

THE SURVEY OF INDIA.¹

THE report on the operations of the Survey of India for the year 1907-8, in addition to the usual record of map-making of a utilitarian character, contains several features of scientific interest. We have long been accustomed to a high standard of work from this department, and it cannot be other than a subject of congratulation that we should see evidence, not only of the maintenance of its previous level, but also of continuous advance. The most recently completed geodetic triangulation, extending for a distance of 480 miles from the Indus to the peak Koh-i-Malik Siah, the junction point of India, Persia, and Afghanistan, is the most accurate operation of its class ever carried out in any country. Computed by the ordinary methods, the probable error of a single angle is $0''\cdot 21$, a quantity not much more than half that of the corresponding figure obtained in any triangulation outside India.

This series of triangles carries the geodetic work to a point marking the most westerly limit reached by the principal triangulation of India. At this distance from the centre of the network the errors of the assumed spheroid become noticeable. Thus the astronomical azimuths observed along this line are consistently smaller than the azimuths computed from the triangulation, showing that the computation is taking the points too far to the north, *i.e.* that the curvature of the spheroid used for the reductions is, over this region, appreciably greater than that of the true geoid.

Pendulum operations were carried on during the year with the special object of ascertaining whether the force of gravity would be found in defect in sub-montane tracts in the south of India to the same degree as in the Himalayan region. In all cases the deficiency was found to be considerably less at these stations than at places of similar altitude in the north. It was also found that for stations on "isolated" hill-masses the degree of compensation of the visible mass is much less than it is on Himalayan stations. From this the general inference is drawn that it is chiefly the subjacent masses that affect the compensation of those visible on the surface.

All this is quite in accordance with the theory, first advanced by Osmond Fisher, that the "roots" of mountain masses are broader and shallower than the mountains themselves. The time is not far distant when it will be possible to draw an approximate section of these roots. It would be interesting to attempt this, in the first instance, by selecting a mountain, of as great a mass as can be found rising abruptly in a flat country, and carrying out a detailed gravimetric survey of the whole area, including the mountain and the flat region, for a considerable distance from it.

The year under review marks an important epoch in the history of the magnetic operations in India in that the preliminary magnetic survey was completed over the whole country with the exception of some frontier regions. Three iso-magnetic charts are published in the report, showing respectively (1) isogonals, and lines of equal secular change of declination; (2) isoclinals; (3) lines of equal horizontal force. During the current year the beginning of the detailed magnetic survey was projected.

Among other points of interest we may note a re-standardisation, with the international metre at Sèvres, of Colonel Everest's old 10-foot standard, indicating that no appreciable change has taken place in the

lengths of the Indian standard bars during the last forty years.

Latitude observations were made with the view of eliciting some information as to the cause of the abnormally high deflection of the level found at Chania. It was observed that the deflection diminished rapidly in every direction from the apparent centre, and the conclusion is drawn that its magnitude originates "in a purely local cause, situated either at the surface or at a small distance below it."

E. H. H.

NIGERIA AND ITS PLANTS.

THE first part of an account of "The Useful Plants of Nigeria," written by Mr. J. H. Holland, now of Kew, but sometime curator at Calabar, appears as one of the Bulletins of Miscellaneous Information (Additional Series, ix.) recently issued by the Royal Botanic Gardens, Kew. A brief outline of the history of Nigeria is given in the bulletin, followed by a survey of the physical features, climate, peoples, botany, agriculture, and forestry, and finally the first part of the account of the useful plants of Nigeria.

Mr. Holland complains that "all the maps constructed so far have been compiled in England from sketches made at various times by numerous surveyors independently of each other." This must have been written some years ago, as Government surveyors have been at work since 1902, both in Lagos and southern Nigeria, and some very good maps have been compiled and issued both by the Survey and the Intelligence Department since 1906. In this connection southern Nigeria has to be congratulated on the excellent work done by skilled native surveyors who have been trained on the coast by the heads of these departments.

It is only too true that the entrance to most of the rivers is too shallow to admit steamers of any great draught, but it has to be remembered that this difficulty has to a certain extent been met by the remarkable build of Messrs. Elder Dempster's steamers, and so far as Lagos is concerned by the indomitable will of Governor Egerton, who already has two great dredgers at work on the Lagos bar. Much larger steamers are now entering the Lagos lagoon, and the hope is that passengers for Lagos who are now transferred from the ocean-going steamers to branch boats will soon be able to land direct on the marina. When these difficulties are overcome, and the railway, already open as far as Jebba and beyond, reaches the hinterland of northern Nigeria, Europe will have easy access to a climate described by Mr. Holland as bracing and delightful, and a country rich in agricultural and mineral wealth.

Under the heading "Climate," Mr. Holland touches on the remarkable difference between the rainfall on the coast and the interior; "during 1906 the maximum rainfall was 251.49 ins. at Egwanga, and the minimum at Olokemeji 40.92 ins." The latter place is only ninety miles from the coast. The author also mentions the Harmattan, a wind which comes from the north-east, across the Sahara desert, characterised by excessive dryness. This wind is prevalent during the dry season, and it is this break in the seasons and this Harmattan that we fear are going to decrease the yield of latex of the Para (*Hevea brasiliensis*) introduced from Ceylon. The Director of Agriculture for the French Colonies on the West Coast of Africa is said to be satisfied, so far as the coast is concerned, that *Hevea brasiliensis* is not going to be a success. We know that the trees at Aburi, on the Gold Coast, have ceased to yield latex. From experiments, however, in southern Nigeria on trees nearly

¹ General Report on the Operations of the Survey of India, administered under the Government of India during 1907-8. Prepared under the direction of Colonel F. B. Longe, R.E. Pp. iv+62, and maps. (Calcutta: Government Printing Office, 1909.) Price 3s.

eight years old, it is expected that the yield per tree will be more than that now given by the native tree (*Funtumia elastica*), but less than that extracted in Ceylon or other places where this break does not occur.

Mr. Holland, under the heading "Botany," touches on the remarkable "increase of our knowledge of the flora of Tropical Africa," which he says "is due to several causes. Old collections

"of very considerable extent which had only casually and partially been studied have now been worked up systematically (e.g., Barter's West African, Schweinfurth's Sudan, and Welwitsch's Angola collections); fresh collections have poured in as new countries were opened up or the establishment of botanical stations in the older colonies facilitated a more exhaustive exploration of their neighbourhood; finally, it was just then Germany started with remarkable and well-directed energy on the botanical survey of her colonies, with the result that in not a few orders 50 per cent. or more of all the additions from recent collections are due to her enterprise."

Anyone who has resided in Nigeria, and has had other duties to attend to, must have had cause to bemoan his inability to make satisfactory horticultural, museum, or herbarium collections; well, in this book he will find full instructions how to make them, though the reader, while thankful to Mr. Holland, will still wonder why Hooker's country has not had the enterprise to do the same as Germany.

The botanical station at Ebutemeta, formed in 1887, has been reduced very greatly in area owing to the needs of the fast developing Lagos Railway, and as it cannot be extended in any direction, has almost ceased to be a distributing centre. But we may fairly conclude that the department's work has not been in vain from the following advertisement in the *Nigerian Chronicle*, October 22, 1909:—"FLOWERS, FLOWERS, FLOWERS! Apply to ONOFUNMI GARDENS, FAJI MARKET."

Olokemeji has quite taken the place of the gardens at Ebutemeta, and is a very large distributing centre. It has become the headquarters of the Forestry Department in southern Nigeria. Native pupils are being trained as agricultural and forest instructors in this interesting spot, once a great Abeokuta war camp. We note the omission of a plan of the gardens and reserve at Olokemeji, but plans are included of the now famous gardens in Calabar, which the author had so much to do in founding, and also of the plantations at Onitsha. He also gives a very interesting historical account of the founding of these botanical stations, and finally of the origin of forest conservancy in Nigeria.

The first part of this interesting publication closes with an incomplete list of the useful plants of Nigeria, a work long looked for by all those interested in the economic development of this remarkable dependency of Great Britain. Wherever we may happen to open this instructive book and commence reading we are at once interested, for be the subject fruit or seed, fibre or timber, the author has so much to say of their virtues and uses that we are for the moment apt to forget all sordid difficulties and to wonder how it is more fortunes have not been made in Nigeria. For instance, the author, describing the *Lophira alata*, writes:—"The wood is very hard and heavy . . . described in the trade as a first-class heavy fancy wood; used for furniture and turnery (Mus. Kew). Admiralty experts have valued it as better than teak (*Tectona grandis*), at about 8d. per foot." Now, knowing that this wood is very abundant in Nigeria, timber merchants there have shipped it home, and instead of the expected 8d. have had to receive 2½d. or 3d. If the Admiralty or any buyer in Europe would guarantee the merchants in Nigeria 5d. per foot for

this timber the buyer could rely on a constant supply, and the merchants would make their fortunes. It is the varying uncertainty in the price of mahogany that makes the timber trade such a dangerous one for the merchant, and is perhaps one of the causes why the Forest Department has been urged to start plantations of teak, plantations, by the way, which are so far doing extremely well.

The need that Mr. Holland has so ably endeavoured to satisfy is a really great one, and we can only hope that the reception of his book by the public—so keen on the natural products of Nigeria—will be such that he will soon be tempted to give us another edition of "The Useful Plants of Nigeria," as full as possible of illustrations.

EUGENICS, MENDELISM, AND BIOMETRY.¹

NOW that the public has become familiar with the word eugenics, it is right that an exposition of its meaning by Sir Francis Galton, the founder of the science, should be easily accessible, and this the Eugenics Education Society has wisely provided by the publication of "Essays in Eugenics." The first essay is on "The Improvement of the Human Breed, under Existing Conditions of Law and Sentiment." It was delivered as the second Huxley lecture before the Anthropological Institute on October 29, 1901. Then follow "Eugenics: its Definition, Scope, and Aims," "Restrictions in Marriage," "Studies in National Eugenics," and "Eugenics as a Factor in Religion," read before the Sociological Society in 1904 and onwards. After this comes the Herbert Spencer lecture delivered before the University of Oxford in 1907, on "Probability, the Foundation of Eugenics," and the volume is concluded by an address to a meeting of the Eugenics Education Society in 1908 on "Local Associations for Promoting Eugenics." The volume, of which the titles quoted give an indication of the contents, forms an admirable introduction to the subject. The host of objections which immediately spring to the mind and tongue of ordinary educated people on first receiving the idea of conscious selective breeding in man are here met with easily intelligible arguments and with common sense. It is to this and to the moderation with which the author expounds his thesis that the present wide realisation of its practicability must be due.

The *Mendel Journal*, of which the first number appeared in October, has been founded in order "that Mendelism shall be presented to a wider public by men who believe in its truth, foresee its future, and who recognise their responsibilities in the work they do," also in order "to gather for the science of genetics a harvest rich in facts relating to human pedigrees and the inheritance of normal characters as well as of peculiarities," and finally "to make it a medium by which authoritative advice and direction may be given in the form of answers to questions upon matters of general interest relating to problems of cattle, cereal and plant breeding."

More than one-third of the number is taken up by an address by Mr. G. P. Mudge, entitled "Biological Iconoclasm, Mendelian Inheritance and Human Society," delivered to the Mendel Society and to the Eugenics Education Society in June, 1908.

Like many lecturers on eugenics, Mr. Mudge realised that in order to convince people of the supremely important part played by heredity in determining physical

¹ (1) "Essays in Eugenics." By Sir Francis Galton, F.R.S. Pp. vi+109. (London: The Eugenics Education Society, 1909.)

(2) *The Mendel Journal*, No. 1, October, 1909. Pp. 216. (London and Manchester: Published for the Mendel Society by Taylor, Garnett, Evans, and Co.) Price 2s. 6d. net.

(3) *Biometrika*, vol. vii., parts i. and ii., July and October, 1909. Pp. 236. (Cambridge: University Press.) Price 20s. net.