

varieties than in those that mature later. Thus it is very common for Japanese wheats to be infested with smut when introduced into this country, and Japanese varieties are always quite early in ripening. Now, as the tendency of dryness and heat is to produce early ripening of plants, it appears that there may be some relation between these parallel facts, and the question is a very interesting one as to why these conditions exist. As a rule the smut is propagated by germinating in the ground with the grain itself, infecting the young plant at that time and growing up through the plant as the plant grows, finally breaking out at the surface in the wheat head. One of two things therefore it seems may be true, either that the abnormal condition of the plant produced by its infection with the smut causes the plant to ripen earlier, or, on the other hand, that the early maturity of the plant allows the smut to work its way to the surface before the plant has grown entirely beyond it. Many observations seem to show that the latter is true, although it is by no means established. The tendency in dry seasons and in early ripening is always to produce more fruit or grain and less of the vegetative portion of the plant. As the smut finally produces its spores at the surface in the head, this condition would naturally favor the maturity of the smut. On the other hand, in later ripening sorts and in moister regions or seasons of greater moisture, the growth of the plant being more rapid and the maturity of the fruit occurring later, the plant is enabled in a sense to outgrow the development of the smut.

A portion of the evening was devoted to a symposium on 'Environment as a Factor in Natural Selection,' the discussion being led by Messrs. W. J. Spillman and H. J. Webber. In the discussion Professor Spillman stated that environment is not only a factor in natural selection; it is the whole of it. It is more than this, for it is a factor in variation. As stated, therefore, the subject covers the whole field of natural selection. It is probable that natural selection has been overworked, and particular attention is called to the fact that much, perhaps most, variation is neither useful

nor harmful, and therefore not amenable to the influence of natural selection. If this is true a great deal of what we see in living organisms is not due to natural selection, but merely to fortuitous variation, perhaps to mutations, as De Vries would have us believe.

It is really change of environment that is important in natural selection. These changes are frequently favorable in that they remove a condition which made selection more strict. Examples of these are common in the case of organisms transplanted to a new habitat, where their natural enemies are absent. Under such conditions variations become permissible that were not possible under the old conditions, and what was before an unimportant species may assume a very important place in the economy of nature.

Mr. Webber stated that while the majority of variations induced directly by the influence of environment are not inherited; nevertheless, the influence of environment serves to destroy those individuals which do not vary in the direction of adapting themselves to the environment. It is only those individuals, therefore, which possess desirable variations that are able to produce seed for the next generation. The action of the environment in the next generation would be exactly the same, those plants only which vary in the direction of fitting themselves to the environment being able to survive and produce seed. In this way natural selection would eliminate such variations as were unfitted to the environment, so that only those plants best fitted would propagate. This action continued through several years would eventually result in rendering hereditary the characters fitted to the environment.

HERBERT J. WEBBER,
Corresponding Secretary.

DISCUSSION AND CORRESPONDENCE.

WHAT IS NATURE STUDY?

THERE seem to be many conflicting definitions in attempts to answer the above question. Here are two examples: "Nature study, as used in this paper, is understood to be the work in elementary science taught below the high school—in botany, zoology, physics, chemistry and geology. We should aim to define re-

sults. Gushing sentimentalism or mere rambling talks will be as barren in results as undigested statistics. To avoid this, the teacher should always have a definite plan before her when the lesson begins."—D. Lange, Supervisor of Nature Study, St. Paul, Minn.

"Nature Study is seeing the things which one looks at, and the drawing of proper conclusions from what one sees. Nature study is not the study of a science, as of botany, entomology, geology and the like. It is wholly informal and unsystematic, the same as the objects are which one sees. It is entirely divorced from definitions, or from explanations in books. * * * To-day it is a stone; to-morrow it is a twig, a bird, an insect, a leaf, a flower. * * * The problems of chemistry and of physics are for the most part unsuited to early lessons in nature study.

"If nature study were made a stated part of a curriculum, its purpose would be defeated."—L. H. Bailey, Cornell University, N. Y.

I have observed the different methods of teaching botany and zoology for many years past. So far as this country is concerned, I think what is now correctly termed nature study started with Louis Agassiz at Harvard, where he invariably set his special students in zoology to work on a starfish, a lobster, a clam or some other animal; not one specimen of one of these, but many of them, not alone those that were full grown, but those of all ages; not only dead specimens, but those that were alive, always with numerous comparisons. For months, the use of books was positively forbidden; and all that was told the student, excepting a few names of parts, was, 'You are right,' or 'You are wrong,' and if wrong, the student was kept at the work until he saw the thing right.

Agassiz was overflowing with enthusiasm. He would throw up both arms with exclamations of delight on seeing a specimen of a common shell-fish that was overgrown. This earnestness and enthusiasm helped secure faithful work from his students. Since working under Agassiz I have not had the slightest doubt that his method of studying nature or nature study was unsurpassed for advanced

students. This method made a lasting impression on Harvard, on her presidents, her professors, and all the students who took his kind of work. Through these students of Agassiz and their students down to the third generation, this spirit of independent work has come filtering along for fifty years or more, till it has finally become widespread and deeply seated, and has recently burst forth into a great flame.

After the manner of Agassiz with his post-graduates, so the teacher of the grades below the high school will treat her young students, of course giving easier problems requiring but a little time each day. The teacher will show her interest, tact and enthusiasm to draw out the best work from her pupils. By all devices, she will seek to get the results of the combined observations of all members of the class before she lets them know her own views on the subject, and even then parts of the work may be left with pupils for further investigation.

With much that is good in nature study comes much that is positively injurious, and unfortunately large numbers are unable to distinguish between the true and the false. One writes a little book giving it some fancy title, distorts the drawings of some seeds and seedlings, inserting outlines of children's faces thereon; she writes some marvelous stories, and all these to help arouse and retain the interest of the child.

I have in my possession a neat drawing made by a student. He made two drawings to represent two honey bees just about to visit apple blossoms. The bees are not alike; each has two wings only; the heads and legs are unlike anything ever attached to bees. The apple blossoms are five-lobed (gamopetalous), with three stamens growing from the base of each lobe of the corolla. He has made drawings of imaginary insects seeking imaginary nectar from imaginary flowers. This student was trained in a state normal school. Such caricatures are absolutely worthless, in fact injurious, to any young person who makes them or even looks at them.

W. J. BEAL.

AGRICULTURAL COLLEGE, MICH.