true that many variations of inbred domesticated plants and animals are very abruptly discontinuous, and that such changes are not caused by selection,* but these facts in no way militate against others equally obvious, that the natural evolution of new types is a relatively slow and gradual process, and that selection may easily influence the direction of this continuous vital motion. The older selective hypothesis was only half erroneous. Selection does not set stationary organisms in motion, but it often guides spontaneous change. It does not explain evolution or vital motion in general, but it does explain adaptation, or motion in some particular direction, as when one species differs from its relatives in special characters which enable it to exist in a special environment. That all adaptations are mere coincidences is as improbable as that all characters represent useful adaptations.

Selection is not, as many 'Darwinians' have maintained, the true, efficient cause of evolution; the vital motion of species proceeds whether selection is operative or not. Species do not acquire characters from the environment, but merely in accordance with it. At any point in the evolutionary journey, selection may determine whether certain characters shall be acquired or not; it is an obstacle in the environmental road over which the species would travel, instead of being the source of power of the organic automobile. By preventing motion in one direction selection may be said, of course, to cause advance in another, but it is apparent that this causality is negative and passive, or a mere figure of speech. Selection may explain why a particular character is accentuated in a particular species, but it is no more a cause of the developmental progress of the species than the turns of the road are the motive power of the vehicle. Segregation enables species to attain differential characters, and selection assists their accommodation to environment, but both these possibilities rest on the more fundamental fact that organic evolution goes forward without external causation in groups of diverse, interbreeding individuals. If a species stood still selection could effect nothing except its partial extinction. In the recognition of a continuous and universal evolutionary motion the kinetic theory supplies the long-sought explanation of selective influence. By ceasing to look upon selection as a mysterious evolutionary cause we are able to ascribe to it a practical and easily comprehensible evolutionary function.

O. F. Cook.

Washington, D. C.,
March 11, 1904.

cause it can not be an advantage to a plant to be able to breed with only half of the members of its species. The same reasoning would apply, however, to all the phenomena of sexual separation, of which the dimorphism of bisexual plants may be an incipient stage. It seems obvious, too, that to breed successfully with half of the individuals of a species is an important advantage over the alternative of breeding less effectively with all of them. The partial or complete sterility of some dimorphic plants to the pollen of others of their own caste may be due to impotency rather than to adaptation, and a dimorphism by which this fatal result could be avoided would certainly be favored by selection.

* Except as selection implies inbreeding, by which mutations are induced.

NATURE STUDY.

To the Editor of Science: In the last two numbers of Science have appeared articles by Drs. Wheeler and Chapman on the abuses of nature writing as exemplified in the writings of Wm. J. Long. These articles have expressed the fear that such work may increase and that it may invade the secondary schools as supplementary reading designed to aid in the instruction in zoology. That this is no idle fear is brought very vividly before the science teacher in the normal schools, for he stands, as it were, an outpost between science and its teaching to immature students. Permit me to call your attention to a pseudo-scientific extravaganza put forth in a seeming serious mood which exemplifies this point. Before me is a book designed evidently for students of the first grades called 'The Tree Dwellers.' It bears the publishers' imprint of Rand, McNally and Co., 1903, and its author is Katherine E. Dopp, of the Extension Division of the Chicago University. The attempt of the book is to place before the stu-

dent an account of primitive child life. The author states in her preface that she was aided in the preparation of her material by the late Professor J. W. Powell, by Fred. J. V. Skiff, of the Field Columbian Museum, and by Professor Dewey, of the Chicago University; other less prominent names are mentioned as collaborators.

Perhaps the most glaring errors that the author has included in her work are certain of the pictures; these are signed by Howard V. Brown.

On page 67 is a sketch of a dinosaur, evidently intended for the *Ceratosaurus* of Marsh, an Upper Jurassic form, chasing a beast that is described as a 'five-toed horse'; accompanying this figure is the following text:

Long, long before the tree-dwellers lived there were wild horses.

They were tiny little creatures.

Perhaps you would not think that they were horses at all.

They were no larger than a fox.

They had stripes like a zebra.

They had five toes on each foot.

They lived on the marshes and on the dry land.

The land at that time was almost covered with water.

The water was filled with fish and reptiles.

Great reptiles crawled about everywhere.

They were masters of the sea and the dry land.

All the creatures feared them, the wild horses tried to keep out of their reach.

The foot of the little horse was not shaped for running, but it was fitted for climbing trees.

When a reptile appeared the *horses climbed the trees.* (Italics mine.)

They stayed in the trees till the danger was passed.

Then they came down to their pastures again.

Again, on page 62 I find a picture of a man in a tree watching a herd of the same horses (?) that were pursued by the Jurassic dinosaur! This makes man contemporaneous with the dinosaur, although it is not so stated in the text.

This book is filled with just such mistakes throughout, notably a figure of a saber-tooth tiger in fierce combat with a hairy mammoth.

That such a book is taken seriously by certain people is shown by the fact that it has been placed in the library of at least one normal school as supplementary reading for students in the kindergarten course, girls who are preparing themselves to teach nature study to infants.

Certainly if such things as anthropology and vertebrate paleontology are to be forced on the four-year-old child the perpetrators should see that it is correct.

We are promised four other volumes by the same author from the same press! Certainly it is time to call a halt.

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SPECIAL ARTICLES.

AN ACCOUNT OF SOME EXPERIMENTS IN REARING WILD FINCHES BY FOSTER-PARENT BIRDS.

DURING the spring of 1901, having some twenty pairs of canary birds mated, I attempted to induce them, in two cases, to incubate the eggs and rear the young of wild fringilline birds. These experiments led me to continue similar efforts during each succeeding spring, and I propose to summarize the results of what occurred in this way, in 1901, 1902 and 1903.

In May, 1901, I secured a set of song sparrow's eggs (*Melospiza cinerea melodia*). There were four eggs in the nest and incubation had just started. I brought the eggs, together with the nest, to my laboratory, and took away from a very tame hen canary bird four eggs which were in her nest, substituting the song sparrow's eggs. I watched the hen canary for a short time to assure myself that my actions had not prejudiced the end I had in view, and was presently delighted to see her return to the nest and settle herself to brood the eggs as if they were her own. In due time, after about eight days, all of the eggs were hatched, and four lusty young song sparrows became the foster-children of the canary. This bird was an especially good parent, as I had proved, by her rearing with success three broods of canary birds during the preceding season of 1901, the whole of the young aggregating thirteen birds, all of which reached maturity, and were strong vigorous examples of their kind. This hen canary