ON THE STUDY OF NATURAL HISTORY*

THE value of Natural History would be more fully appreciated if its higher aims were more perfectly understood. Too many fancied that the study of natural history consisted in mere collecting and naming, and looking at pretty objects. This was, however, mere scientific play; whereas the more thorough study was real work, of use not only as an intellectual training, but also as applied to the practical life of every day. They often heard the remark that the proper study of mankind was man, but to confine their study to him would be to take the first term of a great series, and neglect all the other terms—a proceeding which could lead only to an inaccurate and one-sided view of the order of the universe.

As an illustration of the connection of one class of facts with another he would briefly describe some of the results to which he had been recently led by applying physical methods to the study of the evolution of plants. He had studied the changes that had occurred in the colouring matters in the leaves and flowers during their development from a rudimentary to a perfect state, and the connection between them and the action of light, and had found that there was apparently a most remarkable correlation. When more and more developed under the influence of light, coloured compounds were formed which are more and more easily decomposed by the action of light and air when they were no longer parts of living plants, but dissolved out from them. There was thus apparently some condition in living plants which actually reversed these reactions.

He had also found that in the more rudimentary state of the leaves of the highest classes the colouring matters corresponded with those found in lower classes, and in the case of the petals of flowers their more rudimentary condition often corresponded with some other variety, which thus appeared as if due to a naturally arrested development of a particular kind. This principle would perhaps serve to explain the greater prevalence of flowers of particular colours in tropical or colder regions and at different elevations. Now, since the effect of the various rays of light was different, it became a question of much interest to decide whether an alteration in the character of the light of the sun would produce a somewhat different effect in the case of other classes of plants in which the fundamental colouring matter differed; for example, whether light, with a relatively greater amount of the blue rays, might not be relatively more favourable to the cryptogamia than to the flowering plants. So far this was a mere theoretical deduction; but, if proved to be true by experiment, it might, at all events, assist in explaining the difference in the character of the vegetation of our globe at an earlier epoch, when perhaps our sun was in a somewhat different physical state, and the light more similar to that of Sirius and other stars of the highest and bluer type.

The practical applications of natural history were of course most varied, but he would now merely refer to such as depended upon the equilibrium between different plants and animals. The successful cultivation of useful plants in a foreign country might depend upon very complicated conditions to be learned only by accurate study. The accidental introduction of some plants or animals might prove most injurious if there were no native check to their inordinate multiplication. This was perhaps why in some cases such importations were far more injurious than in their native country, and it became of great importance to learn what means could be taken to provide some adequate check.

* From an address by Mr. H. C. Sorby at the annual *conversazione* of the Sheffield Field Naturalists' Club, January 5.

TRILOBITES

JOACHIM BARRAUDE has published a preliminary epitome (Prague and Paris, 1871, 8vo) of an intended supplement to his "Système Silurien du Centre de la Bohême."

He therein gives a list of the fossils as yet found in the Cambrian formation:—"PLANTÆ: Palæophycus, 1 species; Fucoides, 2; Archæorrhiza, 1; Halopoa, 2; Cordaites, 1; Eophyton, 2; Frœna, 1; Buthotrephis, 1; Scotolithus, 1; Oldhamia, 3; PETRIFICATA INCERTÆ SEDIS: Cruziana, 2; Lithodictyon, 1; ANIMALIA: *Vestigia*, vel Vermium, vel Crustaceorum, vel Molluscorum: Psammichnites, 4; *Spongia:* Astylospongia, 1; *Cœlenterata:* Protolyellia, 1; *Echinodermata:* Spatangopsis, 1; (doubtful Echinoderm?), Agelacrinus, 1; *Vermes:* Micropium, 1; Spirocolex, 2; Scolithus, 4; Monocraterion, 1; Diplocraterion (Arenicolites), 4; Histioderma, 1; *Mollusca:* Dictyonema, 1; Lingula, 2; Lingulella, 1; Discina, 1; Obolus, 1; Hyolithus, 1."

Whilst this formation has only yielded 28 animals, his next epoch, his "Silurische Primordial Fauna" supplies 366 species as follows:—

NUMBER OF GENERA.	CLASSES.	NUMBER OF SPECIES.												DIFFERENT SPECIES.
		CENTRAL EUROPEAN ZONE.		EUROPEAN.		NORTH AMERICA.								
		Bohemia.	Spain.	Scandinavia.	England.	Newfoundland.	Canada—Vermont.	New Brunswick.	New York.	Massachusetts.	Upper Mississippi.	Texas.	Georgia.	
28	Trilobita	27	9	77	61	9	9	18	6	1	37	8	1	252
2	Ostracoda	...	1	5	4	...	...	...	...	...	...	...	...	10
2	Other Crustacea	...	...	...	1	...	...	...	...	...	1	...	...	2
5	Vermes	...	...	...	4	...	...	...	...	...	1	...	...	5
2	Pteropoda	5	...	2	7	...	3	...	...	...	1	...	...	18
1	Heteropoda.....	...	...	...	1	...	...	...	...	...	...	...	...	1
2	Gasteropoda ...	...	2	...	...	...	...	...	...	...	2	...	...	4
12	Brachiopoda ...	2	6	8	12	...	5	6	2	...	9	5	...	55
4	Bryozoa	1	...	4	1	...	...	...	...	...	1	...	...	7
6	Cystidea	5	1	...	1	...	...	1	...	...	...	...	...	8
2	Spongia	...	...	...	3	2	2	...	...	...	...	...	...	7
66	TOTAL	40	19	96	95	11	19	25	8	1	52	13	1	366

The author remarks on the discordance between the picture thus offered and that which should appear to give any positive confirmation to Darwinism. He then goes on to remark on some phenomena in the development of Trilobites.

According to the Darwinian theory, the development of the individual should bear relation to the past development of the species. Now Trilobites, as they develope, increase in number of their body segments, and therefore the earliest Trilobites ought to have few such segments. But those of the primordial fauna are generally characterised by the opposite condition, while the number is left in those of the succeeding fauna.

Again, on the Darwinian theory, there ought at first to be but few types, the number increasing later. But, in fact, out of seventy-five genera of Trilobites, no less than seventy-two appear in the first two Silurian faunas, and the three others at the beginning of the third fauna. Moreover, the perfection of organisation by no means gradually increases but is quite irregular.

Once more as regards orders, there is no approximation as we recede in time. The Trilobites, Phyllopoda, and Ostracoda, are as sharply differentiated at their very first appearance as they are later, and the Trilobites of the lowest beds are not less easy to divide into genera than those of a later period. *Bohemilla* might, perhaps, be