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A NATURALIST IN NORTH CELEBES.

A Naturalist in North Celebes. By Sydney J. Hickson, M.A. (Cant.), D.Sc. (Lond.), M.A. (Oxon. Hon.Caus.). With Maps and Illustrations. Pp. 392. (London: John Murray, 1889.)

THIS book is the outcome of the residence of a specialist for nearly a year upon a small island off the extreme north point of Celebes. Of books of travel there is in these days no lack, and so beaten are the paths along which authors for the most part lead us, that the reader in search of amusement or instruction not infrequently arrives at the index without having met with either. But Dr. Hickson's is not a book of travel: it is a record of a naturalist's life with an almost boundless submarine field for observation close at hand—albeit terrestrially somewhat limited—and when he leaves his coral-girt island, it is to wander in that little-known archipelago which links Celebes to the Philippines, the Sangir, Nanusa, and Talaut groups, whither few but adventurous Dutchmen have penetrated.

Of the fourteen chapters, three are devoted to Talisse, the island on which Dr. Hickson conducted his observations. Four are descriptive of his wanderings in the groups just mentioned, and the remainder for the most part treat of the Minahassa district, its natives, and their mythology and customs. Of these, the author tells us in his preface that "the greater part of the ethnological portion of the book is borrowed from the valuable writings to be found in many of the reports of missionary and other societies, and in Dutch periodicals."

Dr. Hickson owing his voyage almost entirely to a desire to study the corals of the Malay Archipelago, it is naturally to that part of the book which treats of them that we first turn. No one has ever yet done justice to the wonderful beauties of coral-land, and the author, in common with his predecessors, has failed—as everyone must fail—to convey to the untravelled reader an adequate idea of the appearance of a vigorous reef. Perhaps the very fact of being an authority has lessened his chance of success. The description is nevertheless a good one, and the chapter (vi.) the most important in the book. Dr. Hickson has wisely relegated his technical work to the publications of the various learned societies, but he tells us much of interest. The first sight of a coral reef at close quarters astonished him—specialist as he was:—

"I could not help gazing with wonder and admiration on the marvellous sight. . . . I had expected to see a wonderful variety of graceful shapes in the branching madrepores and the fan-like, feather-like alcyonarians, . . . but I was not prepared to find such brilliancy and variety of colour" (p. 15).

That vexed and most important question, the growth of coral reefs—a question upon which it was to be hoped that Dr. Hickson might be able, from the length of his stay and his varied opportunities, to enlighten us—is left pretty much where it was. We should be able to predict with certainty the direction and the rapidity of growth. As it is now, charts of coral islands and reefs become almost valueless in the course of a few years. But the causes both of growth and erosion are still undetermined. Much, no doubt, depends upon the rapidity of the tides. In strong tide-races no true coral reef is ever formed. "Flowing water, which is neither too swift nor too stagnant, bearing the kind of food necessary for the proper nourishment of the corals," is, as Dr. Hickson justly remarks, a strongly predisposing element to vigorous growth. Yet this is not always the case, neither does the converse always hold good; and we cannot agree entirely with the author when he says, "in deep bays or inlets, where tidal and ocean currents are scarcely felt, there is but little vigour in the reef." The inner harbour of Amboyna displays as rich a "sea garden," perhaps, as any in Malayan seas.

Dr. Hickson's daily work on the reefs led him to the certain conclusion that but one true species of *Tubipora* exists. The size of the tubes and the character of the septa—upon which most of the species are founded—are shown to be utterly without specific value; these differences depending entirely upon the position of the coral on the reefs. The following remarks upon a fact which must have struck most naturalists in tropic seas, but which we do not remember ever to have seen in print before, are worthy of quotation. Talking of sunrise and early morning, he says:—

"Not only are the birds and insects, which disappear as the sun becomes more powerful, particularly visible at that hour, but it is the time of day above all others when the surface of the sea teems with animal life. I remember well my disappointment when I first got into tropical waters at finding that my surface-net invariably came up almost empty. It was not until I had been at work some time that I made the very simple discovery that in the early morning hours every sweep of the net brings up countless pelagic forms of all sizes and descriptions" (p. 58).

The question of the food of corals is yet unsettled; but the author, after careful examination of polypes of various kinds, is inclined to the belief that many of them may be, partially at least, vegetable feeders. No doubt the water in the vicinity of mangrove-swamps is very largely charged with the *débris* of leaves and fruit and wood, some of which, sinking to the bottom, must enter the mouths of the polypes. Upon the mesenterial filaments of the Alcyonarians, indeed, particles of vegetable fibre are frequently found. It is suggested that the vigorous reefs frequently seen near extensive swamps, may be explained by such an hypothesis. Upon Darwin's theory of the formation of atolls, Dr. Hickson had little opportunity of forming an opinion—little, at least, until he visited the archipelagos already mentioned. He ultimately came to a disbelief in the general subsidence theory, and is not opposed to Mr. Murray's view—that coral reefs can, under favourable circumstances, grow out into deep sea-water upon the talus of their own *débris*.

Among many references to birds occurs an account (p. 41) of the existence of the maleo, or brush-turkey, in Ruang Island. Unfortunately, we are not told whether this is *Megacephalon maleo*, or the smaller *Megapodius gilberti*. They were most probably the latter; but it would be interesting to know, for the true Megacephalon of Celebes has never, we believe, been recorded as

occurring in the smaller islands. Meyer's story of the whimbrels nesting on trees (probably *Numenius uropygialis*, Gould, by the way—not *N. phæopus*) is quoted, but without comment, and it is worthy of remark that no naturalist has as yet confirmed it. Dr. Hickson is not quite accurate in his statement that there are only two Celebean birds which are likewise English. He must often have noticed, in his rambles along shore, not only the common sandpiper, but also the wide-ranging *Strepsilas interpres* and one or more of the genus *Totanus*, which are not unfamiliar to us at home.

Perhaps one of the best passages in the book is that describing a mangrove-swamp, where the extraordinary conditions of life obtaining within its limits, and the interdependence of that tree and the coral reef, are well illustrated. The scenery of Talisse Island is not particularly beautiful, although the author does not tell us so; but that of the district of Minahassa on the mainland is strikingly lovely, and he describes the view of the Tondano Lake as one without an equal. It was unspoilt to him even by the thought of the "*heerendienst*"—that system of compulsory service which has acted as a red rag to so many Englishmen. Dr. Hickson is not so prejudiced, and is wise enough to recognize—as did Wallace—the enormous advantage which it has conferred upon the people.

"I cannot help thinking," he says (p. 208), "that everyone who is really acquainted with the circumstances of these colonies and the character and condition of the people must admit that it is a service both necessary and just. The Dutch Government has brought to the people of Minahassa not only the blessings of peace and security, but also the possibilities of a very considerable civilization and commercial prosperity. . . . In return for all this, it is only just that every able-bodied man should be compelled to lend a hand in maintaining this happy condition of affairs. In a land where the necessities of life are so easily obtained, . . . it would be impossible for the Government to obtain a sufficient number of them to labour on the roads at a reasonable wage."

The consequence is that they would be neglected. The *heerendienst*, then, as Dr. Hickson shows, is the only system possible, without overburdening the Exchequer, or increasing the taxation beyond the endurance of the people.

We have not space to dwell upon the description of the Sangir Islands, or on the mythology and customs of the natives of Minahassa, which Dr. Hickson has done well to put within the grasp of those who are unacquainted with the Dutch language. Among the folk-lore it is interesting to notice (p. 241) the story of Lumimuüt's impregnation by the west wind—a story which, if we mistake not, is almost identical with one of Egyptian source. The "swan-maiden" tale—which, perhaps, has as wide a distribution over the surface of the globe as any other—again occurs in Celebes. Enough has been said to show that "a naturalist in North Celebes" had a varied interest in his surroundings, which he has contrived to communicate to his readers with success. A little more care, perhaps, would have purged the volume of several misprints, and one or two instances of involved diction.

The woodcuts with which the book is furnished are well enough. We wish that anything could be said in favour of the "process" illustrations. That at p. 33 is bad, and another at p. 137 still worse. But anything more muddy and meaningless than that facing p. 45 we confess never to have seen.

F. H. H. GUILLEMARD.

SAINT-VENANT'S ELASTICAL RESEARCHES.

The Elastical Researches of Barré de Saint-Venant. (Extract from Vol. II. of Todhunter's "History of the Theory of Elasticity.") Edited, for the Syndics of the University Press, by Karl Pearson, M.A., Professor of Applied Mathematics, University College, London. (Cambridge: At the University Press. London: C. J. Clay and Sons. 1889.)

OUR fears lest this "History of the Theory of Elasticity" should, like Thomson and Tait's "Natural Philosophy," remain a magnificent mathematical torso have been agreeably falsified by the early appearance of this instalment of the second volume. It is devoted entirely to the work of Saint-Venant, the distinguished French mathematical engineer.

Saint-Venant is one of the rare examples of a writer who is equally popular with the mere mathematician and with the practical engineer. To quote from the author's preface to this part of the "History of Elasticity," "we live in an age when the physicist awaits with not unreasonable excitement for greater revelations than even those of the past two years about the ether and its atomic offspring; but we live also in an age when the engineer is making huge practical experiments in elasticity, and when true theory is becoming an absolute necessity for him, if his experiments are to be of practical as well as of theoretical value." This is the opinion of the theorist; but the engineer points to his work as magnificent experiments on a gigantic scale, to which he invites the theorist to an inspection, for him to deduce his theoretical laws.

So far as pure theory is concerned, the engineer trusts only to Hooke's law, and Euler's theory of the beam, which neglects the warping of the cross-sections. But Hooke's law is shown by the testing-machine to be only a working hypothesis within very narrow limits of extension and compression, after which the baffling phenomena of plasticity make their appearance, and destroy all the simple mathematical harmony; while as to Euler's theory of the flexure of the beam, the editor, Prof. Pearson, is at present engaged on the mathematical discussion of the permissible limits of the application of the ordinary theory, and, so far, the result of his investigations (in the *Quarterly Journal of Mathematics*) is such as to strike dismay in the heart of the practical man who would be willing to apply his conclusions.

The purely mathematical theory of Elasticity is, at the present moment, in a very curious condition, for a subject in the exact science *par excellence*. Not only are elasticians divided into opposite camps of *multi-constancy* and *rari-constancy*, but we find a war of opinion raging among the most recent investigators—Lord Rayleigh, Chree, Love, Basset, and others. All are compelled to violate apparently the most fundamental rule of mathematical approximation; and, in considering the elasticity of a