the eminent Hollander Went, and his remarkable son, should have their name Germanized to Wendt; and in this connection one may remark that, while the author is probably right, his complete devotion at this time to the idea of hormones as regulatory influences would be regarded by conservatives as premature, and by most persons as too partisan for the author of a "textbook."

So much for some faults. The excellences of the book are no less marked. The treatment of those physiological processes and relations in which water is so largely involved, as in photosynthesis, absorption and transpiration, is that of the master dealing with facts to which he has made his own contributions. Other parts of the book are more compilatory and involve again the individual sense of perspective. The book is so valuable, so usable, that its faults are the more regrettable.

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Introduction à la Biologie Expérimentale. Les êtres organisés. Activités, instincts, structures. By PAUL VIGNON. Preface by M. E. L. Bouvier. Encyclopédie Biologique VIII. Paul Lechevalier, Paris, 1930. Octavo. Pp. viii + 731. 890 figs. 23 pls., 3 in colors. Price 210 frs.

THOSE who have had the pleasure of attending the brilliant lectures of Professor Paul Vignon at the Catholic Institute in Paris will not be surprised at their culmination in a book that is both unique and fascinating. The charm of this versatile guide is irresistible as he conducts us in this book through the fields of animal behavior, protozoology, mimicry and protective resemblance, and the evolution of types by mutation and orthogenesis.

Plentiful, excellent illustrations accompany the story, many of which, especially those on protective coloration and form, including three colored plates, are original. Vignon is a skilful artist.

He is also a thorough-going Aristotelian philosopher. An organism, an organ, any natural phenomenon, is to him an "idea," the expression of ultra-spatial, supernatural control. "The living being is enclosed within a wall behind which the drama of life is enacted." By peering through crevices in this impenetrable fortress, the biologist seeks an inkling into that which is taking place. A plan is in it all; ideas are everywhere, even though some of them are whimsical, such as the monstrously overgrown protuberances of the prothorax in certain leaf-hoppers, which are grotesque and, except as disguises, useless. Yet, in spite of such caprices of nature, nothing is fortuitous nor the outcome of blind mechanism.

Although this philosophy runs like the theme of a symphony through the book, emerging here and there in summaries, the author presents an array of facts from his own observations and the works of others which will be of interest to the psychologist, protozoologist, entomologist and biologist generally.

In the chapters on animal behavior, upholders of the Gestalt-theory and of emergent evolution will find much that is in harmony with their way of thinking; the observations and experiments of Koehler and Jennings, for example, are by no means neglected; but one looks in vain for the name of Jacques Loeb or mention of his theory of tropisms. Naturally the more dramatic incidents in the lives of insects and protozoa are stressed, and they are narrated vividly, but with the careful regard to fact characteristic of a well-trained zoologist.

The mysterious organ-forming "idea" appears in the numerous forms of great beauty in the Radiolaria and in the choice and arrangement of materials for the shells of Foraminifera. No hope is offered that biophysics and biochemistry may eventually explain any of these phenomena, but evolution by mutation is regarded as the way by which organisms proceed toward their goal of utility and beauty. Natural selection, however, is a vain formula; to Vignon orthogenesis, teleological control, is paramount.

The chapter on mimicry, which is defined broadly to include protective resemblances, amply describes the disguises of gastropods, crabs, spiders, and many insects, and is especially valuable because it treats of the flower- and leaf-like Orthoptera to which the author has devoted much research. These include African and Indian mantids which lurk among flowers and turn toward the light and their prey the brilliant colors of their ventral surfaces. Flat expansions of prothorax and coxal segments, colored like flowers, attract small insects into the grasp of the mantid's fore legs.

Even more remarkable are the leaf-like grasshoppers of tropical America, *Pterochroza* and its allies, many of which have been described for the first time by Vignon.[1] The fore wings, even of those which are green, mimic old leaves, with highly variable excised margins and blotches like fungus colonies. These spots are of various sizes in some cases, apparently representing different stages of development of the make-believe fungus.

Other South American grasshoppers of the phaneropterid genus *Pycnopalpa* have great blotches on their green wing-covers, suggesting the ravages of the elm-leaf beetle.

That physiological, physiochemical processes play

[1] P. Vignon, "Recherches sur les sauterelles-feuilles de l'Amérique tropicale," Archives du Muséum, 6, V, pp. 57–214, 1931. 58 figures. 1 pl. en couleurs, 12 pls. en simili-gravure, 12 pls. en phototypie.

a part in wing development and coloration appears not to occur to Vignon, such matters obviously being enveloped in an impenetrable cloud of mystery. He calls attention, however, to the important fact that, in many insects, mimetic structure and the instinct for making use of it develop inseparably. This proves the utility of the mimicry, but can the selectionist show that its possessors have thereby an advantage in the rate of reproduction? This question, likewise, does not interest Vignon, who prefers to think that mimicry "serves to show that Life knows how to introduce something personal and new into nature."

In the final chapter, examples are given of mutations and "orthogenetic series" offered as proofs of evolution. Here are described an example of mutation in *Drosophila,* changes which the wing muscles of Dragon-flies have undergone since the Carboniferous, the strange metamorphosis of the parasitic cirriped *Sacculina,* the change of the reptile's jaw into the bird's toothless beak, of the reptile's scale into the feather, eventually into the gorgeous plume of the bird of Paradise, and finally the evolution of the pine cone into the various types of inflorescence of the higher plants.

Whether looking at the world through mechanistic, organistic, or vitalistic glasses, one can not but admire the vigorous, vivid style, the adequate descriptions and excellent figures of this unique book. Although the experimentalist will find its method deductive and descriptive, rather than that which in America we call experimental, he will find here plenty of problems which seem to require experimental treatment, or he may prefer to turn his imagination into other channels and think of them awhile, as would the poet or artist, simply as ideas.

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SCIENTIFIC APPARATUS AND LABORATORY METHODS

AN AUTOMATIC BALANCE

DURING the course of studies of the relation of soil moisture to plant growth extending over more than a decade it has been necessary to weigh many thousands of soil samples. We have designed and constructed, with the tools usually available in most laboratories, a simple and inexpensive balance which we believe has unique features and which we have found to increase very materially the speed with which weighing may be made.

The balance, which operates on the displacement principle, is shown in Fig. 1. This balance, which has a capacity of 3 kilograms with a sensitivity of 20 milligrams at full load, is of German make and is on sale by most dealers in laboratory equipment in this country. We are also using our device on an analytical balance. Probably many standard makes of beam balances would serve as well as the one illustrated. It will be apparent from the following description that there are, however, several features which are desirable in the balance to be used as a base for our device. The balance is arranged to weigh an article in the left-hand pan by placing weights in the right-hand pan until the difference in weight is 10 grams or less, which is recorded on the scale *a*. The inequality in weights on the two pans is compensated for by the depression of the plunger *b* in the displacement cup *c*, the plunger being depressed until a quantity of liquid is displaced which is exactly equal in weight to the difference in the loads on the weighing pans. A circular disc *d* of slightly less diameter than that of the displacement cup is attached to the plunger *b*. The disc *d* is to dampen the movement of the plunger, and the plunger assembly with the cup and liquid acts as a dashpot.

The plunger assembly is hung from a yoke *e* which

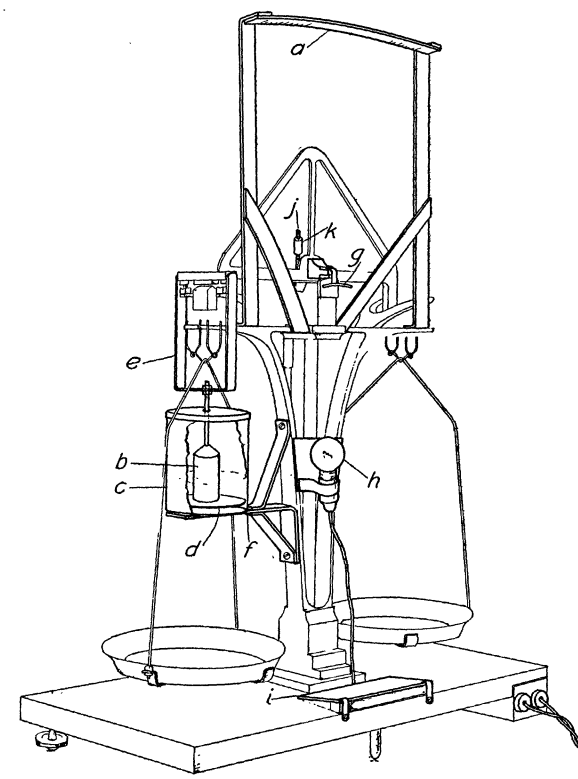

FIG. 1. View from the rear of balance with displacement cup cut away to show plunger assembly. The attachments placed on the stock balance are shown by heavy lines.