about the Canadian flora is how extremely few species enter into it that are not found in the United States. The general question of the characteristics of the North American flora was fully discussed by Dr. Asa Gray in an address to the biological section of the British Association at Montreal, which was published in the issue for November, 1884, of the *American Journal of Science*. Two of its leading characteristics as compared with Europe are the abundant development of peculiar types of Compositæ and Ericaceæ. It is to this present catalogue that we must turn for full details on such matters as these in application to the northern area. One of the most curious instances of a locality for a well-marked plant widely distant from its main area is furnished by the occurrence of *Calluna vulgaris* in very small quantity in Newfoundland, Cape Breton Island, and Nova Scotia. It is not known on the American continent, and the genus *Erica* is entirely absent. A large number of common European plants, such as *Bellis perennis*, *Chrysanthemum Leucanthemum*, *Tussilago Farfara*, *Hyoscyamus niger*, and *Anagallis arvensis* are fully naturalised in Canada. Some British species, such as *Gentiana Amarella* and *Hieracium umbellatum* are represented in Canada by varieties mostly readily distinguishable from the European type. Of plants alpine in their European range which are widely spread in British North America we have instances in *Loiseleuria procumbens*, *Arctostaphylos alpina*, *Linnaea borealis*, *Lobelia Dortmanna*, *Vaccinium uliginosum*, and *V. Vitis-idea*; and of plants of wide European and British dispersion at a lower level in *Campanula rotundifolia*, *Achillea Millefolium*, *Viburnum Opulus*, *Pyrola minor*, and *Andromeda polifolia*. Mr. Macoun has consulted Dr. Asa Gray and Dr. Sereno Watson on all points of doubtful identification, and used the same nomenclature and standard of specific limitation.

J. G. B.

LETTERS TO THE EDITOR

[The Editor does not hold himself responsible for opinions expressed by his correspondents. Neither can he undertake to return, or to correspond with the writers of, rejected manuscripts. No notice is taken of anonymous communications.]

[The Editor urgently requests correspondents to keep their letters as short as possible. The pressure on his space is so great that it is impossible otherwise to insure the appearance even of communications containing interesting and novel facts.]

The Zoology of Dr. Riebeck's "Chittagong Hill Tribes."
—The Gayal and Gaur

IN NATURE for June 25 (*ante*, p. 169) there appeared a review of the late Dr. Emil Riebeck's "Chittagong Hill Tribes." The contributions of the specialists who are entitled "the foremost naturalists of Germany" are mentioned as "separate monographs of great value."

This is no stinted praise, and as one of the separate monographs, that on the zoology, by Dr. Julius Kuhn, is especially noticed, I took the earliest opportunity of reading what I anticipated would prove a very interesting essay on the fauna of a rather imperfectly-known region.

I will only say that I was disappointed. The zoological "monograph" consists of four pages, two and a half of which are taken up by Dr. Kuhn's remarks on the gayal and gaur. These are the only portions deserving notice; the remaining page and a half contain notes, all trivial, and some seriously incorrect, on skulls of a rhinoceros, a bear, and a monkey, of only one of which a specific determination is attempted, and in that instance the name given is, I believe, wrong. Perhaps these notes are not by Dr. Kuhn, for his observations on the gayal (*Bos frontalis* v. *gavæus*) and the gaur (*B. gaurus* v.

cavifrons) show some acquaintance, though an imperfect one, with the literature of the subject. Your reviewer credits Dr. Kuhn with the discovery that "the gayal or wild ox of Bengal, Assam, and Further India does not differ specifically from the gaur of India proper," and Dr. Kuhn writes apparently under the impression that the occurrence of the gaur east of the Bay of Bengal is not known. The range of the gaur throughout Assam, Tipperah, Chittagong, Burmah, and the Malay peninsula has, however, been well known for thirty years at least, and has been repeatedly described by Cantor, Blyth, Jerdon, and other naturalists, whilst the head of a Tenasserim gaur was well figured nearly fifty years ago in the *Journal of the Royal Asiatic Society* (vol. iii., 1836, p. 50). The fact that the wild gaur is called gayal by the natives of some parts of India is also not new. The name by which the tame gayal, *Bos frontalis*, is generally known in the country is not *gayal*, but *mīthan*.

Dr. Kuhn's principal object is to show that the gayal may be a domesticated race of the gaur. It would be impossible to do justice to the subject without going into considerable detail, but the first stage in the inquiry is one to which no reference is made by Dr. Kuhn. This is the question whether *Bos frontalis*, the gayal, exists as a distinct species in the wild state, as stated by Lambert, Colebrooke, Horsfield, Blyth, and others, or whether, as lately urged by Mr. J. Sarbo (*Proc. Z. S.*, 1883, p. 142), there is no such thing as a wild gayal. A very valuable contribution to the history of these animals was published twenty-five years ago by Blyth in the *Journal of the Asiatic Society of Bengal*, vol. xxix. p. 282, in a paper "On the Flat-horned Taurine Cattle of South-East Asia." This paper was, I think, subsequently republished in either *Land and Water* or the *Field*, but I am not certain. One most important circumstance mentioned by Blyth on apparently excellent authority is that the gaur is kept tame in the interior of the Chittagong hills, and, as a tame animal, is quite distinct from *Bos frontalis*. If this is the case hybrids are very likely to occur, for the gayal breeds freely with the much less nearly allied zebu, and such hybrids may account for the occurrence of forms intermediate between the gayal and gaur. An indication that such forms exist is, so far as I can see, the only evidence brought forward by Dr. Kuhn in favour of the gayal being a domesticated race of the gaur, his main argument; his supposed discovery that the tame gayal and wild gaur inhabit the same country being a singularly fine example of a *nidus equeus*.

It will, I hope, be understood that these observations apply solely to the zoological portion of Dr. Riebeck's work; though, in connection with this, in another part of the book, I remark that Plate 14, Fig. 2, which represents a rodent's—probably a squirrel's—skull, is called in the explanation of the plate "the skull of a musk-deer"! Your reviewer's opinion of the work is doubtless founded on the anthropological and ethnological portions; I only dissent from the views expressed as to the zoological monograph.

W. T. BLANFORD

July 11

"The Fauna of the Seashore"

IN the abstract of Prof. Moseley's interesting lecture on "The Fauna of the Seashore," published in the current number of NATURE (p. 212) several agents are referred to as competent to call into play the tendencies to vary which are embodied in each species. These, whether suggested by Prof. Lovén or the author of the lecture, include—light and shade, temperature, currents, food, enemies, favourable condition of water for respiration, and the variation of conditions produced by tides. I venture to think that one very important factor in the variation of the marine fauna, if not the most important, has been left out of the list: I refer to marine waves.

The action of waves on the littoral fauna is not only extremely severe, but it is of constant recurrence; and failure to resist it does not merely involve some minor disadvantage or inconvenience to the object attacked, but its very existence.

A point commonly overlooked by naturalists is the severity of the wave-action arising from the reciprocal character of the wave-currents. Human bipeds occasionally experience the inconvenience of a shifting current when encountering opposing blasts of wind at some street corner during a gale. The marine littoral fauna, living in a much denser medium, encounter two analogous currents for every passing wave heavy enough to affect the bottom, and have to encounter these currents without cessation for the days or weeks the storm may last. Any failure to

resist this inexorable enemy on the part of the shallow water denizens of the sea or any encroachment on exposed areas during fine weather by animals unfitted to meet the storm will incur the penalty of death.

The prime necessity for every member of the littoral fauna is the power of resisting the attacks of waves; and every development and variation undergone by such littoral fauna must of necessity have been carried out under the immediate control of waves.

If, as Prof. Moseley tells us, it was in the "littoral zone . . . that all the main groups of the animal kingdom first came into existence," we may go further and say that these main groups were modelled by the ceaseless action of waves, as these in their turn were brought into being by winds raised by solar heat. Thus the early stages of evolution can be carried back directly, by the two short links of wind and wave, to the sun itself.

One point that I have never published myself or seen recorded by others, is the curious conflict that may be observed between wave- and tidal action. For example, a shell with a wide bathymetrical range, from tide-marks to, say, fifty fathoms, may evince a tendency towards the elaboration of a useful form and sculpture, in the deeper water; whereas, between tide-marks the two daily checks to growth arising from the fall of the tide would immediately check any such variation in sculpture, and the altered form would no longer be best suited to the along-shore conditions.

Moreover, as the form best suited to tide-marks is often in conflict with that best suited to deeper water, the form of a species living between tide-marks might soon diverge from that of the same species frequenting deeper water. As a possible instance I would adduce the case of *Trochus zizyphinus* and *T. granulatus*. These gasteropods have always, I believe, been considered distinct species; but I have in my possession specimens from about fifteen fathoms, showing a distinct passage between the smooth zizyphinus and the sculptured granulatus, and this both in outline and sculpture.

I regret that I have been unable to obtain odontophores of the intermediate forms to ascertain if they confirm the passage from the one species into the other. It is, I think, evident that though *T. zizyphinus* can retain its form in deep water, *T. granulatus* could not retain its symmetrical granulated sculpture were it to invade the tidal strand.

The variety of method exhibited by the littoral fauna in resisting wave-currents affords a most interesting subject of research. Take for instance an exposed ledge of rock—no hypothetical one—with sturdy limpets living on it, the fragile *Pholadidea papyracea* living in it, and the hardy little *Littorina obtusata* clinging to the sea-weed. A storm attacks the trio, and tests their several methods of defence. The limpet is safe on the rock, the *Pholadidea* in it, and the *Littorina*, though at once washed off its feeble support, is safe, thanks to its solid shell, from the utmost violence of the storm. The tenacious hold of the limpet on the solid rock and the feeble adherence of the *Littorina* to the sea-weed indicate very opposite methods of meeting a common danger.

In conclusion I would put in a plea for working-models of the sea in some of our new aquariums. When one sees in a tranquil tank such a fish as the gurnard with its far-spreading feelers ready to steady itself amid swinging wave-currents, one would like to see its machinery brought into action. A gentle swinging motion could be easily imparted to the waters of a tank, and under such conditions the observer would see the animals use the special appliances they possess for resisting or evading their most formidable enemy.

ARTHUR R. HUNT

Torquay, July 6

"New System of Orthography for Native Names of Places"

ALLOW me room for a few remarks on the Royal Geographical Society's "New System of Orthography for Native Names of Places," just published in your number for July 2. The Society has earned the thanks of the public for grappling with the neglected and vexatiously inconsistent question of place-name spelling. Attention was called by myself to this subject in *Notes and Queries* of May and July, 1884, and I can take no exception to the vowel and consonant system suggested by the Society, save to the retention of the un-English letter *x* and to one other particular.

This latter exception deals with the statement contained in paragraph (2) that "no change will be made in the spelling of

names that have become by long usage familiar to English readers—as Calcutta, Cutch, Celebes, Mecca, &c." Now, why make even these exceptions to the excellent rules laid down? Exceptions are always a nuisance, and in the cases of justifiable reforms prove more often than otherwise the means whereby the benefits of such reforms are frustrated altogether. A little more boldness by the Society in grasping the nettle is wanted; and while an improved alternative spelling would soon become familiar to the public, the help given by this concession to logical consistency would encourage reforms both here and in other fields. The attempt to consider the public convenience here illustrated is, I believe, unnecessary; while the seeking to preserve historical spellings, as with other historical and venerable anachronisms, comes to this—that the progress of reform is continually becoming hidebound and stunted, if not stopped altogether, by the impossible attempt to energise distinct stages of growth at one and the same time. It is earnestly to be hoped that the Geographical Society, upon whom the mantle of "Bahnbrecher" in spelling reform has suddenly fallen, will do the wise thing here, and boldly declare against all "exceptions" to the wholesome, justifiable improvement.

The need for, and the influence on other departments of spelling reform, of bold action on the part of the Society is illustrated by the retention of the letter *x*. In any reform scheme of the spelling of English place-names—the next urgent question to the above—the abolition of this letter will stand in the fore-rank of improvements. Witness its mischievous working in "Boxted" (Buckstead), "Hoxton" (Hogston in 1790), "Oxted" (Ockstead), Huxtable (Huckstable), &c.!

N.

July 9

Recession of Niagara Falls in 133 Years

THE fallacy of Lyell's guess at the rate of recession was always plain if we referred to the first accurate account, that of the Swedish traveller Kalm, in *Gent. Mag.*, January, 1751; since which the gorge has both been enlarged full 100 acres, and had miles of its bed deepened many feet. In p. 16, col. 1, A, he said: "Canoes can go yet half a league above the beginning of the carrying place, . . . but higher up it is quite impossible, the whole course of the water, for two leagues and a half up to the great fall, being a series of smaller falls, one under another." Now plainly this whole series have so levelled their bed that the main falls now descend some 160 feet instead of the "137 feet" that he repeatedly maintained (col. 2, E) to be the utmost the engineers, "with mathematical instruments," then admitted. But as for the plan, he is yet more definite. P. 16, col. 1, E: "The river (or rather strait) runs here from south-south-east to north-north-west, and the rock of the great fall crosses it, not in a right line, but forming almost the figure of a semicircle or horse-shoe." (Prof. Tyndall has well remarked that, the upper stream having probably been always much wider than the gorge, the chief fall has always been concave; but Kalm's view makes it appear very slightly so, and we know that very flat segments are, by a perspective illusion, commonly thought semicircles or even "horse-shoes.") "Above the fall, in the middle of the river, is an island, lying also south-south-east and north-north-west, or parallel with the sides of the river; its length is about 7 or 8 French arpents (an arpent being 120 feet). The lower end of this island is just at the perpendicular edge of the fall." He proceeds to tell how this island, once thought inaccessible, had been the scene of the heroic rescue, twelve years before, of two Indians by two others. Then, p. 18, col. 2, F.: "The breadth of the fall, as it runs in a semicircle, is reckoned to be about 6 arpents. The island is in the middle of the fall, and from it to each side is almost the same breadth" (barely 350 feet then, but in his engraving not half that). "The breadth of the island at its lower end is two-thirds of an arpent or thereabouts." His view makes it but one-third the height, *i.e.*, one-third of "137 feet."

Now this mere reef, about 900 feet by less than 80, was plainly one whose length the falls were reducing. Is there the least ground for holding they have ever reduced Goat Island (now ten times larger than that) or will reduce it one rood? But, prolong "Luna Islet" north-north-west till 900 feet long, and you will have the site, I submit, of Kalm's middle rock, barely 350 feet from the point Mr. Wesson marks, on Fig. 2, "New York Shore," and about as much from a Canadian point west-south-west of it. As for Goat Island, it cannot, in his time, have yet been touched by the falls, but may be one of those the hunters had habitually visited above. His description can