

VELOCITY OF EARTH MOVEMENTS CAUSED BY THE MESSINA EARTHQUAKE.

TO the *Reale Accademia delle Scienze di Torino* (1909-10, p. 355) Prof. G. B. Rizzo has contributed an interesting paper on the velocity with which earth movements occasioned by the earthquake which ruined Messina on December 28, 1908, were propagated to different parts of the world. First he gives in detail the observations made with various types of seismographs at 110 stations. These he sums up in tables, which show for the preliminary tremors or P_1 , their followers or P_2 , and the large waves or P_3 , the time taken by them to travel from their origin to these various stations, their average superficial velocity, and the velocities with which the two first types of movement may have passed along paths corresponding to chords. The first results are also shown as curves drawn on squared paper, the two ordinates, respectively, referring to time and distance. The greatest distance considered is 10,000 kilometres, or 90 degrees, although the tables give results to distances exceeding 18,000 kilometres, or 163 degrees. Dr. Rizzo remarks that none of these curves show the flexure near the epicentrum which Schmidt, like Seebach, has used to determine the depth of the hypocentre. The absence of this is taken by Dr. Rizzo to indicate that the origin of the Messina earthquake was very shallow, a conclusion which I do not think will be shared by all seismologists. Many seismologists will, however, agree with him when he bases the idea of a shallow origin upon the comparatively small area of destructivity.

Up to a distance of 1500 kilometres from the epicentre the velocity of all three phases of movements is constant. The inference from this is that up to such a distance the movements are propagated within the crust of the earth, which is estimated as having a thickness of 44 kilometres. From this distance there is a marked increase in the velocity of the first phase, which, however, is not shown by the succeeding phases. The third or large-wave phase he divides into three parts, which he calls L_1 , L_2 , and L_3 . L_1 appears to correspond with the commencement of maximum motion, whilst L_2 is the maximum movement itself. L_3 is the phase which travels the slowest, but if this is to be accepted as a definite and a recognisable phase in a seismogram, there seems to be no reason why we should not also accept very many other phases, which might be indicated by the letters L_4 , L_5 , L_6 , &c.

Of late years, very many hodographs of the character of the one now presented to us by Prof. Rizzo have been constructed. Prof. H. F. Reid has given us an excellent set of time curves relating to the San Francisco earthquake of 1906. Up to a distance of about 55 degrees from the origin these indicate velocities somewhat higher than those given by Prof. Rizzo, but beyond that distance they are very similar. This kind of difference which we find in the work by different seismologists may be due to differences in the manner in which they have interpreted seismograms, but it is much more likely to arise from the non-recognition of all the elements which should be considered when carrying out these particular investigations.

J. MILNE.

THE EBRO OBSERVATORY OF COSMICAL PHYSICS.

EL OBSERVATORIO DEL EBRO is situated in Roquetas, near Tortosa, on the river Ebro, Spain. It is in latitude $40^{\circ} 19' 14''$ N. and longitude $0^{\text{h}}. 1\text{m}. 58.5^{\text{s}}$ E. Its altitude is 51 m. Originally of private origin, it was inaugurated in September, 1904, in connection with the Collège d'Études Supérieures de la Compagnie de Jesus, Tortosa, with the assistance of many private individuals. In October, 1904, it was recognised by the Spanish Government as an establishment of public utility, and, following this, the Government in 1907 made a grant in aid, which is used to defray the cost of the publication of memoirs and bulletins.

The observatory consists of eight separate buildings, and observations are made in meteorology, solar physics, terrestrial magnetism, electricity, and seismology. An account of the observatory, and also of the observations of the total solar eclipse of 1905, is contained in the first

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memoir, written by the director, Padre R. Cirera, S.J. The second, third, and fourth memoirs are entitled, respectively, "La Observacion Solar," "La Seccion Magnética," and "La Seccion Electrica."

In the solar section, daily photographs of the sun are taken both in integrated light by photoheliograph and in "K" by the spectroheliograph, which is of the Evershed type. This instrument gives a disc of 62 mm. diameter, the primary image being formed by an objective of 150 mm. aperture and 2 m. focal length.

The areas and positions of spots, on the heliograph pictures, and of the flocculi, on the spectroheliograph negatives, are measured and published in the monthly bulletins.

In the meteorological section, all the usual observations of pressure, temperature, rainfall, winds, and clouds are made with well-known standard instruments three times a day, viz. at 7h., 14h., and 21h.

The observations of atmospheric potential, ionisation, &c., are undertaken by the meteorological department. In the department of geophysics, the observations of magnetic values and variations are made, and hourly values are tabulated. A microseismograph "Vincentini" and a "Grablovitz" pendulum are used in the seismological section. The results of all these observations, both tabular and curves, are published in monthly bulletins.

The first bulletin is for January, 1910, and those for February, March, and April have also been published. The January bulletin contains a short account of the observatory, and accounts also of the methods used in making and reducing the observations.

Having regard to the amount of work which each bulletin represents, and noting the convenience of having all the different elements registered in one volume, the director, Padre R. Cirera, S.J., is to be congratulated on having been able to issue them so shortly after the making of the observations.

M.

EMOTION AND MORALS.

ON Saturday afternoon, March 11, a meeting of the British Psychological Society was held at King's College, London, Mr. A. F. Shand in the chair, when Dr. William Brown read a paper on "Emotions and Morals." After a brief survey of the views of earlier writers on the nature and classification of the emotions and their relation to ethics, in which, however, the doctrines of Aristotle and Adam Smith ("Theory of Moral Sentiments") were treated at some length, the author proceeded to discuss the meaning of the terms "passion," "emotion," and "sentiment" in relation to the theories of Ribot, Shand, and McDougall. According to ordinary uses of the term, and also to its etymology, passion would seem to indicate an uncontrollable state of mind, in the form either of an actual emotion or a system of emotional tendencies. Although Shand's employment of the term sentiment to express the conception of "a system of emotional dispositions centred about the idea of some object" would theoretically cover the latter of these two uses, passion seems to be a more appropriate and expressive word to indicate those systems which are uncontrollable by the rest of the mind, and issue, under appropriate conditions, in uncontrollable emotions, e.g. "a passion for politics," "a passion for the stage."

The word sentiment, as used in literature, has acquired associations of weakness or placidity which constitutes a slight drawback to its use in scientific psychology to cover all cases included in the technical definition of Shand above-mentioned. "Tender emotion," identified by Ribot and McDougall with the parental instinct, seems to have a wider connotation, and receives more adequate treatment from Shand. In particular, the element of tenderness or pathos present in many æsthetic emotions has little connection with the parental instinct.

The question of "emotions and art" was treated at some length, with special reference to music and the drama. Neither the sensationalistic nor the formalistic theory is adequate as an explanation of music. The ancient Greeks were right in regarding music as "the proper language of the emotions," but it is important to realise that the emotions of music are not, strictly speaking, identical with the emotions of everyday life. They