

THE MECHANICS OF BIOLOGY

WE Americans are often pointed out by the English and German and French as a people who do things in a hurry. Sometimes we are admired for it: other times otherwise. Well, we must not be too puffed up in the one case, nor, in the other, feel too solitary in our guilt. Two scientific books of much interest that have appeared here in Paris in the current fortnight are the stimulus to this sage reflection.

Last year a newspaper critic began an otherwise kindly review of a recent book by an acid reference to college professors who give a new course one year and make it into a book in the next. It is true that the particular book under review was the outcome of a college course, but President Jordan and I had given that course, with annual revision, for ten years, and before that it had already been given for five years by Dr. Jordan alone or with other collaboration. Fifteen years of ripening would seem to be a decent period—even for California fruit!

The authors of the two new French books I have referred to are at this very time, and for the first time, giving the lecture courses on which their books are based. This is at least literally true of Felix Le Dantec's "*La Crise du Transformisme*" (Alcan), and I strongly suspect it to be true of Georges Bohn's "*La Naissance de l'Intelligence*" (Flammarion). Le Dantec's book is composed of the November and December lectures in his still continuing Sorbonne course, while Bohn's course, just beginning, starts off much like his book. In his case, however, it may be fairer to look on the book as the precursor of the course.

In both cases the men are very competent to lecture or write on their respective subjects and both the books and the courses are fascinating contributions to present-moment biological discussion. Each man is an active exponent of a very advanced point of view in his field of special interest, Le Dantec advocating a rigorously mechanical explanation of vital phenomena in general and Bohn a consistently mechanical theory of animal behavior.

The impulse for Le Dantec's writing and the suggestion for his title lie in the swift growth to almost dominating position among species-forming explanations of De Vries's mutation theory. He attacks this theory with all the acuteness and vigor of his logically trained and argumentative mind. If he could only bring to its aid an equal strength of personal observation and experiment he would be an easily triumphant antagonist. But Le Dantec is more prolific of syllogisms than of original observations; is more at home in his lecture room or at his writing desk than in his research laboratory or in the field. And his argument is too often a refinement of logic or a development of terminology rather than a convincing enumeration of facts that carry their own irrefutable conclusion. One can fight for chemism in biology with metaphysic just as as one has long fought against it with the same old nicked and blunted weapon. And in either case the champion has a sorry tool.

Dr. Bohn's book is of very different type. It is the direct contrast in manner. It is judicial rather than lawyer-like, although the author has his convictions. He suspects all explanations too elaborate, but also those too simple. He deplores too much theory, calling for more facts. He analyzes and criticizes, weighs and estimates, and then seeks the simplest way out.

Bohn finds mechanical reflexes, vital rhythms and "differential sensibility" sufficient to account for the behavior of that great mass of the animal kingdom from the Protozoa up to the Crustaceans and insects. In these, with their special development of sense organs, especially eyes, behavior begins to take on its first phase of psychism—by this word being meant no dualistic conception of psyche and body but simply a certain degree of mentality or complicated functioning of nervous system, a behavior based on the association of sensations in addition to the tropismic responses. Finally, with the advent of brained animals, the vertebrates, comes the first intelligence, a dominating of the sensation associations over the mechanical reflexes, the tropisms.

Bohn would do away with the word instinct; and finalism is for him an explanation that comes into play only after a first appeal to other more mechanical inherent causes. "For Jennings," he says, "selection would be effected among the various movements of trial, and the final result would be a tropism. For us, the tropism, as Loeb has said, is something inherent, and it would be one of the elements on which selection would be exercised." Thus for Bohn the psychic evolution of animals would result, in some sort, from the struggle which occurs among the old survivals of the past (as tropisms and the phenomena of differential sensibility), and the new acquisitions (fruit of associative memory). This is made only painfully, and to a certain degree, by "*coups de revolutions*."

Finally Bohn believes that we are sufficiently advanced in our study of animal behavior to be able to enunciate certain laws, not only for the tropisms and differential sensibility—"a conception which for the first time appears in a book of animal behavior"—but also for the associative phenomena. He holds that animal psychology is now no more open to the criticism that its "explanations," such as tropisms, differential sensibility, associations of sensations, etc., are simply labels and terminology and do not really explain the animal mechanism in its behavior, than the other sciences whose more familiar terminology, as "gravitation," "atoms," etc., seem, but in reality only *seem*, to be so truly explanations.

When Newton discovered the laws of universal gravitation, he had to confess that he had no idea as to the *cause* of this phenomenon. Is his merit less great for that? Have not his ideas, although incomplete, permitted us to build a great scientific structure that compels all our admiration, although we may be to-day quite as little advanced as to the subject of the nature of gravitation as was Newton in 1687 or Epicurus three hundred years before Christ? Now in the domain of zoological psychology, the scholars of the new school inaugurated by Jacques Loeb seek to imitate Newton in the domain of astronomy; they analyze the phenomena and establish their laws. . . . As said recently by my regretted master Giard: "The analysis which is necessary to let us

master the phenomena of life furnishes us a surer base than that which tends directly to explain these phenomena."

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NOTES ON ENTOMOLOGY

THE report¹ of M. Roubaud, who spent a year and a half in the Congo region as a member of a commission to study sleeping sickness, is before us. It goes, in much detail, into the habits and habitats of *Glossina palpalis*, the particular species of tsetse flies which is concerned in the spread of this dread disease. Agreeable to the general rule he finds that the flies are very local, rarely going more than 300 yards, but may be carried by air currents and storms to greater distances. They bite only during the daytime, and feed on a great variety of animals. There is a long account of the larva, and of its curious posterior lobes, which apparently represent the posterior spiracles. The fly deposits the full-grown larva on the ground, which crawls into the soil and there pupates. The author details a number of experiments on the effects of different temperatures on the pupæ. Species of *Bembex*, a spider (*Dolomedes*), a beetle (*Cicindela*) and ants are among the natural enemies of the *Glossina*.

A large part of the work is taken up with a study of the Trypanosomes, and five of the plates illustrate them. A long bibliography is appended to the article.

THE new parts of Wytsman's "Genera Insectorum" are as follows: Fascicle 76 is by J. J. Kieffer on the small Hymenoptera of the family Bethyridæ; 30 pp., 3 pls. He considers that they are most closely related to the Scoliidæ. Fasc. 77, by the same author, treats of the small family Stephanidæ; 10 pp., 1 pl. He adopts the classification of Ender-

¹"La *Glossina palpalis*; sa biologie, son rôle dans l'étiologie des Trypanosomiasés," Rapport Mission d'études de la Maladie du sommeil au Congo Français (1906-1908), pp. 333-652, 8 pls., 4to, 1909, Paris, by E. Roubaud.