuracy of observation, a series of 180 short dots regularly spaced at one second less about 1/50 of a second apart are sent out immediately before the ordinary night signals. To facilitate counting, the 60th and 120th dots are omitted. This series of dots is received by the Paris Observatory and other observatories, in each of which the operator listens at the same time to the beats of the master clock or another seconds chronometer. The two sets of beats thus constitute an "acoustic vernier," and during the time that the 180 wireless dots last, three coincidences spaced thirty seconds apart occur between the wireless dots and the beat of the clock. By noting the time indicated by the chronometer at the moment of coincidence, as well as the number of wireless impulses heard before the coincidence occurs, it is possible to calculate the time of the chronometer at the receipt of the first wireless impulse. For instance, if the Greenwich mean time of a coincidence was 23h. 30m. 25s., and the number of the stroke at coincidence was 42, the time of the first beat will have been 23h. 30m. 25s. minus 41 (1 − 1/50) seconds = 23h. 29m. 44·82s.

PROF. BERGSON ON PSYCHICAL RESEARCH.

PROF. HENRI BERGSON delivered his inaugural address as president of the Society for Psychical Research on Wednesday, May 28, in the Æolian Hall, New Bond Street. At the close of the address, which was delivered in French, and held the close attention of the company for nearly an hour and a half, Mr. A. J. Balfour, a past-president of the society, rose to express the thanks of the hearers, and characterised the address as the most interesting and illuminating one that the society has ever received. When we recall that Mr. Balfour himself, Prof. William James, Lord Rayleigh, the late F. W. H. Myers, and many other distinguished men have held the office of president, we can but feel that M. Bergson has justified both the choice of the society and his reputation as a maker of new thought.

M. Bergson took as his principal theme a study of the nature of the prejudices against the work and methods of the society; in fact, against its very existence—prejudices felt, not by the uninformed and unlearned, but by men of science, keenly desirous to extend the bounds of human knowledge. He attributed the objection to the methods which the experimenters in psychical research were forced to adopt in order to pursue their investigations—methods akin to the judicial, the historical, or even to those of the criminal detective, but, since the Renaissance, foreign to the world of natural and experimental science. The great development of mathematical science, based on the recovery of Greek learning, and carried forward by such men as Kepler, Galileo, and Newton, had given to the modern mind the conception of scientific

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 subservices 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.)