

morality being incorporated into religion only in the later stages of culture. One of the most striking points in the whole work is Mr. Tylor's identification of the theory of "images" generally ascribed to Democritus with the savage theory of object-souls. Democritus explained the fact of perception by declaring that things are always throwing off images of themselves, which images, assimilating to themselves the surrounding air, enter a recipient soul and are thus perceived. This theory, Mr. Tylor adduces evidence to prove, is merely an application to the phenomena of thought of one of the most characteristic doctrines of savagery, the doctrine that every object, inanimate as well as animate, possesses a soul of its own. "Nor is the correspondence," says Mr. Tylor, "a mere coincidence, for at this point of junction between classic religion and classic philosophy the traces of historic continuity may be still discerned. To say that Democritus was an ancient Greek is to say that from his childhood he had looked on at the funeral ceremonies of his country, beholding the funeral sacrifices of garments and jewels and money and food and drink, rites which his mother and his nurse could tell him were performed in order that the phantasmal images of these objects might pass into the possession of forms shadowy like themselves, the souls of dead men. Thus Democritus, seeking a solution of his great problem of the nature of thought, found it by simply decanting into his metaphysics a surviving doctrine of primitive savage animism." No more pregnant identification of philosophic tenets with those of earlier religion has been achieved since Comte traced back to fetishism the conception of a soul of the universe as held by certain pantheistic schools.

In describing the nature of the soul as understood by the lower races—well indicated by the way in J. Amos Comenius's "*Orbis Sensualium Pictus*," where he figures *anima hominis* as a dotted outline of a man—Mr. Tylor calls special attention to the spirit-voice, which is conceived as a murmur, chirp, or whistle—as it were the ghost of a voice. Among the Algonquins souls chirp like crickets; among the New Zealanders, Polynesians, and Zulus, they squeak or whistle. Nicolaus Remigius, whose "*Dæmonolatreia*" is one of the ghastliest volumes in the ghastly literature of witchcraft, cites Hermolaus Barbarus as having heard the voice *sub-sibilantis dæmonis*, and, after giving other instances, adduces the authority of Psellus to prove that the devils generally speak very low and confusedly in order not to be caught fibbing. The idea of ghosts whistling is still far from extinct in England. In Leicestershire and elsewhere it is reckoned "very bad" to hear "the Seven Whistlers," though strict inquiry about them only elicits the suggestive fact that "the develin"—or common martin—"is one on 'em."

In his account of the doctrine of transmigration of souls, Mr. Tylor forbears to touch on one circumstance, which probably exercised some considerable influence on its development. When two systems of mythology, both originally derived from the same source, came into close contact after long separation, both the difference and the similarity between them could hardly escape attention. If the names of certain deities common to the two systems had been changed while their history and attributes had remained substantially unaltered, the theory of transmigration would, in some cases, satisfactorily account for the

phenomenon. In fact, mythologically, the doctrine of transmigration is simply true. Mythology is just now demanding of history the extradition of William Tell, on the plea that his ghost is one which has transmigrated from her domain; and the scientific detective who falls in with Robin Hood or King Arthur will hardly fail to recognise in the one the transmigrated soul of Phœbus Apollo, in the other, the wandering spirit of the Bear-ward in Bœotes, returned from his long sojourn in the northern sky.

Tempting, however, as are the inquiries suggested in this profusely suggestive work, the reviewer's limit has already been transgressed. We have not yet, we cannot have for years, or for ages, anything approaching to a complete science of history or exhaustive philosophy of religion, but the scientific student of Primitive Culture will at least admit that in these volumes the foundation of both has been "well and truly laid."

BOOK SHELF

Dr. Dobell's Reports on the Progress of Practical Medicine in different Parts of the World. Vol. ii. (1871, Longmans.)

In these reports Dr. Dobell aims at obtaining from the natives of different countries concise statements of the advances made in medicine and the allied branches of knowledge, which have appeared in foreign journals, or in a more permanent form. He has obtained more or less full and detailed reports from America, Australia, California, China, France, Germany, Iceland, India, Italy, Java, Newfoundland, New Zealand, Portugal, Prince Edward's Island, Shetland Isles, Turkey, and the United Kingdom. The idea is a good one. The flood of periodical literature is so great that it is most difficult to keep up with the weekly journals of this country alone, and it becomes almost hopeless to do so with those of France and Germany. Such reports as those before us materially lighten labour, and the only objection to them is that a man who is working at any given subject cannot rely upon their being complete. The report on French progress by Prof. Villemin is a good one. That on German advances, by Dr. Alhaus is much too short. It might, with great advantage, have been extended at the expense of the excerpts from English writers. Everyone has access to the leading English journals, and, moreover, this part of the work is already well done by Braithwaite and Ranking, but comparatively few have access to Virchow's Archiv, the Deutsch Klinik, and the Wiener Medizinische Zeitung. Many of the English abstracts might have been condensed. We miss a Russian report. Yet both Russian naturalists and Russian physicians have journals of their own. On the whole the book is a useful one, and we can recommend it to our readers as containing a considerable mass of information which they will not elsewhere easily find.

Geometrische Seh-Proben zur Bestimmung der Sehschärfe bei Functions-prüfungen des Auges. Von Dr. Boettcher. (Berlin, 1870. London: Williams and Norgate).

THIS little book, with its test objects, is intended as a substitute for Snellen's test types to be used by those who are unable to read, and has been drawn up by Dr. Boettcher, with especial reference to the testing of the vision of recruits. Besides the ordinary types, it contains a number of figures of squares and rectangles, variously disposed in regard to one another at different distances, and it need scarcely be added of various sizes. The very smallest require good vision to enumerate their number and disposition at the ordinary distance of eight inches, whilst the largest should be seen at two hundred feet. They afford

a good means of determining the existence of Hypermetropia, Myopia, Astigmatism, and other affections of the retina of the eye, and seem to us to be well adapted for the purpose for which they are intended. H. P.

LETTERS TO THE EDITOR

[The Editor does not hold himself responsible for opinions expressed by his Correspondents. No notice is taken of anonymous communications.]

Thickness of the Earth's Crust—Mr. Hopkins and M. Delaunay

IN your numbers for March 16 and 23, 1871 (pp. 400, 420) you give brief notices of the proceedings of the Academy of Sciences in Paris on the 6th and 13th of that month, from which it appears that Mr. Hopkins's method of determining whether the crust of the earth is thick or thin has been again under discussion there. In the latter of these notices M. Delaunay observes that he had been anticipated in his objections by Mr. Hennessy.

It so happens that Mr. Hopkins sent to me in Calcutta in 1878 a copy of Mr. Hennessy's paper (which was published in the *Philosophical Transactions* of 1851) with his remarks in writing in the margin; and I think it will be interesting to your readers if I give Mr. Hopkins's opinion of the paper.

Mr. Hennessy remarks (p. 546) that Mr. Hopkins's "result was founded on the hypothesis of the non-existence of friction and pressure from molecular causes at the surface of contact of the shell and nucleus." On which Mr. Hopkins writes:—"This is not correct. My hypothesis is the absence of friction between the fluid particles themselves."

Again, Mr. Hennessy considers, as a result of his calculation, "that we are entitled to assume that the motion of rotation of both shell and nucleus takes place nearly as if the mass were entirely solid." On which Mr. Hopkins observes: "Nothing could justify the assumption of a mechanical impossibility." And he traces this erroneous conclusion to the fact that Mr. Hennessy has made two assumptions in the course of his calculations which vitiate it throughout; viz., (1) that the axes of instantaneous rotation of the shell and nucleus would coincide (which is implied in the last formula in par. 2. p. 514), "which," wrote Mr. Hopkins, "they certainly would not," and (2) that "the shell (or crust) is rigid" (p. 519, 525) so as to resist, without change of form, the internal pressure which arises from the inner surface, that is, the surface of the nucleus, ceasing to be a surface of equilibrium, which Mr. Hopkins very reasonably considers to be quite inadmissible, and that accordingly the results deduced from these assumptions are "valueless."

2. I will take this opportunity of reverting to my letter to you of April 10, 1871. I there point out that what Mr. Hopkins did consists of two parts—(1) his conception of the idea that as the crust is not solidly connected with the fluid nucleus the amount of precession must depend in some measure upon the thickness of the crust; and (2) his calculation of the amount of precession this idea would lead to, so that by comparison with observation the thickness might be approximately found. In this way he discovered that if the crust and nucleus were homogeneous, and of the same density (which they are far from being), the inner and outer surfaces of the crust being similar and similarly situated spheroids, the internal pressure of the fluid would act so as to leave terms in the precession depending on the thickness of the crust, only of the second order of small quantities; whereas, in the case of the earth where the mass is heterogeneous, the mean density being double of the superficial density, the thickness is involved in terms of the first order in the expression for the precession, and by a comparison with observation leads to Mr. Hopkins's result, viz., that the thickness is very great, something like 800 or 1,000 miles at least.

Calcutta, May 24

JOHN H. PRATT

The Duties of Local Societies

IT is undoubtedly the work proper to local natural history societies to study well the productions of their own immediate neighbourhood, to catalogue all the fossils, plants, and animals, and to note any peculiarities regarding them. In the settlement of the great questions still under discussion, much will depend

upon their faithfully performing this duty. All naturalists will cordially endorse whatever has been said in regarding such societies from this point of view, and will agree in declaring that it is far better they should be occupied in such labour than in the discussion of theories and abstruse general questions, which are better left to larger and more influential bodies. It is their office to collect facts upon which individual minds may generalise. This of course applies to such bodies in their collective capacity, and not to the members as individuals; it is very probable that such individuals may make use of the facts collected by the society.

But it should also be remembered that local societies have another duty to perform, and one, too, of hardly secondary importance, and that is the inculcation of the love of natural history in other minds. Indeed, it will often be found that for a time at least this must take precedence of the work already mentioned. It is well known to all who have taken any active part in field clubs and the like, that the real work devolves upon two or three members, sometimes fewer still, and it is totally beyond the power of these two or three to work up the whole natural history of the district by themselves; they may have the will and the ability, but neither the time nor the means. We have known societies numbering above a hundred members where this was the case; the great majority could not be called working members at all; they joined for various reasons, some merely because it was rather "the thing" to do in the town or village; the greater number probably because they were interested in seeing specimens, hearing pleasantly-written papers at meetings, highly delighted at microscopical conversations, &c., &c., but did not care about working in the subjects for themselves. It is very evident that in such cases the first and foremost aim should be to induce as many as possible to become students of nature, at least to enable them to make intelligent notes of what they observe. Hence we find that the reports of provincial societies occasionally appear with little addition to what is already known, very little local information in them, and though this is to be greatly regretted (and in reality is so by the editors), it should not be regarded, as it often is, merely as matter of reproach by others more advanced. Local magazines and reports are issued mainly for the perusal of the members and others living in the locality, and such persons naturally wish to see the best of the papers that have been read; and the matters that interest them most are not always new discoveries, wherever they may be made.

But besides the ordinary method of reading papers at meetings principally, if not solely, attended by members, there are others to be followed by way of inducing outsiders to join the society. One is that of "Penny Rambles," which has been very successful in some localities. These should be conducted by some one not only well versed in natural history, but gifted with the not common ability to impart his knowledge in an attractive and popular way. There should be a change of conductors as often as possible, but care ought to be taken always to secure good ones, as one disappointment lasts a long time; this implies that some competent person or committee should have the control over the arrangements. Sometimes it will be found that one man makes himself so well understood, and consequently so attractive, that he is preferred to others, and here the *vox populi*, within due limits, should have weight. As for subjects, no naturalist will ever be at a loss: the geology of the neighbourhood, some quarry, sand pit, or sea beach; the botany, some of the rarities and their peculiarities; entomology also, and an occasional chat about some interesting antiquity in the vicinity. No abstruse theories should be taken up, they may be intensely interesting to the real naturalist, but are in a general way unknown, and if known, unappreciated by the multitude.

The science lectures, lately so admirably carried out at Manchester, and already referred to in these pages, will occur at once to every one; they might well be taken up in all large towns. But could not Museum Lectures also be started? The duty of every local society to establish a museum has been ably argued by another pen—a museum not for its own sake merely, but with this secondary idea before them, the good of the town or village in which they may be located; one in which the labouring man shall find displayed specimens of the wealth of his own neighbourhood, as well as typical forms from far off lands. Prof. Huxley has well said in one of his "Lay Sermons" that there is a general impression among people that every event of importance happened a long time ago; it is equally true that they fancy any natural object worth looking at must be sought for a long way off; it is our duty to eradicate both impressions. If some plan could be adopted of giving penny lectures in the Museum, it would