

was most pressing, that of the teaching of geometry. But it can hardly be denied, I think, that there are other branches of mathematics whose teaching might also be greatly improved by an association of teachers, conferring together as to the defects of existing books or methods, and intrusting to sub-committees the task of suggesting means of remedying such acknowledged defects. If this be granted it appears to me that it is our next duty to bring the strength of our existing organisation to bear on other branches of mathematics besides pure geometry. To do this would, I believe, assist rather than injure the work which we have still to do for geometry.

"I cannot doubt but that we have to some extent suffered from the restriction of the field within which we have hitherto worked. Elementary geometry is essentially a *school* subject, that is, one in which a student of mathematics ought to be fairly proficient before he enters on his university course, and which therefore is not a subject of *real teaching* in our universities or higher colleges at all. To this, and not to any ingrained spirit of opposition to improvement, which in the face of the changes going on in our universities it seems to me it would be absurd to charge upon any body of active workers therein, I am inclined to attribute the small amount of interest and attention which we have hitherto been able to obtain for our work, and our failure as yet to procure any recognition of our syllabus in any university of the United Kingdom. Where a subject is not taught, but is only a subject, and rather a subordinate subject, of examination, there can hardly be any very lively and active interest in the improvement of its teaching. It is reasonable to expect, therefore, that, by extending the scope of our work to other subjects, of which only the elements can in general be taught in schools, and which will afterwards be more fully studied at the universities, we shall enlist the sympathies of a wider circle of mathematical teachers, extend the list of our members, and connect ourselves more intimately with the living mathematical teaching of our universities, and then we shall, I believe, greatly promote the recognition of the work which we have already done. . . . Algebra and trigonometry are perhaps less in need of our attention than other subjects, though even as regards these I believe valuable suggestions as to improved methods and range of teaching would arise in the discussion of a committee specially interested in them. But it is only necessary to mention the subjects of analytical geometry, higher geometry, higher algebra, elementary kinematics and dynamics (or mechanics), to bring before the minds of those whom I am addressing a number of questions as to their teaching, from the discussion of which great advantages might arise. Further, I think no one can have followed the more recent expositions of mathematical physics, more especially in the 'Matter and Motion' of Maxwell, and the 'Elements of Dynamic' (alas, only a fragment) of Clifford—to mention only the names of two of the most penetrative geniuses and profound thinkers of our age, whom we have loved and admired while living, and whose premature deaths we, in common with the whole world of mathematical and physical science, deplore as an irreparable loss—without feeling convinced that the time is not far distant when the notion of a *vector* or *step*, as Clifford happily names it, and the simpler consequences of that notion forming a *vector* or *step*-geometry (the basis of the calculus of quaternions), must be made a part of the elementary studies of every student of mathematics, more especially for the purposes of mathematical physics, but perhaps not less for its application to pure geometry. And if this be so I cannot help thinking that our Association, extended as I have suggested, might be the means of bringing together the right men to organise the method and bring it into a suitable stage for elementary instruction. . . . I refer to the improvement of the teaching of arithmetic. I suppose there are none of

us here who have had any experience in the teaching of arithmetic, who have not often wished that they could make a *tabula rasa* of their pupils' minds, as regards this subject, so fatally destructive of all appeals to reason have early unintelligent teaching and bad traditional methods shown themselves to be. In an effort to reform in many points the teaching of arithmetic, we might naturally expect to associate with us the best teachers in preparatory and even in primary schools; and perhaps also members of that very important body of men, the Government Inspectors of Schools; and thus our organisation might become the means of linking together all grades of mathematical teachers, from the humblest to the highest, in an association which could not fail, if heartily supported, to become a powerful influence for good on the whole education of the country."

As the President's proposal took many of the members present by surprise, it was ultimately resolved, as we read, that a special meeting of the Association should be held about Easter next, to consider the desirability or the contrary of thus extending the scope of the Association.

In connection with this matter we have also received a letter addressed to non-members to ascertain, if such an extension of the aims of the Association were adopted, whether they would allow themselves to be proposed as members of the new Association. A draft of rules accompanies the Report, from which we extract the following proposed rules:—"That the Association be called 'The Association for the Improvement of Mathematical Teaching'; that its object shall be to effect improvements in the teaching of the various branches of elementary mathematics and mathematical physics by such means as may appear most suitable in each particular case. This object to be carried out by the reading of papers or raising discussions at meetings of the Association, by the appointment of committees to report on existing defects in the usual methods, order, range, &c., in teaching special subjects, and the expediency of drawing up syllabuses or text-books of such subjects; by the employment of suitable means for bringing the work done by the Association before the universities and other educational or examining bodies, and using its influence to obtain recognition of such work from those bodies."

Another action on the part of the meeting was the passing a resolution "that a sub-committee be appointed to draw up proofs of the propositions of the syllabus of plane geometry." It was shown that many teachers had adopted the syllabus, and that it was meeting with a growing acceptance was evidenced by the steadily improving annual sale, 2033 copies having been already sold.

ILLUSTRATIONS OF NEW OR RARE ANIMALS IN THE ZOOLOGICAL SOCIETY'S LIVING COLLECTION¹

II.

NORTH-EASTERN ASIA has of late years disclosed to its explorers a number of very curious novelties in the class of Mammals. Amongst them are several species of great interest, examples of which have reached the Gardens of the Zoological Society alive.

4. The Tcheli Monkey (*Macacus Tcheliensis*) was so named by the distinguished zoologist, M. Alphonse Milne-Edwards of Paris, from the Chinese province of Tcheli (or Petcheli), in which it is found. The existence of a monkey in a latitude so far north—on nearly the same isothermal line as the city of Paris—is a very remarkable fact, and quite new to zoological distribution.

The occurrence of this monkey in the mountains of the north-eastern district of the province of Petcheli seems to have been first ascertained by M. Fontanier, who was for some years French Consul at Peking, and who transmitted

¹ Continued from p. 38.

many valuable specimens to the Museum of the Jardin des Plantes at Paris. Amongst these was an example of the present animal—a female, not quite adult—which was described and figured by M. Alphonse Milne-Edwards in his "Études pour servir à l'Histoire Naturelle des Mammifères" (Paris, 1868-1874). The celebrated naturalist, Père David, also seems to have met with this monkey in the same district, as he includes it in several lists of the Mammals of Northern China which he has recently published.

For their pair of this scarce monkey now living in the Regent's Park, the Zoological Society are indebted to the kind exertions of one of their Corresponding Members, Dr. S. W. Bushell of H.B.M. Legation at Peking. Dr. Bushell obtained these animals in 1880 from the Yung-ling, or Eastern Mausoleum, of the reigning Manchu dynasty, situated about 70 le from Peking to the north of 40° N.L.

The Tcheli monkey belongs to the same section of the group as the well-known Rhesus monkey (*Macacus*

rhesus), but has a shorter tail, and is generally of a more rufous colour. It is also readily distinguishable by its dense coat of short thick fur, adapting it to endure the bitter winter climate of its native hills, where the thermometer often descends 10° below zero. Like most of its congeners it is rock-loving in its habits.

5. The Water-deer (*Hydropotes inermis*) is another Chinese animal which has only lately become known in Europe.

Until of late years it was supposed that the annual production of deciduous bony processes (antlers) from the frontal bones was an invariable characteristic of the males of the deer-tribe (Cervidæ). In some cases these antlers might attain enormous dimensions, as in the Wapiti (*Cervus Canadensis*) and the Elk (*Alces machlis*); in others they might consist only of diminutive points, as in the Pudu-deer of Chili (*Pudua humilis*). But they were always present to a greater or less extent. The discovery of this little animal served to confirm, however,

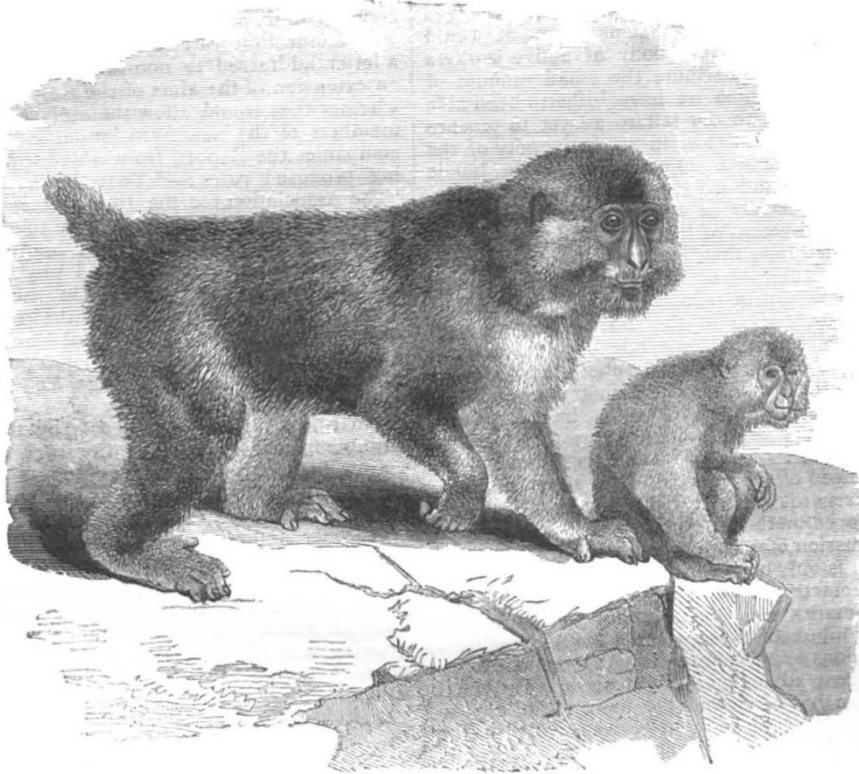


FIG. 4.—The Tcheli Monkey.

the truth of the axiom, that in Nature at least there is no law without an exception. Here we have a deer complete in everything except its antlers, usually the *most* characteristic feature in the males of these animals. In place of antlers the buck Water-deer is provided with other organs of defence in the shape of two long exerted canine teeth, which grow to a considerable size in the adult, and give him ample means of exercising his pugnacious powers.

For our first knowledge of the existence of this singular deer we are indebted to the exertions of the late Robert Swinhoe, who, during his residence in various parts of the Chinese Empire, added so largely to our knowledge of every part of its fauna. Mr. Swinhoe obtained his first specimens of the *Hydropotes* in the market of Shanghai in the winter of 1879, and described it at one of the meetings of the Zoological Society in the following year.

"In the large riverine islands of the Yangtze above Chinkiang," Mr. Swinhoe tells us, "these animals occur in large numbers, living among the tall rushes that are there grown for thatching and other purposes. The rushes are cut down in the spring; and the deer then swim away to the main shore and retire to the cover of the hills.

"In autumn, after the floods, when the rushes are again grown, they return with their young and stay the winter through. They are said to feed on the [rush-sprouts and coarse grasses, and they doubtless often finish off with a dessert from the sweet-potatoes, cabbages, &c, which the villagers cultivate on the islands during winter.

"They cannot however do much damage to the latter, or they would not be suffered to exist in such numbers as they do; for the islands have their villages and a pretty numerous agricultural population. Fortunately for the

deer, the Chinese have an extraordinary dislike for their flesh. They are therefore only killed for the European markets, and sold at a low price. The venison is coarse and without much taste, but is considered tolerable for want of better; it is the only venison procurable in Shanghai. The animal itself gives sport to the gunner; and numbers are slaughtered every winter by the European followers of Nimrod in the name of *sport*. Their numbers however do not appear to get much thinned."

Another most remarkable characteristic of these antler-

less deer is their extraordinary fecundity. Mr. Swinhoe states that according to the testimony of the natives the mothers have four or five young at a birth, and that this is corroborated by Europeans who have killed gravid females and found the like number of embryos in the uterus. This account is to some extent confirmed by observations on the Water-deer in captivity in Europe. Although the Zoological Society have not succeeded in inducing this animal to breed in the Regent's Park, this feat has been accomplished by M. Joseph Cornély of the



FIG. 5.—The Water-deer.

Château Beaujardin, near Tours, in France—one of the most successful "acclimatisers" in Europe. In M. Cornély's beautiful park one of these deer produced three young ones in the spring of 1879, two of which, it is believed, lived to attain maturity. There can be no doubt therefore that the Water-deer is much more fruitful than the rest of its congeners, which certainly never produce more than two at a birth, and for this reason at least would be a valuable animal for domestication.

The adult water-deer standing reached at its shoulder

a height of about twenty inches, and is generally of a pale fawn-colour, paler below.

According to Mr. Swinhoe the "Chinese at Shanghai call this animal the *Ke*; but at Chinkiang it is named *Chang*—the classical term for the Muntjac (*Cervulus Reevesi*). The Chinese dictionary, compiled under authority of the Emperor *Kanghe*, describes the *Ke* as 'stag-like, with feet resembling those of a dog, has a long tusk on each side of the mouth, and is fond of fighting.'"

NOTES ON THE GEOLOGY OF THE COREAN ARCHIPELAGO¹

THIS archipelago, which consists of a number of smaller groups of islands separated by a depth of water varying from twenty to fifty fathoms, lies off the south-west coast of the peninsula of Corea. Whilst many of the larger islands vary from two to six miles in their extreme length, they are all of considerable height: their highest summits attain an elevation generally ranging between 600 and 1000 feet above the sea—Ross or Alceste Island, in the south-west corner of the archipelago, reaching to a height of as much as 1935 feet. The large and naked masses of rock which crown their summits give to these islands a somewhat rugged and

uninviting aspect; and their quaint inhabitants view with ill-concealed dislike the presence of foreign ships within their waters.

I was enabled to land on two occasions on the Island of Mackau—the largest of a group of islands bearing that name. About six miles in length, it possesses some half-dozen lofty peaks, which range in height from 800 or 900 feet to 1400 feet above the sea. Naked masses of quartzite or quartz-rock crown the summits and often compose the upper third of the hills, whilst a thick and dense growth of creepers, shrubs, and mimosas clothes the hill-slopes for their lower two-thirds. The quartzite passes insensibly into a compact quartzitic sandstone underlying it; and lower down this rock assumes a coarse-grained texture, occasionally containing pebbles of quartz embedded in it. From the nature of the ground it was difficult to find

¹ Made during a brief visit of H.M.S. *Hornet* to these islands in October, 1878.