In the chapters contributed by Mr. Bourne one finds side by side an admirable treatment of some groups and faulty accounts of others. Thus of the groups in which Mr. Bourne has accomplished admirable investigations, the Alcyonaria and corals, the description is very good, but for the most of the remaining groups the treatment is sadly behind the times. This is especially the case with the forms which he includes under the order Actiniidæ, because so much has been accomplished within recent years in connection with this group, and with these recent advances the author appears to be entirely unfamiliar, basing his classification, as he states, on the work of Hertwig (1882, 1888) and Andres (1383). It is to be remembered that Hertwig's work formed merely the starting point for a reconstruction of the taxonomy of the Actiniidæ, and the progress of the reconstruction has gone on since its publication with rapid strides.

Some excuse, however, may be found for many of Mr. Bourne's taxonomic enormities in the fact that the chapter was evidently written as many as four and possibly even five years ago and has since remained unpublished. But when we read on p. 38 that 'pains have been taken to make it (*i. e.*, the classification of the Zoantharia) as fully as possible representative of the actual state of our knowledge,' and find the volume in which this statement appears dated 1900, we are justified in expecting some record of the results of comparatively recent investigations. Apparently, however, there has been practically no attempt at a revision of the original manuscript, and though Mr. Bourne may not be responsible for the delay in its publication, he may well be held accountable for the failure to bring it up to date.

A detailed criticism of the classification adopted for the Actiniidæ would almost result in a comprehensive review of the entire order, but a few errors may be mentioned in justification of the criticism made above. One finds, for instance, no mention of the family Aliciidæ established by Duerden in 1895, its type, Alicia (Cladactis), being referred to the Bunodidæ; Hertwig's family Liponemidæ is retained and no mention is made of the family Boloceridæ (McMurrich, 1893); the Phyllactidæ are described as belonging to a group possessing foliaceous tentacles, though their foliaceous organs are really highly modified marginal spherules, as was shown by McMurrich in 1893; and Savaglia is suggested as a member of Hertwig's family, Amphianthidæ, although Carlgren showed in 1895 that it is really a Zoanthid. These for samples: a long catalogue of sins both of omission and commission might readily be made, and, naturally, the unfamiliarity with recent work has led to errors of statement in the descriptive part of the work.

With the corals, as stated above, the case is different, though even here the soft parts, so important for the proper understanding of the affinities of the group, are barely mentioned, being dismissed with only six lines of description. And little fault is to be found with the chapter on the Ctenophores, in which an accurate and sufficiently complete description is found, the author deserving especial credit for the stand he has taken against the current but erroneous idea that these forms are Cœlentera or even directly derived from any of the existing Cœlenterate groups.

Attention has been directed in what has been said above, chiefly to the failings of the volume and possibly an erroneous impression as to its general excellence may have been given. It is, nevertheless, a valuable book to place in the hands of the 'serious student' for whom, the preface informs us, it was written, and even though it fails here and there to be an entirely 'trustworthy presentation * * * of the main facts of zoology' it is assuredly worthy of a place on the reference shelf of every zoological laboratory. It may be stated that the illustrations are abundant and, as a rule, excellent, and bibliographic lists and good indices are given at the end of each chapter.

J. P. McM.

Contributions a l'étude des hyménoptères entomophages. Par L. G. SEURAT. Ann. des Sciences Naturelles. Zoologie, X., Nos. 1–3, Paris, 1899. Pp. 1–159. Pl. I–V.

The development of the larvæ of those parasitic Hymenoptera which live within the bodies of other insects has been the subject of much speculation and of some investigation. How these creatures breathe, nourish themselves,

move, molt and pass their excretions, have been mooted points. Cuvier thought that these larvæ breathed by placing their spiracles in relation with those of the host insect. Gerstaecker, in 1863, came to the same conclusion. Ratzeburg attributed a respiratory function to the anal vesicle in certain Braconids and to the caudal appendage in the Ichneumonids. Boisduval concluded that they do not take nourishment through the mouth, that they do not breathe and that they void no excrement, the larva being analogous to the fœtus in mammalia, which lives the life of the mother. Newport described the larvæ of certain Ichneumonids as having no anus, the rectum and its orifice being rapidly developed at the final larval change. The older authors thought that these larvæ attack only the fatty tissues of the host. Bugnion states that Encyrtus nourishes itself exclusively on the lymph. Ganin has observed a curious hyper-metamorphosis in certain egg parasites of the family Proctotrypidæ. Marchal has made some extraordinary observations upon other Proctotrypids, showing that one form (Trichacis) develops in the nervous system of Cecidomyia, while Polygnotus develops in the digestive tract of the same host.

Seurat, in the paper under consideration, reports the results of investigations which he has conducted upon members of three families of parasitic Hymenoptera. He has studied the Braconids, *Apanteles glomeratus* in the common European cabbage worm, *Aphidius fabarum* in the common *Aphis rumicis* and *Doryctes gallicus*, an external feeder on a wood-boring larva. The Ichneumonids studied are two internal feeders, *Mesochorus vittator* and *Hemiteles fulvipes*, and one external feeder, *Xylonomus præcatorius*. Among the Chalcidids he has studied *Diplolepis microgastri*, an internal-feeding hyperparasite in Microgasterid cocoons, and an external feeder, *Torymus propinquus*, which lives in Cecidomyiid galls, feeding externally on the Cecidomyiid larvæ. The work has been done with the greatest care and the conclusions at which he arrives are of authoritative value. They are summarized as follows:

(*a*) *Manner in which larvæ nourish themselves.*—The external and internal larvæ are formed with very sharp mandibles. The internal forms use them in order to pierce the tissue of the host; the external ones to pierce the skin of the host, making a delicate orifice which permits them to suck up the tissues. The digestive tube is always remarkable by the presence of the very voluminous stomach closed behind (this proves to be the rule in the young larvæ of Hymenoptera) and which serves as a sort of storehouse for food which is digested later. A small quantity of food digested at once suffices for the immediate wants of the larva. The voiding of the excrement only takes place in the interior of the cocoon, the stomach not opening until that time. The stomach of the larva contracts and dilates very rapidly, these movements probably favoring the ingestion of food. The materials which the parasite borrows from its host are varied. In certain cases (*Apanteles glomeratus*) the fat, the blood and the lymph only disappear. In the majority of cases the parasitic larva devours everything except the skin and tracheæ. The parasite respects the viscera up to the last limit and only sacrifices them at the end. He has seen in certain cases the larva devour several host insects.

(*b*) *Respiration.*—The problem of the mode of respiration is a puzzling one with internal feeding larvæ. External larvæ are provided with spiracles permitting the entrance of air. The respiration of the young internal larvæ not yet provided with tracheæ filled with air is effected by osmosis through the skin by the whole surface of the body. The larvæ furnished with an anal vesicle or caudal respiratory appendage breathe with the skin of these organs as well as with the whole surface of the body. These appendages are lacking, however, in certain cases, as in the Aphidiinæ, the Chalcididæ, etc. The tracheæ are not slow in appearing elsewhere. The tracheal system is complicated in accordance with the needs of the larva. *It is entirely closed* and the entrance of the air is made through the skin and the very fine membrane of the ultimate tracheal branches. The entire surface of the skin is carpeted with an extremely rich net-work of fine tracheæ which facilitate the accomplishment of this function. The hypothesis of the osmosis of air from the liquid tissues of the host through the body wall of the parasite and the cover of the tracheæ is

not extraordinary. Weismann, having placed the larva of *Musca vomitoria* under water, has seen that the tracheal system remains filled with air at the expiration of several hours. The respiration of internal larvæ is then very normal, the tracheal system having undergone slight modifications. Upon leaving the host the spiracles open and the air enters through them.

(*c*) *Molts.*—He has observed a molt in the young internal larva of *Apanteles glomeratus*. The mandibles and the larval cuticle are shed. In certain of the young larvæ, one sees, in fact, after the molt of the body, the two mandibles of an earlier stage. The molt is made like that of the pupa, the old skin slipping from before towards the anal end of the body. The larva sheds this old skin into the open space behind it.

Such are the facts concerning the mode of life of internal parasites in their hosts. There is really nothing mysterious in this mode of life. The functions are accomplished normally by means of slight modifications which it would have been easy to foresee.

M. Seurat is heartily to be congratulated on this excellent piece of work, setting at rest, as it does, so many mooted points. It is interesting to note that he has not made any observations at all parallel to those of Marchal, who states that a single egg of Encyrtus laid in the egg of Hyponomeuta dissociates itself into a great number of embryos which develop into individual larvæ in the larva of the host.

L. O. HOWARD.

The Structure and Life-History of the Harlequin Fly (Chironomus). By L. C. MIALL, F.R.S., and A. R. HAMMOND, F.L.S. Oxford, Clarendon Press. 1900. Pp. 191; figs. 129.

Professor Miall has gained an enviable reputation as a student of the life history and structure of a number of common insects, and in the course of this work he has discovered many novel and important facts. His little book entitled 'The Structure and Life-History of the Cockroach,' done in collaboration with Alfred Denny, is a model treatise on Orthopteran insect anatomy and his treatise on 'The Natural History of Aquatic Insects' is one of the most valuable and readable entomological books which has been published of late years. In the present volume the authors have given a very careful study of the development of the Chironomidæ, some of the species of which have long been favorite objects with histologists and embryologists. They have a very special biological interest in their various stages and it is thought that their inclusion in ordinary teaching courses will be desirable and will be facilitated by the present volume. *Chironomus* larvæ are very abundant and are found in pools and streams and at the bottom of deep fresh water lakes, Professor S. I. Smith having dredged them from the bottom of Lake Superior at a depth of nearly 1,000 feet. They have also been found in salt water and Packard has studied a species abundant at low water mark in Salem Harbor.

The larvæ inhabit tubes which they make of silk and mud or aquatic vegetation, and certain of the larvæ possess only a rudimentary tracheal system which appears late in the larval stage. No insect known to the writers has more completely departed from the habits and structure of an air-breathing animal, yet even here is found proof of descent from a terrestrial insect with branching air tubes. This remarkable modification is necessary from the fact that certain of the larvæ live at great depths where it is impossible for them to rise to the surface. This absence of a tracheal system does away with the possibility of breathing by tracheal gills which is the commonest respiratory method with aquatic insects and necessitates the presence of blood gills, so that respiration is accomplished practically as with fishes and larval *Batrachea*.

The whole internal anatomy of all stages is carefully described, with excellent figures, and this is done in a masterly and comparative way and includes a study of the embryonic development. An appendix is devoted to the methods of anatomical and histological investigation.

An important point which the authors bear in mind and which Professor Miall has frequently advanced is that they desire by such work to incite the members of naturalist clubs and other non-academic biologists to take up the study of life histories. Such work in the past has yielded facts of the greatest biologic importance, and yet to-day the field is largely