were the volumes on the Simuliidae, Hippoboscidae, and Phlebotominae in Lindner's *Die Fliegen der Palaearktischen Region.*

For those not familiar with the earlier editions of this work, I will summarize its contents briefly. It is primarily devoted to descriptions, keys, and excellent illustrations that are intended to aid in identifying the insects of medical importance in the Old World. There is also considerable information on the relation of arthropods to disease transmission. An introductory chapter on insect structure, ontogeny, biology, taxonomy, and zoogeography precedes five chapters devoted to Diptera, four chapters devoted to other insects and arthropods, and an appendix on collecting and preserving techniques. The volume is still very useful, although the rather sketchy character of the addenda is a bit disappointing.

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Mathematics

A First Course in Partial Differential Equations: With Complex Variables and Transform Methods [Blaisdell (Ginn), New York, 1965. 458 pp., $12.50], by H. F. Weinberger, is designed as a text for a 1-year course in partial differential equations at the undergraduate or first year graduate level. The differential equations are emphasized from the beginning; the tools for their solution are brought in as needed. General properties of the solutions, such as maximum principles, properly posed problems, characteristics, and domains of dependence, are clearly stated. There are also sections on general orthogonal expansions and on the Sturm-Liouville theory for ordinary second-order equations. Green's functions are introduced in connection with both ordinary and partial differential equations. The book is more than a collection of methods for solving equations, although the standard methods of solution are presented.

By way of preparation, the student should have had a course in advanced calculus and should be familiar with the elementary theory of limits, differentiation (including partial differentiation), and integration, with vector field theory including the divergence theorem, with the theorems on the uniform convergence of sequences and series, with improper integrals, and with the elementary properties and methods of solution of ordinary linear differential equations, mainly those with constant coefficients.

The author begins with a careful derivation of the equations of motion of a vibrating string. The linearization of the resulting equations yields the one-dimensional wave equation which is treated in some detail in the remainder of the chapter, using the customary solution in closed form.

In chapter 2, linear operators are defined and the principle of superposition is shown to hold for such operators. Linear differential equations of the second order are classified as elliptic, parabolic, or hyperbolic.

The maximum principle is established for certain elliptic equations, and uniqueness theorems are proved for elliptic and parabolic equations in chapter 3.

The method of separation of variables is introduced in chapter 4 and leads naturally to a discussion of general orthogonal expansions which are later specialized to trigonometric series. The Riemann-Lebesgue lemma for the general expansions is used to obtain simple proofs of the pointwise and uniform convergence theorems. Series solutions are obtained for many problems.

Chapter 5, which deals with nonhomogeneous problems, begins with a study of second order ordinary differential equations in which Green's functions are introduced to handle the nonhomogeneous term. The Green's function method is carried over to certain partial differential equations along with series solution methods.

Multiple Fourier and other series are used to treat certain problems in higher dimensions in chapter 6.

Chapter 7 begins by developing the Sturm-Liouville theory for second order ordinary differential equations. Special orthogonal sets of functions, such as Bessel functions, Legendre functions, and spherical harmonics are introduced and used to solve additional boundary value problems.

The standard elementary theory of functions of a complex variable is presented in chapter 8, and the general theory is applied to the evaluation of definite integrals in chapter 9.

Brief but fairly inclusive theories of the Fourier and Laplace transforms, including inversion theorems and theorems concerning convolutions, are presented in chapters 10 and 11. A few applications are given to boundary value problems.

The book concludes with a discussion of numerical methods including finite difference methods, iteration methods, and the Ritz method. The question of stability is discussed in connection with the finite difference methods.

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Traité de Zoologie

These two fascicules, part 2, Némathelminthes (Nématodes) and part 3, Némathelminthes (Nématodes, Gordiacés, Rotifères, Gastrotriches, Kinorhynques) (Masson, Paris, 1965. 1497 pp. Set, paper, F. 320; cloth, F. 344), the second and third parts of volume 4 of the **Traité de Zoologie**, edited by Pierre-P. Grassé, are paged consecutively, and of the 1497 pages, 1200 are devoted to the nematodes. The authors involved are L. de Coninck, A. G. Chabaud, M. Ritter, J. Théodoridès, and V. Nigon. The first 586 pages concern the anatomy, reproductive biology (157 pp., by Nigon), natural history, and parasitism of nematodes. The systematics of nematodes occupies pages 586 to 1200. The Nematoda are considered a class, and two subclasses are recognized: Adenophorea (= Aphasmidia), and Secernentea (= Phasmidia *auct.*). The treatment is thorough, reasonably up-to-date (with the exception of some recent electron microscope studies), and will be invaluable to all who work with nematodes, although many zoologists will feel that there is much more here than they need to know about nematodes. This elaborate and detailed treatment is in sharp contrast to the remaining groups of Nemathelminthes (= Aschelminthes) treated in the concluding part of the last fascicule. There is a short treatment of Gordiaceans by A. Dorier, a 150-page chapter on Rotifers, and somewhat perfunctory chapters on Gastrotrichs and Kinorhynchs by Paul de Beauchamp. It is unfortunate that this treatment of lesser groups is in such contrast to the exhaustive treatment of nematodes; certainly the Rotifers should be given more thorough consideration.

The pretty colored diagrams that

are characteristic of this series are very sparse in these volumes, but the black-and-white diagrams are in the usual clear, perhaps sometimes too simplified style that is characteristic of French illustrations (there are 1146 figures). There is one somewhat unnecessary color plate—that of a large red nematode in a dog's kidney.

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African Ticks

The genus *Ixodes* contains more species and is more widely distributed than any other genus of hard ticks. Several species of *Ixodes* are important, well-studied reservoirs and vectors of pathogens that cause considerable human and animal illness; however, the systematics, taxonomy, and biology of the genus have not been adequately investigated, and immature stages of few species are known. Greater knowledge concerning *Ixodes* ticks should serve to revise much current thinking on the biology, ecology, relationships, phylogeny, and disease associations of all tick groups. Nowhere is the genus *Ixodes* more poorly known than in Africa, the Near East, and the outlying islands.

In this book, **Ticks of the Genus *Ixodes* in Africa** (University of London Press, London; Oxford University Press, New York, 1965. 356 pp., $11.20), Don R. Arthur provides an abstract or full review of recent taxonomic literature on the *Ixodes* ticks of these areas. The book's format is attractive, and the space allowed for detailed taxonomic descriptions is exceptionally generous.

The first chapter contains introductory remarks. In chapter 2, 12 of the species known from North Africa and the Near East (to eastern Iraq) are summarized. Chapter 3, the main body of the book, deals with 43 species of the Ethiopian Faunal Region; each developmental stage is known in only 8 of the 43 species. Arthur has described most of these species in recent years. Several dedicated workers (Theiler, Morel, Walker, Clifford, Elbl, and others) are presently adding much more information to the meager body of knowledge concerning this remarkable *Ixodes* fauna. The three species described from Madagascar prior to 1965 are reviewed in chapter 4. Chapter 5 consists of a useful compilation of information on six poorly known, distinctive species that parasitize marine birds on African seacoasts and adjacent islands. Chapter 6 includes several nymphs of uncertain status and *Ixodes paradoxurus*, which has curiously been dropped here rather than in chapter 3 because it may prove to be a synonym of another species.

The illustrations range from good to bad; those for immature stages are poor. The illustrations for *pilosus* and *lewisi* are incorrectly designated.

The short keys for chapters 2, 4, and 5 are useful and operable; the long keys for chapter 3 are not. Inadequate and inaccurate designations of type localities and careless use and spelling of locality names are frequent. Mixed data for the sources of *I. pseudorasus* and *I. lewisi* are as inexcusable as the fact that Arthur has lost, misplaced, or misdirected the type specimens of *I. spinae, I. rageaui, I. minutae,* and *I. arabukiensis*. The treatment of immature ticks throughout is inadequate; in this area the author could have made important contributions. A considerable amount of literature pertaining to certain species has been overlooked. The large map on page 4, in which the Sahara is marked as a transitional zone between the Ethiopian and Palaearctic Faunal Regions, is remarkably inappropriate for the purposes of this book. Comments on disease relationships are more often than not either plainly wrong or confused. For instance, on page 1 the statement that *I. laguri* has been implicated in human nephrosonephritis in three endemic areas of the U.S.S.R. shows complete lack of attention to voluminous literature, much of it in English, disassociating ticks from any relationship to this disease. On the same page, reference to tick-borne encephalitis is as confused as it is in Arthur's book on ticks and disease; Nuttalliellidae is overlooked in mentioning the families of ticks; and the presence of *I. laguri* in Africa is inferred although elsewhere it is recorded no closer to Africa than Turkey. Host names are often carelessly used and poorly documented; use of a generic name in one part of a sentence and of a common name for the same host animal in a different part of the same listing sentence shows that the author did not bother to check even these simple details. No attempt is made to indicate the kind of host from which several of the more common *Ixodes* species have been most frequently taken. Often the author makes no statement of the material examined as a basis for species description, a fact that can be endlessly troublesome to future workers with certain species. Numerous peculiarities of grammar and sentence construction mar the text—for example, the following quotation on page 203: "Morel in his annual report (1958) gives it off herbivores and carnivores."

In Chapter 2 the review of the biology of *I. vespertilionis* is unsatisfactory; the presence of *I. gibbosus* Neumann has been overlooked; remarks concerning *I. kaiseri* in relation to its probably prior name *I. crenulatus* are haphazard owing to the large amount of material easily available for comparative study; the selection of an "electotype" of *I. ricinus* from Wales (p. 56) shows poor judgment since this species was originally described from continental Europe; the statement (p. 45) that the hosts listed for *I. laguri* add considerably to the known host range of this species indicates lack of awareness, for there is much published information on this species; the review of *I. pari* (pp. 68 and 69) shows that Arthur overlooked information which he states is not present in papers he reviews and that he is unaware of a number of informative publications on the biology of this species.

No attempt is made to consider the many interesting aspects of *Ixodes* species relationships, ecology, distribution, and host associations in Africa. Brief reviews of these subjects could have provided a scientific and intellectual stimulus now lacking in this catalog of species.

The value of this book is that a few specialists may temporarily put aside some recent reprints and obtain much of the current taxonomic information on most species of this geographical area from one beautifully bound package. The less knowledgeable user should handle the contents with caution. This book fails to add prestige to the disciplines of taxonomy, systematics, or acarology.

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