REVIEWS AND ABSTRACTS

THE ANOPHELINI OF THE ETHIOPIAN GEOGRAPHICAL REGION. By Botha De Meillon. Publications of the South African Inst. for Med. Res. 10(49), 272 pp., 85 plates, 2 figs. 1947. Johannesburg. Price $3.00. This is an excellent and attractive treatise on the anopheline mosquitoes of Africa. Although largely taxonomic, it contains much information on biology, distribution, breeding places, and disease relations of the Anophelini. There are 9 types of breeding places and the species found in each are listed.

The 18 species and 2 varieties of these which have been found infected with malaria in nature are given. Four additional species have been infected experimentally with malaria parasites, while 4 others are suspected of being vectors on epidemiological grounds.

Keys to the subgenera, groups, and series are followed by keys to the females, fourth stage larvae, pupae, and eggs. Detailed descriptions are furnished of the known stages of each species together with notes on biology, distribution, and relation to malaria. *Anopheles gambiae* Giles, because of its great economic importance, is treated more fully. In Ethiopia, 70 species and 21 varieties of anophelines are recognized and of these 40 are known in the egg stage.

The distribution of all of the species by countries is tabulated and the publications on the Ethiopian Anophelini are well covered in the bibliography. To those concerned with the identification of African mosquitoes, the profuse illustrations are of inestimable value. The author has done a highly commendable piece of work and is to be congratulated.—F. C. BISHOPP, Bureau of Entomology and Plant Quarantine, U. S. Dept. Agr.

REPORT OF THE NINETEENTH ANNUAL MEETING OF THE FLORIDA ANTI-MOSQUITO ASSOCIATION. 1948. Every one interested in mosquito control work will welcome the new 78-page mimeographed pamphlet which has recently come to my desk. It is the report of the Nineteenth Annual Meeting of the Florida Anti-Mosquito Association which met jointly with the American Mosquito Control Association at Fort Pierce, Florida, on March 28–31, 1948.

This meeting was one of the highlights of the year because it was held in conjunction with the annual meeting of the American Mosquito Control Association. Thus the pamphlet reports not only the most recent local activities of a State long famous for its anti-mosquito work, but also contains the report of the most recent developments and findings in this work on a nation wide scale.

There are 10 county reports of anti-mosquito activities in Florida. These reports deal with the varied and numerous problems involved in anti-mosquito operations, the kinds of mosquitoes encountered, the organization of the work, the amount, kinds, and cost of the materials and equipment so ingeniously used. Aircraft spraying appears to be a very important phase of the work in Florida. The results were uniformly gratifying to a State long famous for its fine resorts.

In the pamphlet also are 8 articles by internationally recognized authorities, who reported some of the most recent developments in this field before the meeting of the American Mosquito Control Association. Dr. Paul F. Russell, Staff Member, International Health Division of the Rockefeller Foundation, ably reviews the history of mosquito control operations and points out some of its more important next steps—particularly in the control of malaria.

Mr. George H. Bradley, Senior Entomologist of the U. S. Public Health Service at Atlanta, gives an excellent summary of the work of the Communicable Disease Center there in the Malaria Control program.

Director Harold F. Gray of Oakland gives a most interesting account of the organization and development of mosquito control activities in California, while Dr. Herbert A. Crandell gives a similar account of mosquito control work in Ohio.

The effects of DDT on fish and wildlife are discussed very illuminatingly by Dr. J. P. Linduska, Biologist of the U. S. Department of the Interior.

The Army campaign against mosquitoes in various parts of the world is well described by Major Ralph W. Bunn of the U. S. Army.

Dr. John N. Hughes, of the Entomology Section, Foreign Quarantine Division at Washington, cites interesting facts and figures relative to the importation of mosquitoes from foreign countries by aircraft. The quarantine is becoming increasingly effective.

On the whole, mosquito control has become big business in America. In an article by H. D. Peters, Director of Sanitation at Jacksonville, Florida, and President of the American Mosquito Control Association, it is shown that no less than $10,113,289.00 were spent in 1947 on mosquito control projects. "Mosquito control operations," he says, "are now definitely a part of the everyday life of a very considerable portion of the world's population."

This well edited and informative report brings us up to date on the most recent methods and materials of mosquito control in America. This writer feels that the Florida Association should be congratulated upon its progress toward the eradication of the mosquito menace and that all of us throughout the country should take courage therefrom and be spurred onward through increasing efforts toward our goal.—PERRY W. RUTH, Pres., Virginia Mosquito Control Assoc., Norfolk, Va.

(Editor's Note: A very few copies of these

Florida Proceedings are available, $1.00 per copy. Address J. A. Mulrennan, Fla. State Board of Health, P. O. Box 210, Jacksonville 1, Fla.)

SPRAY TESTS AGAINST ADULT MOSQUITOES. 1. Laboratory Spray Tests with Culicine *(Culex fatigans)* Adults by D. F. Waterhouse. 2. Spray Tests with Anopheline *(Anopheles punctulatus farauti)* Adults by D. F. Waterhouse and D. O. Atherton. Bull. No. 219, Council for Scientific and Industrial Research, 17 pp. Melbourne 1947.

Some of the information contained in this publication, of work done in 1942 and 1943 is already known and newer chemicals have come to the fore. Nevertheless this publication does contain information worthy of note.

Using a Peet-Grady chamber and procedures, these workers found that mosquitoes responded differently to various toxicants than did flies. Species differences were also encountered: *C. fatigans* was more resistant than *Aëdes aegypti, A. notoscriptus* or *A. alboannulatus*. The addition of some common activators for pyrethrum such as sesame oil, D.H.S. activator, n-isobutyl undecylenamide caused no increase in mortality of mosquitoes when they were added to pyrethrins although a Freon bomb containing pyrethrins and sesame oil gave excellent control. Combinations of DDT and pyrethrum were also effective.

In the spray tests against Anopheline adults, Waterhouse and Atherton found that initial contact with the spray particles is important since little difference was noted when comparing one minute and ten minute knock-down and mortality from DDT, pyrethrum, or mixtures of the two. After the ten minute period, sprays containing DDT may cause an additional mortality so that an 18 hour observation was considered desirable. A "standard" spray prepared and used several times per day for knock-down and killing of adults on the wing failed to affect the number of engorged and unengorged anophelines found nesting in sprayed huts and tents in the morning. It was not until the amount of DDT deposited was increased to 50 mg. per square foot that a persistent lethal effect was noticed.—PHILIP GRANETT, N. J. Agric. Expt. Sta., New Brunswick, N. J.

THE MALARIA PROBLEM IN MAURITIUS: THE BIONOMICS OF MAURITIAN ANOPHELINES. W. F. Jepson, A. Moutia, and C. Courtois. Bull. Ent. Res. 38(1):177–208. 1947. 1. A sketch is given of the Malaria Control Organization in Service areas in Mauritius with a summarized history of malaria work in the Island since the first epidemic in 1865.

2. Keys to Mauritian Anophelines and their larvae with notes on their field recognition characters are followed by data on the distribution of adult Anophelines in the Colony and their relation to malaria intensity in different areas.

3. The influence of a number of environmental factors is discussed. It is concluded that temperature is an important limiting factor generally in winter and perennially in the highlands (above 1,000 ft.), but that the flushing action of heavy rains and probably the precipitation of food supply by colloidal iron moving under high rainfall conditions (over 100 in.) from ferrugineous lavas both play their part in the natural control of *A. funestus* and *A. gambiae*. The behavior of *A. gambiae* with respect to temperature is expressed by an area enclosed by two symmetrical catenary curves, that illustrate well the adverse influence on development of low temperatures normally occurring in winter on the coast and all the year round in the residential uplands above 1,000 ft. The thermal death point of *A. gambiae* larvae is about 42° C. and that of *A. funestus* 40° C. and the lower limit of larval activity is 16.5° C. *A. gambiae* develops most rapidly at an estimated temperature of about 37° C.

4. In the coastal regions *A. gambiae* possesses a marked tolerance to highly saline waters and is found commonly at the upper limit of mangrove *(Rhizophora mucronata)* where rainwater and seepages dilute the tidal water. *Paspalum vaginatum* swamp is a dangerous source of *A. gambiae*. The pH of natural breeding places varies from 7.0 to 8.6 and appears to have little influence in affecting distribution in the regions below 1,000 ft.

5. Melanism in *A. gambiae* larvae was found in nearly all lowland areas. It was unrelated to salinity but may be correlated with high temperatures.

6. A consideration of the effect of light on the breeding of Anophelines leads to the conclusion that shade alone is unlikely to be sufficient to control *A. funestus* in sluggish lowland waters. The apparent effect of shading is almost certainly due to the lowered temperature rather than to critical reduction in light intensity.

7. The flight range of Anophelines does not normally exceed 1 mile, and in the town of Port Louis, houses within ¼ mile of a large seasonal breeding area were quite free of both *A. gambiae* and *A. funestus*.

8. The cyclone of 1945 with wind velocity of nearly 100 miles per hour caused a complete disappearance of both adults and larvae for a period of 14 to 21 days.

9. The natural infectivity of *A. funestus* is in the order of 3 to 4 per cent, but locally, infections up to 25 per cent have been recorded. Infection is highest at the end of the transmission period, i.e., June to September.—Authors' Summary and Conclusions.

PROCEEDINGS OF THE SIXTEENTH ANNUAL CONFERENCE OF THE CALIFORNIA MOSQUITO CONTROL ASSOCIATION. 1948. Edited by H. F. Gray and R. F. Peters. The Sixteenth Annual Conference of the CMCA was held at the University of

California on February 12, 1948, under the leadership of President Arthur F. Geib. The State Director of Public Health, Dr. W. L. Halverson, reported the unusual expansion of California mosquito control activity through the new subvention assistance program administered by his department.

The most recent information on the Vectors and Arthropod Reservoirs of certain of the Encephalitides was presented by Dr. W. M. Hammon. To those interested in the details of the California activities, the outline of the Objectives and Scope of the New Bureau of Vector Control by A. H. Dahl, State Dept. of Health, will be very interesting.

For the practical worker in mosquito control, the following presentations are very worthwhile:

"Fundamentals of Community Fly Control"—J. A. Rowe.

Symposium—"New Insecticides—Their Place in Mosquito Control."

Symposium—"Toxicities and Tolerances of New Insecticides."

"Introduction to Two Symposia"—M. A. Stewart.

"A Comparison of the Toxicity of DDT, TDE, and the Methoxy Analog of DDT to Several Species of Mosquitoes"—W. W. Yates.

"Some Physical Factors in the Deposition of DDT Mists as Mosquito Larvicides"—F. F. Ferguson, S. W. Simmons, and W. M. Upholt.

Symposium—"Use of Airplanes for Mosquito Control."

While the above list covers some of the very practical material presented at this Conference, there are two papers, by Prof. Wm. B. Herms and T. G. Raley, which should be read by every mosquito control worker. They are on the subject of public relations, which every mosquito control worker should be continually striving to improve. Prof. Herms has presented a list of ten general principles of any public relations program for your guidance.—RALPH J. VAN DERWERKER, Supt.-Eng., Union Co. Mosq. Ext. Comm., Cranford, N. J.

(Editor's Note: Copies of the Calif. Proceedings are available at $2.50 each from R. F. Peters, Exec. Sec., CMCA, State Dept. of Health, Berkeley, California.)

MOSQUITO FAUNA OF JAPAN AND KOREA. Part I. Mosquito Survey Data on Japan and Their Application in the Control of Mosquito-Borne Diseases, pp. 1–183, 67 figs.—Walter J. La Casse. Part II. Mosquito Fauna of Japan and Korea, pp. 1–273, 75 pls.—Walter J. La Casse and Satyu Yamaguti. Office of the Surgeon General, HQ. I Corps APO 301.

This, the most recent publication on the mosquitoes of Japan, was prepared as part of the activities of the 207th Malaria Survey Detachment in order to gather together information to be used in the control of mosquitoes and mosquito-borne diseases in Japan. The two parts of this large and valuable work are bound together to form a single bulky volume rather awkward to use beside a microscope because of the difficulty in keeping it open at the place you want. The text is typed and reproduced by a photographic process and the excellent line figures, with printed captions are reproduced in the same way. The first portion is devoted to the techniques of carrying on mosquito surveys and control operations, particularly as applied to Japan; to the biology of the Japanese species, and to the mosquito-borne diseases of Japan. These diseases are malaria, dengue fever, filariasis, and Japanese B encephalitis, and particular attention is given to the last. The 67 figures of this first part consist of photographs of breeding places and control operations, numerous tables, and some graphs, maps, and illustrations of collecting equipment. Part I seems to give all of the essential information on the mosquitoes of Japan as they occur in nature, and their relation to man. It should be noted that the statement that all the *Anopheles* reported for Japan are included is not true, since *Anopheles insulaeflorum* was reported by Ogasawara in 1939. Three other species reported from Japan, *Toxorhynchites towadensis, Aedes imprimens,* and *A. nobukonis,* are neither included nor listed in the introduction as not being included.

The second part consists of keys to the adults and larvae of the species, a discussion of the morphology to aid in the use of the keys and descriptions, and a description in detail of the adults and larvae, with a discussion of the biology for each species. The keys appear quite satisfactory for determining the species included although a strictly dichotomous key is to be preferred to one containing 3- or 4-way alternatives. The wording in couplet 7 of the *Culex* key is awkward since it could be interpreted that the two halves mean the same thing. The descriptions appear to be adequate and sufficiently complete when used in conjunction with the excellent figures. These are to be found on plates in the back of the book, two plates for each but one of the species. The first plate contains the adult female, the tarsal claws, the pupal trumpet and paddle, and the male genitalia, and the second plate is devoted to the larvae, usually with a very detailed depiction of the mouth parts. These drawings are excellent and well reproduced and are one of the most commendable features of the book. It is unfortunate that in the text *koreicus* is treated as a subspecies of *japonicus* while under the figure it is given as a valid species. Each species also has a map showing the distribution in Japan and Korea. It might have been more satisfactory to have the illustrations accompany the descriptions rather than to have them grouped in the back.

The 38 species or subspecies of mosquitoes treated include 5 *Anopheles,* 11 *Aedes,* and 17

Culex, as well as one species each for 5 other genera. A new subspecies of *Aedes (A. niveus nipponicus)* is described but no holotype was selected, and no type locality is given. *Culex (Neoculex) rubensis* is credited to Sasa and Takahashi 1948, but this is a manuscript name and the species must be credited to La Casse and Yamaguti as it is quite evident that it was the latter authors that prepared the description and made the illustrations first describing the species. Again no holotype is selected or type locality given. In an appendix to Part II a new species, *Orthopodomyia (O.) nipponica* is described. Two females and a male are designated as syntypes. It is to be hoped that the authors will select a lectotype from these in the near future. It is unfortunate that the bibliography does not include Hsiao and Bohart's "The Mosquitoes of Japan and Their Medical Importance." 1946.

This work is particularly to be commended for the biological information that it contains, and for the splendid illustrations. Undoubtedly more species will be found in the future, many more distribution records will be made, and several of the older species will be rediscovered, but it is a good preliminary work marred only by some careless taxonomic procedures.—ALAN STONE, U. S. Dept. Agriculture, Washington, D. C.

A HANDBOOK FOR THE IDENTIFICATION OF INSECTS OF MEDICAL IMPORTANCE. By John Smart with chapters on Fleas by Karl Jordan and on Arachnids by R. J. Whittick. 2nd Edition. 295 pp., 13 pl. (3 colored), 178 figs. 1948. British Mus. Nat. Hist., London. Price 20s.

For the mosquito worker in any part of the Old World this up-to-date treatise is most valuable. Major attention is devoted to the mosquitoes (more than ¼ of the pages) and of this 2/3 deals with *Anophelini.* The work is designed "to meet the need for a reliable summary guide to the recognition of all the Old World species at present known to be of importance in medicine and hygiene."

The work is made up largely of keys simplified for the use of the working medical entomologist. The use of the keys is greatly facilitated by abundant and well prepared illustrations. The keys include the sub-families of *Culicidae,* larvae, pupae, and adults; the tribes of *Culicinae,* larvae, pupae, and adults; the genera of *Culicini,* adults and 4th stage larvae; and the species of *Anophelini,* adults and larvae. The *Anopheles* are grouped according to world regions. Of particular interest and value is a list of known malaria-carrying *Anopheles* by regions, a citation of literature on distribution of *Anopheles* by regions, and tables giving the distribution of *Anopheles* species by world regions and countries.

The growth of our knowledge of mosquitoes is well exemplified by the fact that this edition lists 39 species and 7 varieties of *Anopheles* in the Australian region as compared with 26 species and 4 varieties in the first edition published in 1943. This, of course, is due to the intensive work in that area during and following World War II.

Insects other than mosquitoes and fleas are treated rather briefly and with few literature citations.

The authors and the British Museum are to be congratulated on getting out this revision so promptly and in such attractive style.—F. C. BISHOPP, B.E.P.Q., U.S.D.A.

EFFECTS OF DDT AND OTHER INSECTICIDES ON FISH AND WILDLIFE. SUMMARY OF INVESTIGATIONS DURING 1947. By Joseph P. Linduska and Eugene W. Surber. Cir. 15, Fish and Wildlife Service, U. S. Dept. of the Interior, 1948. One of the problems concerning all those engaged in the control of mosquitoes and other insect pests is to use insecticides effectually, and at the same time, without injury to beneficial forms of life. Through the efforts of the Fish and Wildlife Service cooperating with other agencies much information of value in guiding insect control operations is being obtained.

In the present excellent summary, which supplements a previous publication (Fish and Wildlife Cir. 11), much information is presented on the effects of DDT sprays on various forms of life in forests, streams, orchards and on the seashore. In large scale aerial applications of DDT-oil solution to forests in Idaho at the rate of 1 pound per acre, birds and mammals were not affected over the area as a whole. In forest spraying operations in Wyoming, the application of 5 to 7½ pounds of DDT per acre caused heavy bird damage, but strangely, fewer fish were killed than in other operations where much less DDT was used.

In extensive tests in West Virginia, stream treatment from the air with 1 pound of DDT in oil solution caused a nominal kill of fish. However, the bottom fauna was largely destroyed. Laboratory tests showed chlorinated camphene to be considerably more toxic to fish than DDT. Tetraethyl pyrophosphate, parathion and bis (p-chlorophenoxy) methane were of the same order of toxicity as DDT.

One of the most important phases of the work was with oysters. No mortality of young or adult oysters resulted from spraying the beds with 1½ pounds of DDT per acre, either as an emulsion or oil solution.

The Service advises, among other things, the use of DDT only where necessary, and for aerial applications over aquatic areas, the use of one-fifth of a pound or less per acre; if repeated treatments are necessary, cut the dosage to one-tenth pound or less. Of course, these quantities are adequate for mosquito control.—F. C. BISHOPP, U. S. Bureau of Entomology and Plant Quarantine.

MOSQUITO-CONTROL PRACTICE WITH DDT. John M. Henderson. Engineering News Record,

92:1034, June 24, 1948. This article discusses principles involved in selecting the proper method of mosquito control. Methods commented on include mosquito-proofing, DDT residual house spraying, drainage and larviciding with DDT, DDD, plain oil and Paris green. The author points out that all of these technics have a justifiable place in mosquito control with the possible exception of larviciding with plain oil or Paris green, use of which in due time should be virtually supplanted by more economical and effective materials. Tables of typical costs are presented with the footnote that they are subject to wide variation in practice.

Among factors mentioned as affecting choice of control methods are: density of human population, rapidity and degree of protection desired, and (for the mosquito), flight range, extent of breeding places and resting and biting habits. Examples are given. Methods of applying larvicides are discussed.

Mosquito-proofing is represented as still a worthwhile method of avoiding mosquito annoyance, but only at private expense. The greatest value of DDT residual house spraying is in controlling malaria in rural areas and small communities. Drainage is particularly indicated around urban areas. Drainage and larviciding in combination have greatest applicability (in competition with adulticiding) for the control of "outdoor biting" species of nuisance mosquitoes, although at times the airplane application of DDT as an adulticide over breeding places to kill newly emerged adults is indicated. DDD larvicide is preferable to DDT for breeding places possessing special wild life value.

The foreword states "When a revolutionary development occurs in any field, confusion as to its import, particularly in relation to established methods or practices often results. With the advent of DDT insecticides, such a condition now exists with regard to malaria control." The main motif of the article is to present a balanced concept of mosquito control to public officials and engineers not engaged in mosquito control activities. It is a substantial abridgment of the original manuscript but still accomplishes much of its intended purpose.—Author's Abstract.

MALARIA NO VALE DO RIO DOCE. EXPURGO DOMICILIAR COM DDT EM SUSPENSAO AGUSA. (Malaria in the Rio Doce Valley. House Spraying with DDT Aqueous Suspensions.) E. Braga, H. Maia Penido, M. Sanches Basseres, D. Bustorff, E. P. Bezerra F. and F. P. de Moura. Revista de Serviço Especial de Saúde Pública 1(3):737–776. Jan. 1948. Rio de Janeiro, Brazil. This is the first published report on large scale DDT house spraying in the control of malaria in Brazil. The Rio Doce Valley, located in the eastern-central section of the country, is about 600 kilometers long. Malaria is practically absent in its middle third, but highly endemic in the lower third, where the vectors are *Anopheles darlingi, A. albitarsis,* and *A. aquasalis,* and in the upper third, where transmission is due only to *darlingi.*

The authors' work was restricted to this last area. After a brief summary of the malaria control measures previously employed in the region, they describe their DDT house spraying program and the results obtained after the first two applications of this insecticide. An area of 1,500 square kilometers was selected, with approximately 5,000 houses and 20,000 inhabitants. The first cycle of DDT spraying was carried out between September and December 1946, and the second from January to April 1947. The operations were performed by 5 spray teams, each consisting of 2 men (one spray operator and one assistant), and all supervised by one chief inspector. Due to the lack of adequate roads in the area, transportation was entirely on foot. All inner walls of the houses were sprayed, up to the height of about 3 meters. The insecticide was a 2.5 per cent suspension of DDT. Suspension was preferred for various reasons: in the rural area concerned, most dwellings are mud huts, and transportation of the suspensive powders alone is cheaper and more feasible than that of solutions or emulsions. In the first treatment, the suspensive powder was Gesarol AK50 (Geigy Co.), Deenol 50F (du Pont de Nemours Co.) was substituted in the second cycle. Lofstrand NER–108 hand-operated sprayers were employed, either with ¼ T 8002 or Nbr. 2 flat-spray nozzles.

	1st Cycle	2nd Cycle
Number of houses sprayed	4388	4783
Per cent of houses sprayed	82.8	84.9
Daily av. no. houses sprayed per team	11.3	12.3
Av. area sprayed per house (sq. meters)	114.98	118.30
Av. DDT per house (gms.)	287.44	291.30
Av. DDT per sq. meter (gms.)	2.49	2.45
Total cost (U.S.$)	6750.00	5700.00
Av. cost per house (U.S.$)	1.55	1.17

The higher cost in the first cycle was chiefly due to the price of the DDT powders used, which was about U. S. $1.80 per kilo for Gesarol and U. S. $1.00 per kilo for Deenol.

The results obtained were very encouraging. Although no apparent decrease was observed in the larval density of *darlingi,* the adults of this species became very rare in the sprayed houses, where nearly all specimens were found dead. The authors reported that the malaria incidence dropped sharply. The highest number of malaria patients registered monthly in the malaria season of 1947 was lower than the lowest number observed during the interepidemic periods of 2 years previous to DDT spraying.

It is claimed by the authors that in the Rio Doce Valley, where the malaria season is restricted to the first 5 months of the year, no more than 2 sprayings, with a 3-month interval, are re-

quired per year. They also emphasize the feasibility of this type of anti-malaria campaign in sparsely populated rural areas of Brazil where *darlingi* is the vector.—L. M. DEANE, Special Service, Public Health, Belém, Pará, Brazil.

PUBLIC HEALTH ENGINEERING. A TEXTBOOK OF THE PRINCIPLES OF ENVIRONMENTAL SANITATION. By Earle B. Phelps and collaborating authors. New York, John Wiley & Sons, Inc., Vol. I, vii + 655 pp., 1948. $7.50. Coming after Professor Phelps' brilliantly written "Stream Sanitation," this book is in some respects a slight disappointment. It appears to be rather uneven in treatment of the subjects, and apparently, judging from this volume and the table of contents of the projected Volume II, some important sectors of sanitation may be omitted or lightly touched upon.

Volume I covers the primary subjects of air and water, including sewage. Chapters 3 to 7 inclusive deal with heating, ventilating and lighting, and are excellent. However, this is followed, as a section of Part I, by Chapter 8, dealing with insect control. It would appear to be more logical to have placed this subject, along with rodents (which are to appear in Volume II) in a separate section concerned with vector control. Sixty-two pages are devoted to insect control, of which 47 relate to mosquitoes. In view of the world wide importance of vector-transmitted diseases, a somewhat larger coverage of the subject, extending it to include such arthropods as ticks and mites, would appear to be justified. The section on mosquito control is well done within the space limitation.

The dismissal of the complex and epidemiologically difficult subject of housing in about two pages is unsatisfactory, even though special phases of the subject are considered in several chapters.

Part II of this volume deals with water and sewage, and it is here that Professor Phelps is at his best. The "biological" approach to the subject, and the unified treatment of such common subjects as sedimentation, is excellent. But it is extremely difficult to write upon such subject material without using either too much mathematics for a medical health officer, or too little for an engineer. Possibly the treatment given is a reasonable compromise for both groups of readers.

From the health department officials' viewpoint, a fuller treatment of cross-connections and back-siphonage, especially administrative measures for control, would have been helpful.

The choice of reference material is always a difficult matter, but in a book of this type an expansion of the chapter references would be advisable. A few of the references have been carelessly cited.

In spite of the inherent difficulties in writing a compendium in this field, this first volume will well repay careful study.—HAROLD F. GRAY, Alameda County Mosquito Abatement District, Oakland, Calif.