

said to be accompanied with thunder and lightning; some of the storms are very heavy, and a lightning recorder has been erected at Johannesburg which gives a permanent record of their intensity and duration. On the High Veldt the mean temperature of the twelve months ranged from 57° at Volksrust to 65° in the Waterberg, the extreme maxima from 87° to 104° , and the extreme minima from 14° to 29° . Telegraphic messages are received and exchanged daily, and the Government has sanctioned the appointment of an assistant, to be trained in weather forecasting at the Meteorological Office in London.

THE THEORY OF FREQUENCY-DISTRIBUTIONS.¹

THREE brief but important notes on the theory of the law of error were communicated to the Royal Academy of Sciences at Stockholm last year by Mr. Charlier, director of the astronomical observatory at Lund. The first of these ("Ueber das Fehlergesetz") is a discussion on the lines, generally, laid down by Laplace. An "error" is supposed to be given by the sum of a large number of elementary errors, each with its own law of frequency; these laws need not be the same, but are subject to the condition that the frequency should not fall off with great rapidity on either side of the mode. On this condition, the law reached is the known expansion in terms of the normal function and its differentials, recently discussed in detail by Prof. Edgeworth (Camb. Phil. Trans., vol. xx.). In his second note ("Die zweite Form des Fehlergesetzes") Mr. Charlier discusses the complementary case, in which the condition stated does not hold, supposing, for instance, that each elementary error can only take the value zero or a , and that the probability of a is very small. The normal function of the former series is now replaced by an auxiliary function of more complex form. These two laws are referred to as Type A and Type B. The third note ("Ueber die Darstellung willkürlicher Funktionen") bears on the general mathematical method employed.

The present memoir, which is written in English, is a sequel to these purely mathematical notes, discussing the practical work of fitting such curves to given statistics and so forth. The method of fitting used throughout is Prof. Pearson's "method of moments," which has proved so widely applicable. The illustrations are numerous; for Type A, frequencies of stigmatic rays in Papaver, Johannsen's distributions of weight in beans, cephalic indices of Swedish recruits, and deaths from typhoid fever in groups of three successive days during an epidemic at Lund; for Type B, De Vries's statistics of numbers of petals in Ranunculus, and Johannsen's figures for sterility in barley. Davenport and Bullard's data for the numbers of glands in the fore-legs of swine are discussed under both heads. These illustrations are followed by a short section on the dissection of a compound curve by Pearson's method (Phil. Trans., 1893). One or two possible cases of approximation are discussed, and an interesting suggestion made as to the employment of a graphic method to lighten the labour of solving the fundamental nonic. The text of the memoir is followed by some tables giving, *inter alia*, the third and fourth differentials of the normal function, and values of the auxiliary function for Type B.

There are several incidental points of interest; a proof of the empirically discovered rule that the difference between mean and median is one-third of the difference between mean and mode for Type A deserves mention, and a suggestion as to an arithmetical check in calculating moments is worth consideration from the practical standpoint. If one may judge from a diagram (Fig. 5), curves of Type A may be bi-modal. Is this so? The point does not appear to receive special attention in the text. The statement on p. 15 that "as a rule it may be advisable

to take the class range smaller than the standard deviation" would seem to be rather incautious. Surely, as a rule, it should be not merely smaller, but a good deal smaller—say one-third of the standard deviation or less?

The memoir and its preceding notes must be commended to the attention of all who are interested in the theory of frequency distributions either from the mathematical or the statistical side.

G. U. Y.

A PLEA FOR AN EXPEDITION TO MELANESIA.

DR. A. C. HADDON, F.R.S., recently brought before the research department of the Royal Geographical Society a plea for the investigation of biological and anthropological distributions in Melanesia. The Melanesian islands constitute a fairly well-marked biological province. Many of the islands are of large size, and there is reason to believe that some of these are vestiges of an ancient land-mass that probably became submerged in the Mesozoic period. The islands of Melanesia have yet to be studied from a geomorphological point of view, and their geology is extremely little known. Botanists would welcome a more ample knowledge of the flora of the district as a whole and of particular portions of it, and many problems of plant structure, distribution, and ecology require detailed investigation on the spot. The same remarks apply to zoologists. Botanists and zoologists alike would welcome an opportunity for extensive or intensive study of the systematic distributional or biological problems of plants and animals in Melanesia.

There are also many anthropological problems in Melanesia that require investigation in the immediate future, since the dying out or modification of arts, crafts, customs, and beliefs that is now taking place, and the shifting and mixing of populations, will soon render their solution difficult and even impossible. On the other hand, there are many districts never yet visited by a white man, and many islands of which science has no knowledge.

There is a certain amount of variation in the physical character of the people of these archipelagoes that requires local study for its explanation. A good deal is known in a general way about the arts and crafts of the Melanesians, but an investigation of the kind proposed would verify existing data, add an immense number of trustworthy facts, and localities could be ascertained of unlocated specimens in our museums, and the uses of doubtful objects could in many cases be discovered. By a combination of these two lines of inquiry, the physical and the cultural, the nature, origin, and distribution of the races and peoples of the West Pacific could be elucidated. Melanesia is peculiarly suitable for studying the stages of the transition from mother-right to father-right, and it would be important to discover the causes that have led to this transformation, and the steps that mark its progress. With this is associated the evolution of the family and the distribution and inheritance of property. Melanesia is also a favourable area for tracing the emergence of government. What are required at the present day are intensive studies of restricted areas, since it is only by careful regional study that the real meaning of institutions and their metamorphoses can be understood. The same applies equally to all the manifold beliefs and usages that are grouped under the term religion. The psychology of backward peoples has been greatly neglected, and the opportunity of a well-equipped expedition would do much to encourage students to undertake this research.

It is superfluous to extend this plea, as all ethnologists will agree that this work requires to be done, and that without delay. The presence of Government officials, missionaries, traders, and of returned indentured labourers tends rapidly to modify or destroy the old customs. Much has already disappeared in many places; we are yet in time in many others if we do not delay.

Dr. Haddon is convinced that the best means of accomplishing the end in view is to organise a prolonged expedition to the Pacific with the absolute control of a

¹ "Researches into the Theory of Probability." By C. V. L. Charlier. Pp. 51. (Meddelanden från Lunds Astronomiska Observatorium, Serie ii. Nr. 4. Kongl. Fysiografiska Sällskapets Handlingar. Bd. 16.) (Lund, 1906.)