

series of soundings over Lake Manasarowar, by means of his portable boat.

On return to Ladak, with characteristic pertinacity, he decided to make a second expedition back again to Tibet, in order to complete his partial exploration of the Trans-Himalaya, as he reflected that, "it was especially irritating to think that others might come here and rob me of these conquests." So with a fresh caravan, got together with the aid of the British officials, he plunged south once more through the terrible Tibetan deserts, and much astonished the discomfited Tibetan chiefs by his reappearance amongst them a year after they had got rid of him with such infinite pains. In this latter traverse, three more passes were surveyed, with the result, to quote the author's own words, that, "When I passed over the Trans-Himalaya for the eighth time at Surnge-la, I had the satisfaction of seeing all the old hypotheses fall down like a house of cards and a new ground plan laid down on the map of Asia, where before the blank patch yawned with its alluring "Unexplored." This mountain-system, it is remarked, cannot be called "a range," because it is a collection of several ranges, more or less parallel or branching off at various angles; Dr. Hedin, however, will find that somewhat similar features are displayed by the Himalayas themselves.

The narrative of the two years' strenuous journeyings for the survey of these formidable mountains, is written in a vigorous, direct, style, which reflects the cheery optimism of this pioneer traveller as he pushed on undaunted, in the face of endless hardships and difficulties. It also shows him animating his men with something of his own abounding enthusiasm, without which, indeed, the exploration could never have been accomplished. The reader feels the swing of the caravan moving through the pages, with the thrill of reality and a pervading sense of danger ahead; though to many readers the repetition from day to day of the details of camp routine, and the reiterated records of the grim struggles of the men and the sufferings and painful deaths of the dwindling baggage animals, will doubtless make somewhat monotonous and unpleasant reading after a time.

Besides the geographical record, so important in itself, and the camp episodes, there is little else that is new. Remarkably few references occur in respect to natural history; scarcely any mention or passing recognition is made of wild animals, or plants, or minerals, such as we expect in the journal of a scientific traveller; and the few remarks which occur in regard to the people and their customs exhibit a lack of familiarity with authentic sources of precise information, and the well-known researches of Rockhill and others. Incidental reference is made to a collection of rock-specimens, the description of which by specialists, is promised along with the detailed maps, which will doubtless be accompanied by an analysis of other objects collected, though no mention is made of them. The young Indian elephant of the Tashi Lama, we are told, "is the only one of his species in the whole country"; but the Talai Lama, we know, has (or had in 1904) a much larger tusker, a present from the Sikhim raja, which had survived the arctic winters of many years at Lhasa, and was housed in a grove near the British mission camp outside that city in 1904. "A *Bod* or Buddhist" is spoken of as if these two terms were equivalent, whereas the former means a Tibetan or inhabitant of *Bod* or Tibet. The "*Bothiyas*" (*sic*) are described as "a mixed people sprung partly from Indian and partly from Tibetan elements," whilst in reality, "*Bhotiya*" is merely the Indian designation of the Tibetan race or

people of *Bod*. A want of precision in the spelling of several of the vernacular place-names is noticeable in a professedly geographical work, thus "*Sekiya*" invariably occurs in the text for the well-known monastery and sect of Sakya or Sakyas, and "*Yere-tsangpo*" for the Yaru (or "upper") Tsangpo; and many of the names are spelt phonetically according to no regular system. To say "*Hor* or *Bod-yul*" is equivalent to saying "*Turkish* or *Tibet*." In regard to the term used for the great Manasarowar Lake by D'Anville in his old map, namely "*Ma-pama Talai*," or Ma-pama Lake, Dr. Hedin gives "*Ma-vang*" as the correct form, but this latter is merely the vulgar vocalization of the name, which is spelt and properly pronounced as "*Ma-pam*"; and our author sagely states that "D'Anville might have added that the Chinese and Talai or Dalai means ocean," and that it was used to imply that this particular lake was larger than the other neighbouring lakes mentioned in his text. This, however, is not correct; "*Talai*" is *not* Chinese, but a Mongol word, and it is applied to all the lakes in that neighbourhood, as well as throughout the Northern Himalayas, irrespective of their size; and in the abbreviated form of "*Tal*" it was imported into Northern India by the Moghal section of the Mongols, and is now naturalised there as the current vernacular name for a lake. Deficiencies of this kind, however, can be corrected in another edition, and in no wise belittle the outstanding importance of Dr. Hedin's splendid geographical achievements.

These attractive volumes, with their wealth of sketches and beautiful photographs, deserve nothing but praise, and form a fitting record of Sir Sven Hedin's magnificent pioneer work amongst one of the most forbidding mountain ranges in the world. This work, too, is of such importance to Indian hydrography as to have gained for its author, amongst other well-earned honours, a knighthood of the Indian Empire. It is also pleasing to observe that his men have not been forgotten, for the thirty-seven Asiatics who followed the explorer faithfully through Tibet, and, as the author generously admits, "contributed in no small degree to the successful issue and results of the expedition," have been rewarded with gold and silver medals, bestowed by the King of Sweden.

COLOUR-BLINDNESS.

FOR a considerable time past dissatisfaction has been felt in certain quarters with the methods adopted by the Board of Trade in examining in colour-vision candidates for certificates as master or mate in the mercantile marine. On June 30, 1909, Lord Muskerry directed attention to the matter in the House of Lords, using the cases of Mr. W. H. Glover and Mr. John Trattles as the text of his argument, and moving that a Select Committee be appointed to consider the conditions under which eyesight tests for the mercantile marine certificates were conducted. Lord Hamilton of Dalzell, in reply, stated that during the last four years 25,151 candidates were examined; of these 239 failed in the colour-vision tests; 64 appealed, with the result that 27 passed and 37 were rejected. The tests, based upon the report of a committee of the Royal Society, which sat at the request of the Board of Trade in 1890, were considered to be efficient as at present carried out. He held that no case had been made out for the appointment of a Select Committee. The Marquis of Salisbury said he had, perhaps, a special claim to be heard in this matter, because he was colour-blind himself. He was convinced that colour-blindness was capricious; on some days he was very much more colour-blind than on other

days. But from the point of view of the Board of Trade and of the mercantile marine such caprice must be very dangerous. The motion was by leave withdrawn.

Since this debate in the House of Lords the case of Mr. John Trattles has assumed greater importance, and it will be well to recount briefly its history and the chief features which it presents. In February, 1904, Mr. Trattles was examined for his certificate as second mate; he passed the colour-vision test, and was granted his certificate. In July, 1905, he went up for examination as first mate, and failed in the colour-vision test. He appealed, and was specially examined by Sir William Abney and Captain Harvey, and again failed. In September, 1905, having refused to surrender his certificate as second mate, a Local Marine Board was called to inquire into his competency. The board found that he was not incompetent to hold his certificate by reason of colour-blindness. In May, 1906, he was examined for a certificate of competency as first mate; he passed the examination, including the sight-test. The Board of Trade was not satisfied, and, after some correspondence, he was offered and accepted a special examination by Sir William Abney and Captain Harvey. It took place in May, 1909, when he again failed in the colour-vision test. He declined voluntarily to surrender his second mate's certificate, and the Board of Trade instituted a special court, consisting of Sir Francis Mowatt, president, with Mr. J. Dickinson, stipendiary magistrate, as legal assessor, to decide the issues. Mr. Trattles therefore came before this court after six examinations in colour-vision during the last six years; on three occasions he passed, and on three occasions he failed.

On the occasion of the special examination by Sir William Abney and Captain Harvey in May, 1909, owing, presumably, to the agitation in the medical and lay Press against the methods adopted by the Board of Trade, certain scientific bodies were invited to send representatives to witness the tests. Dr. W. H. R. Rivers, F.R.S., lecturer in the physiology of the senses in the University of Cambridge; and Mr. J. Herbert Parsons were present, representing the Royal Society and the Ophthalmological Society respectively. These gentlemen were not informed that the case was one likely to render desirable their evidence as witnesses in a court of law. Dr. W. Ettles, who had examined Mr. Trattles, and was of opinion that he was not colour-blind, was also present.

The special court commenced its sittings on December 2, 1909, at the Imperial College of Science and Technology, South Kensington. Evidence was given by Sir William Abney, Dr. Rivers, Mr. Herbert Parsons, Captain Harvey, Captain Fulton, and Fleet-Surgeon Prynne, R.N.; they concurred in their opinion that Mr. Trattles was colour-blind. Mr. Trattles's witnesses included himself and several well-qualified captains, who had had extensive experience of his skill and ability in navigating ships under conditions of difficulty in the North Sea, the Baltic, the Channel, the Atlantic, the Mediterranean, the Black Sea, and in the Mersey. We do not notice the name of Dr. Ettles in the reports we have seen; we should have thought that he would have been an important witness for the defence. Mr. Trattles submitted to an examination before the court, conducted by Sir William Abney. The court further allowed a practical test, conducted by Commander Wilson-Barker, R.N.R., who was nominated by the Trinity House Brethren. It took place on the evening of December 30, when it was "calm, with some haze on the horizon." Commander Wilson-Barker reported that "Trattles had no difficulty whatever in picking up the lights. He had vision of

a quality equal to that of myself and of the look-out man." He instanced two tests to which he attached special importance. On approaching the Nore light at some distance off, Trattles hesitated, questioning if it was not a reddish light. He was correct, the light being a new white light in which some ruby rays are retained as an experiment in penetrating the fog. Trattles was asked to describe the colour of two planets which the Commander pointed out to him from the deck; he did not recognise them, but he correctly described one of them (Mars) as reddish. Sir Francis Mowatt came to the conclusion that Trattles is not incompetent from colour-blindness to discharge the duties of a mate, and directed that his certificate as second mate be returned to him.

We have quoted this case at considerable length because, in our opinion, it demonstrates beyond dispute the urgent need of reform in the methods of conducting inquiries into the colour-vision of candidates by the Board of Trade. Here is a man, with an unimpeachable record in his profession, whose life must have been made a misery from anxiety as to his future career. On the other hand, the public cannot but feel perturbed at the thought that numberless lives are endangered if mistakes are allowed to occur. There are obviously two explanations of the anomaly that the same man may be rejected by the same tests conducted by different examiners; either the tests themselves are at fault or, if efficient, they are not applied with sufficient care or accuracy. Experts whose opinions cannot be lightly disregarded will be found to support both these contentions. For our own part, for reasons which it would take too long to enter into on the present occasion, we incline to the second alternative. The preliminary examinations are conducted by men who have no knowledge of physiology, whatever their other qualifications may be. Even on appeal there is no physiologist amongst the examiners.

We do not wish to labour this point unduly, but owing to the manner in which it has been neglected in the past it merits serious consideration. Defects of colour-vision are defects of a physiological condition, and belong to the class of conditions which the physiologist is accustomed to deal with. Every physiologist to-day must perforce be a more or less accomplished physicist; every physicist is by no means called upon to be an equally accomplished physiologist. The physiologist is familiar with those tantalising variations which characterise living matter, induced by the lability of the medium and the complexity of the forces brought to bear upon it. Even amongst physiologists and ophthalmologists, only those who have devoted particular attention to this highly specialised branch are fully qualified to deal with it. Normal colour-vision shows a great range of variations under differences of intensity of stimulation, differences of adaptation of the retina, differences of the psychological condition, and in different individuals. To take a simple example, the fields of vision for colours vary according to the intensity of the stimulus. Defects of colour-vision show an equally wide range, and whilst it is possible to group the cases according to certain well-defined types, there is none of that accuracy of definition in the scientific picture which rejoices the heart of the physicist. Whilst comparatively gross tests, such as the ordinary tests with Holmgren's wools, used in preliminary examinations by the Board of Trade, suffice to distinguish the graver forms of defective colour sensation, they cannot, as ordinarily applied, be regarded as infallible in less pronounced cases—cases which may yet involve danger to many lives if they are allowed to pass unrecognised. Hence occurs the necessity for more delicate tests, physical indeed in their nature, but

only to be interpreted accurately in the light of a comprehensive knowledge of the physiology of vision.

We have the profoundest respect for the work which Sir William Abney has done upon the subject, and every competent critic will endorse the opinion of Lord Rayleigh, quoted by Lord Hamilton of Dalzell, that the Board of Trade could not be wrong in following his advice. How is it to be explained, then, that his opinion, endorsed by other competent men of science, is not accepted as final? We think that it is largely due to the difficulty, or rather impossibility, of conveying to laymen any adequate conception of the peculiarities of vision of the colour-blind. The difficulty is enhanced by the terminology and phraseology adopted by the expert, who almost invariably speaks, as it were, in the language of the theory of colour-vision which he personally affects. Thus, Sir William Abney describes a man in terms of the Young-Helmholtz theory as *red-blind*, whilst Dr. Rivers, agreeing entirely with the facts of the colour-vision of the individual, describes him as *red-green-blind*, and would doubtless prefer to avoid all ambiguity by calling him *scoterythrous*. Every statement which either might make in endeavouring to convey some idea of the visual perceptions of a colour-blind individual to one who has had no training in the physiology of the senses might be implicitly relied on for accuracy when rightly interpreted, but the probabilities of correct interpretation are exceedingly small, if, indeed, the whole statement is not regarded as a meaningless jargon.

Further, the layman fails wholly to understand why recondite tests, such, for example, as that with simultaneous contrast colours, should be imposed upon the examinee. He can comprehend "practical" tests on board ship, such as that to which Mr. Trattles submitted. It would surprise him greatly to be told that under favourable atmospheric conditions the expert would fully expect a colour-blind person to pick up lights with unflinching accuracy.

The Trattles case will have served an invaluable purpose if, as must inevitably be, it focusses public opinion upon the glaring anomalies of the examination in colour-vision of candidates by the Board of Trade. It appears to us to be imperative that all the conditions should be re-investigated by a competent body, either a carefully selected Royal Commission or a committee of the Royal Society upon which physiologists and ophthalmologists who have devoted special attention to the subject are adequately represented. Among the duties of such a committee would be:—

(1) Re-investigation of the tests for colour-blindness with the view of the adoption of methods less open to attack, and, if possible, of a simpler nature.

(2) Re-organisation of the examinations and of the boards of examiners.

We have no doubt that it would be possible so to revise the conditions of the Board of Trade examinations that it would cease to be necessary to have recourse to a court of law for adjudication on the results of a purely scientific question.

NATURE PHOTOGRAPHY.¹

THE object of Mr. Bedford's book is to encourage the pursuit of nature photography among those who cannot afford either the time or expense to undertake very advanced work in this direction. The author rightly points out that there are great advantages in this method of studying nature over the older method of collecting, and that the study of natural history by means of photography may be taken up by those

¹ "Nature Photography for Beginners." By E. J. Bedford. Pp. xiv+168. (London: J. M. Dent and Sons, Ltd., 1909.) Price 7s. 6d. net.

whose time and means are strictly limited. The first part of the book deals with the apparatus required. A detailed description is left to text-books on photography; some knowledge of cameras and photographic methods is assumed, and the author confines himself to suggestions and to an account of the particular kinds of apparatus which he himself has found serviceable. On the whole, this part of the book should be valuable to a beginner taking up the subject for the first time, but one feels that in some parts space is wasted in describing processes of which a sufficient account is given in every book on photography, and other parts might with advantage be made more full, for in places the reader is left with no clear idea of the nature of the instrument or process recommended. Rough estimates of cost might also have been included; several times we are told that the choice must be decided by the possible outlay, but no actual estimates of expense are given.

The second part of the book deals with the actual photography of living objects. In the chapter on choice of subjects, the author very rightly empha-



Red Admiral Butterfly (wings expanded). From "Nature Photography for Beginners."

sises the fact that a connected series of photographs of one subject or group of subjects is of much greater interest and value than an indiscriminate collection of pictures of isolated things. This is illustrated in the book by the series of plates (Figs. 69-76) showing the early life of a young cuckoo. We regret that the chapter was not extended somewhat, at least so far as to emphasise the value of photographic records of objects which cannot easily be collected or preserved in their natural condition, such as fungi, insect larvæ, or fruits. As an illustration of the excellent results that may follow from the patient collection of photographs of such things, one may mention Connold's useful book on "British Oak Galls."

The chapters on how to observe and photograph the commoner birds and their nests take the form of a conversation, or rather discourse, to an imaginary novice during a series of birds'-nesting excursions. This style of writing is very irritating, as are the frequent references to the pleasures of tea in the country, and these chapters might lead one who had