

themselves written less successful books or articles on the same general subject.

5. The critics present denials, dogmatic assertions, negative testimony. Not one particle of positive evidence has yet been presented against the books which are so vigorously condemned. Meanwhile the fact remains that, though six or seven volumes and a score of articles have already been published, only two slight errors have thus far been pointed out, and they were promptly and gratefully acknowledged.

Other facts and considerations will undoubtedly suggest themselves, but perhaps it were well to consider these first in forming one's judgment as to the books and their critics.

WM. J. LONG.

STAMFORD, CONN., May 7, 1904.

[We hope that this discussion will not be carried further.—EDITOR.]

THE METRIC SYSTEM.

TO THE EDITOR OF SCIENCE: The suggestion of Professor W. Le Conte Stevens that a compromise be made between the metric and the British system of weights and measures, making a foot the fourth part of a meter and an inch two per cent, smaller than the British inch, might be a good one if the English-speaking race were to disappear from the earth, and all its tools and its technical literature be destroyed, but as long as that race continues to use its existing tools and books, so long must the inch persist with its present value. His article is useful, however, in showing the impossibility of the general adoption of the metric system in its present form by the people of this country. He well says: "What may be the form taken by legislation in England and the United States, the people can not be compelled to adopt nomenclature that is thrust upon them as a substitute for that to which they have always been accustomed."

WM. KENT.

ICHTHYOLOGY IN THE 'ENCYCLOPÆDIA AMERICANA.'

TO THE EDITOR OF SCIENCE: Referring to Dr. Gill's note on the 'Ichthyology of the En-

cyclopædia Americana,' I may say that he is quite right in supposing that the proofs of the figures which illustrate my article on fishes were not submitted to the author. Many of these seem to be wrongly named as noted by Dr. Gill.

DAVID S. JORDAN.

SPECIAL ARTICLES.

THE MULTI-NIPPLED SHEEP OF BEINN BHREAGH.*

ON two former occasions† I have had the honor of presenting communications to the academy concerning the multi-nippled breed of sheep on my farm at Beinn Bhreagh, near the town of Baddeck, Nova Scotia.

It will be remembered that in 1889, upon the purchase of some property at Beinn Bhreagh I found myself in possession of a flock of sheep; and that in the spring of 1890, one half of the lambs born upon the place turned out to be twins.

This large percentage of twins led me to examine the mothers of all the lambs with the object of discovering, if possible, some peculiarity that would enable us to distinguish twin-bearing ewes from others.

Upon examining the milk-bags of the sheep a peculiarity was observed that was thought might be significant. Normally, sheep have only two nipples upon the milk-bag, but in the case of several of the sheep examined, supernumerary nipples were discovered which were embryonic in character and not in a functional condition. Some had three nipples in all, and some four. Of the normally nipped ewes 24 per cent. had twin lambs; but of the abnormally nipped 43 per cent. had twins. The total number of ewes, however, was so small (only 51) as to deprive the percentages of much significance. Still the figures were suggestive of a possible correlation between fertility and the presence of supernumerary nipples, and it seemed worth while to make an extended series of experiments to ascertain (1) whether, by selective breeding, the extra nipples could be developed so as to become functional, and (2) whether ewes possessing four functional nipples instead of two would

* A paper read before the National Academy of Sciences in Washington, D. C., April 21, 1904.

† See SCIENCE, Vol. IX., May 5, 1899, pp. 637.

turn out to be more fertile than other sheep and have a larger proportion of twins.

1. In regard to the first point mentioned no difficulty was experienced in developing the embryonic nipples into real functional mammæ yielding milk; and for several years past the ewes born on Beinn Bhreagh (with extremely few exceptions) have possessed four functional nipples.

Of recent years lambs possessing five and six nipples have appeared, and it is obvious that continued selective breeding would ultimately result in the production of a six-nippled variety of sheep.

How far the number of functional mammæ could be increased by selection it is of course impossible to predict; but it is worthy of note that one ewe has been born with four nipples on one side of the body and two on the other; and, as the supernumerary nipples have a tendency to appear in pairs, this probably foreshadows the possibility of an eight-nippled variety.

2. In regard to the second point mentioned the multi-nippled sheep have not proved to be more fertile than normally nippled sheep; and the proportion of twins born has been quite small.

One peculiarity, however, is worthy of notice: The twin lambs, though usually smaller at birth than single lambs, speedily come up to the average of the flock in this respect—so that by autumn there is no substantial difference in weight between the single and twin lambs. The multi-nippled sheep are, therefore, able to rear twins more successfully than normally nippled sheep.

This is an important point, and it suggests the advisability of attempting now—by the elimination of single lambs and the retention of twins for breeding purposes—to produce a twin-bearing stock.

At present the Beinn Bhreagh flock constitutes simply a scientific curiosity, and is of little practical value to the country. I propose to make it of value by engrafting upon it the twin-bearing tendency. In Nova Scotia the winters unfortunately are long, and the cost of winter feeding proportionally great, but the country is otherwise admirably adapted for

sheep-raising upon a large scale. The production of a twin-bearing stock would do much to promote this important industry by enabling the farmers to make a double profit upon lambs without additional cost.

The proposed experiments, however, can not be made with a small flock, and the natural increase of the Beinn Bhreagh flock is so slow that many years would elapse before it would be practicable to carry out the plans proposed. I have sought to increase the size of the flock by the purchase of multi-nippled sheep from surrounding farms, but an examination of several thousand sheep has convinced me that it is no longer possible to purchase sheep having the characteristics of the Beinn Bhreagh flock to a useful degree. I, therefore, propose to purchase large numbers of ordinary two-nippled ewes and mate them with Beinn Bhreagh rams—segregating the present flock as much as possible. The multi-nippled lambs born to the normally nippled ewes will enable us to increase the size of the multi-nippled flock beyond its natural increase—and be otherwise beneficial by the introduction of new blood; but the new blood will probably be detrimental to the particular line of selection hitherto pursued and lead to a reduction in the percentage of multi-nippled offspring in that flock.

The present, therefore, seems to be a fitting time to place in the hands of those interested in evolutionary problems, a detailed account of the flock; and I have prepared for private circulation two pamphlets, one entitled 'Multi-Nippled Sheep of Beinn Bhreagh, Living 1903, and Their Known Ancestors,' the other 'Sheep Catalogue of Beinn Bhreagh, Showing the Origin of the Multi-Nippled Sheep of Beinn Bhreagh and Giving all the Descendants Down to 1903.' I have great pleasure in presenting the first copies of these pamphlets to members of the academy specially interested in the subject.

ALEXANDER GRAHAM BELL.

BOTANICAL NOTES.

POPULAR HELPS IN THE STUDY OF THE FUNGI.

It is particularly gratifying to notice the efforts that Professor Kellerman, of the Ohio