Herbals and Related Botanical Works Published between 1470 and 1670 (14 pages), and II., containing A List in Alphabetical Order of the Principal Critical and Historical Works dealing with the Subjects Discussed in this Book (6 pages). A good index completes the volume.

In the first chapter we find some suggestive sentences. "From the very beginning of its existence, the study of plants has been approached from two widely separated standpoints—the philosophical and the utilitarian. Regarded from the first point of view, botany stands on its own merits as an integral branch of natural philosophy, whereas from the second it is merely a by-product of medicine or agriculture. This distinction, however, is a somewhat arbitrary one; the more philosophical botanists have not disdained at times to consider the uses of herbs, and those who entered upon the subject with a purely medical intention have often become students of plant life for its own sake. At different periods in the evolution of the science one or other aspect has predominated, but from classical times onwards it is possible to trace the development of these two distinct lines of inquiry, which have sometimes converged, but more often pursued parallel and unconnected paths." From which it will be seen that the advocates of "practical" botany to-day are but the modern representatives of the utilitarian schoolmen of the past.

The earliest printed book containing "strictly botanical information," we are told, was a work by Bartholomew, "Liber de Proprietatibus Rerum," which appeared about 1470. Quotations of text or figures are given from the "Ortus Sanitatus" (1491), "The Grete Herball" (1526), Brunfels's "Herbarum vivae Eicones" (1530), Turner's several works (1538–1551), Gerard's "Herball" (1597), the works of Bauhin, Dodoens, Lobelius and many others. The illustrations are most interesting, as showing the development of scientific drawing. Some of the earlier representations of plants were little more than *suggestions* of their appearance (and often of habitat, also), while others, though crude, actually gave a good idea of the characteristic appearance of the plants. The early artists appear to have conventionalized many of their drawings after fashions of their own, then perhaps familiar to the reader, but now not understood.

The chapter on the Doctrine of Signatures (VIII.) will repay reading, especially by the younger school of botanists of to-day. Will the time ever come when the botanists of some later century will look back to *our* beliefs with feeling similar to those we have when we read about the doctrine of signatures?

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Vergleichende Physiologie Wirbelloser Tiere. Von Professor Dr. H. JORDAN. Erster Band, Die Ernährung. Jena, Gustav Fischer. 1913. 8vo. Pp. xxii + 738, 277 text-figures.

There is no telling to what extent our libraries will need enlargement if Professor Jordan carries to completion his encyclopedic "Physiology of Invertebrates," for the 738 pages on Nutrition are to be followed by sections on Respiration, Metabolism, Excretion, Movement, the Nervous System, the Sense Organs and "Psychology."

Excluding the vertebrates, except for the necessary comparisons, and omitting entirely the physiology of reproduction, the plan, as outlined, is to present, with "the greatest unity attainable, a 'biological' treatment of the sum total of the phenomena that make up the life of the individual."

The first installment of this full-grown undertaking begins with a definition of life to which we can not subscribe, and a scene of some comic value in which teleology is shown the door, but asked to leave behind her extremely useful vocabulary. After this follows a systematic treatment of the phenomena of nutrition in all the usual groups of invertebrates, the material under each type or subtype being conveniently divided so that a discussion of the food, together with its modes of capture, always precedes an analysis of the various digestive processes and a discussion of the origin and nature of the involved se-

cretions. These topics in turn are followed by sections on absorption, the elimination of wastes, metabolism, reserve stuffs, and the phenomena of starvation. This list of regulars, now and again is lengthened to accommodate some special structural or functional relation.

Professor Jordan's work inevitably courts comparison with Winterstein's great cooperative handbook, but unfortunately both are incomplete, and the contrast between them in their present state is more apparent than real, for in Winterstein the section on the nutrition of invertebrates is also the product of a single pen. For the present, therefore, the relative merits of team work *versus* individual play in the production of physiological encyclopedias must remain uncertain.

On the whole, Winterstein offers more of immediate interest to the general physiologist, nevertheless, the space devoted by Jordan to comparable sections is nearly the same. Possibly some day some one may read one or the other from cover to cover, but the normal function of each of these books will probably be that of a Thesaurus to be tapped when occasion requires.

Jordan makes access to the wealth of material treated by him more convenient than Winterstein, not only on account of a greater regularity of treatment, but by the employment of heavy-typed captions of various sizes, together with elaborate subject and author indices for which we are not made to wait until the bitter end.

No work of this character ever comes off the ways without its share of misprints, mislabeled figures, misinterpretations, misquotations and sins of omission as well as commission. Numerically most of these types of defect fall well below the average, though one of them is quantitatively as well as qualitatively thoroughly characteristic of the great German text, for it appears to be a law of nature that the mind of the continental bookmaker is selectively impermeable to the efforts of American investigators. This is as true of Jordan as it is of his predecessors, and in consequence there is no group treated by him which here and there could not have been treated a bit better if he had drawn a little on our experience. Considering the numerous phases of nutrition in invertebrates and the number of Americans who have devoted years to the study of special groups, the omission of some of them, or the bare mention of others, shows that our work either does not reach the European, or is not assessed at the value placed upon it here. This may apply justly to some of our work; on the other hand, the discounts levied against certain men who might be mentioned are absurd.

The attempt to cover single-handed a field as large as the physiology of invertebrates is not symptomatic of the age, but the attempt to do so at all certainly is. Whoever knows the highly dispersoid condition of the literature and realizes how largely observation and experiment have been incidents in the work of morphologists and systematists, knows also the value of a reliable inventory of the facts. The importance of this for any special physiology needs no comment, whereas to those who agree with Winterstein that comparative physiology should be an independent science, rather than a method, the whole matter is obvious. However, we may relate special, comparative and general physiology, Jordan's book, like Winterstein's, will do good, but in a somewhat different manner, for it is aimed more directly at teachers of zoology, and for them appears admirably suited.

One of the worst faults of zoological courses on invertebrates is their over-emphasis of structure, a method grounded historically, and based on the belief that the best scientific use to which an organism can be put is to determine its relatives. No doubt this is important, yet how the related things manage to live is also worth knowing. With its well-organized material and superior illustrations Jordan's book shows beautifully how anatomy and physiology can be taught as one subject. "Proofs of Evolution," "Evidences of Relationship" and "Bases of Classification," however, will not readily cede their places, but

much to enliven and augment them will be found in a book which modestly attempts to lay the foundations of a phylogeny of physiological processes. In the concluding chapter occur, among others, generalized summaries of the three principal methods of food intake; an interesting section on salivation with its numerous differentiations; and a phylogeny of the ferments in which trypsin or trypsin-like substances are held to be the oldest. Other matters considered in the final chapter are genetic comparisons of the histological processes involved in secretion and absorption, the fate of absorpta, and finally a discussion of "the liver question," especially interesting to those who question the validity of christening invertebrate organs according as their color, form or location happens to resemble something or other in a vertebrate. This section is summed up in the following paragraph:

"The specialization of a stomach with the secretion of free acid and the necessary pepsin, the formation of special glands, segregated from the digestive epithelium, though pouring their juices into the alimentary tract, the occurrence of a liver correlated with digestion, and finally complicated regulations in the functions of these organs; all this distinguishes the digestive processes of vertebrates from those of invertebrates."

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Die sanitarisch-pathologische Bedeutung der Insekten und verwandten Gliedertiere, namentlich als Krankheits-Erreger und Krankheits-Uberträger. By EMIL A. GÖLDI. Berlin, R. Friedländer & Sohn. 1913. Pp. 155, Figs. 171.

The present small volume which contains a general account of the habits of insects in their relation to diseases is based on material presented by Professor Göldi in a course of lectures which he has been giving for a number of years in the University of Bern.

In spite of its limited size it gives a very good presentation of such facts as can be satisfactorily included in a university course on insects and diseases, and is much better suited for the general student than those portions of the text-books on tropical medicine that are devoted to insects. Its value lies mainly in the fact that the subject is considered primarily from the biological rather than the medical standpoint, and consequently in a more connected and intelligible way for this class of students.

The subject matter is perhaps somewhat different than would be indicated by the title, as much emphasis is laid upon insects which live partly or entirely as parasites of man and domestic animals, to which is added a supplementary discussion of their relation to the transmission of disease. The material is divided into three chapters: first, stinging, biting and caustic insects; second, insects and related Arthropods of parasitic habits; and third, insects and other Arthropods as carriers of disease. The first section is quite fully treated, but the bulk of the text is devoted to the second section, and the third receives rather brief consideration. One might wish that the portion relating to insects as carriers of various infections had been presented in more complete form, but this omission is more apparent than real, for the second chapter contains much material (*e. g.*, the development of trypanosomes) which one might expect to find in the third.

Göldi describes the morphology and physiology of the poison apparatus in the Hymenoptera, scorpions, centipedes and Hemiptera and points out the probable functions of the poison glands in different groups. Thus in the Hemiptera, spiders and centipedes, the so-called poison has apparently been developed as a digestive fluid. He is inclined to believe also that the venom of the scorpion has a digestive function in addition to its poisonous properties. Following this is a discussion of insects, mainly caterpillars of various kinds, that are provided with poisonous bristles or spines which cause irritation to the skin. Numerous species are figured, including a considerable number from equatorial America.