

another bar of identical length, shape, and size. The total resistance when the two bars are in contact is about three-quarters the resistance of one bar alone. As the gap is increased, there is at first a small decrease in the resistance. With a gap equal to the thickness of one bar, the total resistance is the same as when the bars are in contact, and becomes equal to the resistance of one bar alone when the gap is twice the thickness of one bar. With a gap of sixteen times the thickness, the total resistance is only 5 per cent. less than double the resistance of the single bar. It would appear from these experiments that the total resistance of struts, following in the same run of air and more than thirty times the thickness apart, may be assumed to be the same as the total resistance of the separate struts in a clear run of air.

THE Vesterling Organisation Company, Clapham Junction, London, S.W., manufactures a convenient loose-leaf book, which has certain novel characteristics. By the use of a patent device in the back of the book it opens flat at any place. Specially made rings render the filing of new papers, or removal of old, simple and quick. The book will prove of real assistance to lecturers who use copious notes, and to all who have to preserve loose papers in a way which makes ready reference easy.

A 1914 supplement to their "General Apparatus Catalogue, 1910," has been issued by Messrs. Heynes Mathew, Ltd., of Cape Town. The new list of apparatus affords an instructive illustration of recent progress in South African education. The improved methods of teaching geography which have become established in this country, for example, are being taken up in South African schools, and a demand for material for lessons in practical geography is met by a section in the new catalogue being devoted to this subject. Similarly this firm is prepared to supply equipment for practical work in botany and other branches of science.

OUR ASTRONOMICAL COLUMN.

PLANETARY OBSERVATIONS AT THE LOWELL OBSERVATORY.—In *Astronomische Nachrichten*, No. 4710, a telegram is published from Prof. Lowell relating to observations on the satellites of Saturn and on Martian features. With regard to the former it is stated, "Tethys and Dione variable, range quarter magnitudes, periods coincident with revolution." Relating to the latter, the telegram says:—"The full aperture of the 40-in. reflector of the Lowell Observatory only now equipped for visible work shows the canals of Mars as fine direct geometrical lines, thus corroborating the work of smaller apertures. This should dispose of the erroneous idea that [such] apertures do not disclose these remarkable features."

WAVE-LENGTHS OF CHROMOSPHERIC LINES.—It was known soon after the event of the total solar eclipse of August 30, 1905, that Prof. S. A. Mitchell, who was in charge of the numerous spectroscopic instruments which were employed in the United States Naval Observatory eclipse expedition, had secured some most excellent photographs of the spectrum of the chromosphere. It is not until now, however, that

the results of their reduction are published, and these are printed in the current number of *The Astrophysical Journal* (December 1913). The photographs discussed were secured with gratings, both parabolic and plane, and the present paper deals with the reduction of one photograph from each instrument for the purpose of giving chromospheric wave-lengths, intensities, &c., "with as great an accuracy as possible." This communication is finely illustrated with plates showing different portions of the photographs, and they are demonstrative of the very fine adjustment of the instrument during use. A very long table shows the wave-lengths compared with Rowland, and the heights of the chromospheric lines, the corresponding elements and intensities according to Rowland, chromosphere, arc, and spark. No fewer than 2841 lines are tabulated in the chromospheric spectrum, and this above many faint lines which were measured; no lines were included unless they were measured in two or more separate measurements. The paper is full of many interesting summaries of these chromospheric lines arranged according to elements, atomic weights, &c. The conclusions arrived at are important, but it is impossible to repeat them all here. Some of them are as follows:—The "flash" spectrum is a reversal of the Fraunhofer spectrum. The "flash" is not an instantaneous appearance, but the chromospheric lines appear gradually, the highest layers first, the lowest last. The "reversing layer," which contains the majority of the low-level lines of the chromosphere, is about 600 km. in height. Wave-lengths in chromospheric and solar spectra are practically identical, the chromospheric spectrum differing greatly from the solar spectrum in the intensities of the lines. The differences of intensity find a ready explanation in the heights to which the vapours ascend. The enhanced lines are especially prominent in the chromosphere, and these are said to become brighter mainly because at the heights to which they ascend the vapours are mixed with hydrogen at reduced pressure.

THE ANNUAL OF THE BUREAU DES LONGITUDES.—The annual published by the Bureau des Longitudes is familiar to all readers of this column, and the present issue for 1914 will no doubt be found as useful for reference as its predecessors. In addition to the usual astronomical, physical, and chemical data embodied in these small pages, will be found articles of astronomical interest. Thus M. Deslandres gives a *résumé* of solar physics, M. P. Hatt contributes a short article on the deformation of images in telescopes, while M. G. Bigourdan writes very fully on the day and its subdivisions, the hour-zones and the international association of the hour. The seventeenth meeting of the International Geodetic Association is described by M. B. Baillaud.

WHAT IS PSYCHO-ANALYSIS?

PERHAPS the most important and startling scientific theory of modern times is that which Prof. Sigmund Freud, of Vienna, has formed to explain the workings of the human mind. Many thinkers, indeed, hail Freud as the Darwin of the mind, and consider that his views are destined to transform the science of psychology. He certainly has succeeded in explaining such obscure and widely differing phenomena as dreams, wit, the seemingly accidental mistakes in speaking and writing which people so often make, the obsessions and other symptoms found in a large class of mental diseases, and the spontaneous likes and dislikes which we all experience and find so puzzling, in terms of one single hypothesis. Put quite briefly, this is the hypothesis of "the unconscious mind," something quite distinct

from that theory of the "sub-conscious," with which we have been so long familiar in psychology.

The unconscious mind is a legacy from our earliest years of childhood, and its mode of working differs very considerably from that of our mind in later life. A little child is dominated by its wishes and desires, and strives blindly and persistently to satisfy them. Many of these wishes are bound up with the intense love which it feels for its parents or its nurse. Later on, under the influence of education and training, it learns to suppress some of these wishes because they are in conflict with other interests and desires of which it is now capable, and which are more in harmony with ethical and conventional standards. It learns to face pain instead of turning away from it, and to abandon its wishes for the sake of higher aims, instead of clinging blindly to them. But the childish wishes have not been destroyed. They continue to exist in the mind, although their owner is no longer aware of them. They form the nucleus of the "unconscious." In later life similar conflicts may occur, and unacceptable wishes may be suppressed. If these happen to be analogous to the earlier ones, they join them, and so are themselves drawn into the unconscious, and continue to exist in the mind with undiminished intensity, although unable under ordinary conditions to come to consciousness. On the other hand, if they do not become associated with corresponding infantile wishes in the unconscious, they remain ordinary memories, and gradually fade away and lose their intensity as such memories do. They do not become unconscious, but merely sub-conscious, or, as Freud puts it, "pre-conscious."

This distinction between the "unconscious" and the "pre-conscious" is fundamental in Freud's theory. It is a distinction between two classes of memories. Those memories which, as described above, join the unconscious are said to be "repressed." They cannot return to consciousness unless the repressing force of the mind, which Freud calls the "censor," is overcome. They continue, however, to exist with undiminished vigour like the infantile wishes, and with these latter are the cause of the mystifying experiences of life to which we have already referred. They often cause the slips of the pen and slips of speech which befall us when our attention is distracted. In these cases the censor has been caught napping, as it were, and the unacceptable wish comes for a moment to the surface of the mind. Thus a lady, writing to a girl friend who had recently married a man to whom she herself was attached, ends the letter with the words, "I hope that you are well and unhappy." The malevolent wish here comes to unintentional expression. The symptoms of so-called functional mental diseases, such as hysteria, are invariably caused by repressed tendencies from the unconscious. A young girl suffering from hysteria shows the symptom of a tightly-clenched right hand which she is unable to open. By the method of psycho-analysis, which we have still to describe, the physician discovers that the cause of this is a serious adventure which had happened to the girl in early youth, and which she had persistently refused to tell to her relatives. The determination not to tell, which is now quite unconscious, for the girl no longer remembers anything about the past event or the circumstances connected with it, receives a *symbolic* fulfilment in the clenched hand. As soon as the physician brings back the memory, the hand unclenches and the girl is cured.

It has been suggested, with great show of reason, that Hamlet was a hysteric, and that the so-called mystery of Hamlet is due to the effect of unconscious feelings of love towards his own mother dating from

his earliest childhood (of which he is now completely unaware, and his creators—Shakespeare and his authorities—likewise). Hamlet cannot take vengeance on his uncle because he himself in earlier years had wished his father's death, and this persisting wish in his unconscious mind now paralyses his actions. Only in this way, it is thought, can—e.g. Hamlet's soliloquy in Act iv., Sc. iv., after he has at last received overwhelming proof of his uncle's crime, be adequately explained:—

"Now whether it be
Bestial oblivion or some craven scruple
Of thinking too precisely on the event,—
A thought which, quarter'd, hath but one part wisdom
And ever three parts coward,—I do not know
Why yet I live to say 'this thing's to do,'
Sith I have cause, and will, and strength, and means,
To do it."

This inability to act, expressed in the lines italicized, seems to have an adequate psychological explanation in the working of the repressed tendency just referred to, and its concomitant ideas, which Freud calls the "Oedipus complex." In the play of Sophocles, Oedipus unwittingly kills his father, Laius, and marries his mother, Jocasta, and this is a mythical representation of an inner mental tragedy overhanging each one of us, to which the hysteric, through mental weakness, succumbs.

The pleasure and amusement derived from some forms of wit may be explained as due to repressed and forbidden wishes which attain fulfilment in spite of the censor by means of the technique of the joke. Other forms of wit, though not so obviously related to repressed wishes, can likewise be explained in terms of Freud's general theory.

Finally, dreams are, in Freud's view, invariably the disguised fulfilment of repressed wishes. Harmless memories from the previous day, and from earlier periods of life, are manipulated by the dream-activity in such a way that they form a disguise for a repressed wish emanating from the unconscious, enabling the latter to evade the censor and thus come to consciousness during sleep. It would appear that sleep renders the censor less alert than he is during waking life, although if we passed beyond this metaphorical way of putting it we should come to a more profound theory much too difficult to describe, even in outline, here. The dream as it appears to the dreamer is simply a patchwork of memories of apparent unintelligibility, but underlying them are rational dream-thoughts corresponding to the fulfilment of repressed wishes. Often the dream represents the dream-thoughts symbolically, since this is a convenient way of evading the censor.

The method of interpreting any dream is identical with the method of interpreting a hysterical symptom or any other manifestation of unconscious ideas. Indeed, it is the one method whereby Freud has convinced himself of the existence of these unconscious ideas. This method is *psycho-analysis*. The dreamer or patient is asked to put himself into a relaxed and meditative frame of mind, and, starting from different parts of the dream, or different facts in the history of his mental disease, to observe and report faithfully the various ideas that arise spontaneously in his mind in connection with them, suppressing none of them, however objectionable or painful they may be. Experience shows that this method enables ideas in the unconscious to overcome the resistance of the censor and rise to consciousness. In the case of mental disease the bringing back of these repressed memories to consciousness involves the cure of the patient, since they can now be rationally faced and dealt with, and the mental energy that has been locked up in them, "fixated," can be liberated and put at the disposal of the higher conscious self.

Psycho-analysis is a lengthy process, demanding much tact and ingenuity from the psychologist or physician, but its results are of such surpassing interest and value that it should be regarded as one of the most important methods of mental science.

WILLIAM BROWN.

THE SURVEY OF INDIA.¹

THIS general report for 1911-12, which has lately appeared, states concisely the progress made in the various departments of the Survey of India, the detailed descriptions and discussions of results being present in vol. iii. of the Records of the Survey. In the year under review, Colonel S. G. Burrard, F.R.S., was confirmed as Surveyor-General in succession to Colonel F. B. Longe. Topographical surveys were pushed on in various parts of the country, and work was done to meet some special requirements, of which may be mentioned the large-scale map of the Delhi site, with contours at 5 ft. vertical interval for the use of the town-planning committee. On the Geodetic Survey the astronomical latitudes of eleven stations were determined, and at one of these, Bihar, the largest southerly deflection of the plumb-line as yet found in India was found. Pendulum observations were made over the same region. In the principal triangulation the Sambalpur meridional series was commenced, and carried from lat. 23° to lat. 22°. In Kashmir secondary triangulation was carried along the Hunza and Kanjut valleys to form a connection with the Russian triangulation in the Taghdumbash Pamir.

The field detachments of the Magnetic Survey were employed on the detailed examination of the Deccan trap area in Central India and Hyderabad State, where considerable abnormalities exist. Comparative observations were made at the survey base stations, and a large number of repeat stations were visited for observation. In the Map Publication Office orographic colouring, by means of a series of colour tints from light green through yellows, browns, purples, and red, has been adopted for the one-millionth scale in place of shading as facilitating the provision of information. These sheets differ in size and in the unit (foot) of the vertical measurements from those of the international map, but as they form the key to the whole system of nomenclature and the arrangement of the topographical sheets, they cannot be dispensed with.

A series of "departmental papers" is to be commenced. These will be numbered serially, and will include all papers which, being published for departmental use, do not fall within the scope of the "Professional Papers," and are not of public interest.

Those, however, who are interested in the technical details of surveying will turn rather to the third volume of the Records of the Survey of India, where full accounts of this work will be found. Topographical surveys included triangulation, levelling, traversing, and detailed measurement on various scales from 1 in. to one mile, to 20 in. to one mile in cantonment survey. Many points of interest and modifications in procedure are noticed, among which we may mention the experimental use of Bristol boards instead of drawing paper on the plane-tables used in the field. If these are fastened firmly to the board by one edge only, and loosely by cloth slips

¹ General Report on the Operations of the Survey of India during the Survey Year, 1911-12. Prepared under the Direction of Colonel S. G. Burrard, F.R.S., Surveyor-General of India. (Calcutta: pp. vii + 36 + 12 maps, 1913.) Price Two Rupees or Three Shillings.

"Records of the Survey of India." Vol. iii., 1911-12. Prepared under the direction of Col. S. G. Burrard. Pp. 176 + 12 maps. (Calcutta.) Price 4 Re. or 6s.

on the other sides, the trouble arising from distortion of the sheet when working in very dry climate is greatly reduced. Further experience with these boards is awaited.

In geodetic work the use of a new and more powerful zenith-telescope is reported, and determinations of latitude were made with it at eleven stations. Of these all stations but one, Khajnaur, on the north side of the Siwalik Hills, the attraction of the plumb-line is southerly, the largest value being at Biharas, mentioned above. In the pendulum work, observations were made to the north of the Ganges in a region which showed unusually low density, and it is suggested that Karachi, situated on the edge of the high plateau which forms the southern edge of the Ganges valley, may be near the crest of a ridge of high density. An important piece of work in this connection was an investigation of the isostatic theory of Mr. Hayford, with respect to a number of Indian stations, and the results obtained for the above-mentioned stations are given. In the account of precise levelling it is mentioned that experiments are being carried out with a new pattern of aluminium staff.

A full account of the magnetic survey and work in the observatories is given, but this calls for no special remark. In an appendix is given a synopsis of geodetic work near Dehra Dun, which is illustrated by a map showing the triangulation and gravity observation stations, as well as the lines of precise levelling. The whole volume forms a valuable contribution to the literature of high-grade surveying.

H. G. L.

THE ASSOCIATION OF TECHNICAL INSTITUTIONS.

THE twenty-first annual meeting of the above association was held at the Clothworkers' Hall, Mincing Lane, on January 30 and 31 last, and was attended by upwards of 120 delegates representing all the important technical institutions in the United Kingdom, of whom about ninety-seven are enrolled in the association.

The new president, Sir Alfred Keogh, K.C.B., on taking the chair, delivered his inaugural address, in which he dealt with the report of the Royal Commission on the reconstitution of the University of London, and especially with that part of it concerned with technological studies. He expressed great satisfaction with the position accorded to the faculty of technology in the proposals of the Commission, particularly with respect to the methods of administration and with the prominence assigned to the sphere of utility in educational questions.

The Commission recommended the establishment of a self-governing faculty of technology in the University, such faculty to embrace all branches of applied science. He dwelt upon the extreme importance of bringing the specialisation of science well within the sphere of the University, and expressed gratification that entrance to the University would be made more accessible to the fit student with greater freedom for the teacher.

Various questions of considerable importance to the well-being of technical institutions were considered. Amongst them, the registration of teachers and the proposals of the newly established Teachers' Registration Council. Great satisfaction was expressed with the happy solution of this extremely difficult question by means of which the profession of teacher had been unified, and it was unanimously agreed that it was desirable that all eligible members of the teaching staffs of technical institutions should seek enrolment.