the new genera or species described, and this notably in the case of the last work of the illustrious Claparède, and again in the case of Van Beneden's memoir, where we are told, simply enough, that "a number of new and little-known cestoid and other parasitic worms are described and figured." A whole page is taken up with a list of the Annelids referred to in a paper by Prof. Grube, but the list is quite useless, as it wants the remarks as to their synonymy.

Prof. Traquair's portion of the Record appears to have been very well executed. We wish he had given us the list of the Echinoderms from the Dutch East Indies, as described by Herklots. It would have been much more valuable than the list given of very common species from the East Frisian coast; and although we notice an omission of a paper or two among a group (the Cœlenterates) somewhat familiar to us, yet this portion of the volume leaves very little to be desired.

No one individual could write an exhaustive criticism on such a work as this Zoological Record. We have not even attempted it. The moment the volume reached us we cut its pages, and in noting its contents the remarks that we have now made recurred to us; but in addition to these there was also present to us the thought of how much we owed for the successful publication of this work to its accomplished editor and his well-qualified and trusty staff of friends. E. P. W.

OUR BOOK SHELF

- I. *Earthquakes, Volcanoes, and Mountain-building*, three articles published in the "North American Review," 1869—1871. By J. D. Whitney. 8vo, pp. 107. (University Press, Cambridge, United States, 1871.)
- II. *Historical Notes on the Earthquakes of New England*, 1638—1869. By William T. Brigham, A.M., A.A.S. 4to, pp. 28. (Boston, 1871.)

THE first of these works is a small volume containing three reviews, or essays, as they might be more correctly termed, reprinted from the "North American Review," and written by the well-known geologist Mr. Whitney, formerly director of the Geological Survey of California. They are well worthy of perusal, not only from the easy, somewhat popular style in which they are written, but more especially from their containing a tolerably fair summary of the opinions held by most of the later scientific writers who have treated of the phenomena of earthquakes, volcanoes, and mountain-building, as it is here termed, drawn up by one who is evidently well-read in the literature of these subjects.

To give in its turn a summary of the author's opinions as far as we are able to understand them from a perusal of these three essays, we might state, in the first place, that he lays considerable stress on the geographical data, which show that the area within which the greater earthquakes have been mainly confined is also to a great extent coincident with that of the greatest displays of active volcanic forces; and on the observations showing the action which the moon, or rather of the sun and moon combined, exert on the number and intensity of earthquakes, which, if accepted, indicate an internal condition of fluidity in our globe; he believes both in the chronological succession of volcanic rocks, and in their having proceeded from some common or connected source within the earth, but does not agree with those who regard the access of water as the great agent in volcanic cataclysms; disbelieving (in opposition to some elaborate calculations to the contrary) that the force capable of being developed

by steam at such immensely high temperatures, could be sufficient to account for the phenomena of ejection; and although admitting the proximity of volcanoes in general to the sea, points out that some of those in South and North America are situated inland, several hundred miles distant from the ocean.

Regarding the differences in texture between the granitic rocks and those of recent volcanic origin as due mainly to the different conditions of our globe in the early periods in which they were erupted, Mr. Whitney protests against the hypothesis, so much brought forward of late, that the former are merely sedimentary deposits, brought within the action of, and softened or liquefied in, some unaccountable way by internal heat, and with respect to the origin of mountains, regards the external action of rain and rivers, now so all-absorbing in the minds of most English geologists, as altogether secondary to more powerful internal forces, believing, whilst mountain-building is to a great extent the result of an antagonism between subsiding and stationary masses of the earth's crust, that in all the great chains of mountains we have ample proof that this is at the same time accompanied by the intrusion of eruptive rocks from below, as a necessary consequence.

The second brochure by Mr. Brigham is reprinted from the memoirs of the Boston Society of Natural History; it appears to be the first part of a more lengthy communication to the Society, and is entitled "Volcanic Manifestations in New England;" it is an apparently exhaustive catalogue of all the principal earthquakes which have taken place, or rather been recorded, since the discovery and settlement of the country until the commencement of last year, bearing evidence of much industry, and appearing to be a valuable contribution to the records of American Seismology. D. F.

Astronomische Tafeln und Formeln. Herausgegeben von Dr. C. F. W. Peters, Assistant der Sternwarte in Altona. (Hamburg: W. Mauke, 1871; London: Williams and Norgate.)

A USEFUL collection of auxiliary astronomical tables compiled by the son of the well-known editor of the *Astronomische Nachrichten*. It brings under one cover many tables for which the computer has ordinarily to resort to different books; and in some cases the tables are exhibited in a more expanded form than that in which they are usually printed. It contains copious tables for converting time into arc, sidereal into solar time, hour and minute intervals into decimals of the day, refraction and hypsometric tables, tabular data referring to the figure of the earth, tables of squares and trigonometrical functions, and many others for facilitating the reduction of astronomical observations. It has also a collection of formulæ in common request, goniometrical, trigonometrical, and astronomical. The collection is based upon, and is in many respects closely similar to that made by Schumacher in 1822, and which was re-edited and enlarged by Warnstorff in 1845. Dr. Peters has, however, added many new tables, and modernised others where necessary. We could wish that a little more care had been bestowed upon the printing; the figures on some of the pages are very indistinct, and would tease a computer sorely. The defect is not accidental to a single impression of the work, for two copies have come before us, and in both the same pages are faulty. J. C.

LETTERS TO THE EDITOR

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

Zoological Statistics and the Hudson's Bay Company

AMONG the "Notes" in NATURE of December 28, there is one in which mention is made of the great dearth of martens imported into London this last season from Hudson's Bay, also

of the death of 3,000 Indians from small-pox in the Saskatchewan district. It is then added "that martens that are not killed, and Indians that die, mean reduced dividends to the Hudson's Bay shareholders and traders."

Having lived a good many years in the Hudson's Bay Territory, perhaps you will permit me to mention a curious circumstance which I noticed, in illustration that martens may abound yet comparatively very few be killed.

In all parts of the fur country east of the Rocky Mountains, where there is timber, hares (*Lepus americanus*), or "rabbits," as they are commonly, but wrongly, called, are found in greater or less numbers, and they congregate in certain favourite localities. The Indian pitches his tent near one of these places, and by setting snares (which his wife and children attend to), easily supplies himself and family with food, whilst the skins of the hares are worked up into most comfortable blankets.

The hunter all the while is trapping the marten and other fur-bearing animals that assemble to prey upon the poor rabbits, and is thus enabled to secure without much labour a large and valuable stock of furs, chiefly martens.

The hares are, however, liable to a very fatal epidemic,* which usually attacks them when they have become very numerous, and they gradually die off, so that in two or three years there is scarcely one to be seen. This scarcity continues for a couple of winters or so, after which the hares again begin to increase, so that at periods of eight or ten years they are at their maximum.

During this dearth of hares, the Indian has to go to a fishery, or is obliged to travel about in search of buffalo, deer, or other game as a means of support, and has little time for trapping the marten; and if he had the time, he would still be under great disadvantage, for the marten, lynx, and fisher have also to scatter themselves all over the country to pick up a precarious living on lemmings, partridges, and other odds and ends, instead of feasting in luxury and ease, as they do, on the hares when abundant. Thus, when hares are numerous, many marten skins are obtained, when hares are few marten skins are also few, not necessarily because martens are scarce, but that they are difficult to get.

The death of even 3,000 prairie Indians in one season, however injurious it might be to the trade of the Hudson's Bay Company in other kinds of furs, would not particularly affect the number of marten skins obtained.

I may here record a striking instance of the efficacy of vaccination as a preventative of small-pox. Nearly forty years ago this dreadful disease spread like a scourge from the Missouri river all over the prairies, being carried by bands of horse-stealers from one tribe to another; for these amiable "children of nature" no sooner heard of any of their neighbours being attacked by the terrible disorder, than parties went immediately to rob the sufferers of their most valuable property. They got the horses, but they also caught the disease, and many hundreds died. The Crees, a tribe of many thousands, having nearly all been vaccinated by the Hudson's Bay Company's officer in charge of the district, escaped with the loss of only two of their number.

JOHN RAE

Ripples and Waves

THE article by Sir William Thomson upon Ripples and Waves in the November part of NATURE, which has just reached me, reminds me of a little capillary wave, the examination of which used to be a source of amusement to me some years ago; and as I have never seen any description of it, my observations may not be without interest to some of your readers.

I had long noticed this little wave, winding about, like a hair upon the surface, amongst the eddies which formed in a deep river below a considerable fall, which I used to frequent; but I first got an insight into its nature in a very different situation. I was in a canoe in a sheltered bay, with just enough wind overhead, without any ripple on the water, to make my canoe drift broadside on at the rate of, perhaps, half-a-mile an hour, when I saw my little wave formed about three feet in advance of the canoe. Being in the neighbourhood of a marsh the water was very impure, and the behaviour of the little particles floating in it attracted my attention. Any objects reaching to the depth of from an eighth to a quarter of an inch below the surface passed on to the canoe unaffected by it; but smaller particles were sud-

denly agitated on passing the wave, and after getting a few inches within it, they were arrested at distances varying with their size, the larger ones penetrating farther than the smaller ones. If the wind died away the wave was maintained at a greater distance from the canoe, and it was still perceptible at a distance of fully eight or nine feet from it, after which it became fragmentary and disappeared. If the pace of the canoe increased, the wave came nearer to it, and the particles, which had been brought to rest at various intervals according to their sizes, were driven up together, forming at last a sort of scum in advance of the canoe. If the wind increased suddenly, the wave disappeared, and the slightest ripple on the surface obliterated it at once; but if the wind freshened very gradually, the wave approached nearer and nearer, becoming at the same time more strongly defined, until it came to within about nine inches from the canoe, and was maintained there under its lee, even after there was breeze enough to make a considerable ripple outside. If pressed beyond that, ripples of quite another character would form just in advance of the wave, and it would break up, and the canoe would pass over the scum which had collected within it.

With this clue as to its nature, I frequently examined the wave in the situations where I had first seen it. Wherever there was any impediment to the stream, as a tree stretching out into it from the bank, there was the little wave ahead of it, at distances from the impediment varying with the force of the current. In the spring, when the water was high, a good deal of foam would be brought down from the falls above, and would collect against these obstructions, but always leaving an inch or two of clear water within the wave. Upon clearing away the foam the wave would soon again be formed, and the next patch of foam which came down would experience a little jerk, as it passed the wave, and penetrate a few inches within it, when it would be arrested, and there would start out from underneath it little particles of sawdust, or other substances, which had been entangled in it, and would range themselves beyond it, in the order of their sizes. Presently more foam would come down, pushing on what had arrived before, till soon there would be an accumulation of it, as at first.

Where the wave was found winding about amongst the eddies there was no solid obstacle, but only one stream meeting another, and it was not at first sight easy to distinguish which was the front and which the back of the wave. The accumulation of scum, however, on one side showed this, and much more so the behaviour of the wave itself, according to the side from which you approached it. If you came down upon it with the stream, with your canoe broadside on, no effect was produced on the wave; but if you passed over it, it was almost immediately reformed on the other side. But if you approached it from the other side, you pushed it on before you; and by careful handling I have often succeeded in detaching a portion of the wave, and carrying it on before me for ten or fifteen yards; whilst after awhile another would be formed in the same place. Sometimes, where the water boiled up from below, there would be an irregular circular patch, surrounded by one of these waves, which you might drive up till the two sides met; or if you approached it stern on, you would cut the circular patch into two, in which case each would run up rapidly to their centre into a little conical jet, and if your pace was at all rapid there would be a drop projected upwards from it.

The wave is so minute that it was not easy to come to any conclusion as to its shape and size; but from the distorted reflection of an object held above it I satisfied myself that under ordinary circumstances it could not be more than one-twentieth of an inch high, the distortion not extending beyond half-an-inch on each side of the sharp cusp, and that it was convex towards the stream, with a very slight trace of concavity on the side of the obstacle generating it. It seemed as if the wave itself was a little elevated above the surface, and that it sloped back very slowly towards the obstacle. This is in accordance with the description above given of a narrowing circular patch running up to a jet; for, although the motion in that case was too rapid to permit of any precise observation, just before it closed in the patch had the appearance of a little table land elevated above the general surface. Upon one occasion, when a boom had been stretched across the river, running at the time fully five or six miles an hour, the wave was only about nine inches from the boom, against which a dense scum was collected, but still with about an inch of clear water between it and the wave. The wave in this case must have been fully an eighth of an inch high, and on its farther side were a succession of ripples, very much exceeding the capillary wave in height and amplitude, and differing

* It is quite as fatal in its effects as the grouse disease, and the causes are little known. The hares are found sitting in their forms dead. The Indians say they can tell when the disease is about to commence by a peculiar growth found in the abdomen.