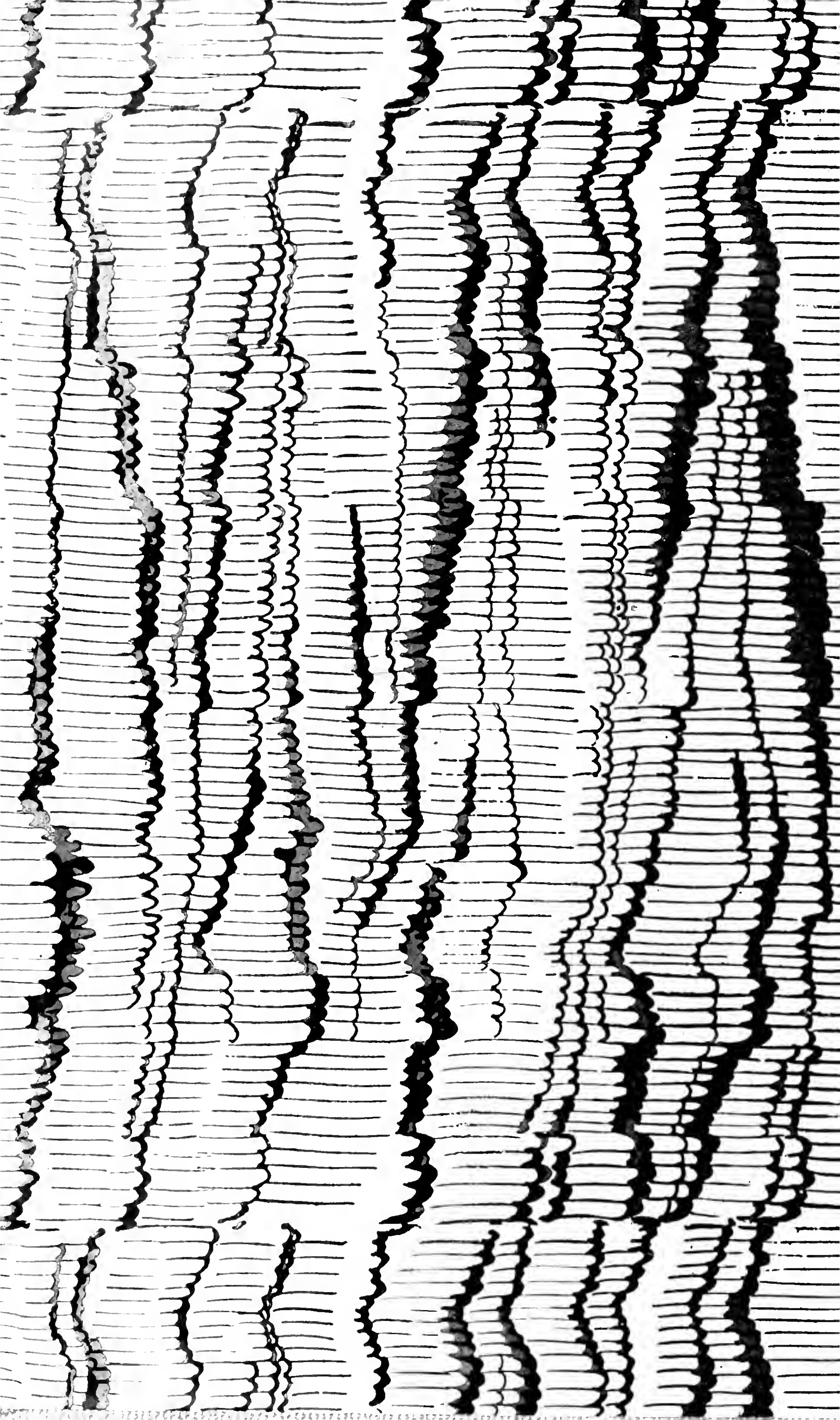

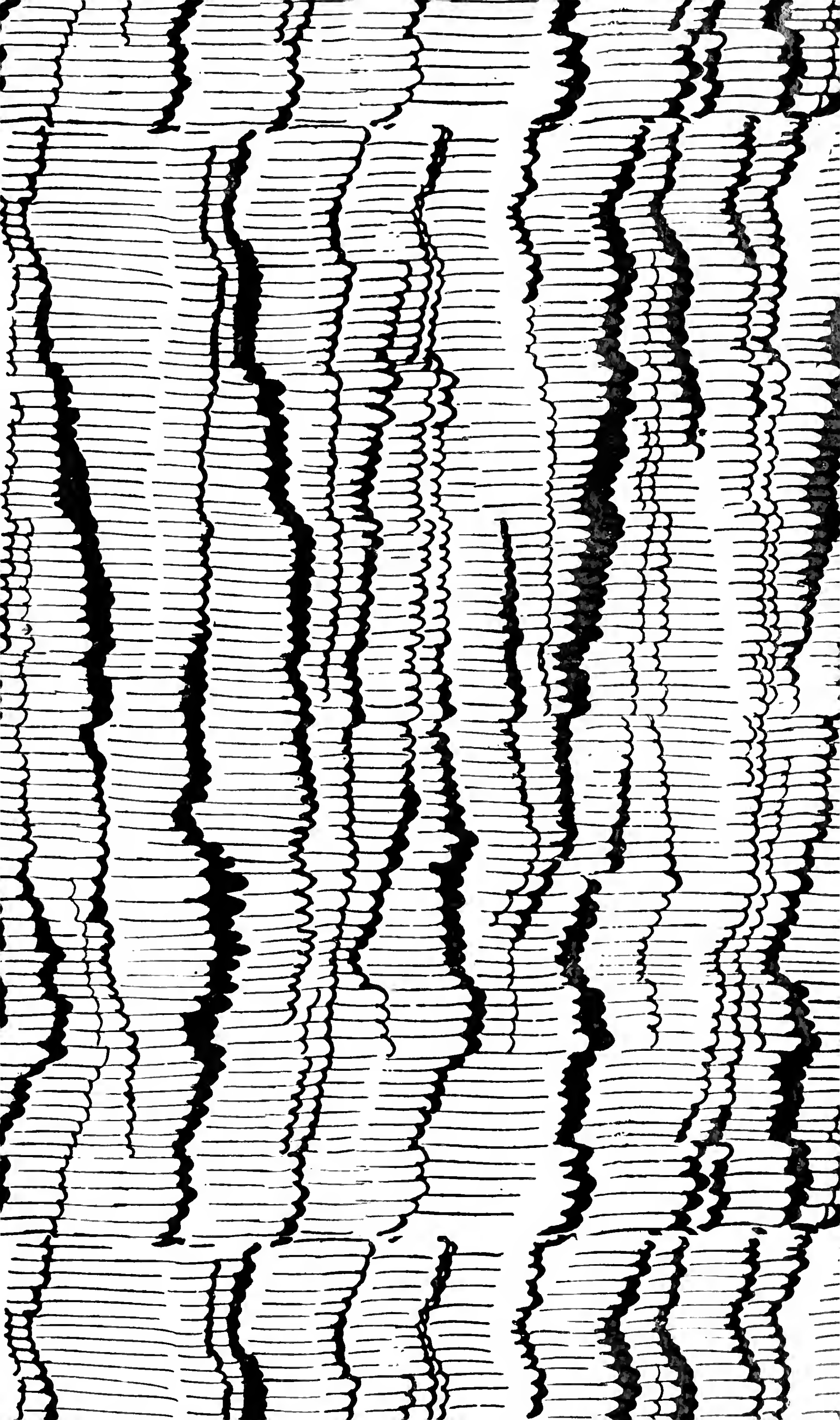

THE REVIEW OF APPLIED ENTOMOLOGY.

SERIES B: MEDICAL AND VETERINARY.

VOL. VI.

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ERRATA.

Page 46 line 39 for "1916" read "1915."
,, 65 ,, 30 ,, "(*Cultseta*)" ,, "(*Culiseta*)."
,, 112 ,, 8 ,, "*Gastrophilus* (*Rhinoestrus*) *nasalis*" read "*Rhinoestrus purpureus*, Br. (*nasalis*)."
,, 240 ,, 22 ,, "cresote" read "creosote."

(C554) Wt.P1921/144. 1,500. 5.19. B.&F.Ltd. Gp.11 3.

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REVIEW
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VOL. VI.] [1918.

CORNWALL (J. W.) & MENON (T. K.). **On the Possibility of the Transmission of Plague by Bed Bugs.**—*Indian Jl. Med. Research, Calcutta*, v, no. 1, July 1917, pp. 137–159. [Received 27th October 1917.]

Bed-bugs that have fed on a case of septicaemic plague must undoubtedly be regarded as ambulant cultures which, when ruptured, set free virulent plague bacilli. This paper describes transmission experiments in which virulent strains of *Bacillus pestis* were employed. A large proportion of the bugs infected died within a few days; the majority of the survivors had entirely overcome their infection and contained no viable bacilli. Some common non-pathogenic bacteria are as fatal to bugs as the most pathogenic. Bugs infected with bacteria generally refuse to feed for a long time. A sterile re-feed, if the infection has not been entirely overcome, may lead to a fatal recrudescence. *B. pestis* can survive in the stomach of a bug which has had one or more sterile feeds after the original infected feed, for at least 38 days, and the bacillus, recovered by culture from the stomach of an infected bug, retains its virulence for guinea-pigs. Attempts to obtain a growth of *B. pestis* by allowing infected bugs to feed on a sterile fluid through a rabbit-skin membrane failed. Experiments to transmit plague to guinea-pigs by means of the bites of infected bugs were also unsuccessful. *B. pestis* may be recovered by cultivation of the proboscis of a bug in broth within an hour of its infected feed. The presumption is that bacilli that have been stranded in the sucking tube multiply in the culture medium.

Bugs cannot regurgitate their stomach contents in the act of feeding; if, therefore, they transmit plague by biting, they must do so by washing out with the saliva bacilli that have been stranded in their sucking-tubes and that do not remain there for long after an infected feed. It has not yet been definitely proved whether bugs can or cannot transmit plague by biting; but the likelihood of this taking place under natural conditions is small.

AWATI (P. R.). **Studies in Flies. iii. Classification of the Genus *Musca* and Description of the Indian Species.**—*Indian Jl. Med. Research, Calcutta*, v, no. 1, July 1917, pp. 160–191, 10 plates. [Received 27th October 1917.]

In a previous paper the author gave a key to the identification of the species of the genus *Musca* [see this *Review*, Ser. B, iv, p. 172]. In the present one nearly all the species enumerated in this key are described.

Sinton (Capt. J. A.). A Trematode Parasite of Anopheline Mosquitos. —*Indian Jl. Med. Research, Calcutta*, v, no. 1, July 1917, pp. 192–194, 1 plate. [Received 27th October 1917.]

In 1914, while dissecting mosquitos for malaria parasites, an encysted Trematode was found in a number of Anophelines, of which *Anopheles funestus* var. *listoni* was the most commonly infested, while *A. culicifacies* frequently harboured the parasite. No Culicines were found to be infested. The parasite was present in both sexes of the mosquito, and was also found in the larvae of *A. culicifacies* and *A. willmori*. Male mosquitos were found to be considerably more heavily infested than females, a possible explanation being that the deleterious results produced by a heavy infestation of the larva so act on its growth as to cause a tendency for such a larva to develop into a male.

The parasite in slight infestations forms cysts in the abdomen, but may also involve the thorax. It is apparently similar to a species of *Agamodistomum* described by Matirano in 1901 in *Anopheles claviger* and to a similar parasite described by Alessandrini in 1909 in *A. maculipennis*. These authors thought that the alternate host might be a bat, but it is more probably some insectivorous bird with aquatic habits, such as the wag-tail. A table shows the frequency of occurrence of the parasite in the species of *Anopheles* examined.

Sinton (Capt. J. A.). The Anopheline Mosquitos of the Kohat District. *Indian Jl. Med. Research, Calcutta*, v, no. 1, July 1917, pp. 195–209. [Received 27th October 1917.]

An investigation was carried out during the summer months of 1914 and 1915 in and around the Kohat Cantonment, North-West Frontier Province, the results of which are somewhat incomplete owing to the exigencies of military service. The area investigated is in a valley, at an altitude of 1,725 ft., where cultivation is almost entirely dependent upon irrigation. The smaller irrigation ditches leading to the fields and running through privately-owned land, where they are often overgrown and leaky, form ideal breeding-places for mosquitos.

The following species, which are given in the order of their abundance, are recorded with notes on their habits, seasonal prevalence and breeding-places: *A. stephensi*, Liston; *A. culicifacies*, Giles; *A. rossi*, Giles; *A. funestus* var. *listoni*, Liston; *A. rhodesiensis*, Theo.; *A. maculipalpis*, Giles; *A. pulcherrimus*, Theo.; *A. turkhudi*, Liston; *A. fuliginosus*, Giles; *A. nursei*, Theo.; *A. willmori*, James. Of these, six species have been proved to be malaria-carriers in nature, viz., *A. culicifacies*, *A. funestus* var. *listoni*, *A. fuliginosus*, *A. maculipalpis*, *A. stephensi* and *A. willmori*, while *A. turkhudi* and *A. rossi* have been experimentally infected in the laboratory. It is therefore not surprising that malaria is very prevalent in the district. A chart, compiled from the records of the Kohat Laboratory, shows the seasonal prevalence of benign and malignant malaria and the relative frequency of *A. stephensi* and of *A. funestus* var. *listoni* combined with *A. culicifacies*. Owing to the similarity of curve shown in the chart, it is considered probable that there is some relation between the prevalence of *A. stephensi* and the benign tertian epidemic, while it seems probable that the malignant tertian epidemic is largely if not entirely due to *A. listoni* and *A. culicifacies*.

Vorticellid Protozoa were found as external parasites of larvae of *A. stephensi*. It is believed that in the West Indies these parasites are harmful to the larvae, which, if they survive, develop very slowly. Acarine parasites were frequently found on *A. stephensi*, *A. willmori*, and *A. maculipalpis*. Internal parasites included sporozoites found once out of 45 specimens in the salivary glands of *A. stephensi*, while zygotes were found once in the gut of *A. culicifacies*, of which 40 examples were examined. One female of *A. listoni* showed a heavy infection with Herpetomonads in the alimentary tract, while infection with encysted Trematodes was fairly frequent [see preceding paper].

LUCY (S. H. R.). **Health and Sanitation on Estates.**—*Agric. Bull. Fed. Malay States, Kuala Lumpur*, v, no. 10, July 1917, pp. 389–402.

This paper is written from the point of view of a sanitarian concerned with the opening up of virgin jungle for cultivation and the employment thereon of immigrant labour. The site chosen for coolie lines should be flat, well weeded and free of all cultivation, and as distant as possible from ravines and swamps and other favourite breeding-grounds for mosquitos. There should be plenty of light in the lines, though unfortunately the coolies, as well as Anopheline mosquitos, prefer darkness, and the buildings should be whitewashed inside and out at frequent intervals. The usual anti-malarial measures are advocated, including quinine prophylaxis, oiling and piping. Oil-spraying is considered the most suitable measure for mosquito reduction on estates and has proved very successful. Medical supervision and hospital accommodation are discussed and Europeans are advised to have at least one room in their bungalows screened and provided with a double door; certain minor precautions against mosquitos and malaria are enumerated.

HASEMAN (L.). ***Sarcophaga haemorrhoidalis* Larvae as Parasites of the Human Intestine (Dipt.).**—*Entom. News, Philadelphia*, xxviii, no. 8, October 1917, pp. 343–346.

Cases of intestinal myiasis are recorded due to larvae of *Anthomyia*, and those of *Calliphora* (*Musca*) *vomitoria* and *Sarcophaga carnaria* in neglected wounds. Intestinal myiasis seems to be due in most cases to the so-called rat-tailed Syrphid maggots (*Eristalis*), the larvae of ANTHOMYIIDAE, MUSCIDAE, and SARCOPHAGIDAE, while myiasis of the urinary tract is caused by the larvae of *Fannia*.

A most unusual case of intestinal myiasis due to *Sarcophaga haemorrhoidalis* is that of a family, consisting of husband, wife, daughter aged nine, and son aged six, all of whom, with the possible exception of the husband, had been subject to attacks during which large numbers of maggots were passed after taking salts, oil or other laxatives. Exhaustive enquiries into the habits and surroundings of the family led to the conclusion that the living larvae had been repeatedly ingested owing to the negligence of the mother in cooking and handling foods;

it had been her practice to leave cold foods such as meat, vegetables and cheese, lying uncovered on the table from one meal to the next. This view is supported by the fact that this fly deposits larvae rather than eggs, that the attacks were most numerous during the heat of summer, and that they decreased when the food was heated before consumption.

Felt (E. P.). **Household and Camp Insects.**—*New York State Mus. Bull., Albany*, no. 194, 1st February 1917, 84 pp., 41 figs. [Received 31st October 1917.]

This bulletin dealing with household and camp insects and a few of the more important pests of domestic animals, and embodying the most recent methods for their control, has been issued owing to the great demand for information on this subject.

An index and bibliography of over one hundred works are appended.

Goodwin (Col. T. H.). **Sanitation in War.** *Milit. Surgeon, Washington, D.C.*, xli, no. 4, October 1917, pp. 377–387, 6 figs., 1 plate.

This concise review of sanitation in the field contains practical notes on flies and lice and the methods of destroying them.

Brulé (M.) & Jolivet (L.). **Cinq Cas de Paludisme autochtone apparus simultanément dans une Ferme belge. Traitement du Paludisme par le Novarsénobenzol.** [Five Cases of indigenous Malaria appearing simultaneously at a Belgian Farm. The Treatment of Malaria with Novarsenobenzol.]—*Bull. & Mém. Soc. Méd. Hôpit. de Paris*, 3rd Series, xxxii, no. 37–38, 4th January 1916, pp. 2304–2310.

None of the patients mentioned in this paper had been out of France, or had lived in malarious districts, or had suffered from malaria before. The farm in question is situated in marshy mosquito-infested land near the Belgian frontier and several examples of *Anopheles maculipennis* were captured on it.

Steudel (—). **Verlauf endemischer Malaria nach Entfernung der Parasitenträger.** [Course of Endemic Malaria after Removal of the Carriers.]—*Arch. f. Schiffs- u. Tropen-Hyg., Leipzic*, xxi, no. 2, January 1917, pp. 21–29.

In 1916 the army corps of which the author was general medical officer was stationed on the Russian front in a district where malaria was endemic. The inhabitants in the firing zone had been removed in the preceding autumn, and there were therefore no human carriers present. The invading Germans, a much larger body of men, were also free from malaria parasites. The Anophelines hibernating in buildings included a large number of carriers, but these would probably die soon after oviposition, and the succeeding generation of mosquitos would have no opportunity of acquiring infection provided that cases of primary malaria among the troops were at once removed from the district and energetically treated. The following measures were therefore adopted: Every case of malaria or suspected malaria was immediately placed under mosquito-nets and, as soon as the diagnosis was confirmed, was removed to a hospital in a locality free from malaria. Only relatively few cases of malaria occurred, these being probably due to a variety of causes, including the longer survival of some Anophelines after hibernation, the unsuspected presence of some carriers among the soldiers themselves, wind-carriage of mosquitos, and the acquisition of infection behind the firing zone.

GRAY (C. P.). **Larva migrans on the Mexican Border.**—*N.Y. Med. Jl., New York*, cvi, no. 1, 7th July 1917, pp. 15–16, 2 figs.

Cases of vesicular dermatitis on the backs of troops marching with packs are described. In the author's opinion the larva migrans of an Oestrid fly was responsible for this affection, which was traced back to an old corral infested with flies and horse manure. No definite parasite was found however, and no satisfactory evidence is adduced in support of this view.

MITZMAIN (M. B.). **Is Mosquito or Man the Winter Carrier of Malaria Organisms?**—*U. S. Public Health Service, Washington, D.C.*, Bull. no. 84, December 1916, 29 pp., 19 figs. [Received 5th November 1917.]

This paper records studies carried out for the purpose of determining which of the potential hosts, mosquito or man, is the carrier responsible for the perpetuation of the malaria organism during the inactive period of winter. The majority of writers on malarial epidemiology are unanimous in expressing the belief that the mosquito phase of the overwintering of malaria is a negligible factor; these opinions are however based upon a uniform absence of experimental proof.

Hibernation studies were made during February to June, 1915, in the southern part of the United States, where conditions seem to be essentially similar to those occurring in other localities to which previous literature has referred. In the course of exhaustive searches, the only places in which mosquitos were found were under houses and in the depth of woods; no eggs, hibernating larvae or pupae were discovered. The conclusion drawn is that adult females are the only forms that hibernate in the regions studied; eggs or stored fat-cells were found upon dissection of the individuals captured, while no males were observed. The later appearance of male Anophelines indicates recent emergences and is interpreted to herald the arrival of the spring brood, which generally occurs in the early days of May. Laboratory tests showed that oviposition did not take place at temperatures between 40° and 55° F. It was ascertained in the course of these winter studies that the occasional biting of disturbed hibernating *Anopheles* had no pathogenic significance, all the clinical malarial infections occurring in the region during this period being proved to be recurrences of former attacks. It was concluded therefore that hibernating Anophelines collected in this region did not harbour malaria parasites, for none could be found in 2,122 specimens that were dissected.

In the investigation of man as the responsible winter carrier, 1,184 persons residing within the area under consideration were examined for malaria parasites, the results showing that 492 were infected, and nearly one-fourth of these were found to harbour gametocytes. Material was thus provided for mosquitos to carry on the spring cycle of new infections. Of the infections discovered, 317 were of the subtertian type, 8 were mixed infections, the remainder consisting of simple tertian types and a single quartan. Of 15 gametocyte carriers identified, 8 were similarly infected during the preceding autumn. The incrimination of man as the sole winter carrier is emphasised by the fact that three malaria-infected examples of *Anopheles quadrimaculatus* were found in the homes of the gametocyte carriers during 15–26th May, previous to which time 1,180 specimens of *Anopheles* from this source had been found to be negative.

GILL (Major C.A.). **The Prevention of Malaria in War, with Special Reference to the Indian Army.**—*Jl. R. A. M. C., London*, xxix, no. 4, October 1917, pp. 439–456.

Apart from the results of infection acquired on field service, malaria prevails in the Indian Army to a degree which is at present not appreciated, official statistics not fully representing the prevalence of acute malaria, much less the incidence of chronic, latent or masked cases. Since the Indian Army is mainly recruited from among the agriculturists of the rural districts, who rarely or never undergo a course of curative treatment, it follows that numbers of them harbour the malaria parasite for many years, and in a year following a severe epidemic, it may safely be asserted that nearly every recruit from an affected area will be infected.

The active transmission of the disease by means of Anopheline mosquitos occurs chiefly during July, August, September and October, and in the absence of measures against them, troops are subjected to a variable degree of fresh infection during their course of service. Infection is often so slight that men remain on duty until any unusual strain, such as a prolonged march in the sun, precipitates an attack. Outbreaks of malaria do not therefore always imply fresh infection, but, more frequently, the subjection of a malarious body of troops to climatological or other environmental conditions favourable to malarial relapses, from which it follows that the best method of reducing malaria in the Indian Army on field service lies in the detection and cure of infections of old standing, as well as the prevention of fresh ones.

The prevention of malaria among troops on field service, especially when campaigning in malarial countries, is often impossible, owing to the combination of tactical and medical problems being impracticable. The only possible method of safeguarding the health of the troops is by means of prophylactic doses of quinine, much time, money, and ingenuity having been expended in the vain endeavour to protect them from the bites of mosquitos; though if circumstances permit, these two measures may be combined with advantage.

As regards the prevention of fresh infection, experience has shown that the use of mosquito nets by troops is attended with many difficulties, and it is suggested that such protection should take a collective rather than an individual form, such as screened enclosures of wire gauze erected in the vicinity of barracks. Others measures of considerable value are quinine prophylaxis during the malarial season.

attention to general health, the provision of an ample supply of suitable food, the avoidance of undue fatigue and excessive exposure to the sun, and the prevention of chills, attention to which in time of peace will ensure the efficiency of the army in time of war.

HUTSON (J. C.). **Warble Flies.**—*Agric. News, Barbados*, xvi, no. 403, 6th October 1917, pp. 314–315.

This paper summarises the information which has appeared in the literature on the warble flies, *Hypoderma lineatum* and *H. bovis*.

SEALE (A.). **The Mosquito Fish, *Gambusia affinis* (Baird and Girard), in the Philippine Islands.**—*Philippine Jl. Science, Manila*, xii, Sec. D, no. 3, May 1917, pp. 177–187, 1 fig. [Received 8th November 1917.]

In 1905 the experiment was tried of stocking the ponds and breeding pools of mosquitos in the Hawaiian Islands with mosquito-feeding fish, the species selected being *Gambusia affinis*, from Texas. These fish have multiplied rapidly, several hundred thousand having been bred and distributed from the few hundred introduced. They effectively clear the water of mosquito larvae and of the egg-masses of *Culex pipiens* on the surface. In 1913, 24 of these fish were brought from Honolulu to the Philippine Islands; these now number more than 7,600 in the streams and swamps of the Philippines. They have proved capable of maintaining themselves in ponds already stocked with *Micropterus salmonoides* (black bass) and such native fish as *Ophiocephalus striatus* and *Therapon argenteus*, and have even multiplied in the presence of these voracious species. There remains no doubt that within a few years they will materially decrease the numbers of mosquitos and greatly assist in eliminating malaria from the Islands.

DYAR (H. G.). **The Mosquitoes of the Pacific Northwest (Diptera, Culicidae).**—*Insecutor Inscitiae Menstruus, Washington, D.C.*, v, no. 7–9, July-September 1917, pp. 97–102, 1 plate.

As compared with California, the Pacific North-west is poor in mosquitos, both in individuals and species. Only three black-legged species of *Aëdes* occur in the mountains instead of six as in California, this being the result of the climate, frequent rains producing dense forest with moss and undergrowth together with permanent pools in which *Aëdes* do not thrive. The species of *Culex*, *Culiseta* and *Anopheles* that frequent such places are the same as in California, minus the tropical element.

The following species occur: *Aëdes aloponotum*, sp. n., a peculiar species of the *A. cantans* group; *A. increpitus*, Dyar; *A. curriei*, Coq., a coast species breeding in tidal pools; *A. cinereus*, Meig.; *A. varipalpus*, Coq.; *A. aboriginis*, sp. n.; *A. altiusculus*, sp. n., the larvae of which were found in water underlying snow; *Culiseta impatiens*, Walk., larvae of which were found in a dark forest pool, being preyed upon by larvae of *Eucorethra*; *C. incidens*, Thoms.; *Culex tarsalis*, Coq.; *C. saxatilis*, Grossbeck (*territans*, auct.) and *Anopheles occidentalis*, D. & K.

DYAR (H. G.). **Notes on *Aëdes* at Lake Pend d'Oreille, Idaho (Diptera, Culicidae).**—*Insecutor Inscitiae Menstruus, Washington, D.C.*, v, no. 7–9, July-September 1917, pp. 102–104.

The following species of *Aëdes* were taken in mountainous country well forested with conifers down to the lake margin: *A. aestivalis*, Dyar; *A. idahoënsis*, Theo.; *A. cinereus*, Meig.; *A. canadensis*, Theo.; *A. vexans*, Meig.; and *A. sansoni*, D. & K.

DYAR (H. G.). **Notes on the *Aëdes* of Montana (Diptera, Culicidae).**—*Insecutor Inscitiae Menstruus, Washington, D.C.*, v, no. 7–9, July-September 1917, pp. 104–121.

Disregarding the high forested regions and the sparsely wooded hills, and referring only to the river valleys, it appears that mosquitos are naturally abundant in Montana, and certain species have been much increased in numbers by artificial conditions, breeding successfully in pools produced by irrigation. Originally confined to a single annual generation following the spring snows, many species now breed as often as the farmers furnish suitable pools, e.g., *Aëdes curriei*, *A. nigromaculis*, *A. vexans*, *A. trivittatus* and *A. spenceri*. The river valleys furnish two faunal areas: the wooded river bottom itself, characterised by *Aëdes aldrichi*, *A. cinereus* and *A. sansoni*; and the high flood plain, destitute of trees and resembling a prairie, characterised by *A. curriei*, *A. nigromaculis* and *A. idahoënsis*, and invaded by *A. vexans*, which, however, is commoner in the river bottom.

A. curriei, Coq., is a widespread species, especially on the prairie, the larvae appearing in the early snow pools. The eggs will hatch the same year as laid, and in the presence of irrigation other broods appear every time that suitable pools are formed. *A. campestris*, D. & K., is a closely allied form, differing in being slightly larger. *A. canadensis*, Theo., is found only near the mountains, not in the plains and river valleys, being characteristic of the northern Atlantic coast region, extending to Florida and westward through Canada to the Rocky Mountains. *A. nigromaculis*, Ludl., occurs in the prairie section of the river valleys. The eggs hatch whenever submerged, overwintering not being necessary. *Psorophora signipennis*, Coq., was previously recorded only from Mexico, Texas, and New Mexico. Other species mentioned are: *A. fletcheri*, Coq., *A. riparius*, D. & K., *A. sansoni*, D. & K., *A. mimesis*, sp. n., *A. triseriatus*, Say, *A. pullatus*, Coq., *A. prodotes*, sp. n., *A. aestivalis*, Dyar, *A. idahoënsis*, Theo., and *A. aldrichi*, D. & K.

DYAR (H. G.) & KNAB (F.). **Notes on *Aëdes curriei* (Coquillet) (Diptera, Culicidae).**—*Insecutor Inscitiae Menstruus, Washington, D.C.*, v, no. 7–9, July-September 1917, pp. 122–125.

This paper discusses the synonymy of *A. curriei*, which is now considered to constitute but a single species ranging over most of the United States; it is strongly established in the western plains and the desert country of Utah, Nevada and eastern California, but also penetrates to all the coasts, including those of New England and the

Gulf of Mexico. It does not occur in forested country, but is locally abundant in favourably situated tidal pools. It has as many generations in the year as the conditions warrant.

The authors are now of opinion that *A. quaylei*, D. & K., *A. lativittatus*, Coq., and *A. onandagensis*, Felt, are synonyms of this species, their separation, mainly on larval characters, having broken down upon further investigation. They also consider that a second species may still be confused with *A. curriei*, viz., *A. mediolineatus*, Ludl., which has hitherto been treated as a melanotic variety of the former.

DYAR (H. G.). **A New *Aëdes* from the Rocky Mountain Region (Diptera, Culicidae).**—*Insecutor Inscitiae Menstruus, Washington, D.C.*, v, no. 7–9, July-September 1917, pp. 127–128.

The new species dealt with in this paper is *Aëdes acrophilus*, from Lake Louise, Alberta, Canada.

HOWARD (C. W.). **Hibernation of the House-fly in Minnesota.**—*Jl. Econ. Entom., Concord, N.H.*, x, no. 5, October 1917, pp. 464–468.

There has been much discussion in recent years as to the manner in which *Musca domestica* (house-fly) passes the winter. It has been shown conclusively that in a mild climate, such as that of Texas, it is possible for both larvae and pupae to pass the winter and for adults to emerge in the spring. Hewitt, after observations on flies in Ottawa in 1915, returned to the older theory that the fly hibernates as an adult in a dormant condition where temperature and food-conditions are suitable, while suggesting that immature stages may survive the winter in such favourable conditions as warm stables. Adult house-flies are rarely found in winter in buildings or other protected places.

Temperatures in Minnesota frequently fall to —25° or —30° F. and remain below zero over considerable periods in mid-winter. Flies continue to breed until late in October or early November, the last adults that have not been killed by *Empusa muscae* generally succumbing to the first heavy frost in November. Individual adults of both sexes have been taken in each month from December to April in houses where temperature and food-conditions are favourable. House-flies seldom become noticeable before mid-June, and are not abundant until mid-July. Experiments were conducted to test the ability of adult house-flies to live through the winter, but in all cases the flies died when the temperature neared freezing-point. During the summer of 1914 several attempts were made to find the reaction of various stages of *M. domestica* to low temperatures; the results indicated that all stages are very sensitive to low temperatures, even 40° F. causing death if long continued. In the spring of 1914, 1915 and again in 1917, living pupae were carefully sought for in the manure and compost heaps on the University farm. Over 1,600 apparently living pupae were thus collected, but not a single adult emerged from them in the laboratory, nor were any adults observed about the compost heap or in houses up to 10th June. These observations point to the conclusion that the conditions of Minnesota winters are not favourable to hibernation of the house-fly in any but the adult stage, and then only in places where there is a sufficiently high temperature and where food-conditions are favourable.

Marchand (W.). **An Improved Method of rearing Tabanid Larvae.**—*Jl. Econ. Entom., Concord, N.H.*, x, no. 5, October 1917, pp. 469–472.

The study of the bionomics of Tabanids is a subject of considerable importance, and for experimental purposes a more practical method of rearing them than the usual one, in which damp sand is employed as the rearing medium, is desirable. The author, while investigating the life-history of these flies, found that the larvae of most of the species do not need earth or sand, which is always troublesome in use, as it hides the larvae from sight and has to be washed away before they can be examined. A convenient method is to use test tubes supplied with a rolled up sheet of filter paper and filled with water to a height of about ½ inch, which will keep the paper moist for a number of days. A piece of cheese-cloth held in place over the open end of the tubes with a rubber band keeps the larvae from escaping. This method is not entirely new, but is recommended when careful observations of a limited number of larvae are desired. It would probably prove useful also for the rearing of larvae of Tipulids, Stratiomyiids, Lampyrids, etc. Some hints are given on the collecting of Tabanid larvae; the author found an ordinary kitchen sieve, into which lumps of mud and sand are taken from above the water line, but not far from it, gives excellent results.

Boynton (W. H.). **A Disease in Cattle in the Philippine Islands similar to** ***Anaplasma marginale*****, Theiler (1).**—*Philippine Agric. Review, Manila*, 1917, x, no. 2, pp. 119–127.

This paper discusses three cases of disease in cattle resembling anaplasmosis. There are two forms of *Anaplasma*: *A. marginale*, to which affected animals frequently succumb, and *A. centrale*, which does not cause death either by direct inoculation of blood or by tick infestation. An animal inoculated with *A. marginale*, when recovering from *A. centrale* infection, develops the disease, but in a much milder form, proving that some protection is afforded thereby, though not complete immunity.

The incubation period of this disease after tick infection either by *Margaropus* (*Boophilus*) *decoloratus* (blue tick), which also transmits *Piroplasma* (*Babesia*) *bigeminum*, or by *Rhipicephalus simus* (black pitted tick), is rather long, varying from a little under two months to a few days over three months.

Animals immune to *P. bigeminum* can be infected with anaplasmosis either by means of ticks or blood inoculation, showing that this parasite affords no immunity against anaplasmosis, and also *vice versa*.

However, since the further developments of the disease have not been studied, there is a doubt whether, in the three cases mentioned, the animals really suffered from it, or from some other ailment which brought about the formation of anaplasma-like bodies in the red blood cells, especially in view of the fact that such bodies may be produced artificially by the subcutaneous injection of phenylhydrazine, nitro-benzol and pyrogallic acid.

LEGER (A.) & LE GALLEN (R.). **Etude experimentale du Pouvoir Pathogène de *Spirochaeta crocidurae*.** [Experimental Study of the Pathogenicity of *Spirochaeta crocidurae*.]—*Bull. Soc. Path. Exot., Paris,* x, no. 8, 10th October 1917, pp. 694–696.

In a recent paper the presence of *Spirochaeta crocidurae* was recorded in the blood of a shrew, *Crocidura stampflii* [see this *Review*, Ser. B, v, p. 98]. The present paper describes experiments in which these parasites, taken from the blood of the shrew, have been successfully transmitted to other animals, including the common mouse, *Mus musculus*, the field-mouse, *Arvicola amphibius*, the white rat and several species of wild rats (*Mus rattus*, *Mus alexandrinus*, *Mus decumanus*, etc.). The monkeys, *Cynocephalus* and *Cercopithecus*, are susceptible to the virus, but they have not been fatally infected. Rabbits and guinea-pigs on the other hand have always proved resistant to infection.

RODHAIN (J.) & VAN DEN BRANDEN (F.). **Essais de Transmission des Parasites de la Malaria à la Roussette,** *Cynonycteris straminea.* [Experiments in the Transmission of Malaria Parasites to the Flying-fox, *Cynoncyteris straminea*.]—*Bull. Soc. Path. Exot., Paris,* x, no. 8, 10th October 1917, pp. 704–706.

In these experiments a flying-fox (*Cynonycteris straminea*) was tested with respect to its susceptibility to various forms of malaria. The results showed that this bat is apparently not susceptible to subcutaneous injections either of *Plasmodium falciparum* or of *P. malariae*, and appears to be equally resistant to the bites of *Anopheles* (*Pyretophorus*) *costalis*, Lw.

VAN DEN BRANDEN (F.). **La Roussette,** *Cynonycteris straminea*, **Animal de Laboratoire.** [The Flying-fox, *Cynonycteris straminea*, as a Laboratory Animal.]—*Bull. Soc. Path. Exot., Paris,* x, no. 8, pp. 731–732.

The susceptibility of the flying-fox to infection by *Trypanosoma gambiense* has already been recorded [see this *Review*, Ser. B, iv, p. 101]. The abundance of these animals throughout the Congo and the facility with which they can be kept in cages, renders them very valuable for laboratory work in diagnosing human trypanosomiasis in regions where guinea-pigs and monkeys are difficult to procure. They are numerous in the forest belts along the river banks, where *Glossina* abound, and must therefore be reckoned with as reservoirs of the virus.

ROUBAUD (E.). **Nouveau Cas de Paludisme contracté sur le Front francais.** [A fresh Case of Malaria contracted on the French Front.]—*Bull. Soc. Path. Exot., Paris,* x, no. 8, 10th October 1917, p. 706.

A French soldier in hospital at Paris was suspected of malarial infection and upon examination was found to harbour numerous schizonts of *Plasmodium vivax*. This man, who is not known to have had any previous attack of malaria, has served throughout the War in various parts of northern France and Belgium. For about a year he was in Champagne, where he frequently worked in the marshes; according to his own account he must then have contracted the disease, although the first attack apparently occurred as late as July 1917, or a year after his departure.

LAMOUREUX (A.). **Le Paludisme autochtone de la Région du Lac Presba (Albanie du Sud).** [Indigenous Malaria in the Lake Presba Region (Southern Albania).]—*Bull. Soc. Path. Exot., Paris*, x, no. 8, 10th October 1917, pp. 707–710.

The occurrence of locally acquired malaria, due to *Plasmodium vivax* only, is recorded in the region of Lake Presba, which is a closed region that might have been expected to be free from any imported malaria. The examinations were carried out in the spring and summer; carriers were found in each village, but the endemic index was in every case low, being generally proportionate to the Anopheline density. Unfortunately, the investigations had to be abandoned at the beginning of August, but it is hoped to obtain some data on the possibility of the existence, in the course of an annual or seasonal cycle, of a transformation from *Plasmodium vivax* to *P. praecox*, and *vice versa*, as hinted in an earlier communication [see this *Review*, Ser. B, v, p. 98]. The utility of multiplying accurate and prolonged investigations of malaria in other regions is pointed out, with the object of elucidating several points not yet understood in the biology of these Haematozoa.

D'ANFREVILLE (L.). **La Lutte antipaludéenne à Salé, Maroc.** [Antimalarial Campaign at Salé, Morocco.]—*Bull. Soc. Path. Exot., Paris*, x, no. 8, 10th October 1917, pp. 710–715.

Investigations into the question of malaria control at Salé, which, like the rest of Morocco, suffers from malaria, chiefly of the tertian form, showed that the infection comes almost entirely from the Oulja valley which lies to the east of the town. The urban and suburban dwellings were found to be quite free from Anopheline breeding-places, while the Jewish quarter and the military camp, including the convalescent hospital, all of which lie in the passage of *Anopheles* flying from the valley, show a considerable percentage both of mosquitos and malaria. Remedial measures suggested are: quinine prophylaxis for those whose work takes them into the neighbourhood of the Oulja valley and mechanical protection of buildings adjacent to the valley against adult mosquitos. Anti-larval measures would be of little use in this case, and sanitation and drainage operations in the Oulja valley would be a lengthy and costly operation.

STEFKO (W.). **Piroplasmose et Anaplasmose en Turquie (1916).** [Piroplasmosis and Anaplasmosis in Turkey (1916).]—*Bull. Soc. Path. Exot., Paris*, x, no. 8, 10th October 1917, pp. 723–724.

Both piroplasmosis, due to *Piroplasma bigeminum*, and anaplasmosis, due to *Anaplasma centrale*, were found in 1916 in cattle in Turkey imported from Russia. Mortality among these cattle is as high as 80 to 90 per cent., simultaneous infection by both parasites being frequently observed. The tick responsible for conveying the infection is *Margaropus* (*Boophilus*) *annulatus*. *Ixodes corniger*, Kol., and *Rhipicephalus simus*, Koch, are of less frequent occurrence in this region.

STEFKO (W.). **Dengue à Trébizonde (Turquie) en 1916.** [Dengue at Trebizond (Turkey) in 1916.]—*Bull. Soc. Path. Exot., Paris*, **x**, no. 8, 10th October 1917, p. 724.

Dengue fever is prevalent in Turkey. In June and July 1916, having started in the lower quarters of the town, this disease attacked the whole population of Trebizond, particularly the Russian soldiers. The intermediate host is believed to be *Stegomyia fasciata*.

VAN SACEGHEM (R.). **Contribution à l'Etude de la Dermite granuleuse chez des Equidés.** [Contribution to the Study of Granular Dermatitis in Horses.]—*Bull. Soc. Path. Exot., Paris*, x, no. 8, 10th October 1917, pp. 726–729.

The three species of Spiroptera known to parasitise horses and cause granular dermatitis are, *Habronema megastoma*, *H. microstoma* and *H. muscae*. These are all carried by the house-fly; the first is found in the stomach of horses and donkeys, the others in horses only. The course of the development of *H. muscae* in the fly has been traced [see this *Review*, Ser. B, iv, p. 12]. Infestation is very frequent in the Lower Congo, and proof that it is carried by flies exists in the fact that horses kept in stables, where *Musca domestica* and *Stomoxys* are abundant, alone contract the disease. In a stable at Zambi where several horses were affected, 20 per cent. of the flies were found parasitised by a larva which is apparently that of *H. muscae*, though in the few autopsies made recently only *H. megastoma* has been found. The larvae, entering a wound, give rise to an inflammation similar to that caused by *Ankylostoma duodenale* upon entering the human skin, the irritation causing the animal to enlarge the wounds and thus create an entrance for more parasites. It is hoped that experiments now in progress will further elucidate the nature of this disease.

LEGER (M.). **Le Paludisme à la Guyane Française: Index endémique des diverses Localités.** [Malaria in French Guiana: endemic Index of various Localities.]—*Bull. Soc. Path. Exot., Paris*, x, no. 8, 10th October 1917, pp. 749–756.

Malaria has been recorded by many authors as the principal cause of disease and death in French Guiana. *Plasmodium vivax* (tertian benign malaria), *P. praecox* (tertian malignant) and *P. malariae* (quartan) are all found, but the country, whilst being more malarial, with an average endemic index of 17, than the French possessions in Indo-China, is much less so than any French African colony, its unhealthiness being exaggerated. Although decreasing, malaria is still unfortunately a serious obstacle to the economic development of the country and an immediate anti-malarial campaign is recommended.

Bishopp (F. C.) & Wood (H. P.). **Mites and Lice on Poultry.**—*U.S. Dept. Agric., Washington, D.C.*, Farmers' Bull. no. 801, May 1917. 27 pp., 14 figs. [Received 7th November 1917.]

The external parasites of fowls dealt with in this bulletin include the common chicken mite, *Dermanyssus gallinae*, De G., which breeds in the cracks of roosts and buildings and feeds on the blood of fowls. Two or three applications of crude petroleum or certain coal-tar products to the breeding-places are generally sufficient to destroy this pest. Suggestions for suitable roosts and nest-boxes are given with diagrams. A mite, *Cnemidocoptes mutans*, Robin, is the cause of scaly-leg on poultry, and can be controlled by dipping the legs in crude petroleum. For *C. gallinae* (itch mite), which burrows into the skin near the base of the feathers, applications of sulphur ointment are recommended. *Laminosioptes cysticola*, Vizioli, and *Cytoleichus nudus*, Viz., are soft-bodied mites; the former bores into the skin, and the latter is found in the air passages, lungs and internal organs of chickens and turkeys, and, when present in large numbers, interferes with the breathing of the bird. *Rivoltasia bifurcata*, Riv., feeds on the feathers, causing no apparent injury. *Freyana chanayi*, Trou., and *Megninia cubitalis*, Megn., are found on the wing-feathers of turkeys but are not known to injure the birds. The chiggers, or red mites, that attack chickens are the same as those attacking man. Sulphur ointment or kerosene and lard will destroy them, and light dusting of the chickens with flowers of sulphur will help to repel the mites.

More than 40 species of lice are found on the various domestic fowls, chickens being the favourite host of the majority of them. Injurious species include *Lipeurus heterographus*, Nitzsch (head louse); *Menopon biseriatum*, Piaget (body louse); *M. pallidum*, Nitzsch (shaft louse); *Lipeurus variabilis*, Nitzsch (wing louse); less important being *Goniocotes hologaster*, Nitzsch, *G. abdominalis*, Piaget, and *G. dissimilis*, Nitzsch. A species which seems to be peculiar to turkeys is *Goniodes stylifer*, Nitzsch. *Lipeurus temporalis*, Nitzsch, and *Docophorus icterodes*, Nitzsch, are common on ducks and geese. Pigeons are attacked by *Lipeurus baculus*, Nitzsch, and *Goniocotes compar*, Nitzsch. A new insecticide, which is recommended as being both cheap and effective in destroying poultry lice, is sodium fluoride. It is stated that a single application will destroy all species of poultry lice. The application can be made by dusting, but dipping is recommended, this method having the advantage of being cheaper and quicker than dusting; from 30 to 45 seconds is required for each bird, and no injury has been found to result from this treatment.

Hargrave (J. C.). **Cattle Mange (Psoroptic Scabies).**—*Agric. Gaz. Canada, Ottawa*, iv, no. 10, October 1917, pp. 860–862.

Scabies or mange in cattle is a specific disease of the skin caused by a mite, *Psoroptes communis bovis*. This parasite gives rise to scab in other animals, though a distinct variety of it is peculiar to each, and the malady is not transmissible from one kind of animal to another. Development takes place upon the body of the host, maturity being reached in about eight days; four days later mating and oviposition occur, each female depositing about fifteen eggs, which hatch in three or four days.

The disease usually begins at the root of the tail and may spread over the entire body, with the exception of the lower part of the legs. A crust, due to the thick fluid secreted, forms over the skin, beneath which the mites multiply.

Treatment consists either of thorough hand applications, or the immersion of the animal in a dipping vat. The first method is applicable in the case of domesticated animals in small herds, the animal first being clipped and the crusts removed by means of soap and hot water, followed by the immediate application of a dressing such as creolin, tobacco, sulphur, petroleum, or vegetable tar. The mixture recommended consists of sulphur (2 lb.), oil of tar (8 oz.) and raw linseed oil (1 gal.), gradually heated together but not boiled, and applied at a temperature of 110° to 120° ; this application should be repeated in ten days after washing off the previous one. The best mixture for dipping is composed of flowers of sulphur (24 lb.), fresh unslaked lime (10 lb.) and water (100 gals.), and requires very careful preparation. The lime is first carefully slaked and made into a paste, into which the sulphur is thoroughly mixed, the whole being then added to boiling water and well boiled and stirred for at least two hours. The liquid is then drawn off and water added to make 100 gals., the animals being held in this for two minutes or longer at a temperature of 110° to 115° F., during which period all crusts or scabs should be loosened by means of a hoe or stiff brush, the treatment being repeated in not less than 10 nor more than 15 days. The best results are obtained by the use of the cage vat, the animal being driven into the cage, which is then lowered into the vat by block and tackle and held there the desired length of time, but the swimming vat must of necessity be used when stock in large numbers has to be dealt with.

Mange first appeared in southern Alberta in 1893, and in 1895 two vats were erected ; these, however, gave such indifferent results that in 1904 the Veterinary Director-General required some 1,900 townships in southern Alberta and south-west Saskatchewan to have all their animals dipped under supervision. Conditions have improved to such an extent that there are now only 1,100 townships affected by the order, and the number of these will be reduced very shortly.

MACFIE (J. W. S.). **Report of the Accra Laboratory for the Year 1916,** *London*, 11th February 1917, pp. 7-30, 2 plates, 8 figs. [Received 13th November 1917.]

In the examination of various animals at the laboratory during 1916, a few trypanosomes were found in the blood of a reedbuck which may have been either *T. pecaudi*, the common cattle species, or *T. gambiense*, the human parasite, and the same polymorphic trypanosomes were found in a dog. One of two horses examined yielded *T. vivax*, and the other *T. congolense*, while one mule examined was infected with what was probably *T. pecaudi*. Six black rats examined yielded *T. lewisi*, and the piroplasm, *Nuttallia decumani*, was found in four black rats and two field rats.

In 1916, as in the previous year, *Stegomyia fasciata* was the species of mosquito the larvae of which were most frequently collected from the compounds, being abundant at all seasons of the year. Of all West African mosquitos, this is the one that is most independent of seasonal influences and that has the least need of a resistant stage in which to tide over the dry season.

Macfie (J. W. S.). **The Identifications of Insects collected at Accra during the Year 1916, and other Entomological Notes.**—*Rept. Accra Laboratory for the Year 1916, London,* 1917, pp. 67–75, 3 plates, 3 figs. [Received 13th November 1917.]

To the list of mosquitos occurring at Accra, of which 41 species have been recorded, 14 additional ones were added during 1916, the species not previously collected being: *Anopheles marshalli, A. mauritianus, Aëdomyia africana, Culex consimilis, C. tritaeniorhynchus, Ficalbia mediolineata, Mimomyia hispida, M. plumosa, M. splendens, Mucidus scatophagoides, Ochlerotatus apicoannulatus, O. ochraceus, O. wellmani* and *Stegomyia simpsoni.*

The natural enemies of mosquito larvae appear to be innumerable, the chief being tadpoles, Notonectids, beetles and dragon-fly larvae, and they play no inconsiderable part in reducing the number of mosquitos and thus indirectly limit the incidence of malaria and other diseases.

The larvae of *Stegomyia fasciata* were found to be frequently infected with the gregarine, *Lankesteria culicis,* the presence of which, however, had no ill effect on the development of the insect.

Several specimens of *Musca domestica* (house-fly) collected from butchers' stalls were dissected to determine the prevalence of infection with *Herpetomonas muscae domesticae,* with the result that 42·5 per cent. were found to be heavily infected. This parasite is spread from fly to fly by contamination, but similar parasites have been experimentally transmitted to mammals by inoculation and feeding. It has been stated that herpetomoniasis and leishmaniasis are really the same, and although the latter does not appear to occur in West Africa, there is the possibility of man becoming infected with the former by eating food contaminated by the house-fly carriers.

A mite, identified as *Notoedres muris,* Megnin, a species common in England, where it merely produces warty excrescences on the ears of the animals it attacks, has been found infecting experimental white rats. It gives rise to a sort of eczema, which beginning on the tail, feet and ears, rapidly spreads to all parts of the body, soon causing death; the greater pathogenicity of this parasite at Accra is probably due to the difference in the climate.

Macfie (J. W. S.). **Fungal Infections of Mosquito Larvae.**—*Rept. Accra Laboratory for the Year 1916, London,* 1917, pp. 76–80, 1 plate, 3 figs. [Received 13th November 1917.]

Larvae of *Stegomyia fasciata* collected in Accra in April were found to be infected with a fungus forming brownish masses in the thorax or abdomen. This has been identified as a species of *Fusarium.*

Another fungus infection of *Stegomyia fasciata* larvae occurred in the stock-jar, where a strain of this mosquito had been maintained for some weeks. The larvae were covered with a waving mass of fungal hyphae, which did not penetrate the body, but which had a harmful effect, impeding movement and interfering with moulting. This growth appeared to be due to two forms, one a species of *Nocardia* and the other an undetermined fungus.

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Macfie (J. W. S.). **A Monomorphic Trypanosome of Man.**—*Rept. Accra Laboratory for the Year 1916, London,* 1917, pp. 60–66, 1 chart. [Received 13th November 1917.]

In a recent case of trypanosomiasis a monomorphic trypanosome was found in the blood of a native of the Gold Coast which appears to be intermediate, as regards its morphology, between *T. vivax* and *T. uniforme.* While *T. vivax* is a very common parasite of domestic animals in W. Africa, being found in no less than 76 per cent. of the hump-backed cattle examined in 1914, neither *T. uniforme* nor *T. caprae* has hitherto been identified in the Gold Coast. The latter has been discovered in goats in the neighbourhood of L. Tanganyika, and, like *T. vivax,* is carried by *Glossina morsitans,* being probably only a variety of *T. vivax. T. uniforme,* discovered in Uganda in the blood of cattle, is carried by *G. palpalis.* It would be a serious matter if *T. vivax,* which is not pathogenic to monkeys, and which hitherto has been harmless to man, should prove to be pathogenic, since it is widely distributed, very abundant, and transmitted by the bites of *G. palpalis, G. morsitans,* and *G. tachinoides,* to which the natives are constantly exposed.

Ingram (A.). **A Key to the Species of *Anopheles* occurring in the Gold Coast.**—*Rept. Accra Laboratory for the Year 1916, London,* 1917, pp. 83–86, 3 plates, 1 map. [Received 13th November 1917.]

This key deals with twelve species of *Anopheles* indigenous to the Colony and has been drawn up with a view to helping medical officers in out-stations to the identification of species in the absence of reference literature.

These species are:—*A. rufipes, A. squamosus, A. pharoensis, A. cinctus, A. costalis, A. nili, A. rhodesiensis, A. funestus, A. marshalli, A. flavicosta, A. mauritianus, A. umbrosus.*

d'Aremberg (Prince P.). **Extraits des Procès-verbaux des Séances générales de la Société: Entomologie.** [Extracts from the Minutes of the General Meetings of the Society: Entomology.]—*Bull. Soc. Nat. Acclimat., Paris,* lxiv, no. 10, October 1917, pp. 401–402.

The author criticises the method of destruction of warble-flies in cattle in England, where two species, *Hypoderma lineatum* and *H. bovis,* occur. Eggs are laid on the hairs of the legs or abdomen, and the larva, passing down the hair, enters the body of the host and completes its development in the back. The English method is to attack the larva when in the back of the animal; the author of this note contends that it is preferable to sterilise the feet and abdomen of the animals, by singeing or by frequent immersion in disinfecting liquids, once in every four days, since that is the period of incubation of the egg.

Eradication of Ticks.—*Rept. Agric. Dept. St. Lucia, 1916–1917; Barbados,* 1917, pp. 18–19. [Received 21st November 1917.]

Donkeys recently imported into the Island were found to be heavily infested with lice and were sprayed twice in four days with Cooper's dip, without being previously clipped, with very satisfactory results, as within twenty-four hours of the second spraying they were found to be quite free from lice.

Cattle badly infested with ticks were rubbed with Cooper's tick grease, the dead ticks being removed next day by rubbing with a wad of dry grass. During the rainy season the best results are obtained by spraying the animal first, keeping it under cover until dry, and then rubbing the most infested part with cattle grease, before turning it out to pasture.

LISTON (Major W. G.). **Report of the Bombay Bacteriological Laboratory for the Years 1915 and 1916,** *Bombay*, 1917, 9 pp. [Received 23rd November 1917.]

Research work in connection with plague has been restricted to the practical application of hydrocyanic acid gas for the destruction of rats and fleas in houses. Several different types of machine for generating and distributing the gas were designed and constructed and practically tested in houses, showing that with suitable precautions the gas can be used with safety and some success. Rats placed in barrels or deep boxes, or near the tiles of the roof, escaped, because in the first case the gas, being lighter than air, failed to diffuse downwards in the barrel, and in the latter, because fresh air entering through the tiles diluted the gas so as to render it innocuous. The action of the gas on insects was much more marked than on mammals, bugs, fleas, cockroaches and mosquitos being readily killed, though certain grain weevils proved more resistant. A simple form of apparatus has been designed for use in hospitals for the destruction of bugs in beds, bedding and clothing.

BODKIN (G. E.). **Cowfly Tigers. An Account of the Hymenopterous Family Bembecidae in British Guiana.**—*Jl. Bd. Agric. British Guiana, Demerara*, x, nos 3 & 4, April & July 1917, pp. 119–125. [Received 20th November 1917.]

In this account of the various species of Bembicid wasps that occur in British Guiana, it is stated that in one burrow of *Monedula denticornis* the remains of the following flies that had been carried in by the female as food for the larvae, were found: the Muscid, *Stomoxys calcitrans*, L.; a Stratiomyid, *Hermetia illucens*, L.; a Syrphid, *Eristalis obsoletus*, Wied.; and a Tabanid, *Tabanus trilineatus*. The larvae are voracious feeders, one kept under observation being noticed in the course of one day and night to devour six individuals of *Stomoxys*, one *Tabanus trilineatus* and one *T. semisordidus*.

NUTTALL (G. H. F.). **Bibliography of *Pediculus*. Including zoological and medical Publications dealing with human Lice, their Anatomy, Biology, Relation to Disease, etc., and Prophylactic Measures directed against them.**—*Parasitology, Cambridge*, x, no. 1, 29th November 1917, pp. 1–42.

The lack of knowledge of the literature on lice shown by most recent writers has, in some instances, led to remarkable blunders, which would have been avoided if the authors had been familiar with the work accomplished by their predecessors.

The present bibliography, the first on the subject hitherto issued, enumerating 639 publications, includes comments by the author, and a system of key-lettering whereby the contents of the publications is indicated. It is published in advance of the author's papers on *Pediculus* (1) so as to avoid repeating references to the literature which will be fully treated in the parts that follow, and (2) to help other investigators.

NUTTALL (G. H. F.). **The Part Played by *Pediculus humanus* in the Causation of Disease.**—*Parasitology, Cambridge,* x, no. 1, 29th November 1917, pp. 43–79, 1 plate.

A critical summary of what is known regarding disease-transmission by lice, and an account of their pathological effects. The louse's salivary glands contain anti-coagulins. A mass of information is brought together in this paper for the first time.

NUTTALL (G. H. F.). **The Biology of *Pediculus humanus.***—*Parasitology, Cambridge,* x, no. 1, 29th November 1917, pp. 80–185, 2 plates, 2 text-figs.

An exhaustive account of the biology of the louse, incorporating the work of other writers and that of the author. The subject matter is divided into three parts dealing with (1) the prevalence and modes of dissemination of lice, (2) methods of study and (3) special biology. The index to the contents covers two pages.

HOWLETT (F. M.). **Notes on Head and Body-Lice and upon Temperature Reactions of Lice and Mosquitoes.**—*Parasitology, Cambridge,* x, no. 1, 29th November 1917, pp. 186–188.

Experimental observations made in India and bearing out what is stated in the foregoing publications by Nuttall: that head-lice may acquire body-louse habits and appearances, and that they react to a source of warmth. *Culex fatigans,* unlike the other species experimented upon, does not react to a source of warmth.

MARCHAND (W.). **Notes on the Early Stages of *Chrysops* (Diptera, Tabanidae).**—*Jl. New York Entom. Soc., Lancaster, Pa.,* xxv, no. 3, September 1917, pp. 149–163, 3 plates.

The egg-laying instinct of *Chrysops callidus* is apparently determined by two factors, the presence of water, and of plants growing above its surface. The eggs are laid in the morning hours from the latter part of May till the end of July, forming a cohesive cluster on the under-side of leaves, at a height of from 6 inches to 2 feet above the surface of the water. The habit of laying in the morning differentiates this species sharply from the others observed, which oviposit in the late afternoon. The egg-cluster is protected by a shining outer membrane, which seems to be a secretion of the eggs themselves, and each cluster may contain 250–300 eggs. The act of oviposition, which entails a long preparation in choice of a suitable place, occupies about three-quarters of an hour, after which the fly darts off suddenly. If disturbed, however, it does not return to the same leaf, and an egg-mass once abandoned is never completed.

The eggs are at first white in colour, but soon change to a mottled grey and then to black; hence it is not possible to make any direct observations upon embryonic development, the duration of which is about five days. In hatching, the larvae leave all the eggs of a cluster at about the same moment; this occurs almost invariably in the evening soon after sunset, or later. The larvae, which are very active, cling together in masses, which soon lose their hold on the smooth surface of the cluster and drop into the water, where the masses become disintegrated and each larva moves about with a slow wriggling movement.

The young larvae are about one millimetre in length and are positively phototropic, but after the first moult this is reversed and they burrow into the mud, where they remain until pupation. In appearance they are greyish white, elongate, tapering at both ends, with the tracheae not yet filled with air, and the prolegs not exserted, and hence presenting a more or less even surface. The very marked peculiarities possessed by the very young larvae of *Chrysops* enable them to be differentiated from those of *Tabanus*. Only a few hours after hatching, if in water, they begin to moult, this first moult not having been noticed in Tabanid larvae. They then appear more slender and slightly longer than before, with the prolegs protruding. Under laboratory conditions, in water they perished in less than a week without special care, and even when fed on crushed dragonfly larvae, mosquito larvae and small crushed caterpillars, their numbers always rapidly diminished owing to their cannibal tendencies.

Grubbs (S. B.). **Ventilation after Fumigation.**—*Public Health Repts., Washington, D.C.*, xxxii, no. 42, 19th October 1917, pp. 1757–1761.

The time required to ventilate the hold of a vessel after fumigation with hydrocyanic gas or sulphur dioxide is variable, being dependent on the depth and size of the hold, area of the hatchway, velocity of the wind and humidity of the atmosphere. The uncertainties and delays of natural ventilation, which may take from one to twelve hours, can be avoided by the use of a gasoline-driven fan worked by three motors, two of the horizontal pattern (downward blast) and one of the vertical pattern (horizontal blast). By this mechanical means the holds of cyanide-fumigated vessels are rendered safe in 30 minutes, and those that have been sulphur-fumigated in 30 to 40 minutes. The installation of such a plant by steamship companies pays for itself many times over in the saving of time effected.

Phelps (E. B.) & Stevenson (A. F.). **Experimental Studies with Muscicides and other Fly-destroying Agencies.**—*U. S. Hygienic Laboratory, Washington, D.C.*, Bull. no. 108, December 1916, 30 pp.

A paper by the same authors recording these experiments and results has already been abstracted [see this *Review*, Series B, v, p. 9].

Mosquitoes and Malaria in Formosa.—*Taiwan Igakukai Zassi* [Jl. Formosa Med. Soc.], no. 167, 28th September 1916, pp. 803–808. [Abstract in *China Med. Jl., Shanghai,* xxxi, no. 2, March 1917, pp. 167–168.]

The following mosquitos are recorded from Formosa: *Culex sitiens, C. mimeticus, Anopheles* (*Myzorhynchus*) *sinensis, A. maculipennis, A.* (*Neocellia*) *willmori* and *A.* (*Myzomyia*) *listoni.*

Miyakawa (B.), Nagayo (I.), Mitamura (D.) & Inamura (H.). **Notes on the Mite producing Tsutsugamushi (River Fever of Japan).**—*Taiwan Igakukai Zassi* [Jl. Formosa Med. Soc.], no. 168, 28th October 1916, p. 859 [359 ?]. [Abstract in *China Med. Jl., Shanghai,* xxxi, no. 2, March 1917, p. 179.]

In the cages in which adult examples of the mite, *Leptotrombidium* (*Trombidium*) *akamushi,* had been kept, some forms were found that were identical with them in shape, but which were believed to be nymphs. Details of the structure of the larvae, nymphs and adults of the mite are given.

Kawamura (R.) & Yamaguchi (S.). **Tsutsugamushi (River Fever of Japan): The probable Finding of the Nymph Stage of the Mite producing the Disease.**—*Taiwan Igakukai Zassi* [Jl. Formosa Med. Soc.], no. 168, 28th October 1916, pp. 359–360. [Abstract in *China Med. Jl., Shanghai,* xxxi, no. 2, March 1917, p. 179.]

A number of mice infested with mites were placed in a zinc-lined box which was partly buried in sandy soil. When examined a month later, the adult parasite had entirely disappeared and in the soil eight-legged individuals were found similar to the adults, but differing in structure from the nymphal form previously described by Nagayo.

Miyashima (K.) & Okumura (O.). **Tsutsugamushi (Japanese River Fever): The Egg, Nymph and Adult Form of the Mite,** ***Trombidium akamushi.***—*Saikin Gaku Zassi* [Jl. of Bacteriology], no. 253, 10th October 1916, pp. 1–16. [Abstract in *China Med. Jl., Shanghai,* xxxi, no. 2, March 1917, pp. 175–177, 3 plates.]

On 9th September 1916, Kawamura and Yamaguchi reported that they had carried the nymphal stage of *Leptotrombidium akamushi* through a moult to the adult form. A week later the present authors announced that they too had reared the adult form from the immature stages. A certain amount of moisture was found to be required for the metamorphosis of the nymphs and the damp sand had to be protected from the direct rays of the sun. The amount of previous feeding made a considerable difference in the size of the adult mite. Temperature was found to exert an influence on the rate of metamorphosis from the larval stage to the nymph, requiring about 3 weeks in June and only 6–8 days in August. Summaries are given of the points of noticeable change in the transformation from nymph to adult and of the points of obvious difference by which this adult mite is distinguished from other species which might be confused with it.

AYYAR (T. V. RAMAKRISHNA). **Notes on the Life-History and Habits of the Eye-fly,** *Siphonella funicola,* **de Meij.**—*Madras Agric. Dept. Year Book 1917, Madras,* 2nd February 1917, pp. 76–83, 6 figs.

This troublesome Oscinid fly is a shining black insect resembling the house-fly but much smaller, which at certain times in the year is a veritable nuisance to man owing to its habit of hovering about the face and settling at the corners of the eyes. The insect appears to have a special liking for the lachrymal secretions and for perspiration ; it also feeds greedily on blood, commonly settling on cuts, scratches, open sores and other wounds. It frequently gets into the eyes of those engaged in reading, writing, etc., especially in the case of school children, who during the summer months commonly suffer from the disease known as "sore eye," which is popularly attributed to eating too many mangoes, but is probably caused by a germ carried by this fly. This insect is also suspected to be the carrier of the Koch-Weeks bacillus, which is the cause of severe conjunctivitis, and a similar fly is said to cause eye disease in the Southern States of America.

Siphonella funicola is widely distributed all over India, Ceylon and Java, being found both along the sea coast and at fairly high elevations, except during the cold months from November to February.

Unfortunately all attempts to discover the natural breeding haunts of this fly have so far been unsuccessful, all kinds of rotting animal and vegetable matter, kitchen and stable refuse, silo pits and drains having been examined without result ; effective and radical control measures are therefore impossible for the present. Its peculiar habit of swarming in large numbers on slender bits of rope and string, preferably old ones, and forming aerial colonies under thatched roofs affords a temporary opportunity for control by trapping such colonies with a wide-mouthed jar, or burning them with a torch in the early morning or late evening. Household sanitation and personal cleanliness and the use of repellents, such as eucalyptus oil rubbed on the coat collar, are also measures affording temporary relief.

The life-history worked out from eggs laid on cow-dung by flies in captivity shows that it occupies from 16–20 days, and the adults, fed on sugar, have lived from 10–12 days. All attempts to obtain oviposition on other substances such as mango fruits, horse-dung, rotting fibrous matter from trunks of palmyra palms, vegetable mould, soil from gutters near kitchens, etc., have been unsuccessful, although other members of the family OSCINIDAE are known to breed on plant tissue in different countries, or as scavengers in decaying vegetable matter, one species, *Oscinis theae*, being recorded as a leaf-miner of tea in India.

Points that require further investigation are :—The number of broods of *S. funicola* in the year ; whether the fly has a resting or hibernating period and, if so, in what stage ; the number of eggs laid by one fly ; the natural enemies, if any, of this insect ; and its natural breeding haunts and chemotropic characters.

NELSON (E. W.). **The Rat Pest.**—*National Geographic Mag., Washington, D.C.,* xxxii, no. 1, July 1917, pp. 1–23. [Received 14th November 1917.]

In this popular and profusely illustrated article the author urges that rats should not be tolerated at a time when the entire world is in fear of famine. While local campaigns are useful and extremely desirable, no permanent result can be expected until the campaign becomes an international one.

Particulars are given of the amazing fecundity of the brown rat, the U.S. Public Health Service estimating that in cities the rat population equals the human, while in country districts it is three or four times as great. Besides destroying vast quantities of human food, rats do considerable damage to poultry and other domestic animals.

In addition to transmitting bubonic plague, the house-rat is known to convey infection of trichinosis, septic pneumonia, epidemic jaundice, and rat-bite fever, and is unquestionably a potential distributor of diphtheria, typhoid, scarlet fever, and infantile paralysis, being as a disease carrier the form of vermin deadliest to mankind.

BLANCHARD (R.). **Le Danger du Paludisme et de la Fièvre jaune en France; Moyens de l'éviter.** [The Danger of Malaria and Yellow Fever in France; Methods of Prevention.]—*Bull. Acad. Méd., Paris*, lxxvii, no. 21, 22nd May 1917, pp. 657-669.

In the course of an investigation into parasitic diseases in the summer of 1916, particularly among native troops of the French army, the author recorded the presence on the French Mediterranean coast of *Anopheles maculipennis*, a carrier of malaria in France, and also of *Stegomyia fasciata* (*calopus*), the carrier of yellow fever. This is the first definite record of the latter mosquito in France, where, judging from its abundance at Nice, it apparently finds ideal conditions for its existence. *A. maculipennis* probably occurs throughout the whole Mediterranean region, *S. fasciata* already occurring in Spain and throughout the Mediterranean Coast. On 19th September, a prefectoral decree was published ordering a campaign against mosquitos and indicating the necessary measures to be taken.

The author reviews the distribution of the five principal malaria-carrying mosquitos occurring in Europe, of which *A. bifurcatus*, *A. algeriensis* (probably synonymous with *bifurcatus*), and *A. maculipennis* are found in France. The greater immunity of the English troops in the Macedonian campaign is attributed entirely to the better sanitary conditions of their expeditionary force.

Stegomyia fasciata must be considered henceforth as belonging to the entomological fauna of southern France, its introduction being probably due to the transport to France of native troops from Senegal. These soldiers are subjected to an insufficient medical examination before leaving Africa ; if, therefore, a case of yellow fever exists among them, the presence of *S. fasciata* on board will preserve the virus and infect others, who, upon their arrival in France, will in turn infect the indigenous mosquitos and thus an epidemic of yellow fever is inevitable. In the face of this prospect, it is well to remember that *S. fasciata* is considered capable of being a mechanical vector of the trypanosome of sleeping sickness. The author urges the necessity of a detailed inquiry into the distribution of *Anopheles* in France, no systematic study of the Anopheline fauna having yet been made ; he also suggests the division of France into sections each headed by a zoologist who has specialised in the study of mosquitos and malaria. This latter measure has since been adopted [see this *Review*, Ser. B, v, p. 189].

Netter (—). **Sur le Danger du Paludisme en France.** [On the Danger of Malaria in France.]—*Bull. Acad. Méd., Paris,* lxxvii, no. 22, 29th May 1917, pp. 686–690.

This paper reports a discussion arising out of the previous paper. The author refers to the doubt that exists as to whether persons who are carriers of malaria parasites and the presence of *Anopheles* are the sole factors in the dissemination of malaria, and expresses the fear lest the public in France may be alarmed by the suggestion that malaria convalescents should be sent to those localities where malaria has not previously existed.

M. Blanchard, replying to this discussion, referred to literature which entirely refutes the view that there are factors other than infected persons and Anophelines in outbreaks of malaria, though it is quite possible for mosquitos to be present without the disease (the so-called *paludismo senza malaria* of the Italians) and took the opportunity of reassuring the public, who, he believes, have no cause for alarm, although certain measures are indispensable in the face of so serious a danger.

Leger (L.) & Mouriquand (G.). **Sur l'Hibernation des Anophèles en Dauphiné.** [On the Hibernation of *Anopheles* in Dauphiné.]—*Bull. Acad. Méd., Paris,* lxxvii, no. 38, 2nd October 1917.

Continuing previous investigations in Dauphiné on *Anopheles maculipennis* and *A. bifurcatus* [see this *Review*, Ser. B, v, p. 148], the authors found that in that region *A. bifurcatus* hibernates in the larval stage, producing adults in April, whilst *A. maculipennis,* hibernating in the form of adult fertilised females, gives rise to adults much later, at the beginning of summer. This fact is interesting in connection with the experience of Grassi, who found that at the same temperatures *A. bifurcatus* is much more suitable for the development of *Plasmodium* than *A. maculipennis.*

Hoffman (F. L.). **A Plea and a Plan for the Eradication of Malaria throughout the Western Hemisphere. Address read in Abstract before the Southern Medical Association, 10th Annual Meeting, Atlanta, Georgia, 14th November 1916.**—*Prudential Press, Newark, N.J.,* 1917, 65 pp.

This pamphlet deals in a clear and practical manner with the possibilities of the prevention and control of malaria. The first essential towards the end in view is the united effort of all government agencies, whether federal, state or municipal, and the international co-operation of all the principal countries of the western hemisphere; once this is secured the author is convinced that the elimination of malaria, which in its economic aspect is at present the most important disease of the southern United States, will be attained in course of time. The early history of and literature concerning the disease is dealt with a some length. The essentials of an effective anti-malarial campaign include the study of meteorological and topographical conditions; consideration of the species of *Anopheles* and other mosquitos in the area affected by malaria; the discovery and eradication of Anopheline breeding areas, the methods of such eradication being briefly outlined; the screening of houses and destruction of Anophelines within them; a campaign against domestic mosquitos, which may be briefly summarised as the abolition of all stagnant water, and the application of modern methods, by which it is declared possible to effect ten times more improvement in health than has hitherto been the case.

A well-considered and far-reaching plan for organising all government agencies into a united campaign for the prevention and control of the disease is considered in detail. It is suggested that the question of quinine prophylaxis should be thoroughly reconsidered in view of the conflicting opinions as to its value. The practical use of natural enemies of mosquitos, such as the fish that have been found useful in the West Indies and Hawaii and the possible value of alleged deterrent trees and plants suggest vast possibilities for important scientific research. Statistical considerations are entered into at some length. Malaria eradication is considered as essentially a labour problem of the first importance, as well as being an important factor in military efficiency.

Foreman (F. W.) & Graham-Smith (G. S.). **Investigations on the Prevention of Nuisances arising from Flies and Putrefaction.**—*Jl. Hygiene, Cambridge*, xvi, no. 2, 31st October 1917, pp. 109–226, 4 figs.

Investigations for the purpose of discovering an easy and practicable means of mitigating the various nuisances arising from exposed animal matter deal, as a preliminary step, with the destruction of adult flies. These may be killed by alimentary poisons, though they are very resistant to many which are extremely toxic to other animals, such as potassium cyanide. The best results have been obtained by the use of aniline, which is not dangerous to man, while it is cheap and easily obtainable in large quantities and very dilute emulsions of it rapidly kill both eggs and larvae. Since the destruction of adult flies makes little difference to the general fly population, and since flies are most easily and effectually destroyed in the egg and larval stages, successful treatment lies in attacking these in exposed animal matter, manure, and refuse. In carcases, eggs and larvae may be killed by watery emulsions or solutions of larvicides, though these soon lose their efficiency in the presence of water, while larvicides of an oily nature retain their potency for long periods and are therefore more suitable. An efficient fluid of the former type is composed of aniline 50 c.c., glacial acetic acid 6·6 c.c., phenol 5 grms., bile 5 c.c., soft soap 20 grms., and water to 1,000 c.c., the ox bile being added to promote the spread and penetration of the fluid. Experiment has shown that the best oily larvicide is coal-tar creosote oil, "country make," containing about 14 per cent. tar acids, a high flash-point, no unpleasant smell and no undesirable poisonous properties. Treatment with creosote oil, besides being of great practical value, also renders the study of putrefactive processes possible, an accurate knowledge of the factors that govern putrefaction being of great benefit to those engaged in work connected with medicine, sanitation, animal nutrition, meat preservation and allied problems.

The action of creosote oil on maggots is to cause them immediately to become contracted, hard and tense and, within 15 minutes, of a deep red colour, changing to black within 24 hours. Eggs shrivel and are immediately killed, as are also adult flies when sprayed with it, and those touched with only minute droplets, as well as those exposed to the vapour of the oil, soon die.

The bodies of animals, both small and large, can be preserved for several weeks, even in warm and showery weather at the height of the fly season by efficient surface treatment with creosote oil, provided that the oil is thoroughly applied by means of a brush and the external apertures are carefully treated. Open carcases can be similarly preserved if the exposed surfaces are treated, as they are then protected from the influence of rain and soil water, but the removal of the abdominal organs is disadvantageous, as the process permits of the introduction of putrefactive organisms into the tissues. The burial of carcases containing eggs or maggots does not prevent the subsequent emergence of the flies [see this *Review*, Ser. B, iv, p. 143]. This treatment repels flies completely for a week or two and prevents any oviposition for two or three weeks, the eggs even then failing to hatch, or if maggots should emerge from any of them, these also die. Surface treatment combined with injection preserves the body for many months. Maggots may be destroyed at any stage of decomposition, this process being arrested and all odour eliminated by suitable treatment with creosote oil. The latter fact is of great importance as regards post-mortem examinations, both human and animal, rats suspected of plague often reaching the laboratory in an advanced stage of decomposition. The use of creosote also protects the workers from the bites of rat-fleas. It would be difficult to overestimate the benefit to be derived from the use of this substance in trench warfare, if used in sufficient quantities. Bodies are mummified by its action and completely deodorised, even after and during a fall of rain, quite small quantities from a spray killing and repelling flies in great numbers. In Gallipoli the most prevalent flies were *Musca domestica*, *Fannia canicularis*, *F. scalaris*, *Calliphora vomitoria*, *C. erythrocephala*, *Lucilia caesar*, *Sarcophaga carnaria* and *Muscina stabulans*.

The use of creosote has been most effectively tried in field experiments to free dugouts and shelters from flies, a sack being simply hung over the entrance and roughly sprinkled with the oil mixture. A shelter that was full of flies attracted by decomposing animal matter previously placed there was, at the end of 15 minutes, quite free from flies and completely deodorised. Spraying the surroundings of latrines rendered them fly-free for four days.

The destruction of maggots in large heaps of farmyard manure is difficult, owing to the impossibility of reaching them except by the penetration of water-soluble larvicides, experiments having proved that maggots are extremely resistant to the most toxic larvicides, when these are applied in the form of solutions. Hence manure should be kept free by spraying with creosote at the earliest opportunity, each addition to the heap being spread evenly and sprayed at the rate of 100 c.c. per horse per day. This treatment does not injure the manure in any way. A similar treatment of 10–20 c.c. per day applied with a sprayer in sanitary bins would keep them free from maggots, deodorise them and repel flies, the expense being negligible, while refuse tips would require no further treatment, especially if dust-carts were provided with suitable sprayers.

The chief objections to the use of creosote oil for such purposes are (i) its irritant action on the skin and mucous membrane, which is slight, while the eyes can be protected by glasses during spraying operations; (ii) its inflammability, which is however low, except when used as a spray, suitable precautions being then easily taken; (iii) difficulties in transport, which in view of the excellent results obtained, and when weighed against the economy in labour, are of little importance.

DICKINSON (C. G.) & HILL (G. F.). **Investigations into the Cause of Worm Nodules** (*Onchocerca gibsoni*) **in Cattle.**—*Rept. Dept. Trade & Customs, Melbourne,* 15th August 1916, 7 pp. [Received 19th November 1917.]

This report, dealing with experiments conducted from August to January, is supplementary to those already recorded [see this *Review*, Ser. B, iv, p. 8]. The conclusions reached were the same as before, namely, that calves from a nodule-free State became infected within eight months of their arrival when grazing on high, dry ground in company with infected cattle; and further, that such calves did not become infected during the same period when enclosed in an open pen with a concrete floor within 30 yards of a paddock within which affected cattle were pastured, although exposed to the attacks of *Tabanus mastersi*, Wlk., *T. nigritarsis*, Tayl., *Stomoxys calcitrans*, L., *Lyperosia exigua*, de Meij., several species of CULICIDAE, the tick, *Margaropus* (*Boophilus*) *australis*, Fuller, and probably sandflies, all of which may therefore be eliminated from the list of possible vectors. The following common species of mosquitos may also be eliminated, it being safe to assume that calves grazing in the open paddock were frequently bitten by them: *Anopheles* (*Myzorhynchus*) *bancrofti*, Giles, *Ochlerotatus* (*Culicelsa*) *vigilax*, Skuse, *Taeniorhynchus brevicellulus* (*Chrysoconops acer*, Wlk.), *Culex sitiens* Wied., *Pseudoskusea basalis*, Tayl., and *Taeniorhynchus uniformis*, Theo. It was found that certain species of TABANIDAE, notably *T. rufinotatus*, Big., and *T. cinerescens*, Macl., rarely, if ever, attack stock under a roof.

The negative results of these experiments have not led to the discovery of an intermediate host of the parasite causing onchocercosis in cattle, but they have definitely excluded as possible vectors the above-named species and any purely aquatic forms other than those found in the drinking water, which was obtained from a bore 116 feet deep.

CHATTON (E.) & BLANC (G.). **Notes et Reflexions sur le Toxoplasme et la Toxoplasmose du Gondi** (*Toxoplasma gundii*, **Nicolle et Manceaux, 1909**). [Notes and Reflections on the Toxoplasma and Toxoplasmosis of the Gundi (*Toxoplasma gundii*, Nicolle & Manceaux, 1909).]—*Arch. Inst. Pasteur, Tunis,* x, no. 1–2, October 1917, pp. 1–40, 1 plate.

The gundi [*Ctenodactylus gundi*] is the mammal in which toxoplasmosis has been most frequently and most regularly found, the disease occurring regularly in the season October to March. The virus has never been found in the animal in natural conditions, the disease appearing only after at least 17 days' captivity, though there is no proof that it is contracted at the Institute at Tunis. The natural ectoparasites of the gundi are the ticks, *Rhipicephalus sanguineus*, Latr., abundant in the nymphal stage, and *Hyalomma* sp., occasionally found in the nymphal stage; a mite, *Trombidium* sp., abundant in the larval stage; a flea, *Coenopsylla mira*, Rothsch., peculiar to the gundi and rarely found. Two biting flies, the Chironomid, *Thersestes* (*Myctero-typus*) *laurae*, Weiss, and the Simuliid, *Simulium lineatum*, and probably other nocturnal flies that bite man and other mammals in the neighbourhood of water also attack the gundi. Of these parasites, only *Rhipicephalus sanguineus* and *Trombidium* sp. seem possible carriers of toxoplasmosis in nature, though neither these nor the other parasites mentioned breed on the gundi in captivity. As possible vectors in the laboratory, *R. sanguineus*, of canine origin, *Dermanyssus* sp. from birds, *Ctenocephalus canis* (*serraticeps*) (dog-flea) and *Cimex lectularius* (bed-bug) should be considered. Two dogs, living in a kennel adjoining the gundi cage, apparently contracted toxoplasmosis, one in 1910 and one in 1917. The gundi is apparently the most susceptible animal to its own virus, intraperitoneal inoculation, which alone has been tried, proving fatal. After the gundi, the mouse is the most susceptible species, many other small rodents falling into this category. The white rat is resistant; rabbits and dogs can be infected only by intravenous inoculation; the cat is more susceptible than the dog; the receptivity of the pigeon is inconstant.

A bibliography of 48 works is given.

Weiss (A.). **Contribution à l'Etude des Aphaniptères: Une Ctenopsylle nouvelle, *Ctenopsylla copulabilis*, sp. n.** [Contribution to the Study of Aphaniptera: a new Ctenopsyllid, *Ctenopsylla copulabilis*, sp. n.].—*Arch. Inst. Pasteur, Tunis*, **x**, nos. 1 & 2, October 1917, pp. 77–81, 1 plate.

This paper describes *Ctenopsylla copulabilis*, sp. n., found in Tunis as a parasite of the Mustelid, *Zorilla lybica*, and of the rodent, *Elyomys munbianus tunitae*. The author disagrees with an earlier writer who records *Echidnophaga* (*Sarcopsylla*) *gallinacea* as an occasional parasite only of *Erinaceus*, having found this species as an habitual parasite of the hedgehog during two years' investigations in Tunisia.

Sanidad del Campo. [Rural Sanitation.]—*Bol. Agric. Técnica y Económica, Madrid*, ix, no. 103, July 1917, pp. 612–616.

Under a decree of 8th August 1916, the Rural Sanitation Inspection service has been thoroughly re-organised, and while it is as yet too early to appreciate the results of the new measures, it is hoped that in time these services will become as indispensable and beneficial as other technical branches of the Ministry. In particular there are many reforms in which the sanitary authorities must combine with the engineers in order to carry out their work, such as the clearing of malarial areas and the cultivation of rice and medicinal plants on modern lines.

A table shows the data collected by district inspectors as to malarial conditions, and contrasts the present circumstances with those in the year 1913. The geographical distribution of malaria in Spain, the intensity and spread of the disease with its summer and autumnal epidemics, and the microscopic examination of blood smears collected from even the smallest and most distant villages, have been worked out thoroughly and indicate in detail the present malarial conditions in each of the 14 agricultural districts into which Spain has been divided. It is a significant fact that, while the number of municipal malarial centres has increased, the number of cases of disease and death have diminished in spite of the lack of quinine since the outbreak of the War and the scarcity of food. This is considered to be entirely due to the constant propaganda on the subject of hygiene disseminated by the sanitary authorities and the district inspectors, and it is hoped in time to clear, by the cultivation of medicinal plants and the re-aforestation of agricultural holdings in marshy and malarial districts, at least a part of the 750,000 acres that constitute the principal existing foci of malaria.

Piètre (M.). **De la Oncocercosis bovina en la Argentina.** [Bovine Onchocercosis in Argentina.]—*Bol. Minist. Agric., Buenos Aires,* xxi, no. 1, January–June 1917, pp. 35–41, 2 plates. [Received 1st December 1917.]

In 1913 the author discovered in France a new disease of cattle due to a Nematode, which was provisionally named *Onchocerca bovis*, and he now records the occurrence of this parasite in Argentina.

Joan (T.). **Nota sobre un Estado larvario del *Gastrophilus nasalis*.** [A Note on a larval Stage of *Gastrophilus nasalis*.]—*Bol. Minist. Agric., Buenos Aires,* xxi, no. 1, January-June 1917, pp. 42–45, 3 figs. [Received 1st December 1917.]

The penultimate stage of this Oestrid larva is here described.

Jaeschke (V. J.). **Los Baños arsenicales.** [Arsenical Dips.]—*Bol. Minist. Agric., Buenos Aires,* xxi, no. 1, January-June 1917, pp. 46–69. [Received 1st December 1917.]

This paper is a concise review of modern knowledge of arsenical dips and contains no new facts.

Guiteras (J.). **Recientes Observaciones sobre la Fiebre amarilla.** [Recent Observations on Yellow Fever]—*Repertorio de Med. y Cirurg., Bogotá,* viii, no. 6, March 1917, pp. 265–279. [Reprint from *Bol. Asoc. Méd. de Puerto Rico.*]

The author dissents from the conclusions of Marchoux as to the existence of a specially mild form of yellow fever that never merges or develops into the more severe one. The mild and severe types are always found together and are due to the same infection. In many so-called foci of yellow fever the disease present is not yellow fever, but another disease, such as a pernicious form of malaria. Even where no special measures have been adopted against *Stegomyia fasciata*, local medical testimony in Central America agrees that yellow fever is dying out, owing to the more rigid enforcement of quarantine measures. This has happened at Caracas and Maracaibo. The conditions at Guayaquil will remain very favourable to this disease until energetic measures are taken against *S. fasciata*, which at present enjoys unbounded opportunities for breeding there.

GOUGH (L.). **On *Wohlfartia magnifica*, a Sarcophagid parasitising Man.**—*Bull. Soc. Entom. d'Egypte, Cairo,* Year 1917, no. 1, January-March 1917, pp. 23–25. [Received 3rd December 1917.]

Specimens of maggots taken from the orbits and in ulcers behind the ears of patients in ophthalmic hospitals in Egypt have been identified as the larvae of a Sarcophagid, *Wohlfartia magnifica*.

FLEMING (A. M.). **Notes from a Lecture on Malaria and Blackwater.**—*Rhodesia Agric. Jl., Salisbury,* xiv, no. 5, October 1917, pp. 638–644.

In this lecture the causes and methods of prevention of malaria and blackwater fever are emphasised in a clear and popular manner.

SINCLAIR (J. M.). **Birds as Tick Carriers.**—*Rhodesia Agric. Jl., Salisbury,* xiv, no. 5, October 1917, pp. 657–658.

In reply to a correspondent who suggested the possibility of ticks, carried by birds, being responsible for isolated outbreaks of African coast fever, the author states that, for the establishment of such an outbreak the following conditions must be fulfilled :—The tick must be picked up by a bird on the infected veld ; this tick must be capable of transmitting coast fever ; the tick must not attach itself to the temporary host, or its power of transmitting disease will be lost ; the tick must be carried to a clean area and there dropped ; and it must then attach itself to an animal susceptible to this disease. The chances against the occurrence of this combination of circumstances are so great as to remove it from the realms of probability, though the actual possibility cannot be denied. Further, granted that the disease can be thus transmitted, its prevention remains an impossibility, since the birds cannot all be destroyed, neither can they be kept off infected areas, nor can they be subjected to compulsory dipping !

HUTCHINS (E.). **Report of the Chief Veterinary Officer.**—*Ann. Rept. Uganda Dept. Agric. for the Year ending 31st March 1917, Kampala,* 1917, pp. 27–31. [Received 3rd December 1917.]

Losses from trypanosomiasis have been less serious among native herds than in previous years. A large percentage of military transport cattle working on the Bukakata-Mbarara road became infected ; there are no tsetse on this road, but it is possible that some of the oxen became infected near Bukakata, where *Glossina palpalis* is found on the lake shore. Oxen also died from the disease on the Fort Portal-Mubendi road where there are no tsetse ; infection in this case probably came from some transport cattle sent from Kampala to Matiri, the trypanosome concerned (*T. pecorum*) apparently being transmitted at Matiri by *Haematopota* and other Tabanids which were very numerous there during the rainy season. A microscopic examination of the municipal oxen is now made weekly. The most serious veterinary problem to be faced is that of the losses from trypanosomiasis among cattle that become infected in areas where no tsetse occur; such losses have in past years been very heavy in Buganda, and are the greatest obstacle to the development of cattle transport in the Buganda and Western Provinces. The primary source of infection is in the *Glossina* areas. Cattle becoming infected there and subsequently brought into contact with healthy herds in fly-free areas have caused extremely heavy losses both among native herds and transport oxen. Many such outbreaks have occurred in areas in which no tsetse have ever been found and in which the other domesticated animals do not become infected. It would appear that *Tabanus* spp. are the most probable carriers where they are present in any numbers; in some outbreaks *Stomoxys* and possibly *Haematopota* appear to have been the transmitting agents. It is hoped that as the tsetse areas become better known and more accurately defined it will be possible, by the control of stock routes, to avoid the passage of cattle through fly areas and thus to bring about a very material reduction in the danger of infection from this source.

An Ordinance passed in November controls the movement of animals through tsetse-fly areas and provides for compulsory dipping.

East Coast fever is endemic throughout the Buganda Province. More work requires to be done in mapping out the non-endemic areas in the Eastern Province and in testing the immunity of cattle from outlying and more recently administered parts of the Province. Money has been sanctioned for the construction of a cattle dip in Kampala, where the grazing is very heavily tick-infested, and it is hoped that when the regular dipping of cattle has been established, together with the eradication of ticks, a reduction in the number of biting flies that molest the cattle may also be effected by this means. In the Mubendi district a number of water-buck died in November and December owing to unusually heavy infestation by brown ticks. Filaria were found on examination of blood slides obtained from these antelopes.

Piroplasmosis in dogs was recorded in 37 cases in Kampala. One dog brought from Masindi was found to be infected with *Trypanosoma brucei* and died.

JAMES (S. P.). **Note recording the Proof that *Anopheles maculipennis* is an efficient Host of the benign tertian Malaria Parasite in England.**—*Jl. R.A.M.C., London,* xxix, no. 5, November 1917, p. 615.

In order to ascertain by experiment whether *A. maculipennis* is an efficient host and carrier of the malaria parasite in England, a benign tertian gamete-carrier, who had contracted malaria in England, allowed adult female specimens of *A. maculipennis* to feed on him between 30th August and 15th September. Dissections of these mosquitos showed many of them to be largely infected with zygotes. This is the first occasion on which this experiment has been made successfully in England.

Extra Cantonment Zone Regulations.—Ordinances enacted by the City of Louisville, Ky., cooperating with the United States Public Health Service in the Sanitary Control of the Civil Zone around Camp Zachary Taylor.—*Public Health Repts., Washington, D.C.*, xxxii, no. 44, 2nd November 1917, pp. 1842–1849.

Ordinances recently adopted by the city of Louisville, Kentucky, for the purpose of protecting the health of the residents and preventing the spread of communicable diseases to the troops now in training in camp near the city include: regulations for the prevention of the breeding of mosquitos; for the protection of fruit and vegetables that are usually eaten raw against flies and other insects, and against contact with cattle; and for the care, disposal and transportation of manure and garbage in fly-proof receptacles.

Wicherski (O. G.). **Sanitation about Military Camps.**—*Mthly. Bull. California State Bd. Health, Sacramento*, xiii, no. 5, November 1917, pp. 207–210.

The establishment of military construction camps has been practically unattended by sickness owing to the enforcement of sanitary measures, especially those directed against flies, the chief of which include the daily cleansing of the camp by the removal of garbage in fly-proof covered containers for pig-feeding; the daily removal of manure, which is at once spread on the fields; the daily purification of fly-proof latrines or outhouses; and the constant examination of the water supply.

Welch (P. S.). **Entomological Notes: Effect of Cold on Malaria Parasites.**—*Trans. American Microscopical Soc., Decatur, Illinois*, xxxvi, no. 2, April 1917, pp. 98–99. [Received 8th December 1917.]

King [see this *Review*, Ser. B, v, p. 73] has investigated the validity of the older assumption that the development of malaria parasites in *Anopheles* is arrested at a temperature of about 60° F. and that the parasites themselves are destroyed at lower temperatures. A series of experiments with *Plasmodium vivax* (the parasite of tertian malaria) in *Anopheles quadrimaculatus* showed that it can survive exposure to a temperature of 30° F. for 2 days, 31° F. for 4 days, and a mean temperature of 46° F. for 17 days. In a smaller series of experiments with *Plasmodium falciparum* (the aestivo-autumnal parasite) in the same species of mosquito, the sporonts showed a 24-hour resistance to temperatures as low as 35° F.

Bedford (G. A. H.). **The Spinose Ear Tick (*Ornithodoros megnini*, Dugès).**—*Union of South Africa, Dept. Agric.*, Local Series no. 18, 12th July 1917, 6 pp. [Received 11th December 1917.]

The subject matter of the first part of this paper has already been noticed [see this *Review*, Ser. B, i, p. 139]. Measures for eradicating the ticks must be directed towards destroying them on their hosts by pouring an insecticidal liquid into the ears, the best preparation being two parts each of Stockholm tar and oil to one part of turpentine; from a teaspoonful to a tablespoonful is poured into each ear, according to the size of the animal, after well stirring the mixture. On badly infested farms it may be necessary to repeat the treatment every two or three weeks, or even every week, but usually one treatment a month is sufficient. Infested animals should be treated before removal from one farm to another. An accessory measure is the keeping of animals on the veld instead of in sheds, which, being usually built of large, loosely packed bricks of cow-dung, afford excellent breeding places for the ticks and are practically incapable of disinfection, the only method possible being the closing and abandonment of them for a period of at least two years.

Riley (W. A.). **Animal Parasites and Rural Sanitation.**—*Ninth Ann. Rept. Quebec Soc. Protection Plants from Insects & Fungous Dis., 1916–1917*; *Quebec*, 1917, pp. 99–109, 9 figs.

In discussing animal parasites and the nature of their injury to the host, the author draws attention to possible dangers from domesticated animals, which harbour a long list of both external and internal parasites that may be conveyed by them to man. It is suggested that modern sanitary knowledge demands a change in the public attitude towards the keeping of these animals.

Lochhead (W.). **Near Relatives of Insects Injurious to Plants and Animals.**—*Ninth Ann. Rept. Quebec Soc. Protection Plants from Insects & Fungous Dis., 1916–1917*; *Quebec*, 1917, pp. 138–144.

This paper gives a brief résumé of various pests, including a number of mites and ticks affecting man, cattle and poultry.

Van Hoof (L.). **Note préliminaire sur la Fièvre récurrente parmi les Troupes belges dans l'Est Africain Allemand.** [Preliminary Note on Relapsing Fever among the Belgian Troops in German East Africa.]—*Bull. Soc. Path. Exot., Paris*, x, no. 9, 10th November 1917, pp. 786–791.

This paper records observations on an epidemic of relapsing fever among French colonial troops in the north of German East Africa. A great number of the soldiers were natives of Congolese provinces, where the disease is practically non-existent, and contracted it in Ruanda and Urundi where it attacks all natives indiscriminately. These local natives having been bitten by ticks from their infancy and suffering constant re-infection acquire an immunity against the bite of *Ornithodorus moubata* that renders the tick almost innocuous to them. It is known also that the disease is less serious when contracted in infancy. Many treatments were tried for this malady, the results showing that it is possible to arrest the fever by the use of drugs, if applied during the first attack, when the first spirochaetes are discovered, but that these are useless in the second or later attacks, the spirochaete of relapsing fever being the most resistant to arsenic. In such cases mercurial salts have given the only satisfactory results.

BLANC (G.). **Au Sujet de Paludisme autochtone de la Région du Lac Presba. Note complémentaire.** [On Indigenous Malaria in the Lake Presba Region. Supplementary Note.]—*Bull. Soc. Path. Exot., Paris,* x, no. 9, 10th November 1917, p. 804.

The author, continuing the investigations of Dr. Lamoureux in connection with indigenous malaria in the Lake Presba region [see this *Review,* Ser. B, vi, p. 12], records examinations of 14 children in this area between 1st and 17th September 1917, none of which had received quinine treatment. The results agree with those previously made and confirm the existence in the region west of Lake Presba, during the spring and summer season, of indigenous malaria due only to *Plasmodium vivax.*

MALLOIZEL & BONNARD. **Note sur le Paludisme autochtone dans la Presqu'île de Langle (Golfe du Morbihan).** [Note on Indigenous Malaria in the Peninsula of Langle (Gulf of Morbihan).]—*Bull. Soc. Path. Exot., Paris,* x, no. 9, 10th November 1917, p. 805.

Twenty-five cases of indigenous malaria have been studied in this region; eight of these being exclusively due to the parasite of quartan malaria (*Plasmodium malariae*) and five others to parasites of the benign tertian form (*P. vivax*). One case only of malaria, in a hospital where soldiers from Salonika were under treatment, showed the malign tertian form. These cases of indigenous malaria respond readily to quinine treatment; in fact such a diminution of the disease was obtained in September and October that the population is continuing the treatment, being persuaded that they will by this means be eventually freed from the fever.

RODHAIN (J.) & VAN DEN BRANDEN (F.). **Essais sur la Pluralité des Espèces flagellées parasitant le Tube digestif des Invertébrés. Note préliminaire.** [Attempts to determine the Plurality of flagellate Species parasitising the digestive Tract of Invertebrates. Preliminary Note.]—*Bull. Soc. Path. Exot., Paris,* x, no. 9, 10th November 1917, pp. 811–814.

The authors have previously, in 1911, made experiments to determine whether the forms assumed by the trypanosomes of mammals in the digestive tract of *Glossina* can adapt themselves to that of non-blood-sucking insects that can harbour forms allied to *Crithidia.* Having found Crithidial forms in the digestive tract of *Gerris fossarum,* the latter were regularly fed on *Glossina morsitans* taken in the open and largely infected with *Trypanosoma congolense, T. pecaudi* and *T. cazalboui.* Infection did not result, the trypanosomes of *G. morsitans* evidently not adapting themselves to the intestine of *Gerris fossarum.*

By similar experiments it was proved that trypanosomes that abound in *Pycnosoma, Sarcophaga* and *Glossina* cannot develop in the intestine of Asilids [see this *Review,* Ser. B, i, p. 140]; trypanosomes of *Pycnosoma* do not adapt themselves to the intestine of mosquitos of the genus *Stegomyia,* nor to bugs such as *Cimex hemiptera* (*rotundatus*); those of *Glossina palpalis* do not become adapted to the intestine of *S. fasciata* or of *C. hemiptera.* These results indicate that flagellates that parasitise the digestive tract of an invertebrate of determined species cannot adapt themselves to the intestine of an invertebrate of another species. The plurality of the flagellate species parasitising the digestive tract of invertebrates therefore seems to be established.

DUCHAMP (J. C.). **Contribution à la Pathologie des Balkans: La Fièvre spirochéto-plasmodique des Serbes.** [Contribution to the Pathology of the Balkans: Serbian Spirochaeto-plasmodial Fever.]—*Bull. Soc. Path. Exot., Paris,* x, no. 9, 10th November 1917, pp. 827–834.

Relapsing typhus in Serbia has presented symptoms that have led to its being considered as a type apart in the group of recurrent fevers. It has also been remarked that, in individuals who have previously suffered from malaria, this disease frequently follows recurrent fever without the transition being observed. In the present paper the author records the simultaneous presence in the blood of the spirochaete and the plasmodium, and to the resulting disease he gives the name, spirochaeto-plasmodial fever. The co-existence of the two parasites is due to the juxtaposition of the spirochaete with the plasmodium that has preceded it and will survive it; the result is an acute infection grafted upon a chronic infection.

In a note, Dr. Laveran observes that he prefers to describe the malady recorded above as recurrent fever associated with malaria, as being more accurate and more easily understood. He also points out that the clinical conditions observed by the author of the present paper are neither new nor peculiar to the Serbs.

LAVERAN (A.). **Identification des Virus de Trypanosomiase équine marocaine de deux Origines,** [Identification of the Virus of Trypanosomiasis of Horses from two different Localities in Morocco.]—*Bull. Soc. Path. Exot., Paris,* x, no. 9, 10th November 1917, pp. 850–856.

In 1915 a trypanosome attacking horses that was observed in various regions in Morocco, and particularly at Casablanca, was described as a new species under the name *Trypanosoma marocanum* [see this *Review*, Ser. B, v, p. 97]. In the same year a case of trypanosomiasis was observed in a horse at Mazagan. The author of the present paper undertook experiments in order to identify the trypanosome of Casablanca and determine whether the virus from these two sources was of the same species. The results indicate that the Mazagan virus cannot be identified with either *T. evansi*, *T. soudanense* or *T. berberum*, while the Casablanca virus cannot be identified with *T. evansi*, *T. brucei* or *T. berberum*. It appears however that the Mazagan virus must be identical with the Casablanca one (*T. marocanum*). While a goat that had acquired immunity for *T. evansi*, *T. soudanense* and *T. berberum* became infected upon inoculation with the Mazagan virus, but later showed immunity from the Casablanca virus, it is notable that the Mazagan virus only was able to confer this immunity.

ARMAND-DELILLE (P.), PAISSEAU (G.), ABRAMI (P.) & LEMAIRE (H.). **Le Paludisme macédonien.** [Malaria in Macedonia.]—*Paris*, Masson et Cie., 1917, 109 pp., 1 plate, 15 figs. Price 4 francs.

This booklet gathers together the data obtained from various studies of the epidemics of malaria that raged during the summer of 1916 among the French troops stationed in Macedonia. The accuracy of the clinical descriptions and the suggestions for treatment will doubtless be found useful in view of the probability of further outbreaks of malaria in the Eastern Army and among the troops evacuated from Salonika.

PANISSET (L.). **Les Gales du Cheval. Causes et Conditions de leur Diffusion dans l'Armée et dans les Exploitations particuliers. Prophylaxie et Réglementation sanitaire.** [Forms of Horse Mange. Causes and Conditions of their Dissemination in the Army and in private Enterprises. Prophylaxis and Sanitary Regulations.]—*Vie Agric. et Rur., Paris,* vii, no. 49, 8th December 1917, pp. 405–407, 2 figs.

This paper reviews the recent legislation dealing with the treatment of mange in horses and points out that, while sarcoptic mange is the only serious form of the disease, all other types of the malady are included in the decree regulating the notification and treatment of infected animals. Observance of sanitary regulations and hygienic conditions for all animals wherever possible and prompt and energetic treatment of infested animals are recommended as the best preventive of the spread of the disease.

VAN ROON (K.). **Dienst der Pestbestrijding, Verslag over het derde Kwartaal 1916.** [Plague Control Service, Report for the 3rd Quarter in 1916.]—*Batavia,* 1917, 24 pp. [Received 14th December 1917.]

In three districts in Java the average flea index was 2 for the house rat [*Mus rattus*] and 0·95 for *Mus concolor*; *Mus decumanus* was taken in two of these districts, with an average figure of 1·9. At Solo the index of *Xenopsylla cheopis* for the months of July, August and September was, for the house rat, 1·5, 2·6 and 3·1, and for *M. decumanus,* 0, 3·3 and 3·7, one specimen of *Ctenocephalus felis* being taken in July. At Bojolali the *X. cheopis* index for the same three months on the house rat was 2·6, 2·8 and 4·8; in September, 4·3. In two further localities the average *X. cheopis* figure for the house rat was 3·3 and 3·5 for August and September respectively.

MASON (C.). **Report of the Government Entomologist.**—*Nyasaland Protectorate, Ann. Rept. Dept. Agric. for Year ended 31st March 1917, Zomba,* pp. 9–13. [Received 15th December 1917.]

Tsetse investigations were confined to the Upper Shire valley, which is suspected of being the most probable source of infection of cattle trypanosomiasis; visits were made to it at four definitely marked seasons—in July at the time of the bush fires, in December at the beginning of the rains, in February and March during the rains, and in

May after the rains and before the bush fires. The absence of outbreaks due to *Glossina morsitans* during the past season appear to indicate that the fly area has receded in this district.

It is considered probable that *G. brevipalpis* has a far wider distribution at Mlanje than is at present known.

DE PEYERIMHOFF (P.). *Ceratopogon* (**Dipt. Chironomidae**) **et** *Meloe* (**Col. Meloidae**).—*Bull. Soc. Entom. France, Paris*, no. 15, 10th October 1917, pp. 250–253.

Articles dealing with CERATOPOGONINAE sucking the blood of caterpillars and of other insects have already been noticed [see this *Review*, Ser. B, ii, pp. 132 and 204]. Records of *Ceratopogon* sp. sucking the blood of CULICIDAE have been received from India in the case of *Culex fatigans*, and three species of *Anopheles*, the females of which, gorged with human blood, each bore two parasites. In Lower Burma *Anopheles fuliginosus* is heavily parasitised, the degree of 6 per cent., established by count, being probably far below the actual figure.

During two successive years the author has observed the large Cantharid beetle, *Meloe majalis*, L., to be attacked by females of *Ceratopogon* sp., which puncture the abdomen and become distended with the yellowish fluid that all these beetles emit so readily. The CERATOPOGONINAE that attack mammals can evidently, like the CULICIDAE, carry and transmit to their victims morbid micro-organisms. Though no observations yet permit of this rôle being assigned to them in medical entomology, they are suspected vectors, and that being so, there is also a possibility of their transmitting organisms to Arthropods. For the verification of this point *Meloe* would afford ideal material owing to its large size, the ease with which it can be kept and fed in captivity, its abundance at certain seasons and its habits, which allow of renewed samples of blood being obtained without killing the insect.

Notes Vétérinaires.—*Vie Agric. et Rur., Paris*, vii, no. 50, 15th December 1917, p. 428.

For follicular mange on dogs applications are recommended of an ointment consisting of 1 part carbolic acid, 2 parts camphor and 6 parts white vaseline. This should be applied each day, one-fourth part of the dog's body being treated on each occasion. After four days a tepid bath of 2 per cent. potassium pentasulphide should be given, and the treatment generally requires 9 to 16 days.

Lice on horses can be destroyed by a solution of 5 lb. soft potash-soap in 25 gals. water, to which 2 gals. hypochlorite of soda (Eau de Javelle) is added immediately before use. This wash should be applied all over the animal and rubbed well into the skin, at a temperature as hot as the hand can bear. A better plan is to pass the animal through a bath containing this mixture. After one application practically all the parasites present emerge from the skin and die almost immediately. The solution appears to have no effect upon the epidermis of the horse and is recommended for its economy, its cleanliness and safety, and for its efficiency against both the eggs and the adults.

Ritchie (A. H.). **Ticks.**—*Jl. Jamaica Agric. Soc., Kingston,* xxi, no. 7, July 1917, pp. 266.

Evidence from stock owners as to the advantages of freeing cattle from ticks by dipping or spraying is recorded. Losses are said to have been reduced from 15 per cent. to vanishing point, while the value of the animals has increased by about 40 per cent. since tick-eradication work was started.

Ingram (A.) & Macfie (J. W. S.). **The Early Stages of Certain West African Mosquitos.**—*Bull. Entom. Research, London,* viii, no. 2, December 1917, pp. 135–154, 4 plates, 8 figs.

Emphasis has been laid on the importance of larvae in specific determination, since " many species of *Culex* are of uncertain identity without the associated larvae, while some *Aëdes* have identical adults, yet dissimilar larvae. The characters of the larvae lie in the modification of the chitinous appendages and the arrangement of the hairs. As these are fully retained by the cast skins, it is possible to preserve both the larva and the adult of the same identical specimen, thus assuring absolutely correct associations." Following this plan the authors have reared various West African mosquitos the larvae of 14 being here described, and they point out, that, so far from crab-hole mosquitos being harmless and negligible, as has been stated, *Culex thalassius, Ochlerotatus irritans* and *Anopheles costalis* especially are vicious biters and invade houses, while the last is a proved carrier of malaria.

The species here dealt with are :—*Anopheles marshalli*, Theo., breeding in a *Pistia*-covered pool ; *Stegomyia simpsoni*, Theo., breeding in holes in trees ; *S. unilineata*, Theo., found in a hole containing a small quantity of water in the trunk of a flamboyant tree (*Poinciana regia*) ; *Mansonioides africanus*, Theo., breeding in pools and swamps in which *Pistia stratiotes* is growing, but hitherto not found in association with any other water-plants, the larvae being most plentiful during the rainy season, which reaches its height in June. The eggs are laid in clusters of about 150 on the under-surface of the leaves of *P. stratiotes*, which become nearly horizontal as the plant unfolds, thus bringing the eggs into contact with the water with their pointed ends downwards. On hatching, the egg breaks horizontally at its widest point and the detached cone-shaped piece falls to the bottom ; the larva, on escaping, also descends to the bottom and attaches itself to the root of a *Pistia* plant, selecting a delicate rootlet and not the main tap-root as the older larvae do.

Ochlerotatus albocephalus, Theo., breeds in various situations such as small cavities washed out by the sides of cement drains running across an open and wind-swept golf course, an empty grave in the Accra cemetery, broken pipes, earth drains, pools and crab-holes ; *O. minutus*, Theo., in crab-holes ; *O. apicoannulatus*, Edw., and *Cyathomyia fusca*, Theo., in water containing rotting leaves, etc. The larva of *Eumelanomyia inconspicuosa*, Theo., is further described. The larvae of *Culex thalassius*, Theo., are found in widely different situations such as a brackish lagoon, the water of which contained 680 parts of chlorine per 100,000 and was exposed to the full heat of the sun, fresh water pools, foul-smelling water-holes, earth drains, an iron pot and a spring, so that a high degree of salinity is not essential for this species, which is one of the most troublesome mosquitos in houses. The larvae of *C. tritaeniorhynchus*, Giles, occurred in large numbers in a swamp formed by the heavy rains in June, where a day or two later the larvae of *C. tigripes* var. *fuscus* were found preying upon them. A week later none were to be found, but other natural enemies such as Ephemerid larvae, dragon-fly larvae, *Notonecta*, larvae of *Hydaticus* and other water-beetles were unusually numerous. *C. guiarti*, Blanch., was found breeding in a swamp on both sides of the railway embankment and covered with *Pistia stratiotes*; *Mimomyia splendens*, Theo., bred in a small pool covered with the same water-weed, with which its larvae appear to be definitely associated. The leaves of this plant are strongly ribbed on the under-surface, and in expanding come in contact with the surface of the water carrying down with them a film of air. The larvae attach themselves to the leaves in a horizontal position with their siphons inserted into the air film, in which position they were able to live for as long as 24 hours and even moult, without direct access to the air.

Schwetz (J.). **The Western and Northern Limit of *Glossina morsitans* in Northern Katanga.**—*Bull. Entom. Research, London,* viii, no. 2, pp. 165–168, 1 map.

A knowledge of the distribution of *Glossina morsitans* is of the utmost importance, entomologically, medically and economically, because of the obstacle to the breeding of cattle presented by this carrier of animal trypanosomiasis. In a previous paper, the restriction of this insect to regions with a particular type of vegetation was suggested as the result of observations made between the rivers Lualaba and Lomami in 1913 and 1914 [see this *Review*, Ser. B, iv, p. 30]. More recent journeys over the same ground in 1916 have more definitely determined the western limit and also established the northern limit in the neighbourhood of 5°·30 S. Lat., that is, a little south of Kongolo. The western limit coincides roughly with the Lualaba-Lomami watershed, but frequently this insect disappears a little to the east of this line. It must be understood that the limit of *G. morsitans* is not a precise, sharply defined or permanent line, but is affected by seasonal variations, especially those due to bush fire migrations.

Schwetz (J.). **Preliminary Note on the Tsetse-flies of the Kabalo-Albertville (Lualaba-Tanganyika) Railway.**—*Bull. Entom. Research, London,* viii, no. 2, pp. 169–175, 1 map.

Previous investigations of the route of the Lualaba-Tanganyika Railway from the point of view of *Glossina* have already been noticed [see this *Review*, Ser. B. i, p. 31]. The present notes made in 1916, since the completion of the railway, establish the fact that *G. morsitans* occurs in great numbers along the western third of the railroad and along the eastern third rather less abundantly, but not at all, or hardly at all along the intermediate portion, where however *G. palpalis*, *G. brevipalpis*, *G. pallidipes* and *G. fusca* are all found.

This distribution of *G. morsitans* is due to the difference of vegetation in the three sections. and not to the presence or absence of game. The argument that the absence of *G. morsitans* in the third (eastern) section is due to the diminution of game owing to the exploitation of the railway and the passage of troops, is not a sound one, as the presence of men in greater numbers would have the same effect, but is more probably the result of the artificial clearing of the banks of the railway and of the thinning of trees in its vicinity.

TURNER (R. E.). **On a Braconid Parasite of *Glossina*.**—*Bull. Entom., Research, London,* viii, no. 2, December 1917, p. 177.

This paper describes *Coelalysia glossinophaga*, sp. n., a Braconid bred from pupae of *Glossina* in the Gold Coast.

WATERSTON (J.). **Chalcidoidea bred from *Glossina* in the Northern Territories, Gold Coast.**—*Bull. Entom., Research, London,* viii, no. 2, December 1917, pp. 178–179, 1 fig.

The species dealt with in this paper are *Dirhinus inflexus*, sp. n., of which a preliminary description is given, and *Chalcis amenocles*, Walk., both having been bred from puparia of *Glossina* in the Gold Coast. The former is closely related to *Dirhinus giffardi*, Silv., and *D. ehrhorni*, Silv., both of which have been described from Southern Nigeria, where they attack fruit flies of the genus *Ceratitis*.

VERNEY (L.). **La Diffusione della Risicultura sotto i Riguardi igienici.** [The Spread of Rice Cultivation from a Hygienic Standpoint.]—*Annali d'Igiene, Rome,* xxvii, no. 11, 30th November 1917, pp. 700–719.

Rice cultivation is not necessarily productive of malaria, provided that the fields are not permanently flooded. In South Carolina, for instance, water is admitted only at certain periods and the conditions are far healthier than in regions where Anophelines are able to breed undisturbed.

HEWITT (C. G.). **Report of the Dominion Entomologist for the Year ending 31st March 1917.**—*Dominion of Canada, Dept. Agric., Ottawa,* 1917, pp. 15–16. [Received 29th December 1917.]

Gastrophilus haemorrhoidalis (red-tailed bot-fly) and *G. nasalis* (nose-fly) are apparently increasing in the prairie provinces; their distribution is being studied. *Hypoderma lineatum* and *H. bovis* are also spreading gradually, chiefly owing to the introduction of cattle from infested regions. The tick, *Dermacentor albipictus*, has in many cases caused the death of moose in Saskatchewan.

Sodium fluoride is considered a very promising insecticide in the control of household insects; it has previously proved valuable where cockroaches are concerned, and has recently been used with success in the control of the ants, *Camponotus pennsylvanicus* and *Crematogaster lineolata*, when infesting houses.

In the military training camps of the Canadian Expeditionary Forces visits have been made and lectures given to the medical officers and sanitary units on the question of the suppression of insects affecting the health of troops in camp and at the front.

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THE REVIEW OF APPLIED ENTOMOLOGY.

SERIES B: MEDICAL AND VETERINARY.

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WHITE (E. E. D.). **Dipping Cattle.**—*Queensland Agric. Jl., Brisbane,* viii, no. 4, October 1917, pp. 207–209.

The loss of cattle from tick fever at the time when the tick [*Margaropus annulatus australis*] first appeared in north-east Queensland, twenty years ago, was as much as 60 per cent., and though there are no losses from fever now, owing to the acquired immunity of cattle in badly infested country, yet the great annual loss sustained owing to the irritation caused by ticks is not generally realised, 80 per cent. of the total of female animals branded each year dying from this cause. Although complete tick eradication measures are at present impracticable, yet the suppression of ticks by means of systematic dipping, with the consequent decrease of mortality of stock, must be regarded as the best possible investment.

The following practical points should be noted :—The dipping tank should be wide, at least 6 ft. across at the water line, to reduce the risk of cattle injuring each other, and should be provided with a good incline and big wide steps on the walk-out as an aid to weak animals ; the draining yard should be long and from 8–12 ft. wide ; tanks should be arranged so that cattle need not be driven more than 7 or 8 miles ; frequency of treatment must depend on the nature of the country, it being necessary in some districts every three weeks, while in others an occasional dipping will suffice ; the best time for treatment is from April to July, for the reasons that the grass is good, the cattle are strong, the weather cool, and the ticks, if unchecked, are rapidly increasing, one dipping at this time being worth more than four in August. It has been stated that it is impossible to dip weak cattle or fattening bullocks, but experience has shown that in both cases it results in improved condition; though it is advisable not to put cattle on the road immediately after treatment, but to allow them at least five days' rest.

McKENZIE (J. W.). **The House Fly.**—*Jl. Dept. Agric. Victoria, Melbourne,* xv, no. 10, October 1917, pp. 628–631, 1 fig.

This article summarises the well-known facts concerning the life-history, habits and dangers of *Musca domestica* (house-fly). In 1915 the deaths of 71 infants occurred in Victoria due to intestinal troubles, 74 per cent. of these being in the five months between December and April, at which period the house-fly is most active, as against 26 per cent. during the rest of the year. The prevalence of ophthalmia is almost entirely due to infection by flies, the majority of cases among infants being due to their being unable to protect the eyes from attack. Formalin added to sweet milk in the proportion of 2 oz. formalin to 1 pint milk is very attractive to flies and should be exposed in shallow plates with a piece of bread in the centre for the flies to alight on.

An illustrated description is given of a fly trap easily made from a wooden box and some wire gauze.

CURLEWIS (A. W.). **Sheep Dipping.**—*Jl. Dept. Agric., Victoria, Melbourne,* xv, no. 10, October 1917, p. 634.

The very marked increase in the number of lice-infested sheep, as compared with recent years, may be attributed not so much to the

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failure of owners to dip their stock, as to the following contributory causes :—Inefficient dipping, which is the result of non-compliance with directions regarding the mixing and strength of the wash used ; the use of non-poisonous dips ; deterioration of the dipping material, owing, probably, to a shortage of some of the necessary chemicals ; and, finally, the failure to dip lambs at the same time as the rest of the flock.

STURGESS (G. W.). **Report of the Government Veterinary Surgeon for 1916.**—*Ceylon Administration Report, 1916* ; *Colombo,* Part 4, 26th February 1917, 6 pp.

The following insects were identified during the year : *Tabanus striatus,* F., *Chrysomyia* (*Pycnosoma*) *flaviceps,* Mg., causing myiasis in a dog's mouth, and a tick, *Margaropus* (*Boophilus*) *australis,* Fuller.

SWEET (Georgina) & SEDDON (H. R.) **The Viability of *Melophagus ovinus,* Linn., the Sheep Louse-Fly, Sheep Ked, or Sheep-"Tick."** —*Veterinary Jl.* (with Australian Supplement), *London,* lxxiii, no. 4, April 1917, pp. 6–14.

The only records of this subject appear to be those of Curtice and Swingle, both of whom found that *Melophagus ovinus,* L., died within four days when removed from the sheep. The experiment detailed in this paper were performed with batches of 20 examples of this Hippoboscid fly taken from unshorn sheep in November, *i.e.,* the Australian summer. These all died, under various experimental conditions, within 2-11 days. The experiments point to the conclusions : (1) That a moderately cool, uniform temperature is the most favourable condition for the persistence of the insect off the sheep and without food, especially if it be dry. (2) If extremes of temperature be present, moisture is necessary, dryness soon proving fatal. (3) The life of individuals in shed wool is short under a uniform temperature whether cool or moderate. (4) The state of nutrition does not seem to have influenced the vitality of these flies.

VIGEL & CHOLET. **Lepinay's Treatment of Mange by Sulphurous Anhydride, applied to the Horse.**—*Veterinary Jl., London,* lxxiii, no. 8, August 1917, pp. 267–276, 6 figs.

The authors, who belong to the French Army Veterinary Service, claim originality for the application of sulphurous anhydride (SO_2) in the treatment of horse-mange. The plant consists of a generator and a disinfecting chamber, details of which are given. The disinfecting chamber may contain as many as ten stalls, each of which has a window allowing the horses' heads to project. A cloth collar is fitted to the window and fastened round the animal's neck, or, in the case of a new model, drawn up on to the forehead, above the eyes, on to the temples and under the throat. The horse is clipped and then washed with a solution of sodium carbonate and soft soap worked in with a stiff brush. Fumigation is effected when the skin is thoroughly dry, generally on the next day. With this apparatus it is easy to attain a rapid concentration of 5½-6 per cent. of gas, the temperature within the chamber rising to 86° F. Fumigation lasts two hours. On the horse leaving the chamber its head and neck are subjected to a vigorous dressing with cresylated oil, 1 in 10. In order to destroy mites in the external ear a freshly made, warm emulsion of 3 per cent. cresyl is introduced into the ear, and also rubbed into its base. Three days after fumigation the animal is again washed. This treatment has proved to be effective, simple, inoffensive, rapid and economical. Ringworm also yields to this treatment, while lice and their eggs are completely destroyed in 25 minutes.

CLAYTON (T. A.). **Guérison de la Gale, des Teignes et des Phtiriases animales par la Sulfuration.** [The Cure of Mange, Ringworm and Phthiriasis by Fumigation with Sulphur.]—*Bull. Acad. Médecine, Paris,* lxxviii, no. 50, 29th December 1917, pp. 811–819, 7 figs.

In view of the success attending the treatment of mange in man and horses in the British army by fumigation with Clayton gas the French authorities examined this method in 1917. The procedure adopted has been described in the preceding paper. At a strength of 3-4 volumes per cent. of sulphurous anhydride from 1 to 2 hours were required for fumigation. Beginning on the third day afterwards, the animals were well rubbed down daily. No other treatment was required, and every one of the 70 horses dealt with was cured. Harness may be disinfected at the same time, and the gas will also cure ringworm and destroy lice.

GOODALL (T. B.). **The Forest Fly.**—*Veterinary Jl., London,* lxxiii, no. 11, November 1917, pp. 403–404.

This is a short popular note describing the habits of *Hippobosca equina*, which infests both ponies and cattle in the New Forest in the summer months.

ZAMMIT (T.) & ALCOCK (Major W. B.). **Report on the Subject of Laboratory Investigation in Cases of Plague in the Island of Malta.**—MS. Report. [Abstract in *Trop. Dis. Bull., London,* x, no. 5, 15th November 1917, pp. 283–285.]

This report relates to work in connection with the outbreak of plague in Malta in the spring of 1917. From 2nd April to 1st July about 1,000 rats were examined, 15 of which were infected with *Bacillus pestis*. *Xenopsylla cheopis*, *Ctenopsylla musculi*, rarely *Ceratophyllus fasciatus*, and still more rarely *Ctenocephalus* sp., were found on the rats, but never on man. *Pulex irritans* was found exclusively on man. From *Mus rattus* in the plague-infected area 102 fleas were examined, of which 60 were *X. cheopis*, 38 *Ctenopsylla musculi*, 3 *Ceratophyllus fasciatus* and 1 *Ctenocephalus*. From *Mus decumanus* from the non-infected area of 180 fleas examined, 118 were *X. cheopis*, 49 *C. musculi*, 3 *C. fasciatus* and 10 *Ctenocephalus*. A species of tick (*Ixodes*) was found in great numbers on some individuals of *M. rattus* and *M. decumanus* and a louse was also noted on both species of rats.

HADWEN (S.) & BRUCE (E. A.). **Anaphylaxis in Cattle and Sheep, produced by the Larvae of** *Hypoderma bovis, H. lineatum* **and** *Oestrus ovis.—Jl. Amer. Vet. Med. Assoc., Ithaca, N.Y.*, li, no. 1, April 1917, pp. 15–33.

Anaphylaxis has been reproduced in cattle, sheep and small animals, with extracts of the larval stages of *Hypoderma bovis, H. lineatum* and *Oestrus ovis*, in both the acute and chronic forms as defined by Richet. The reactions can be induced by returning an extract of the animal's own larvae into the jugular vein, showing that larvae living in animals make them receptive. Instances in nature are recorded where injury had ruptured the larvae subcutaneously, liberating their contents in sufficient quantity to produce shock. Animals that had recovered from the reaction were found to be immune for varying periods. Eye and other local reactions were obtained with extracts applied to the mucous membranes. In cattle the reaction was specific for extracts of *Hypoderma*, and in a horse for *Gastrophilus.*

HALL (M. C.). **Parasites of the Dog in Michigan.**—*Jl. Amer. Vet. Med. Assoc., Ithaca, N.Y.*, li, no. 3, June 1917, pp. 383–396.

The following parasites are recorded on dogs in Michigan. The sucking louse, *Haematopinus* (*Linognathus*) *piliferus*, and the biting louse, *Trichodectes latus*, the latter being predominant; the common dog flea, *Ctenocephalus canis*; and the demodectic mange mite *Demodex folliculorum* var. *canis.* The common American dog tick, *Dermacentor variabilis*, and *Sarcoptes scabiei* var. *canis*, probably also occur in Michigan.

HALL (M. C.). **Notes in Regard to Horse Lice,** *Trichodectes* **and** *Haematopinus.—Jl. Amer. Vet. Med. Assoc., Ithaca, N.Y.*, li, no. 4, July 1917, pp. 494–504, 3 figs.

Not very much work has been done on the bionomics of the lice infesting horses, viz:—the sucking louse, *Haematopinus asini*, and the biting lice, *Trichodectes pilosus* and *T. parumpilosus.* During the winter of 1916-17 the author undertook some experiments of which this paper gives the results. Of 24 horses attacked, 22 were infested with *H. asini*, and only 2 with *T. pilosus.* In a number of tests *Haematopinus* lived 1 or 2 days after removal from the horse, while *Trichodectes* lived from 5 to 6 days. This difference may be partly due to the fact that both species were kept in vials with some of the horse's hair, which perhaps furnished food to the biting lice, while the sucking lice, being deprived of blood, speedily starved. The eggs are attached to the hairs close to the skin and are most common on the flanks and around the angle of the jaw. To determine the length of time required for hatching, eggs were taken from horses and kept in Petri dishes at temperature from 70°-88° F., but the humidity factor was not ascertained. The length of time that the eggs had been on the horse was unknown, so that a longer time may be required than here given. In the case of *T. pilosus* eggs hatched in 5-6 days and those of *H. asini* in 10 to 18 or 19 days. In both cases however a large majority of the eggs failed to hatch, which is believed to have been due to unfavorable incubation conditions.

To regulate with certainty the proper intervals for dipping, it is necessary to ascertain the length of time required for the development of the lice on horses. According to Herms (1915) sucking lice mature in 3 or 4 weeks, and practical experience indicates that two dippings are usually ample. On the other hand, the statement by Herms that these lice hatch in 5-6 days is apparently not true of *H. asini*. Herms also states that biting lice hatch in 5-8 days, which accords with the author's experience, and mature in 3-4 weeks. Under these conditions horses should be dipped for biting lice twice at intervals of 10-20 days, 2 weeks being probably the safest interval. Where both kinds of lice are present, an interval of about 20 days appears to be indicated.

Tests, which are as yet incomplete, indicate that *Trichodectes* is more resistant to insecticidal treatment than is *Haematopinus*. As sodium fluoride has been found effective against poultry lice and as *Trichodectes* is also a Mallophagan, handfuls of this substance were rubbed into the coat of an infested horse—with complete success. As was expected, no effect was obtained on horses infested with sucking lice. The fluoride treatment is applicable in winter and apparently does not injure the hair or skin. Other insecticides include coal-tar dips, fish-oil, a 2-3 per cent. watery solution of creolin, a mixture of 1 part petroleum to 10 parts methylated spirit, and grey mercury ointment (not more than 150 grains at one application). Washing the coat with soapy water and then dusting with fine beech or peat ashes is also a useful measure. Other dusting powders that may be used are naphthaline, sulphur, pyrethrum, etc. The author is not convinced by the statement of European investigators that one method of removing the human body louse [*Pediculus humanus*] from clothing is to put the garments on a horse, though lice thus transplanted " might die of something akin to gastralgia or even nostalgia " !

HADWEN (S.). **The Life-history of *Hypoderma bovis* and *H. lineatum*.**—*Jl. Amer. Vet. Med. Assoc., Ithaca, N.Y.*, li, no. 4, July 1917, pp. 541–514.

The principal differences between *Hypoderma bovis* and *H. lineatum* are tabulated in the first part of this article, which also records observations made at Agassiz, British Columbia, including notes on the seasonal prevalence of these flies [see this *Review*, Ser. B, iv, p. 195]. *H. lineatum* oviposits as early as 15th April, though the usual period is during May. Between the last appearance of *H. lineatum* and the first of *H. bovis* there is usually an interval of 10 days during which the cattle are immune from attack of either species. It is not yet known how the larvae reach the oesophagus, through which they pass to the submucosa. The earliest record made at Agassiz was on 15th August, when larvae 3·4 mm. long or slightly larger were found. *H. lineatum* makes its appearance on the backs of cattle about 15th December and *H. bovis* about a month later. By this time the larvae have grown to about 15 mm. At this stage it becomes difficult to separate the two species. In the latter part of the season (mid-March) the last larvae to leave the gullet are at the paunch end. They pass out under the pleura and go to the neural canal either up the crura of the diaphragm or up the posterior border of the ribs, entering the canal by the posterior foramen; from there they descend the canal under the dura mater, emerge again through the foramen and reach the back, forming the warbles. The larvae follow connective tissue exclusively; none have been discovered in muscular tissue. *H. lineatum* begins to emerge in February and finishes about 1st May. *H. bovis* begins about 1st May and ends approximately on 1st July. The average pupal period for *H. bovis* is 32½ days and for *H. lineatum* a little less.

Smith (E. I.). **Tick Eradication.**—*Jl. Amer. Vet. Med. Assoc., Ithaca, N.Y.*, li, no. 6, September 1917, pp. 779–786, 4 figs.

This is a general account of the measures adopted in Louisiana against ticks infesting cattle. In 1916 there were 1,516,081 dippings under the supervision of inspectors; the work was done on the 21-day system.

Carment (A. G.). **Public Health Division's Report for 1915.**—*Zanzibar Protectorate Med. & Pub. Health Repts. for 1915*; *Zanzibar*, 1916, pp. 19–36.

Filariasis was very widespread during the year, and in 150 examinations of blood films microfilaria were found in nearly 39 per cent. The malarial death rate greatly diminished, showing a decrease of over one-third from that of the previous year, indicating good work accomplished by the chief sanitary inspector and his assistants.

The report on trypanosomiasis records an outbreak of the disease at Mwera in July 1915. Examinations of the blood of a herd of bulls revealed many trypanosomes; many blood-sucking flies, including *Stomoxys calcitrans* and *S. nigra*, attacked the animals. This outbreak proved to be the most serious ever experienced in Zanzibar. The author considers that the trypanosomes found probably resemble those reported in 1906 as being of the type *T. brucei evansi*. In inoculation experiments, guinea-pigs proved absolutely immune, but goats, dogs, a monkey and a donkey were all successfully inoculated. A feature of interest in connection with this epidemic was the occurrence of three simultaneous outbreaks that could scarcely be connected by a vector. It was found that even the most casual isolation of one infected animal in proximity to healthy ones prevented the spread of the disease.

Aders (W. M.). **Entomology in Relation to Public Health and Medicine.**—*Zanzibar Protectorate Med. & Pub. Health Repts. for 1916*; *Zanzibar*, 1916, pp. 47–49.

The information in this paper concerning the mosquitos of Zanzibar and Pemba has been dealt with elsewhere [see this *Review*, Ser. B, v, p. 147].

The tick, *Rhipicephalus pulchellus*, is common on imported stock from British East Africa, but is apparently unable to acclimatise itself on the island and has never been taken from local stock. A number of non-blood-sucking flies, including *Musca domestica*, *Chrysomyia* (*Pycnosoma*) *putoria* and *Biomyia tempestatum*, have been taken feeding in conjunction with *Stomoxys calcitrans* and *S. nigra*. These flies alight in close proximity to a feeding *Stomoxys*, and the moment the latter moves there is a scramble among the non-bloodsuckers for the remaining droplet of blood. It seems therefore possible for non-bloodsucking flies to transmit various blood parasites mechanically through the agency of wounds. *Oestrus ovis* is found in the larval stage in nearly every goat's head examined throughout the island.

Cleveland (R. A.). **Public Health.**—*Cyprus Ann. Med. Rept. for Year ending 31st December 1916, Nicosia,* 23rd April 1917, pp. 7–11.

The malarial incidence shows a steady reduction since 1912 to approximately one-fourth of the cases then recorded. The climate of Cyprus is unfavourable for mosquito breeding until April, the period from November to March generally being too cold, especially for *Anopheles*. Anti-malarial work therefore begins in April of each year. The details of this work for the year under review are given and comprise the usual measures.

Alexander (D.). **Sanitation.**—*Govt. Gold. Coast Med. & Sanitary Rept. for Year 1916, Accra,* 27th April 1917, pp. 11–14.

Various preventive measures against mosquitos have been regularly and thoroughly carried out. A new method of fumigating buildings against mosquitos was tried experimentally at Accra and has given very satisfactory results. Creolin was first used, then Izal and then a mixture of the two substances. It was found necessary to use enamelled receptacles instead of dull iron in order to avoid a deposit of soot after the process. The apparatus required is simply a receptacle holding enough fumigant for a room of 3,000 cub. ft. and a lamp capable of vaporising this amount in three hours. Doors and windows do not need sealing, but merely closing, and the room can be entered a few minutes after the doors are opened. This method is much cheaper than fumigation by sulphur. The control of tsetse-flies at fords and watering places is being attempted by bush clearing.

Horn (A. E.). **Colony of the Gambia: Annual Medical & Sanitary Rept. for Year 1915,** *Bathurst*, 1916, 23 pp.

Malaria was prevalent among the native population in Bathurst during September and October, 1915. Oiling was extensively practised and the percentage of infected compounds has considerably decreased in consequence. A total of 622 mosquitos was taken consisting of :—*Stegomyia* 94 per cent., *Culex* 5·5 per cent., *Anopheles* ·5 per cent. The high percentage of *Stegomyia* indicates the necessity for a determined campaign against the conditions of mosquito breeding in compounds. Anti-mosquito measures practised have included frequent prosecutions of persons on whose premises mosquito larvae are found, frequent inspections and advice to the public, bush clearing and the stocking of wells and lagoons with suitable fish. Some dozens of fish taken from the drains were emptied into a large salt lagoon in which *Culex thalassius* was breeding ; these need constant renewing owing to wastage from predatory birds. General sanitary methods have also assisted in mosquito control.

ORPEN (R. W.). **Colony of the Gambia: Annual Medical & Sanitary Rept. for Year 1916,** *Bathurst*, 1917, 25 pp.

There was a considerable amount of malaria during the year, most of the cases being imported into Bathurst by persons coming in from the rivers and creeks where mosquitos abound. In the town itself the Anopheline breeding-grounds are being gradually reduced. *Stegomyia fasciata* is still the most prevalent species. One fatal case of yellow fever occurred.

A few cases of human trypanosomiasis having occurred, two of which proved fatal, the question was raised of having the mangroves cleared away from the town and it is hoped that in the coming year a considerable belt will be freed from *Glossina*. The mosquito indices, which have been taken each month during the rains, show on the whole an improvement. The fish with which the wells and lagoons have been stocked have proved a great success, and the clouds of *Culex* that used to invade the town from time to time have disappeared. *Chromis bimaculatus* and *Hemichromis macrocephalus* are the species that have been employed, the lagoons being connected up by canals so that the fish could pass freely from one to the other. Oiling has also been more extensively practised than in previous years.

FANTHAM (H. B.). **Some Parasitic Protozoa of Man, and their probable Evolution.**—*Med. Jl. S. Africa, Johannesburg*, xiii, no. 3, pp. 33–48, 37 figs.

The subject-matter of this paper is indicated by its title, incidental mention being made of the insects concerned in the transmission of these protozoa.

DYAR (H. G.). **The Mosquitos of the Mountains of California (Diptera, Culicidae).**—*Insecutor Inscitiae Menstruus, Washington, D.C.*, v, no. 1–3, January-March 1917, pp. 11–21.

In this paper the author notices among other mosquitos all the the species of *Aëdes* occurring in the Sierra Nevada mountains of California. *A. tahoënsis*, Dyar, from the northern part of these mountains has peculiar breeding places consisting of isolated pools, filled by melting snow, which usually become quite dry by the first of July. This species is always present in these pools in large numbers, being the commonest mosquito of the mountains during its season. *A. hexodontus*, Dyar, breeds in marshy pools, often of very small size, filled by snow-water. *A. increpitus*, Dyar, occurs in vast numbers in valleys, the Yosemite valley in May being full of the larvae in the river and woodland pools. This species has also been found breeding in wave pools behind gravel beaches at the end of a lake, and in a grassy pool in a meadow, where the larvae appear early and can be found throughout June. The larvae of *A. palustris*, Dyar, live in grassy marshes, the adults flying in the high mountains. *A. vexans*, Meig. (*sylvestris*, Theo.) is a widely spread species, occurring rarely in the Yosemite valley, though widely distributed over Europe and N. America. It breeds in temporary woodland and roadside pools along the Atlantic seaboard. *A. cinereus*, Meig. (*fuscus*, O.) is a species common to Europe and America, breeding in temporary woodland pools in the east, but being a river valley species in the west. *A. cataphylla*, Dyar, is a very characteristic species of the locality, being the second earliest species to appear on the wing. *A. varipalpus*, Coq., breeds in water in holes in trees, generally in oaks, but also in alders, willows and sycamores. The species extends throughout California, both along the coast and in the mountains as far as Washington and British Columbia. *A. ventrovittis*, Dyar, is a very early species, being the first of those found in snow pools. The males and larvae are unknown. *A. fisheri*, sp. n., is similar to the last in size, but is late in occurrence, the male being unknown. *Culiseta inornatus*, Willis., is typical of the low country and occurs only sparingly in the mountains. It has been found breeding in muddy pools in cattle pasture. *C. incidens*, Thomson, is very common everywhere in the west, both in the plains and mountains; it breeds in any enclosed water all the summer, having been found in August in an ice-cold mountain spring, where the larvae were preyed upon by those of *Eucorethra*. *C. impatiens*, Walk., has a northern distribution from Alaska eastward to the mountains of northern New York, but has not previously been recorded from California. The larvae inhabit cold spring pools and can be found all the summer, the adults hibernating. *Culex tarsalis*, Coq., is an abundant species throughout the west, especially in the lowlands, breeding in all kinds of permanent and semipermanent pools, and adapting itself readily to irrigation water. It occurs throughout the mountains in open warmer pools. The adults are supposed to hibernate. *C. saxatilis*, Grossbeck (*territans*, auct., non Walk.) is a species well known on the Sierras, where the larvae have been collected in grassy pools.

BUTLER (C. S.) & HAKANSSON (E. G.). **Some first Impressions of the Virgin Islands, medical, surgical and epidemiological.**—*U. S. Naval Med. Bull., Washington, D.C.*, xi, no. 4, October 1917, pp. 465–475, 9 plates.

Stegomyia, which is the common house-infesting mosquito in the recently acquired United States portion of the Virgin Islands, breeds preferably in rain-water and is common in cisterns but rare in wells, even though these be shallow and open at all times. The authors suggest as a possible explanation of this that the eggs may be laid after rain in the water-holding depressions in the house-gutters. They stand drought well and later rains may wash them into the cisterns where they hatch. If correct, this would complicate the question of rendering the cisterns mosquito-proof.

PITTALUGA (G.) & DE BUEN (S.). **Nota sobre los Dipteros del Géenro *Phlebotomus* en España.** [A Note on the *Phlebotomus* found in Spain.]—*Bol. Inst. Nacional Hyg. Alfonso XIII. Madrid*, xiii, no. 50, 30th June 1917, pp. 137–145, 3 plates.

The authors have found *Phlebotomus papatasii* and *P. legeri* in Spanish Guinea, Palma de Mallorca and Malaga, and *P. minutus* in Grenada, Palma de Mallorca and Malaga. A brief description of these three species is given. Dengue occurs in Spain and possibly sandfly fever. Oriental sore is known to be present, and the gecko, *Tarentola* (*Platydactylus*) *mauritanica*, the supposed reservoir, is distributed nearly throughout the Peninsula.

TOYODA (S.). **Study of the Organism of Relapsing Fever in Manchuria.**—*Saikingaku Zasshi* [Jl. Bacteriology], no. 250, 10th September 1916, pp. 47–77. [Abstract in *China Med. Jl., Shanghai*, xxxi, no. 4, July 1917, pp. 334–335.]

The spirochaete producing relapsing fever in Manchuria and Korea is regarded as different from that causing the disease elsewhere. This strain is already known to be pathogenic to monkeys, and the author has succeeded in infecting the mouse, rat and guinea-pig, though it seems to have less virulence for these animals than the African and European virus. An animal once recovered from an infection with the Manchurian spirochaete is not susceptible to reinfection with the other strains. Lice were recognised as the transmitting agents, though no additional proof of this was obtained.

TANAKA (K.). *Trombidium akamushi.* **Differentiation of the true Kedani Mite from a Species found on the Ears of wild Rats.**—*Tokyo Iyakukai Zasshi* [Jl. Tokyo Med. Soc.], xxx, no. 22, 20th November 1916, pp. 49–51, 1 plate. [Abstract in *China Med. Jl., Shanghai*, xxxi, no. 4, July 1917, p. 347.]

It has been taken for granted that the mites found on the ears of wild rats are the true carriers of tsutsugamushi or river fever of Japan. The author states that two species are confused and demonstrates the differences between them, which are mainly concerned with the shape of the hairs, in a series of photographs and drawings. It is pointed out that rats and their parasites are widely distributed over Japan, while the disease is limited in extent.

SECRETE (—). **Notes on Mosquito Distribution.**—*Taiwan Igakukai Zasshi* [Jl. Formosa Med. Soc.], no. 169, 28th November 1916, pp. 943–947. [Abstract in *China Med. Jl., Shanghai*, xxxi, no. 4, July 1917, p. 348.]

The species of *Anopheles* collected in Daito in 1902 by Tsuzuki and believed to be *Anopheles* (*Myzomyia*) *rossi* was also taken in south Formosa by Kishita, who also recorded it under the same name; it has since been identified as *A.* (*Nyssomyia*) *ludlowi.* At the port of Arito the author collected *A.* (*N.*) *fuliginosus* and *A.* (*M.*) *rossi*, and Morita has reported *A.* (*Myzorhynchus*) *sinensis* from the same locality. In October 1915 Kawasaki collected this species, as well as *A.* (*M.*) *punctulatus* and *A. listoni. A. sinensis, A. maculatus, A. rossi* var. *indefinitus* and *A. tessellatus* are common in Formosa. These four have been reported from the vicinity of Hongkong, together with *A. jeyporensis, A. karwari, A. maculatus* var. ?, *A. minimus, A. minimus* var. ? and *A. indiensis* [see this *Review*, Ser. B, iii, p. 141]. Three species of *Stegomyia* are reported from Formosa:—*S. fasciata, S. albopicta* (*scutellaris*) and *S. w-alba.*

SECRETE (—). **Notes on Mosquitoes.**—*Taiwan Igakukai Zasshi* [Jl. Formosa Med. Soc.], no. 170, 28th December 1916, pp. 1025-1028. [Abstract in *China Med. Jl., Shanghai*, xxxi, no. 5, September 1917, pp. 418–419.]

Four common species were found in the district of Toeucho, *Anopheles sinensis, A. listoni, A. punctulatus* and *A. willmori*, as well as two species new to Formosa, *Leicesteria longipalpis,* discovered in the Malay Peninsula in 1904, and *Phoniomyia bimaculipes,* Theo., recorded from New Guinea. *A. sinensis, A. rossi, A. ludlowi, Desvoidya obturbans,* and *Culex fatigans* were captured in one locality in thick weeds near rice-fields.

HAYASHI (Y.). **Mosquito Eradication by Fumigation.**—*Taiwan Igakukai Zasshi* [Jl. Formosa Med. Soc.], no. 173, 28th March 1917, pp. 153–162. [Abstract in *China Med. Jl., Shanghai,* xxxi, no. 6, November 1916, p. 519.]

For the wholesale destruction of mosquitos that convey malaria and possibly dengue in Formosa the military authorities use a fumigator constructed as follows:—About 25 gm. of common insect powder [said to be the pollen of *Aster chinensis*] is placed in strips of waste paper and rolled into ropes about 2 feet in length. These cigarette-like rolls are twisted together with a somewhat longer strip of old cloth, which projects a few inches beyond each end. This rope is then doubled on itself in the middle and the projecting ends are tied and used as a means of attachment. For indoor use this rope is laid on a tile, suspended from some non-combustible support or put into a charcoal brazier. When lighted at the doubled end these ropes will burn for about two hours.

ESCOMEL (E.). ***Latrodectus mactans* and *Gliptocranium gasteracanthoides* in the Department of Arequipa, Peru.**—Translation in *New Orleans Med. & Surg. Jl., New Orleans,* lxx, no. 6, December 1917, pp. 530–542.

Two dangerous spiders, *Latrodectus mactans* and *Gliptocranium gasteracanthoides,* occur in southern Peru, where their bite sometimes causes death. Treatment with potassium permanganate, internally and externally, is the remedy which has given the best results.

PIRAS (L.). **Présence de *Stegomyia fasciata* (*calopus*) dans le Port de Gênes et ses Environs.** [The Occurrence of *Stegomyia fasciata* in the Harbour and District of Genoa.]—*Bull. Office Internat. d'Hyg. Publique, Paris,* ix, no. 4, April 1917, p. 485. [Abstract from *L'Igiene Moderna,* January 1917, p. 1.]

Large numbers of *Stegomyia fasciata* (*calopus*) have been found in the harbour of Genoa, both in ships and buildings, from June to September. There has however never been an epidemic of yellow fever either in the city or in the surrounding district.

BLANCO LEDESMA (D. A.). **Dos nuevos Casos de Miasis. Miasis ulcerosa**—*Sarcophaga carnaria.* **Miasis nasal**—*Lucilia hominivorax* **o** *Chrysomyia macellaria.* [Two new Cases of Myiasis. An Ulcerous Myiasis due to *Sarcophaga carnaria* and a Nasal Myiasis due to *Chrysomyia macellaria.*]—*Gaceta Med. de Caracas* (*Venezuela*), xxiv, no. 9, 15th May 1917, pp. 79–80.

A case of ulcerous myiasis is recorded due to the larvae of *Sarcophaga carnaria* found in a sore for which the patient was in hospital. In the second case numerous larvae of *Chrysomyia macellaria* were expelled from the nose. The respective species were identified from adults bred from the larvae.

GABBI (U.). **Dissenteria amebica.** [Amoebic Dysentery.]—*Malaria e Malattie dei Paesi Caldi, Rome*, viii, no. 5–6, September-December 1917, pp. 218–240, 7 figs.

This paper on amoebic dysentery is one of a series of monographs on the diseases of armies in the field. The flies, *Musca domestica* and *Calliphora erythrocephala*, are mentioned as being among the agents disseminating this disease.

GALLI-VALERIO (B.). **La Distribution géographique des Anophélines en Suisse au Point de Vue du Danger de Formation de Foyers de Malaria.** [The geographical Distribution of Anophelines in Switzerland from the Point of View of the Danger of the Formation of Malarial Foci.]—*Bull. Office Internat. d'Hyg. Publique, Paris*, ix, no. 12, December 1917, pp. 1566–1582. [From *Bull. Service Suisse d'Hyg. Publique*, nos. 39–40, 6th–13th October 1917, pp. 440 and 453.]

The introduction of numerous interned prisoners of war suffering from malaria led to the author being entrusted with the extension to the whole of Switzerland of the Anopheline survey that he had previously carried out in some districts, establishing the presence of *Anopheles maculipennis*, *A. bifurcatus* and *A. plumbeus* (*nigripes*) [see this *Review*, Ser. B, i, p. 40 ; iii, p. 224 ; v, p. 42]. To avoid delay the two first-named only were included in this extended survey, which was limited to public waters, some of which moreover were not examined as access to them was not possible for military reasons. The presence of Anophelines and the presence or absence of local conditions favourable to them are the points of practical importance noted in this paper, which forms a very complete record for the entire country.

SCHÜFFNER (W.). **Die Brutplätze der Mücken, deren Behandlung und kurze Bemerkungen über die Aussichten einer Malariabekämpfung.** [The Breeding Places of Mosquitos, their Treatment and the Prospects of a Malarial Prophylaxis.]—*Geneesk. Tijdschr. v. Nederl.-Indië, Batavia*, lvi, no. 7, 1917, pp. 1013–1026.

This is a review of the additions made of recent years to our knowledge of the breeding-places of *Anopheles*. In many cases the question of cost prohibits thorough anti-malarial drainage, and in others the felling of forests, instead of reducing the number of these mosquitos, results in their increase.

OTTEN (L.). **Over den Infectiositeitsduur der Indische Rattevloo** (*Loemopsylla cheopis*). [The Duration of the Period of Infectibility in the Indian Rat-flea.]—*Geneesk. Tijdschr. v. Nederl.-Indië, Batavia*, lvii, no. 2, 1917, pp. 309–315.

In Java, where the temperature is lower than in British India and where the seasons are less sharply differentiated—so that it is scarcely possible to speak of a seasonal prevalence of plague—the duration of the period of infectibility of the rat-flea, *Xenopsylla* (*Loemopsylla*) *cheopis*, was observed to be longer than in British India. The observations are shown in a table, from which it appears that the infestation of *Mus rattus griseiventer* (common house rat), *M. concolor* (small house rat) and *M. rattus diardii* (field rat) differ but little, a result in accordance with their infection under natural conditions. The period of infectibility of the flea extended to 43 days, the longest period yet reached in transmission experiments without artificial conditions of temperature and moisture. The period of 43 days occurred on *M. concolor*, those for *M. rattus griseiventer* being 36, and for *M. diardii*, 37 days respectively.

van Breemen (M. L.). **Een voorloopig Onderzoek betreffende de verschillende Soorten van Anophelinen, te Soerabaia voorkomende.** [A preliminary Investigation on the various Species of Anophelines occurring in Soerabaya.]—*Geneesk. Tijdschr. v. Nederl.-Indië, Batavia,* lvii, no. 3, 1917, pp. 325–329.

During 1916 the author collected at Soerabaya (Java) the larvae of *Anopheles barbirostris, A. sinensis, A. rossi* and *A. rossi* var. *indefinitus* ; in the early part of the same year larvae of *A. kochi* were also taken. It is remarkable that malaria should be common, while none of the generally recognised carriers are to be found. *A. ludlowi,* which Stanton found at Semarang, is absent from Soerabaya, where *A. rossi* appears to be the predominant species and comprised nearly all the specimens taken indoors. Investigations in August, when the disease was at its height, demonstrated sporocysts in the fifteenth specimen of *A. rossi* examined, though whether this mosquito was infected with the human malaria parasite was impossible of proof. Further investigation is necessary to ascertain whether *A. rossi* is actually the principal malaria carrier at Soerabaya and whether it has replaced *A. ludlowi* in this rôle in the eastern portion of Java.

Swellengrebel (N. H.). *Myzomyia rossi,* **Giles,** *M. ludlowi,* **Theo., en** *M. indefinita,* **Ludl.**—*Geneesk. Tijdschr. v. Nederl.-Indië, Batavia,* lvii, no. 4, 1917, pp. 490–495, 1 plate.

These three mosquitos are closely allied morphologically, and at least one of them is becoming suspect of transmitting malaria. The present paper records the differences between them with a view to preventing any confusion.

de Raadt (O. L. E.). **De Rol van de Huisrat in de Epidemiologie der Pest.** [The Rôle of the House-rat in the Epidemiology of Plague.]—*Geneesk. Tijdschr. v. Nederl.-Indië, Batavia,* lvii, no. 4, 1917, pp. 520–533, 1 fig.

The author disagrees with Otten's statements that rats play only a minor part in the spread of plague in Java and that the house-rat is seldom met with in the fields there [see this *Review,* Ser. B, v, p. 65]. As regards the latter point, he instances cases in support of his own view, and concludes that in the fields Otten sought the house-rat in localities where the conditions were abnormal. The house-rats, *Mus rattus griseiventer* and *M. concolor*, were found by the author to an extent varying from 5 to 9·6 per cent. Otten also obtained a similar proportion (8.5 per cent.) in one instance where his own figures show a low *Xenopsylla cheopis* index (0·12) in the field-rats, *i.e.*, where the mortality of the house-rat was small ; in cases where Otten was unable to find the house-rat this was due to high mortality corresponding to a high index (0·80) in the field-rat. The great importance of the house-rat, especially *M. rattus griseiventer*, in spreading rat-plague is therefore again brought into the foreground.

It is remarked that Otten's paper might lead the reader to infer that the primary reservoirs of the out-door flea, *Pygiopsylla ahalae*, are in the fields. These are in fact in the woods, where favourable developmental conditions are constant, which is not the case in the fields.

Otten (L.). **Over de Biologie van *Mus concolor*.** [The Biology of *M. concolor*.]—*Geneesk. Tijdschr. v. Nederl-Indië, Batavia*, lvii, no. 4, 1917, pp. 534–568.

The author disagrees with most of the conclusions reached by De Raadt in the latter's investigations concerning the biology of the Javanese house and field-rats [see this *Review*, Ser. B, iv, p. 128]. His own results include some already published [see this *Review*, Ser. B, v, p. 65] and he also states that the rat population of woods and coffee estates is either non-existent or very scanty. Together with *Mus jerdoni* and the field-rat [*M. rattus diardii*] a few specimens of the house-rat, *M. concolor*, are present, while the other house-rat, *M. rattus griseiventer*, is not. The field-rat and *M. concolor* living out-doors are exclusively parasitised by *Pygiopsylla ahalae*, a true out-door flea, which however occurs as a facultative house-flea in hilly districts.

Nöller (W.). **Blut- und Insektenflagellatenzüchten auf Platten.** [The Plate Culture of Flagellates from Blood and from Insects.] —*Archiv. f. Schiffs- u. Trop.-Hygiene, Leipzic*, xxi, no. 4–5, February-March 1917, pp. 53–94, 3 figs., 1 plate.

This is a technical paper the subject-matter of which is indicated by the title.

Werner (H.) & Wiese (O.). **Die Uebertragung von Rekurrensspirochäten durch Kopfläuse.** [The Transmission of Recurrent Fever by Head Lice.]—*Arch. f. Schiffs- u. Trop.-Hygiene, Leipzic*, xxi, no. 8, April 1917, p. 139.

Cases of recurrent fever among civilian workers on the Eastern Front provided an opportunity of ascertaining the increase of *Spirochaeta recurrentis* in the head-louse, *Pediculus capitis*. Eleven examples taken from a healthy person were placed upon a recurrent fever patient at the height of the fever. Eight days later, two of these individuals were found to be heavily infected with spirochaetes.

TICHO (A.). **Beitrag zur Ophthalmomyiasis.** [A Contribution to the Knowledge of Ophthalmomyiasis.]—*Archiv. f. Schiffs. u. Tropen-Hyg:, Leipzic,* xxi, no. 10, May 1917, pp. 165–171, 1 fig.

A parasite, believed to be the first-stage larva of *Rhinoestrus purpureus*, Brauer, was found in the eye of a patient who applied for treatment at Jerusalem stating that a fly had flown against his left eye on the previous day. In a second case three similar larvae were taken from the eye of a patient infested under similar circumstances; and in a third one an Oestrid larva, which could not be more closely identified, was found to be the cause of the trouble.

SIKORA (H.). **Ueber Anpassung der Läuse an ihre Umgebung.** [The Adaptation of Lice to their Surroundings.]—*Arch. f. Schiffs- u. Trop.-Hygiene, Leipzic,* xxi, no. 10, May 1917, pp. 172–173.

In this preliminary note the adaptation of lice to the colour of their surroundings is confirmed. Lighting has no influence. Two cages were used with white, gray and black compartments; one was often exposed to sunlight, while the other was always kept in the dark. In both cages the lice in the white divisions were quite light-coloured, those in the grey ones were of a medium shade, and those in the black ones were very dark.

Hermaphrodite examples were found both among lice taken in nature and among those bred in captivity.

WEIDNER (E.). **Behandlung der auf den Menschen übertragenen Pferderäude mit Petroleum.** [The Treatment of Horse-mange in Man with Petroleum.]—*Münchener Med. Wochenschr., Munich,* lxiv, no. 4, 23rd January 1917, pp. 132–133.

Severe human cases of horse-mange were completely cured in from two to four days by the application of petroleum once daily. The petroleum must be rubbed in until the skin is dry. This requires about fifteen minutes if the entire body is affected, while to treat an arm, a leg, the back, or the chest two or three minutes only are necessary. A teaspoonful is the proper quantity for either the back, the chest, or each limb. If the troops are not marching, each application may be followed at a few hours' interval by a bath and change of linen.

SCHLICHTEGROLL (—). **Ein Beitrag zur Wanzenvertilgung.** [A Note on Bug Eradication.]—*Münchener Med. Wochenschr., Munich,* lxiv, no. 7, 13th February 1917, p. 239.

If a few drops of a solution containing spirits of ammonia 50 parts and oil of turpentine 10 parts, are allowed to fall into cracks infested with bugs, the latter will speedily emerge. The mixture must be well shaken before use. It also allays the irritation caused by the bites.

BAUMGARTEN (A.). **Ueber ein neues Entseuchungs- und Entläusungsverfahren.** [A new Process for destroying Germs and Lice.]—*Münchener Med. Wochenschr., Munich,* lxiv, no. 13, 27th March 1917, pp. 434–435.

Naphthaline vapour is a quick and certain destroyer of lice, while it is cheap and does not injure the articles treated. Lice are killed within 10–15 minutes at a temperature of 104° F., as soon as the air is saturated with the vapour, which has great penetrative power, so that lice placed in a buttoned-up pocket of thick material are not protected. Bed-bugs and flies also succumb within a few minutes. Cholera vibrios, and the bacilli of dysentery and typhus are totally destroyed by a two-hours exposure at 177° F., while anthrax spores require four hours. The naphthaline adhering to the treated articles is easily brushed off.

In these experiments the author evaporated about 7 oz. of naphthaline in an iron retort joined to the disinfecting chamber by a short iron pipe. The chamber measured 16 in. by 20 in. by 20 in. and was constructed of wood with an external plating of iron. A hole in the top of the box allowed the recording thermometer to protrude.

KLOSE (F.). **Ein Beitrag zur Epidemiologie der Weilschen Krankheit.** [A Contribution to the Epidemiology of Weil's Disease.]—*Münchener Med. Wochenschr.*, *Munich*, lxiv, no. 21, 22nd May, 1917, pp. 691–692.

Reiter has reported positive results in the experimental transmission of Weil's disease by biting flies, but only under very restricted conditions [see this *Review*, Ser. B, v, p. 113]. In the cases observed by the author in January 1917 both biting flies and mosquitos may be excluded, the temperature sometimes being as low as —1° F. Insect transmission does not therefore provide a complete solution of the question.

WERNER (H.) & BENZLER (J.). **Zur Aetiologie und Klinik der Febris quintana.** [The Aetiology and Clinical Symptoms of Five Day Fever.]—*Münchener Med. Wochenschr.*, *Munich*, lxiv, no. 21, 22nd May 1917, p. 695.

Two cases are recorded in which the infection was transmitted by the bites of lice. In one of them the senior author was the person who contracted the disease, and as he had suffered from it about six months previously it would appear that immunity is not conferred for long.

LENZ (F.). **Beobachtungen über Malaria in malariafreier Gegend.** [Observations on Malaria in a Region free from the Disease.]— —*Münchener Med. Wochenschr.*, *Munich*, lxiv, no. 12, 20th March 1917, pp. 394–396.

About eighty cases of malaria were observed in the summers of 1915 and 1916 in the prisoners' camp at Puchheim. There were many water-holes in the moor, the dark soil of which is well warmed by the sun. *Culex* spp. were very abundant. Of the less common Anophelines, two species were observed, one being apparently *A. maculipennis.* The outbreak of relapses caused by warm weather is considered to indicate an adaptation of the malarial plasmodia to the flight season of Anopheline mosquitos.

MÜHLENS (—). **Beobachtungen über Malaria in malariafreier Gegend.** [Observations on Malaria in a Region free from the Disease.]—*Münchener Med. Wochenschr., Munich*, lxiv, no. 25, 19th June 1917, pp. 829–830.

Referring to the preceding paper the author disputes Lenz's statement that " the outbreak of relapses caused by warm weather indicates an adaptation of the malarial plasmodia to the flight-season of Anophelines " and adduces evidence against this. Relapses may occur before the warm season and chiefly do so during the transition from winter to spring.

LENZ (F.). **Erwiderung auf die Bemerkungen von Prof. Mühlens.** [Reply to the Remarks of Prof. Mühlens.]—*Münchener Med. Wochenschr., Munich*, lxiv, no. 25, 19th June 1917, p. 830.

In reply to the above criticism, the author points out that he himself mentioned cases where relapses occurred before the warm season, but he considers that such relapses are not the rule and that they may be due to warmth indoors or to direct sunlight. Nor did he claim warmth to be the sole factor. He also stated that the malaria curve falls earlier than the temperature curve. His hypothesis is not weakened, but actually strengthened by these facts. The first increase in warmth gives rise to the outbreak of relapses, and as only few cases of latent plasmodia carriers are left over, it follows that only a few relapses occur later on. The adaptation of the plasmodia to the Anophelines lies precisely in the fact that the schizonts circulate in the blood during the flight-season of the Anopheline generation that has hibernated. In the case of later generations of Anophelines the conservation of the plasmodia is ensured by new infection. In Upper Bavaria, where the summer is short, the curve of relapses falls close to the new infections. In the Mediterranean regions the great mass of new infections occurs much later than that of the relapses. In 1916 only one generation of Anophelines was observed in Upper Bavaria, though there are several in the Mediterranean regions.

TEICHMANN (E.). **Ein neues Mittel zur Bekämpfung der Stechmücken.** [A new Means of combating Mosquitos.] — *Münchener Med. Wochenschr., Munich*, lxiv, no. 32, 7th August 1917, pp. 1041–1042.

After successful experiments with hydrocyanic acid gas against lice [see this *Review*, Ser. B, v, p. 130] the author tested this poison against adults of *Culex annulatus* and *C. pipiens.* These mosquitos proved about 400 times more susceptible than the adults and eggs of *Pediculus humanus* (*vestimenti*). A strength of 0·02–0·03 volumes per cent. proved deadly, none of the mosquitos reviving on being removed after an exposure of 15 minutes.

BASS (R.). **Die sanitätspolizeiliche Bekämpfung des Fleckfiebers im Felde.** [Sanitary Police Measures against Typhus in the Field.] *Münchener Med. Wochenschr., Munich*, lxiv, no. 33, 14th August 1917, pp. 1088–1089.

This is an account of a successful campaign against typhus on the Russian front by carefully watching the inhabitants in the area concerned and removing and isolating cases as soon as possible. One sanitary officer was usually sufficient for areas containing about 1,300 inhabitants. This system requires men and transport facilities, both of which are available in an army.

DA ROCHA-LIMA (H.). **Klinik und Aetiologie des sogen. "Wolhynischen Fiebers" (Werner-Hissche Krankheit). II. Ergebnis der ätiologischen Untersuchungen und deren Beziehungen zur Fleckfieberforschung.** [The Clinical Aspects and Aetiology of the so-called "Volhynian Fever" (Hiss-Werner's Disease). II. The Result of the aetiological Investigations and their Relation to the Investigation of Typhus.]—*Münchener Med. Wochenschr., Munich,* lxiv, no. 44, 30th October 1917, pp. 1422–1426, 3 figs.

The examination of several thousand sections of lice shows that *Rickettsia prowazeki* (which occurs exclusively in lice infected with typhus) is the sole micro-organism of this type that regularly develops as a parasite in the cells of the stomach and small intestine of the louse. Many other similar micro-organisms from sick and healthy persons are found in lice, and the only present means of differentiating between them and *R. prowazeki* lies in this biological character of cell-parasitism. As this last is ascertainable only by means of suitable dissections, no reliance can be placed in results obtained from smears. Lice from Volhynian fever patients (and sometimes from other sick persons and from healthy ones) may contain in the stomach gut a micro-organism very similar to *R. prowazeki*; this the author calls *R. pediculi*. *R. pediculi* chiefly differs from *R. prowazeki* by developing, not *in* the epithelial cells, but *on* them and in the lumen of the stomach, *R. pediculi* cannot be held to cause Volhynian fever unless a number of hypotheses are taken into account. It would appear that blood examination with the technical means at present available does not provide a sure method of determining the causative agent of typhus. The Volhynian virus is present in the blood not only during the fever stage but also long after, so that the dissemination of the disease by healthy carriers must be reckoned with.

KIRSCHBAUM (—). **Zur Epidemiologie der Malaria.**—*Münchener Med. Wochenschr., Munich,* lxiv, no. 43, 23rd October 1917, pp. 1405–1408.

This is an account of an epidemic of benign tertian malaria among German troops in north-western Russia which began in February and March 1916 amid ice and snow. It rose very rapidly to the culminating point in May and then fell somewhat less rapidly through June, July and August, reaching its end in October. The expected revival in August and September did not occur, and this abnormality is attributed to the inclement weather impeding the development of the parasites in the mosquitos, while it may also have been unfavourable to the mosquitos themselves. Except in July the temperature curve was below 60° F. and only once in July did it reach 68° F. The outbreak is held to be due to infections of the summer of 1915 that had remained latent and not to direct infections from mosquitos that had hibernated. The latent period therefore lasted at least 6 months (February 1917) and in some cases extended up to 11 months (July, 1917), during which time the troops were living under conditions of hard work and continued exposure, which are usually considered favourable to an outbreak. These conditions were very marked during the advance in 1915, and it is suggested that the resultant continued metabolic changes may have curbed injurious developments, while later on the men were resting in winter, a season during which the parasites were inactive.

Koch (J.). **Zur Uebertragung des Erregers des europäischen Rückfallfiebers (Febris recurrens) durch die Kleiderlaus.** [The Transmission of the Agent of European Recurrent Fever by the Clothes Louse.]—*Deutsche Med. Wochenschr., Berlin,* xliii, no. 34, 23rd August 1917, pp. 1066–1069, 6 figs.

An outbreak of recurrent fever among Rumanian prisoners of war enabled the author to ascertain that the clothes louse [*Pediculus humanus*] is by far the most common and dangerous transmitter of the disease. It is not necessarily the only one, for in the course of an experiment bed-bugs that were allowed to feed once on patients whose blood contained spirochaetes were immediately afterwards found to be infected, while others, used as controls, were not.

Kraus (R.) & Rosenbusch (F.). **Kropf, Kretinismus und die Krankheit von Chagas.** [Goitre, Cretinism and Chagas' Disease.]—*Wiener. Klin. Wochenschr., Vienna,* xxx, no. 35, 30th August 1917, pp. 1104–1105.

Maggio and Rosenbusch have shown that *Triatoma infestans* infected with a trypanosome, probably identical with *Trypanosoma cruzi,* occurs in many parts of Argentina [see this *Review,* Ser. B, iii, p. 205]. On the other hand goitre has only been found in the northern mountainous provinces of Salta and Jujuy. It has never been possible to demonstrate the presence of the parasite in the persons affected, nor do the acute forms of Chagas' disease found in Brazil occur in these provinces. Infected *Triatoma* abound in the Calchaqui valleys in Salta, but goitre and cretinism are absent. This is also the case in Cordoba and Buenos Aires, so that the conclusion is reached that in Argentina *Triatoma* does not convey Chagas' disease, perhaps owing to climatic conditions. Further information is required as to whether endemic goitre and cretinism occur in the mountainous districts of Brazil, and whether infected *Triatoma* and Chagas' disease are present in the plains.

Hase (A.). **Experimentelle Untersuchungen zur Frage der Läusebekämpfung.** [Experimental Investigations concerning the Control of Lice.]—*Centralbl. Bakt., Parasit. u. Infektionskr., Jena,* Ite Abt., Ref., lxvi, no. 14, 9th November 1917, pp. 344–346. [Abstract from *Zeitschr. Hyg. u. Infektionskr.,* lxxxi, 1916, p. 319.]

The first part of this paper records experiments against lice with various reagents. It was found that 3 and 5 per cent. solutions of cresol-soap killed lice and their eggs within an hour. At 1 per cent. strength 4 hours are required; this weaker solution is suitable for washing linen. These results also apply to carbolic acid, except that the 3 and 5 per cent. solutions require 2 hours. Soft soap is only useful as a mechanical aid when bathing. The second section deals with experiments with a vacuum apparatus, none of which were of practical use.

YOUNG (A.). **Arthropod Parasites suggested as a Factor in the Aetiology of Soldier's Heart and allied War Diseases.**—*Canadian Med. Assoc. Jl., Toronto,* vii, no. 11, November 1917, pp. 1020–1024.

It is suggested that the digestive secretion of parasitic animals, hitherto considered innocuous, may act as a toxin when introduced into the tissues of the human subject, and that the life-cycle of insects may explain the peculiar outbreaks and disappearances of epidemics, even when of bacterial origin, as there are probably many symbiotic relationships between insects and bacteria.

HIRST (S.). **On Three new Parasitic Acari.**—*Ann. & Mag. Nat. Hist., London,* xx, no. 120, December 1917, pp. 431–434.

The new mites described are *Chirodiscoides caviae,* gen. et sp. n., infesting the guinea-pig; *Demodex muscardini,* sp. n., found on *Muscardinus avellanarius* (dormouse); and *D. erinacei,* sp. n., which is possibly a variety of *D. caninus,* on an English hedgehog.

SHIPLEY (A. E.). **Health and Insect Life in War and Peace.**—*Jl. State Medicine, London,* xxv, no. 12, pp. 353–369.

This paper gives a popular account of the more common insects that attack man or his domestic animals, as well as those that interfere with his food supply.

WILLOUGHBY (W. M.). **Outbreaks of Plague on S.S. Sardinia and Matiana, 1917.**—*Lancet, London,* cxciii, no. 4919, 8th December 1917, pp. 867–869.

Fatal outbreaks of plague on two ships between Bombay and London are attributed to partial fumigation of these vessels. In each case cargo was discharged at an intermediate port, the holds being fumigated before unloading, and the outbreaks took place subsequent to fumigation. If the assumption be true that the rats were driven to the living quarters, it is important that all possible paths of communication for rats be closely investigated in any partial fumigation of a ship and the living quarters fumigated simultaneously with the holds, if the rats have a path of escape to them. The author also doubts whether the rat infection existing on these ships would have been disclosed at the proper moment for most effective action had the human cases not occurred. In practice the present safeguard against the landing of infected rats is the power of the port sanitary authorities to put questions and make examinations concerning rat mortality and sick rats. In the absence of repetition of the questions from day to day during a ship's stay in port a discovery of importance may not be disclosed at the proper time for effective action, if at all.

WATERFIELD (N. E.). **Two Cases of Filariasis.**—*Brit. Med. Jl., London*, no. 2976, 12th January 1918, p. 54.

These cases of filariasis are recorded from the Red Sea littoral of Arabia. Mosquitos (*Culex, Stegomyia* and Anophelines) abound in Jeddah, and this natural source of infection is accentuated by the presence of pilgrims from Central Africa, where filiariasis is rife. At Suakin, however, on the Sudan Red Sea littoral, where the conditions are exactly similar, even to the presence of pilgrims, the disease is unknown. The blood of both patients was found to contain embryos of *Filaria bancrofti.*

LEFROY (H. M.). **Two Experiments in House Fumigation.**—*Ann. App. Biol., London*, iv, no. 3, December 1917, pp. 115–118.

The first experimental fumigation of a whole house here described was in the case of one in the suburbs of Pusa, badly infested with the house mite (*Glycyphagus domesticus*), which had been driven into every part of the house by the attempted fumigation of single rooms. The house, which was composed of twelve rooms having a volume of approximately 30,000 cub. ft., was prepared by closing all apertures, all internal doors being left open. The insecticides tried were hydrocyanic acid gas and carbon bisulphide, the latter being used for the floors; the quantities required were 40 lb. of 98 per cent. cyanide with 40 lb. sulphuric acid, and 54 lb. carbon bisulphide. The chemicals were apportioned to the various rooms, etc., and the fumigation was carried out by three men, beginning at the top of the house. The total cost of chemicals worked out at about £3 10*s*. On visiting the house 26 hours later the fumes were so strong that it was impossible to enter it, so that it remained shut up for a total period of 69 hours. On opening it, search revealed a few living mites, but three months later no more had been found, and two months later still the house was reported absolutely clear. Probably a second fumigation 14 days later would have destroyed every mite, though both the egg and the hypopial stage of this pest are very resistant to fumigation.

The experiment shows that cyanide and carbon bisulphide can be used together; the escaping vapours are not offensive to neighbouring houses; the escape of gas from an ordinary house is slow; bisulphide vapour escapes slowly from ordinary ventilated floors; the cost of fumigation is not excessive; neither gas damages the contents of a house; a single fumigation at the strength used may be sufficient by destroying practically all the mites and making further increase impossible; carbon bisulphide alone, however, even at this strength is not very effective.

The second case of fumigation was that of a two-storey, semi-detached house of 18,000 cub. ft. capacity heavily infested with the usual wingless type of book-lice (PSOCIDAE). The infestation, which had lasted from April to August was due to the two foot space below the floor being damp and not well ventilated, the beams being covered with fungus and the whole forming a breeding-place for the Psocids, partial treatment as before having driven them from room to room. A similar fumigation was carried out with tetrachlorethane instead of carbon bisulphide, 12 lb. of 130 per cent. sodium cyanide and 12 lb. tetrachlorethane being used. The house was entered 48 hours after fumigation. There was no complaint from neighbours, no damage to property and the house was completely cleared. The cost of the chemicals used was about two guineas.

NICOLL (W.). **The Conditions of Life in Tropical Australia.**—*Jl. Hygiene, Cambridge*, xvi, no. 3, December 1917, pp. 269–290.

Insects are an important factor in influencing the conditions under which Europeans in tropical Australia are obliged to live. While the house-fly [*Musca domestica*] is less common than in England, *Stomoxys calcitrans* and *Tabanus* spp. are numerous. *Stegomyia fasciata* and *Culex fatigans* are common domestic mosquitos; Anophelines are much less abundant, *Anopheles maculipennis* being the species most frequently encountered. Ants are ubiquitous household pests, all food requiring to be most carefully screened from them and protected by ant traps. Their presence, although undesirable, is harmless, and they probably are of some value as scavengers. Cockroaches, principally *Blatta* (*Periplaneta*) *orientalis*, are equally troublesome in houses and frequently attack the bindings of books.

Both birds and frogs constitute important enemies of insect life in Australia; the tree frogs, *Hyla arborea*, *H. gracilenta* and *H. aurea*, all occur in great numbers and are particularly useful against household insects, frequently entering houses, where their presence, within reason, is undoubtedly beneficial. Lizards and snakes are probably useful in a similar manner.

Among human parasites, both fleas and lice occur, but apparently not in excessive numbers. *Xenopsylla cheopis* (Indian rat-flea) is probably the commonest, but *Pulex irritans* and *Ceratophyllus fasciatus* also occur on rats. *Phthirius pubis* is a common human parasite and *Pediculus capitis* and *P. humanus* (*corporis*) are not uncommon.

Dengue fever is considered to have been the cause of more sickness than any other disease in tropical Australia. Its occurrence is apparently seasonal, but an epidemic may extend over the better part of a year. Malaria is comparatively uncommon in North Queensland. The majority of cases originating in Australia are of the benign tertian type, though many serious cases are imported from adjoining regions, such as New Guinea. While outbreaks of plague have occurred, it has not become established in the continent, owing largely to efficient quarantine measures and to the sparsity of the population.

FLETCHER (T. B.). **Report of the Imperial Pathological Entomologist.**—*Scientific Reports Agric. Research Institute, Pusa, for 1916–17*: *Calcutta*, 1917, pp. 91–102. [Received 14th January 1918.]

The fly, *Chrysomyia* (*Pycnosoma*) *flaviceps*, the life-cycle of which is about 38 days, is strongly attracted to putrefying meat or dead animals and is capable of infecting meat by dropping its eggs through wire gauze. It is also attracted to over-ripe mango fruits and to a plant, probably a species of *Justicia*, which is also attractive to many other Diptera. Maggots extracted from human nostrils, from tumours, and from the foot of a cow suffering from foot and mouth disease were apparently of this species. This fly is always followed by a Calliphorine Muscid, probably another species of *Chrysomyia*, which is similarly attracted to putrefying meat, and the larvae of which are predaceous on other Dipterous larvae, especially those of *Sarcophaga*. Another peculiarity of this last species is the habit of producing progeny of one sex only by a given female, though parthenogenesis does not occur. *Sarcophaga ruficollis* is common in decaying matter of animal origin. The adult gives birth to living larvae instead of eggs, and these pupate after a larval period of 10 days, the pupal stage lasting for 20 days. Maggots extracted from a tumour of a patient in Pusa hospital proved to belong to a species of this genus. A species of *Lucilia*, the life-history of which occupies 25 days, is attracted to exposed meat and dead animals at almost all seasons except during the severe cold of winter. Adults have been kept alive for 6 or 7 weeks. The Sepsid fly, *Piophila casei*, breeds in the fatty tissues of meat. The larvae are parasitised by a small Hymenopteron, which, however, is not confined to this species, but attacks any fresh fly pupae, especially those of Phorids. The Phorid, *Aphiochaeta ferruginea*, is attracted to fresh meat and also to decomposed meat, in which it oviposits. The larva matures within 10 days, the pupal period lasting about 4 weeks. In *Ecitomyia* sp., another Phorid which frequents decomposing meat and animal matter, the pupal period is 15 days. Four species of HISTERIDAE, which have not as yet been found breeding in meat or dead animal matter, prey upon large flesh-fly larvae. *Musca nebulo*, *M. angustifrons*, *M. nigrithorax*, *Ulidia aenea* and a small Borborid, have been found feeding, but not breeding on exposed meat. The larvae and pupae of various CALLIPHORINAE are parasitised by Chalcids, which in their turn are attacked by a small hyperparasite.

Small Tabanids oviposit on the leaves of aquatic plants such as *Polygonum glabrum* and *Phragmites kurka* growing in shallow water, the time of egg-laying being between noon and 2 p.m. in the case of *Chrysops stimulans*, between 9 and 10 a.m. in that of *Tabanus bicallosus*, while *Haematopota* spp. oviposit mostly during morning and evening hours, but never during the heat of the day. The eggs of all these are free from egg-parasites. *Tabanus albimedius*, *T. striatus* and *T. hilaris* oviposit on any aquatic plants grown in deep or shallow water or in mud, or on leaves of large trees overhanging water. The egg-masses of *T. speciosus* are covered with some chalky substance and those of other large species of *Tabanus* are glued together, all these egg-masses being subject to attack by Chalcidid parasites. *T. nemocallosus* invariably oviposits on the upper portion of *Phragmites kurka* and *Lantana aculeata*, plants drooping over deep water. The gregarious larvae of this species show considerable resistance to death from drowning, while the eggs can stand submergence for 72 hours. Freshly emerged flies would not suck blood for some time, under laboratory conditions, being capable of resisting starvation for 5 days in humid surroundings. They show a marked tendency to drink water in captivity, and if the habit of sucking sugary food is acquired, the blood-sucking habit is resumed with reluctance. This fly has probably one brood in a year, the larval period being 9 or 10 months, the TABANIDAE generally hibernating in the larval stage. The eggs are parasitised by a small Chalcidid, which was also bred out from the eggs of an Acalyptrate fly.

Several species of *Culicoides* were bred out from green algae near the edges of a well-reservoir, both the larvae and adults of which differ from *Culicoides kiefferi*. The larvae congregate at one spot and remain half buried in the algal substance, occasionally coming to the water surface. Moulting and pupation take place under water, and the pupae remain floating on the surface, only those hatching out (after about 60 hours) that are capable of floating.

The flies bred from dung include:—*Philaematomyia insignis*, *Bdellolarynx sanguinolentus*, *Lyperosia minuta*, *Musca autumnalis* (*corvina*), *M. angustifrons*, *M. nebulo*, and *Ulidia aenea*.

The eggs of *Stegomyia albopicta* (*scutellaris*) are capable of resisting desiccation for over 6 months, provided that they have been kept moist for some time previously. At Pusa *S. albopicta* hibernates in the egg-stage until the hollows in trees are filled with rain-water towards the middle of the year. *Aëdes thomsoni* can also resist a long period of desiccation, but this capacity is much less marked in *Stegomyia w-album*, *Ochlerotatus gubernatoris*, *Armigeres obturbans*, and *Cyathomyia brevipalpis*. The rather rare mosquito, *Armigeres magnus*, appears early in the rainy season, breeding in bamboo stumps and occasionally in hollows of trees; it inflicts a rather severe bite. In the larval stage it is larvivorous, as are also *Culex concolor* and *Armigeres obturbans*. *Cyathomyia brevipalpis* is a sylvan species frequenting undisturbed, dark, dry places such as hollows in trees, in which it oviposits, as well as in stumps of cut bamboos. The following species have been reared from breeding traps consisting of cut pieces of bamboo filled with water:—*Stegomyia albopicta*, *S. w-album*, *Cyathomyia brevipalpis*, *Armigeres magnus* and *A. obturbans*.

Work in the Botanic Gardens, and Observations on Plants.—*Rept. Agric. Dept. St. Vincent for 1916–17*; *Barbados*, 1917, pp. 1–3. [Received 9th January 1918.]

It is stated that *Girardinus poeciloides* (millions fish) continues to thrive in a lily pond in the gardens, keeping down mosquito larvae and also controlling Aphids that occasionally attack lilies just above the water level. Fish from this pond introduced into swamps in two malarial districts have become well established, while in three other similar localities, though they have not been seen since their introduction, there is every reason to hope that they will survive and prove of value in mosquito control.

Cooley (R. A.). **Fourteenth Annual Report of the State Entomologist of Montana.**—*Montana Agric. Expt. Sta., Bozeman*, Bull. no. 112, December 1916, 76 pp. [Received 2nd January 1918.]

Ornithodorus megnini, Dug., the spinose ear tick, was discovered during 1916 on cattle in eastern Montana, very large numbers being taken from the ears of calves and young stock, which in consequence of the irritation were liable to loss of flesh and even death. Its occurrence in some localities in Montana for several years past is now an established fact, and measures must be taken against it as an important pest.

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Parker (J. R.). **Notes on the more common Mosquitos of Montana.**—*Fourteenth Annual Report of the State Entomologist of Montana; Montana Agric. Expt. Sta., Bozeman,* Bull. no. 112, December 1916, pp. 69–75. [Received 2nd January 1918.]

The great majority of the Montana mosquitos belong to the genus *Aëdes* and hibernate in the egg-stage, hatching taking place at various intervals during the following season under the influence of snow water, or of spring or summer rains. The eggs, which are laid on the ground, do not necessarily all hatch at the first flooding, and newly emerged larvae may appear at subsequent floodings. *A. curriei*, Coq., is one of the most abundant, most widely distributed, and most virulent of the Montanao msquitos, occurring in the river valleys and plains and hatching throughout the late spring and summer months whenever the necessary moisture is present; the larval period lasts from 5 to 7 days and the pupal period 2 to 3 days. The adults are voracious at all times, except when forced into inactivity by low temperatures or high winds. *A. sylvestris*, Theo., occurs in much the same localities as *A. curriei*, but in smaller numbers, the adults biting severely both by day and night. *A. nigromaculis*, Ludl., is another troublesome species, especially towards nightfall, occurring abundantly in some localities, but being much more restricted in range and in numbers than the two previous species. *A. spenceri*, Theo., bites severely both by day and night and has been found in similar localities. *A. pullatus*, Coq., is extremely annoying in several of the higher mountain valleys, where it has been taken in timber, but is not widely distributed. Other species which occur in small numbers and are not of much economic importance include *A. campestris*, D. & K., *A. fletcheri*, Coq., *A. idahoensis*, Theo., *A. hirsuteron*, Theo., and *A. fuscus*, O.S.

The species of Montana mosquitos belonging to the genus *Theobaldia* (*Cultseta*) seldom occur in such numbers as to be troublesome *T. inornata*, Willis., *T. incidens*, Thomps., *T. impatiens*, Walk., and *T. alaskaensis*, Lind., all pass the winter in the adult stage, the eggs being laid directly in the water in more or less permanent pools.

Only two species of the genus *Culex*, *C. tarsalis*, Coq., and *C. territans*, Walk., the former of which is stated to bite at night, occur in Montana. They are continuous breeders in more or less permanent pools, where the eggs are deposited directly in the water and hatch during the same season.

There are only three records of the occurrence of an Anopheline mosquito, viz., *Anopheles occidentalis*, D. & K.

Schoppe (W. F.). **Control of Poultry Lice and Mites.**—*Univ. Montana Agric. Expt. Sta., Bozeman,* Circ. 64, February 1917, pp. 65–71, 6 figs. [Received 2nd January 1918.]

Infestation of poultry with *Dermanyssus gallinae* (poultry mite), which is far more harmful than the louse, is induced by want of sanitation and cleanliness. A satisfactory spraying solution consists of 4½ gals. water, 1 quart Zenoleum, 1 quart kerosene, and this should be applied with a stiff brush or force pump so as to reach all crevices.

Menopon pallidum (poultry louse) is specially harmful to young chicks, occurring on the head and under the wings, while in the adult they are most common just below the vent. Each bird must be treated separately by dusting, by applying grease or mercuric ointment, or by dipping. An effective dusting powder may be made by mixing together 3 parts gasoline and 1 part crude carbolic acid (90–95 per cent. strength). If the latter cannot be obtained, 3 parts gasoline and 1 part cresol should be taken and mixed together, enough plaster of Paris being then added gradually, while stirring, to take up all the moisture. This powder should be worked thoroughly into the feathers. Greasing the head and under the wings with lard is the method usually adopted with young chickens. For older birds, mercuric ointment (1 part), mixed with vaseline (2 parts), should be well rubbed into the skin below the vent and under each wing, care being taken not to leave it in lumps upon the feathers for fear of poisoning.

For mature birds, a quicker and more satisfactory method is that of dipping, which is quick and inexpensive but cannot be used in the case of table poultry, as the odour remains in the feathers for months and imparts a disagreeable flavour to the flesh. Any of the sheep or cattle dips can be used, provided that the solution is rather weak, heated to a temperature of 60° F., and that the operation is carried out on a warm day.

Howard (C. W.). **A Demonstration in Mosquito Control.**—*Jl. Econ. Entom., Concord, N.H.*, x, no. 6, December 1917, pp. 517–521.

This paper describes a campaign undertaken in Minneapolis for the purpose of ridding at least one part of the town from mosquitos, though they have not carried malaria or any of the mosquito-borne diseases to either Minneapolis or Minnesota, in spite of the fact that both *Anopheles maculipennis* and *A. punctipennis* are present. Other species constituting troublesome pests in these cities are *Aëdes canadensis, A. sylvestris, Culex pipiens, C. restuans* and *C. tarsalis*, with several of minor importance such as *Taeniorhynchus* (*Mansonia*) *perturbans*.

The plan followed was to select some ten square miles in the Lake district of south Minneapolis and work on this as a demonstration in order to gain support from the public for the larger undertaking that was contemplated. The work was begun in June, too late for the control of the first spring brood of *A. canadensis* and *A. sylvestris*, but the later broods were held in check. A weekly inspection of every yard and premises in the district was made and the swamps sprayed four times during the season. Every attempt was made to eliminate breeding-places and to interest the public in rendering assistance. By 1st August few mosquitos were left; screens to doors and windows ceased to be a necessity and the pest was no longer troublesome.

As a demonstration of the possibilities of mosquito control under city conditions the campaign was a marked success, and shows what can be done when the work has been well planned and carefully carried out by capable inspectors. The area chosen was one of the most difficult parts of the city in which to carry out control work, and a preliminary survey confirms the opinion that the entire city could be practically freed from mosquitos at small cost, while the reduction of house-flies could be also undertaken by the same staff of inspectors. With flies and mosquitos under control, many sources of disease would be eliminated, and expensive screens on doors, windows and porches would no longer be needed. It is hoped, with the assistance of the City Health Department, to work on a larger scale next season with a large staff of inspectors.

Howard (C. W.). **New Tick Records for Minnesota.**—*Jl. Econ. Entom., Concord, N.H.*, x, no. 6, December 1917, p. 560.

Two examples of *Ornithodorus talaje* are recorded from Minnesota, having presumably been sent from Oklahoma in hay used to pack glass. This species has formerly been reported from Florida, Texas and California. *Dermacentor albipictus* is another tick that has recently become established in Minnesota, having in all probability been introduced on wapiti brought from Montana two or three years previously.

Howard (C. W.). **A Suggestion for the Destruction of Cockroaches.**—*Jl. Econ. Entom., Concord, N.H.*, x, no. 6, December 1917, p. 561.

As superheating has been found to be a successful method for the control of bed-bugs [*Cimex lectularius*] in dwelling houses, it would seem probable that the cockroach, *Phyllodromia* (*Blattella*) *germanica* (croton bug), might be controlled in the same way. The author has conducted experiments to ascertain the degree of heat fatal to this species. Temperatures below 120° F. were variable in their effect, but exposure to a temperature of 122° F. to 140° F. for 20 minutes destroyed them all. This method is difficult to employ, owing to the habit of this insect of hiding in cracks, between walls, etc. Cold has also been found very destructive to this cockroach. Exposure to 24° F. for three hours killed all insects treated, 18° F. killed all in 20 minutes, 10° F. in 5 minutes, and 0° F. in 5 to 10 minutes. Practical tests based upon these observations have not yet been made, but the suggestions are offered for what they are worth.

Crumb (S. E.) & Lyon (S. C.). **The Effect of Certain Chemicals upon Oviposition in the House-fly** (*Musca domestica*, **L.**).—*Jl. Econ. Entom., Concord, N.H.*, x, no. 6, December 1917, pp. 532–536.

During the summer of 1916, the authors were engaged in investigating the question of the substances in horse manure that stimulate females of *Musca domestica* to oviposit. It was found that the ether extract possessed this quality in some degree, but that the chief incitant remained after complete ether extraction and was a product of fermentation. Further investigation gave positive evidence that this stimulant was carbon dioxide. Experiments were then carried out for testing more thoroughly the effect of both ammonia and carbon dioxide on fly oviposition. An apparatus was devised, and is described in this paper, for these tests and the results are given in tables. Carbon dioxide was found to give an 82·8 per cent. higher stimulus to oviposition than ammonia.

Brandt (F. R.). **Revision of Veterinary Report for the Year 1916.**—*Nigeria Ann. Rept. Agric. Dept. Northern Provinces for 1916, Lagos*, 1917, pp. 7–10. [Received 28th January 1918.]

Trypanosomiasis was very prevalent in the southern part of the Northern Provinces, the trypanosomes varying considerably in virulence. Tsetse-flies were found on the streams on some ranches and cattle moved there contracted trypanosomiasis during the rainy season.

Froggatt (W. W.). **"Policemen Flies." Fossorial Wasps that catch Flies.**—*Agric. Gaz. N.S.W., Sydney*, xxviii, no. 9, 3rd September 1917, pp. 667–669, 2 figs. [Received 28th January 1918.]

Fossorial wasps are predaceous on small flies, especially *Musca autumnalis* (*corvina*). They have also been noticed in sheep-yards picking off *Chrysomyia* (*Calliphora*) *varipes* from the soiled wool on sheep's backs. Three species that are known to have this habit are *Stizus turneri*, sp. n., common all over the western districts of New South Wales, and found burrowing in a sand-drift left by river flood waters in February; *Stizus* sp. a widely distributed species, that has frequently been recorded as catching flies on the fleece of sheep; and *Nysson* sp., which has the same distribution and habits as the two previous ones.

Leake (J. P.). **Winter Outbreak of Poliomyelitis. Elkins, W. Va., 1916-17.**—*U.S. Public Health Repts., Washington, D.C.*, xxxii, no. 48, 30th November 1917, pp. 1995–2015, 5 charts, 1 table.

In the course of the investigations into the cause of the winter outbreak of poliomyelitis at Elkins, the conclusion was reached that summer insects did not play any necessary rôle in the spread of the disease. Careful watch revealed only a few rather sluggish house-flies and other non-biting flies, while mosquitos were seen out of doors on three days, but *Stomoxys calcitrans* was never found, though stables, manure piles and sunny walls were searched repeatedly. An argument against the spread of the disease by insects commonly associated with filth, such as bed-bugs and lice, lies in the fact of its incidence in most cleanly homes.

Chidester (F. E.). ***Dytiscus* as a Destroyer of Mosquito Larvae (Col., Dipt.).**—*Entom. News, Philadelphia*, Pa., xxviii, no. 10, December 1917, p. 454.

The larvae of Dytiscid beetles have long been considered important enemies of the mosquito. Laboratory experiments showed that a single individual placed in a small jar containing many mosquito larvae killed great numbers, as many as 434 being destroyed in two days. The author has however found many larvae in pools also occupied by Dytiscids and concludes that, while these beetles may be of great importance in killing larvae when present in tremendous numbers, where the larvae are widely distributed, there is little likelihood of their complete extermination by this enemy.

Howard (L. O.). **Remedies and Preventives against Mosquitos.**—*U.S. Dept. Agric., Washington, D.C.*, Farmers' Bull. no. 444, 1917, 15 pp.

Protection from the bites of mosquitos may be obtained by the use of protective liquids, such as spirits of camphor, oil of pennyroyal, oil of peppermint, lemon juice, vinegar, and oil of tar, of which a few drops should be rubbed on the face and hands or sprinkled on the pillow at night. The drawback to the use of these is, however, that their effect does not last through the night. Oil of citronella retains its effectiveness for several hours, while a mixture of oil of citronella 1 oz., spirits of camphor 1 oz., oil of cedar ½ oz., will usually keep the common house mosquitos away if a few drops are placed on a towel hung over the head of the bed, or rubbed on the face and hands. Even this mixture loses its efficacy towards the end of a long night and therefore offers no protection against the attacks of *Stegomyia fasciata*, F. (*Aëdes calopus*, Meig.), the yellow-fever mosquito, which begins to bite at daylight. Another mixture, avoiding the use of oil of citronella with its unpleasant odour, consists of castor oil 1 oz., alcohol 1 oz., oil of lavender 1 oz. A mixture that successfully retards the evaporation of the oil of citronella is made of oil of citronella 1 oz., and liquid vaseline 4 oz. Oil of cassia, a 5 per cent. solution of potassium sulphate, and pure kerosene have all been recommended, the last being extensively used in the Philippines.

As a means of protection, the screening of houses, the use of netting for beds, and the wearing of veils and gloves after nightfall are obvious necessities in badly infested regions, while rain-water supply tanks and barrels should also be screened, unless fish can be placed in them to destroy the larvae.

Smudges and fumigants consisting of substances that emit a dense smoke on burning are commonly used in camps and houses. Of these pyrethrum powders are very effective when fresh and pure, and are most economically used by moistening and moulding them into small cones, which, after drying, burn readily when lighted at the apex. A more economical method is that of burning the powder on a metal screen above the chimney of a kerosene lamp, though to clear houses of mosquitos effectively, pyrethrum must be burned at the rate of nearly 1 lb. powder to every 1,000 cu. ft. of space.

Mimms culicide is a liquid that may be kept for some time in air-tight jars, and is made of equal parts by weight of carbolic acid crystals and gum camphor. The acid crystals are melted over a gentle heat and poured slowly over the gum, forming a clear, rather volatile liquid, with a pleasant odour. In fumigating, 3 oz. of this mixture should be volatilised over a lamp of some kind for every 1,000 cu. ft. of space, the rooms treated being made as nearly air-tight as possible. Fumigation against possible disease-bearing mosquitos is best effected by burning lump sulphur in a small pot, at the rate of 2 lb. sulphur for each 1,000 cu. ft. of space. Other recommended deterrents are the burning of dried orange peel or powdered jimson weed (*Datura stramonium*) which burns more freely if mixed with nitre or saltpetre, 1 part to 3 of *Datura*.

Descriptions of two apparatuses, one for catching and the other for trapping mosquitos, are given, with a list of popular remedies for mosquito bites.

The subject of the abolition of breeding-places is fully dealt with, especially those of *Culex pipiens*, *C. fatigans* (*quinquefasciatus*) and *Stegomyia fasciata*, which breed in every chance receptacle of water, many of the more unlikely ones being enumerated.

Other mosquitos that breed in swamps and salt marshes must be dealt with by drainage measures, or, when this method is not practicable, by oiling the water surface, common kerosene being the most satisfactory oil, as regards both efficiency and price. A special larvicide, largely used in Panama has already been noticed [see this *Review*, Ser. B, iv, p. 97].

Control by means of natural enemies is of practical value, one of the most useful being a gold-fish of the genus *Girardinus*, which destroys the larvae, as do also some aquatic insects, while others as well as birds and bats eat the adults.

The planting of certain trees and plants, such as *Eucalyptus*, the castor-oil plant and china-berry tree, is sometimes stated to act as a deterrent, though there is little scientific evidence of this.

HERMS (W. B.). **The Mosquito Survey of California. An Account of the Second Season's Work.**—*Mthly. Bull. Cal. State Bd. Health, Sacramento*, xiii, no. 6, December 1917, pp. 267–271.

In the course of this detailed account of the work of the mosquito survey from May-October, 1917, the author records the occurrence of salt-marsh mosquitos in several districts, these being the only ones found in the San Francisco Bay area. With very few exceptions the Anophelines collected along the coast were *Anopheles pseudopunctipennis*, a slight or ineffective carrier of malaria.

An inspection of the smaller military camps showed that, owing to ignorance, the sanitary conditions, particularly with regard to flies, mosquitos and the disposal of camp sewage, were very imperfect, in many cases Anopheline mosquitos being found breeding within a few feet of the tents. On another camp site *Anopheles quadrimaculatus*, *A. punctipennis* and *A. pseudopunctipennis* were found to be breeding, while the salt-marsh mosquito, *Aëdes curriei*, was at times very troublesome.

Much good would doubtless result from a greater measure of uniformity and co-ordination in administration.

LAGRIFFOUL (A.) & PICARD (F.). **Remarques sur le Paludisme dans la XVI^e Région. Cas autochtone à *Plasmodium praecox*.** [Remarks on Malaria in the 16th District. A locally-acquired Case due to *Plasmodium praecox*.]—*Bull. Soc. Path. Exot., Paris*, x, no. 10, 12th December 1917, pp. 883-885.

The majority of the cases of malaria from Macedonia were contracted in the summer of 1916. Although the conditions were highly favourable for infection by *Plasmodium praecox*, the causative agent in most cases was *P. vivax*. Very few cases of the simultaneous presence of these two parasites were observed. The persistence of *P. praecox* was remarkable, lasting for more than a year after the original infection.

With regard to France, several interesting observations have been made. Although ague has never completely disappeared from Hérault, cases had become very rare in the years preceding the war. A decided recrudescence has however been observed recently in Montpellier and other localities. Among these cases, several were undoubtedly locally acquired and were of the type produced by *Plasmodium vivax.* Although this recrudescence of malaria might be explained by the presence of soldiers repatriated from Salonika, African troops and Turkish prisoners employed in agricultural work, the fact that the tertian benign form had existed in the district long previously indicates some local cause. The history of one particular case seems to point definitely to this conclusion. A Basque sapper, recently convalescent, who had never been to Salonika nor out of France, was found to carry schizonts and gametes of *Plasmodium praecox.* After being at Montpellier for some time he was sent into barracks at Lattes, where, eight days after his arrival, he suffered from a first attack of fever, which was soon followed by several others. As the incubation period is 15 days the infection could not have been acquired at Lattes, and every indication points to this patient having become infected in the barracks at Montpellier, where many malaria-carriers are stationed temporarily. These barracks, moreover, are beside a stream where many Anophelines breed, while a neighbouring river also harbours many mosquito larvae.

This record demonstrates the urgent necessity for the anti-anopheline organisation created in France by the State and the utility of the preventive measures that must be taken if *Plasmodium praecox* is not to become definitely established on French soil. The presence of locally-acquired tertian malignant malaria should cause no surprise: it is propagated in Macedonia in regions where the summer and autumn are no warmer than in the French Mediterranean region, Montpellier being the French town for which the maximum summer temperature is recorded.

DE GOYON (J.) & BOUVIER (J. E.). **La Lutte antipaludique dans un Régiment d'Infanterie coloniale en Orient, 1917.** [The Anti-malarial Campaign in a Colonial Infantry Regiment in the Balkans, 1917.]—*Bull. Soc. Path. Exot., Paris,* x, no. 10, 12th December 1917, pp. 886–890.

Anti-malarial measures in a colonial infantry regiment in the Balkans were undertaken with special care during the summer of 1917, owing to the particularly unfavourable conditions under which this unit was placed. Drainage and oiling operations were extensively carried out in view of the abundance of Anophelines, of which the most common species was *A. maculipennis.* Experience showed the necessity of convincing both officers and men of the existence of malaria and of the measures essential to their protection from the disease. Quinine was found to be a valuable preventive, provided that the doses are regularly taken. Mechanical protection should be compulsory, but improved patterns of both the mosquito net for day wear and the mosquito tent are required. The use of citronella ointment was not popular among the men, particularly as in Macedonia water for washing was frequently scarce. Wherever possible doors and windows should be screened with wire screening. Troops were kept as much as possible on elevated positions and removed from the native carriers.

Malaria patients were treated mainly in isolation camps. No fatal case was recorded during the whole summer. It is very desirable that special laboratories under the control of the anti-malarial mission should be established wherever possible near the military stations.

Cot (—) & Hovasse (—). **Quelques Remarques sur les Anophélines de Macédoine.** [Some Remarks on the Anophelines of Macedonia.] —*Bull. Soc. Path. Exot., Paris,* x, no. 10, 12th December 1917, pp. 890–896.

In the course of a study of the Anophelines of Macedonia, the authors have found only three species in the region of Salonika, namely, *Anopheles maculipennis, A. bifurcatus* and a variety of *A.* (*Pyretophorus*) *superpictus* for which the name *macedoniensis* is proposed. *A. bifurcatus* is extremely rare and none of the specimens captured proved to be infected. *A. maculipennis* abounds mainly in marshy land, and with it colonies of *A. macedoniensis* occur, both species being vectors of malaria. The latter form is described and differentiated from its allies, *A. superpictus* and *A. palestinensis.* The life-cycle of these Anophelines is essentially variable, particularly in the larval stage, the duration of the larval development being dependent upon temperature and nutrition. It was found, contrary to the generally accepted opinion, that neither an altitude of about 3,000 feet, nor a night temperature as low as 50° F., is sufficient to arrest development The minimum period of development has been recorded in mid-August, nymphs of *A. superpictus* var. *macedoniensis* having been obtained in 36 hours under natural conditions. This period, which is shorter than anything previously recorded, indicates the probability of an additional generation of Anophelines in Macedonia during the summer season. Though Hydrachnid larvae have been recorded as ecto-parasites of Anopheline larvae and though many were present in the streams examined, no such parasitisation was observed. A considerable number of larvae were found parasitised by microscopic algae, and their development was considerably retarded in consequence. These individuals however produced normal nymphs some 20 days later than unparasitised ones, and it is evident that the internal changes preparatory to the nymphal stage entirely eliminated the parasite. This fact has apparently not been previously recorded, and is of importance as having a bearing on the malaria question, since these parasitised larvae, developing after varying periods, produce, as it were, a continuity of hatching between the successive generations.

The percentage of Anophelines found to be infected was 8 per cent., the ookinetes apparently agreeing with the characteristics previously described for *Plasmodium falciparum.* Oocysts were found in various stages of evolution. Only in three cases were the salivary glands found to be infected. It is the authors' intention to discuss this subject further when investigations have been completed.

Suldey (E. W.). **L'Index endémique du Paludisme à Madagascar.** [The Endemic Index of Malaria in Madagascar.]—*Bull. Soc. Path. Exot., Paris,* x, no. 10, 12th December 1917, pp. 915–923.

This paper gives the results of many blood-examinations of native children in Madagascar during a journey on the west coast in 1913–1914, in one of the most unhealthy regions of the colony. Haematozoa were found in about half the cases examined, though an enlarged spleen was rarely found.

LACASSAGNE (A.). **Considérations pratiques sur la Prophylaxie et le Traitement des Paludéens en Macédoine.** [Practical Considerations of the Prophylaxis and Treatment of Malarial Subjects in Macedonia.]—*Bull. Soc. Path. Exot., Paris,* x, no. 10, 12th December 1917, pp. 923–932.

The author records in this paper the results he has obtained in the treatment of malaria through two summer and autumn seasons with the Balkan army. His experiences have led him to the conclusion that malaria among the army in Salonika should be treated by the standard methods, the application of which should be supervised. He considers that quinine is the only medicine required, the best method of administration being by the mouth; this treatment should be prolonged and thorough, and is quite compatible with regimental service in war time. Anti-malarial prophylaxis is quite possible and can be made in a large measure a sufficient preventive of the disease, but can only be efficiently carried out by regimental doctors when acting under military authority and when themselves convinced of the efficacy of their methods.

RAVERET-WATTEL (G.). **Le *Gambusia affinis,* Baird et Girard : Son Utilisation pour la Destruction des Moustiques.** [*Gambusia affinis*: Its Use in the Destruction of Mosquitos.]—*Bull. Soc. Nat. Acclimat., Paris,* lxiv, no. 12, December 1917, pp. 445–451, 1 fig.

This paper gives an account of *Gambusia affinis,* a small fish that lives almost entirely on the larvae of harmful insects. In waters where mosquito-eggs are laid the larvae constitute the principal diet of *G. affinis,* being devoured in enormous quantities. This fish is considered superior to any other species as a mosquito-destroyer.

TAYLOR (F. H.). **Report for January to June, 1916.**—*Half-Yearly Rept. Australian Inst. Trop. Med., Townsville, Queensland, from 1st January to 30th June, 1916, Commonwealth Australia, Govt. Printer for State of Victoria,* 1917, pp. 6–8. [Received 25th January 1918.]

Investigations on the value of potassium cyanide as a larvicide have shown that when used at the strength recommended by Ross and Edie (*Ann. Trop. Med. & Parasitology,* v, p. 385, 1911) it is very destructive to the egg and young pupal stages of mosquitos, but is not so harmful to the pupae. Owing to the number of grades of potassium cyanide on the market, further experiments are necessary before definite results can be obtained.

Experiments to test the effectiveness of a cresyl fumigation apparatus against mosquitos are not yet completed. Investigations into the relative mosquito density of a given area of Townsville are being carried out.

The following species have been identified:—CULICIDAE: *Pseudoskusea basalis,* Tayl., *Reedomyia pampangensis,* Ludl., *Mansonioides (Taeniorhynchus) uniformis,* Theo., *Taeniorhynchus (Chrysoconops)* *aurites*, Theo., *T. brevicellulus*, Theo. (*acer*, Theo.), *Ochlerotatus* (*Scutomyia*) *notoscriptus*, Skuse, *O.* (*Culicelsa*) *vigilax*, Skuse, *O.* (*Culicada*) *annulipes*, Tayl., *O.* (*C.*) *cumpstoni*, Tayl. var., *Lophoceratomyia* sp. n., *Culex sitiens*, Wied., *C. fatigans*, Wied., *C. sagax*, Skuse, *Macleaya tremula*, Theo., *Culicada demansis*, Strick., *C. vandema*, Strick., *Stegomyia tasmaniensis*, Strick., and *Hulecoeteomyia* sp. n.

TABANIDAE: *T. cinerescens*, Macl., *T. nigritarsis*, Tayl., *T. rufinotalis*, Bigot, *T. nemopunctatus*, Ric., *T. duplonotatus*, Ric., *Silvius frontalis*, Ric., and *S. elongatulus*, Tayl.

FROGGATT (J. L.). **A Simple Type of Blow-fly Trap.**—*Agric. Gaz. N.S.W., Sydney*, xxviii, no. 9, 3rd September 1917, p. 626, 1 fig. [Received 28th January 1918.]

The method of destroying sheep-maggot flies by trapping them before they have time to deposit their eggs upon the sheep is one that is yielding good results. A cheap and simple trap can be made by covering the open end of an empty kerosene tin with wire gauze which must overlap the sides about 2 inches. Let into the centre of this cover is a funnel, 4 inches in diameter and 5 inches long, the opening at the apex, inside the tin, being about the size of a threepenny piece. The inside of the tin is painted white, the outside also being painted as a protection. The trap can be baited with any offal or with sour milk.

HADLINGTON (J.). **Poultry Notes.**—*Agric. Gaz. N.S.W., Sydney*, xxviii, no. 9, 3rd September 1917, pp. 671–673. [Received 28th January 1918.]

Vermin in poultry houses naturally fall into two groups, parasites that live and hibernate in the poultry house on roofs, etc., such as *Dermanyssus gallinae* (red mite), and those which pass their whole existence on the fowl, such as *Goniocotes abdominalis* (large chicken louse). The latter may be combated with a dust bath, or by dusting the birds by hand with insecticides, or sulphur, or with equal parts of sulphur and fine ashes. The best method of keeping poultry houses free from vermin is to spray them with kerosene emulsion as often as necessary. The emulsion, which should be applied by a force pump so as to reach all the cracks and crevices, is composed of 8 oz. soft soap dissolved in 1 gal. boiling water, 1 gal. of kerosene being slowly added while stirring, and the whole thoroughly shaken to effect emulsification. For use, 10 gals. soft water must be added, and if the spray is to be also a disinfectant, one tablespoonful of miscible carbolic acid to each gallon of emulsion should be stirred in. Where the infestation is severe, 2 or 3 applications may be necessary at intervals of 1 or 2 days.

PARODI (S. E.). **Acción Patógena de los Ixodideos.** [Pathogenic Action of Ixodids.]—*Anales Soc. Rural Argentina, Buenos Aires*, li, no. 2, March-April 1917, pp. 111–124. [Received 31st January, 1918.]

This paper is a review of the subject of tick-infestation, and gives an account of the various parasites transmitted by Ixodids and of their evolution in the tick and in the animal host. The method of transmission from tick to host is described. The ticks dealt with include *Margaropus annulatus*, which transmits *Piroplasma bigeminum* and

Anaplasma marginale as well as *Theileria* and *Nuttallia.* The author records his own experiences in the investigation of the evolution of the parasite in the tick. While studying the transmission of *Anaplasma* he has come to the conclusion that *Stomoxys* and Tabanids do not transmit this disease. Healthy animals placed with those infected, but freed from ticks, remained uninfected although they were attacked by these flies.

Campaña contra la Garrapata. Medidas Oficiales. [Campaign against the Tick. Official Measures.]—*Anales Soc. Rural Argentina, Buenos Aires,* li, no. 2, March-April 1917, pp. 124–125. [Received 31st January 1918.]

The Argentine Government, acting upon the advice of the Ministry of Agriculture and upon information furnished by various agricultural societies, issued a decree in April 1917 for the purposes of (1) calling attention to the losses caused by ticks, (2) pointing out the necessity for vigorous sanitary action, and (3) authorising the application of the measures suggested by a Commission appointed by the Ministry of Agriculture in October 1916, if considered suitable by the Live Stock Department.

The decree defines the limits of certain areas as tick-free, intermediate or infested. Very strict rules are laid down regarding the movement of cattle from one area to another; these will be enforced two years after the date of the decree. Cattle may be moved from unclassified establishments only after preliminary dipping and then only within their own defined area. Official dipping-tanks will be installed in the larger cattle markets and wherever considered necessary throughout the intermediate and infected areas. Corrals are to be set apart for the temporary housing of tick-free cattle journeying from the north. The best insecticides for tick eradication will be obtained and exact instructions issued for their application in varying proportions throughout the different seasons, as well as practical instructions for dipping. The biology of the tick [*Margaropus annulatus*] and methods for its destruction are to be studied under direction of the Ministry of Agriculture, and only competent inspectors will be chosen to superintend the dipping-tanks. All expenses in connection with tick treatment will be reduced to a minimum.

Popoff-Tcherkasky (D.). **Beitrag zur Kenntnis der Differentialcharacter zwischen** *Pediculus capitis,* **de Geer, und** *Pediculus corporis,* **de Geer.** [A Contribution to the Knowledge of the Differential Characters between *P. capitis* and *P. humanus* (*corporis*)]. —*Centralbl. Bakt., Parasit. u. Infektionskr., Jena,* 1te Abt., Orig., lxxix, no. 1, 19th December 1916, pp. 29–33, 4 figs.

In this paper, dated July 1914, the differential characters of *Pediculus capitis* and *P. humanus* are reviewed, the conclusion being reached that these are two extraordinarily closely allied species. It may indeed be supposed that man was originally parasitised by a single species of louse that later became differentiated by adaptation to different habitats. The only constant differential character is the greater length of the antennae and of the femora of the first pair of legs in *P. humanus.*

Galli-Valerio (B.). **Beiträge zur Biologie und zur Bekämpfung der Läuse. 3. Mitteilung.** [Contributions to the Biology and Control of Lice. 3rd Communication.]—*Centralbl. Bakt., Parasit. u. Infektionskr., Jena,* 1te Abt., Orig., lxxiv, no. 1, 19th December 1916, pp. 33–35.

The head louse [*Pediculus capitis*] cannot be induced to live on white mice, though experiments made to determine whether this was due to the light colour of the host were inconclusive. The protective value of various substances against the bites of lice was investigated, basic nicotine (12 per cent.) alone proving of any use. A number of insecticides were tested and it was found that oils kill lice quickly, especially the thicker kinds, as these adhere better.

Steudel (—). **Fraktionierte Entlausung.** [Louse Eradication in successive Stages.]—*Münchener Med. Wochenschr, Munich,* lxiv, no. 42, 15th October 1917, pp. 1373–1375.

The process of eradicating lice on man by a single treatment requires so much time and care as to be inapplicable where a large number of troops is involved. In the case of a division or entire army which has become infested during mobile operations it is not feasible—at the beginning of a war of positions—to change quarters after disinfection or to disinfect the men thoroughly. It is suggested that disinfection by successive stages solves the problem. This method aims at destroying as many lice and eggs as possible on each of several occasions divided by a 14-day interval. Each treatment comprises bathing the men and passing their clothes through a heating apparatus. The first one will kill the majority of the lice and eggs and the second will kill almost all the lice that previously escaped as well as individuals that have since hatched. The 14-day interval does not allow the lice to increase to such an extent as to induce migration, so that the second treatment will—theoretically—dispose of all the lice, leaving a small number of eggs only. A third treatment after a similar interval will kill all the lice hatched from these eggs, while they are still immature, and should ensure total eradication. An example is given of the practical working of this method in the case of a body of troops 2,000 strong equipped with a plant capable of dealing with 30 men and their equipment.

Werner (H.). **Die Malaria im Osten und ihre Beeinflussung durch die Besonderheiten des Krieges nebst Bemerkungen über Anophelenbiologie und Malariatherapie.** [Malaria on the Eastern Front and the Influence exercised on it by the Special Conditions of the War, with Remarks on its Treatment and on the Biology of Anophelines.]—*Münchener Med. Wochenschr., Munich,* lxiv, no. 42, 15th October 1917, pp. 1375–1377.

In the case of malaria on the eastern front the annual curve of endemicity varies from the usual type owing to the abnormal conditions due to the War. In this paper a chart of the incidence of the disease in a corps in the summer of 1916 shows that malaria was present in March, remained at the same low level until mid-April, then increased up to the first week in June, and after diminishing till the first week in

July, suddenly greatly increased up to the first week in August, afterwards decreasing until it reached its original level at the end of September. There were thus two waves, a small one in May and a large one in August. The civil population had been removed from the district and the military placed in occupation were practically free from malaria. The first outbreak is attributed to infected Anophelines that had hibernated. The incidence of Anophelines is roughly parallel to that of the second outbreak, but about three weeks earlier. The newly emerged mosquitos are not believed to have derived their infection from the civil population, soldiers infected in the first outbreak, Russian prisoners or deserters, or the Russian front opposite. The survival of the hibernated mosquitos is also rejected as a possible source, because it would give a uniform curve, decreasing gradually. Apart from prolonged incubation in the troops, the inheritance of malarial infection in the mosquito provides the only explanation of this phenomenon. The inheritance of typhus infection in the louse and of relapsing fever in the tick are analogous cases.

In the section dealing with the biology of Anophelines the preference of these mosquitos for latrines is recorded [see this *Review*, Ser. B, v, p. 62], as well as their remarkable power of resistance to intense cold, they being found to occur in localities where for several weeks the temperature was between 14° and —15° F.

KLINGMÜLLER (—). **Ueber die Bettwanze.** [The Bed-Bug.]—*Münch. Med. Wochenschr., Munich,* lxiv, no. 52, 25th December 1917, pp. 1653–1654.

This paper records a number of observations on bed-bugs [*Cimex lectularius*], which are very abundant on the Russian front, where they may perhaps be concerned in the transmission of disease, though the author does not believe this to be the case.

When moving, the bugs easily lose their hold and this accounts for their falling from ceilings on to persons sleeping beneath. They feed on man and other mammals, though they do not, as a rule, suck blood immediately they are placed on the flesh, but wander about for some time. Their saliva probably contains a substance that prevents the blood from coagulating, and this and the mechanical injury caused probably give rise to the irritation produced. All persons are bitten indiscriminately, though some suffer much more inconvenience than others. Individual bugs can live for over a year, and one example was kept in captivity for 440 days. They are very resistant to starvation, some surviving after 221 days without food, while young bugs that had never fed lived for 150 days. They can also withstand such low temperatures as 0° F. [in the original, —17°, which is assumed to be Centigrade], living in a torpid state, and even quite young individuals survive the winter cold. Bugs are therefore able to survive for over six months in an uninhabited house. The eggs are more sensitive to cold, and if exposed to low temperatures they fail to hatch. Odour does not appear to guide bed-bugs in their search for blood, nor do they seem able to distinguish colours. When not seeking food, they usually remain in one place and appear to prefer a wooden surface. They are easily killed in water and other harmless fluids, while soapy water, alcohol, benzol, etc., destroy them very rapidly.

To destroy them walls and bedsteads may be scorched with a soldering lamp, and the author cleared a barracks in this manner. Before reaching maturity the bed-bug undergoes 5 moults at intervals ranging from about 10 days to several months. In most cases severe cold and prolonged hunger delay moulting and general development. In the case of 35 bugs the total life-cycle occupied an average of 210 days. Mating takes place some days after the fifth moult. Oviposition occurs throughout the year. In the case of 131 eggs hatching took place after an average period of 23 days.

NATVIG (L. R.). **Beitrag zur Biologie der Dasselfliegen des Renntiers.** [Contribution to the Life-history of the Bot-Flies of Reindeer.]—*Tromsö Museums Aarshefter* 38 & 39, 1915–1916, pp. 117–132, 5 text-figs., 1 plate. [Received 4th March 1918.]

These observations on *Cephenomyia trompe*, L., and *Oedemagena tarandi*, L., were made in those parts of Norway to which the Laplanders bring their reindeer to pasture from the beginning of May till September. Every year some of the young animals fall down dead, and their death is believed by both the Laplanders and the farmers to be due to the presence of *Cephenomyia trompe*, L. The author had an opportunity of dissecting a young reindeer which had died, and he found in the nasal cavities and the larynx as many as 130 larvae of this species. In the absence of other symptoms, he concludes that death had been caused by the larvae giving rise to suffocation. It was repeatedly noticed that reindeer suffer from catarrh in the nose, the animals being then very irritated and trying to rub their noses against tree-trunks. After violent sneezing, pupae of *C. trompe* may be found on the spot where the animals have been standing. It is very remarkable that no larvae are found on the ground under these circumstances, but this is doubtless due to the fact that the larvae transform into pupae very soon after leaving their host.

The adult flies emerge in from 15–19 days, the first being found on the 12th July and the last on the 31st of that month. The reindeer always become very agitated when the flies were seen hovering around them and try to escape oviposition by lowering their heads and hiding their noses in the vegetation.

In the skin of the reindeer above-mentioned about 300 larvae of *Oedemagena tarandi*, L., were also found. *O. tarandi* oviposits chiefly on the new coat which is growing at this time, the number of eggs laid on one hair varying from 1 to 9. The young larvae hatch in about a fortnight.

MARZINOVSKY (Dr. E. I.). **Лихорадка** *Pappataci* **на Кавказскомъ фронтѣ.** [Pappataci-Fever on the Caucasian Front.]—**« Медицинское Обозрѣніе.»** [*The Medical Review*], *Moscow*, lxxxvii. no. 13–14–15–16, 1917, pp. 603–613. [Received 12th February 1918.]

Until recently the only tropical disease known in Russia was malaria; of late, however, a number of new diseases such as kala-azar in Trans-caucasia, tropical dysentery and blackwater fever have made their appearance. In many localities on the coast of the Black Sea *Stegomyia* *fasciata* has been discovered and outbreaks of yellow fever may be expected. During the War, the Russian army in Asiatic Turkey and Persia suffered to a considerable degree from sand-fly fever, the carrier of which is *Phlebotomus papatasii*. A table showing the position of the genus *Phlebotomus* in the Diptera, and a list of 24 species of this genus hitherto described are given, followed by a description of *P. papatasii*, and a short account of its life-history. The author subjected himself to the bites of some examples of this midge, which were brought from Trebizond to Tiflis, having been caught in a room where patients with this fever were lying, and in a few days he fell ill with the disease. The midges died in captivity in from 5 to 7 days. Preventive remedies against this disease are extremely difficult and must be directed chiefly to sanitary measures and to the destruction of the breeding-places of the insects. Fumigation as a means of keeping the insects away from houses is useless, but the use of nets for protection when asleep is very effective. Recently cases of sand-fly fever have also occurred in Tiflis.

MARZINOVSKY (Dr. E. I.). **Новый видъ** *Phlebotomus*'а **въ Россіи**—*Phlebotomus caucasicus*, sp. nov. [A new Species of *Phlebotomus* in Russia—*Phlebotomus caucasicus*, sp. nov.]— **« Медицинское Обозрѣніе.»** [*The Medical Review*], *Moscow*, lxxxvii, no. 13–14–15–16, 1917, pp. 612–614, 17 figs. [Received 12th February 1918.]

Nothing was known until quite recently about the presence of *Phlebotomus* in Russia, but in 1916 a search for *P. papatasii* in Tiflis resulted in the discovery of the above new species, which is here described and figured. It is thought probable that *P. caucasicus* may also act as carrier of sand-fly fever.

GARIN (C.). **Etude sur un Bacille Parasite des Larves d'Anophèles : le B. de Loutraz.** [A Study on a Bacillus parasitic in Anopheline Larvae ; the Bacillus of Loutraz.]—*C. R. Soc. Biol., Paris*, lxxxi, no. 1, 12th January 1918, pp. 41–43.

In the course of experimental investigations on the larvae of *Anopheles maculipennis* and *A. bifurcatus* during the summer of 1917, it was found that they were attacked by an epidemic, the bacillus of Loutraz being isolated from the dead larvae. The virulence of this bacillus is greatest when just isolated from the dead larva, and it decreases by slow degrees in succeeding passages through artificial media. The larvae do not become infected by ingestion, but in the course of respiration at the surface of the water, where the bacilli multiply. This organism has no pathogenic effect on the larvae of *Culex pipiens*, nor on grasshoppers, by ingestion, nor on mammals such as the guinea-pig, dog, and rabbit either by intraperitoneal or subcutaneous injection. Gold-fish also lived for a month in water daily contaminated with it.

Further experiments will be made to show whether this bacillus, so fatal to Anopheline mosquitos in small vessels, is equally so in nature ; whether the artificial contamination of Anopheline breeding-places will result in an appreciable diminution in the number of larvae ; and whether the artificial contamination of ponds and marshes in malarial countries will prove an efficacious means of combating these mosquitos, and consequently malaria.

CALVERT (P. P.). **Insects and Human Mortality in War.**—*Old Penn, Philadelphia,* xvi, no. 12, 21st December 1917, pp. 297–302.

This paper is the report of a lecture delivered by the author in Philadelphia.

The various diseases that have been responsible for a high percentage of mortality in the present and in previous wars are reviewed, almost all of these being now known to be insect-borne. The relation of the louse, *Pediculus humanus* (*vestimenti*), to typhus are discussed in detail, the history of the investigations into this relation being given, and the importance of keeping typhus patients and these insects apart, which has so far been successfully accomplished during the present campaign on the western front, is insisted upon. The French anti-malarial campaign of 1917 in the Balkan Army is described. The dangers arising from the prevalence of house-flies and mosquitos in the neighbourhood of training-camps are discussed, a promising feature being the marked improvement that has been observed in those camps where fly and mosquito control has been thoroughly and practically carried out, the insect problem in many camps being considered as solved.

The author emphasises the immense importance of entomological science in discriminating the kinds of insects, in elucidating their physiology and life-history, without which their vulnerable points cannot be known, and in discovering their relations to the rest of the world and the health of its plant and animal inhabitants; in all of these fields much yet remains to be learned. Experience demonstrates that all insect problems affecting the health of the army and of the civilian population supporting it should be investigated by men trained in entomological work.

WILLIAMS (T. H.). **Dipping Sheep: A Warning to Flock-owners.**—*Jl. Dept. Agric. S. Australia, Adelaide,* xx, no. 8, March 1917, p. 597. [Received 2nd February 1918.]

This brief notice calls the attention of sheep owners to the necessity of using poisonous powder dips in compliance with the requirements of the Stock Diseases Act, a case having arisen in which a flock treated with a non-poisonous carbolic dip had shown signs of infestation by ticks and lice three weeks later.

HUIE (L. H.). **The Bionomics of the Tiger-beetle** (*Cicindela campestris*).—Separate, dated 14th September 1916, from *Proc. R. Phys. Soc. Edinburgh,* xx, part 1, 1915–1916, pp. 1–11. [Received 5th February 1918.].

This paper describes detailed observations of the life-history and habits of *Cicindela campestris*, the larvae of which burrow in sand, peat, or in the borders of sandy roads. Their favourite food appears to be blow-flies, which may often be seen projecting from a larval burrow.

MACDOUGALL (R. S.). **Insect and Arachnid Pests of 1916.**—Reprint from *Trans. Highland & Agric. Soc. Scotland*, 1917. pp. 1–10, 39 figs.

Recommendations for the control of lice [*Pediculus humanus*] include the use of the powder known as N.C.I. [see this *Review*, Ser. B, iv, p. 133] and of undervests of butter-muslin soaked in insecticide solution [see this *Review*, Ser. B, v, p. 91].

The mites causing itch, mange or scab such as *Sarcoptes, Psoroptes* and *Symbiotes* (*Chorioptes*) are described, and a key to them is given. *Demodex folliculorum*, the mite causing demodectic or follicular mange, and *Trombidium holosericeum* (harvest mite) are also dealt with.

DEXLER (G.). **Observations on Certain Flies Infecting Meat and Causing Human Myiasis.**—*Agric. Gaz. Canada, Ottawa*, v, no. 1, January 1918, p. 99. [Abstract from *Zeitschrift für Fleisch- und Milchhygiene, Berlin*, Nov. 1st & 15th, & 1st Dec. 1916.]

From observations on the adults, eggs, larvae and pupae of flies that visit meat, carried out in the largest markets in Vienna, the author concludes that flies prefer, both for feeding and for oviposition, fresh meat at a temperature of at least 62° F., chilled or frozen meat being avoided by them. The eggs are laid for preference in those parts of the meat that are fairly damp, warm and not directly exposed to sunlight, especially the abdominal cavity, lower part of the back, muscle folds, etc. The species most frequently occurring on meat are *Lucilia sericata*, Meig., *Calliphora erythrocephala*, Meig., *Sarcophaga haemorrhoidalis*, Meig., *S. nurus*, Rond., *S. falculata*, Pand., *Phormia groenlandica*, Zett., *Muscina stabulans*, Fall., *Fannia canicularis*, L., and *F. scalaris*, L.

The following occur rarely on meat, on which they feed, but never oviposit:—*Ophyra leucostoma, Drosophila funebris, Musca domestica, Calliphora vomitoria, Sarcophaga carnaria, Musca meridiana*, and *Stomoxys calcitrans*, the presence of their larvae affording no evidence as to whether the meat is putrid or not. The size of the larvae in infected meat is practically of no use for determining the length of infection. The exposure of infected meat to a temperature of 50° F. arrests the process of hatching and causes the eggs to die off, while the larvae are killed by drying or by exposure to direct sunlight. A temperature below 44·6° F. arrests the development of the larvae, but does not kill them, the optimum growth temperature being between 68° and 104° F. The larva pupates on the fifth or sixth day after hatching.

MARCHOUX (E.). **Influence du Milieu extérieur sur la Résistance de l'Organisme au Paludisme.** [Influence of Environment on the Resistance of the Organism to Malaria.]—*Bull. Soc. Path. Exot., Paris*, xi, no. 1, 9th January 1918, pp. 1–3.

The author discusses the observations made by Lagriffoul and Picard [see this *Review*, Ser. B, vi, p. 70] on the rarity of such cases of mixed infections of malaria as were previously recorded by him. Criticising the statement that malarial subjects who were favourably situated for infection by *Plasmodium praecox* were nevertheless found in the majority of cases to be infected with *P. vivax*, the author doubts whether these individuals are to be regarded as enjoying special immunity. An explanation is required as to why *P. praecox* alone is found in the tropical zone, why this form of the malarial parasite does not exist in France, and why the two and sometimes the three forms of malarial haematozoa are found in the sub-tropical zone. He suggests that it must be admitted that the conditions of existence of the various parasites in man are fixed by the climate. The inexplicable disappearance of *P. praecox* in France has been described from the author's own observations.

His investigations have led him to the conclusions that carriers of *P. falciparum* recover spontaneously in France when they have regained a good general state of health, and he is of opinion that this is abundantly proved by long experience among the Colonial troops infected in the tropical zone. He also considers that the varying constitutions of the liquid environment of the parasite play an important part in the cure of malaria.

LEGER (A.) & CERTAIN (—.). **Recherche du Spirochète ictéro-hémorragique chez les Rats de Dakar.** [Investigations regarding the Ictero-haemorrhagic Spirochaete in the Rats of Dakar.]—*Bull. Soc. Path. Exot., Paris*, xi, no. 1, 9th January 1918, pp. 19–22.

In the course of the investigations recorded by the author, many rats from the sewers and shipping port of the town of Dakar, Senegal, were examined, including 67 individuals of *Mus alexandrinus*, 35 of *Mus rattus*, and 18 of *Mus decumanus*. Inoculations from these rats always produced negative results in guinea-pigs. In one individual of *Mus decumanus* a spirochaete was observed, identical in morphology and pathological action with that recently described in a shrew under the name *Spirochaeta crocidurae* [see this *Review*, Ser. B, v, p. 98]. This is considered important on account of the great resemblance between this spirochaete of sewer animals and those of human recurrent fever.

In spite of numerous negative results, it is considered premature to conclude that the spirochaete in question does not occur in the rats of Dakar, especially as a malady diagnosed as acute jaundice, which in some cases proved fatal, was recorded as an epidemic in 1916 among soldiers from camps in the neighbourhood of Dakar. It is hoped to complete this preliminary inquiry, which was made during the winter, by further investigations during the coming season.

VELU (H.). **Les Affections du Cheval à Parasites endoglobulaires au Maroc.** [Equine Diseases produced by Endoglobular Parasites in Morocco.]—*Bull. Soc. Path. Exot., Paris*, xi, no. 1, 9th January 1918, pp. 26–27.

The author points out that the malady clinically described as equine piroplasmosis is in reality two distinct diseases, caused by entirely different parasites, viz., *Nuttallia equi* and *Piroplasma caballi*. These two diseases are differentiated by their symptoms.

Moor (C. G.) & Cooper (E. A.). **Field Sanitation.**—*London*, Baillière, Tindall & Cox, 220 pp., numerous text-figures. Price 2*s.* 6*d.* net.

This booklet contains simple instructions relative to the maintenance of health and the prevention of disease. It is described as the outcome of many changes in sanitary work and appliances that have developed during the War, and is published with a view to assisting all those interested in field sanitation. A chapter is devoted to the control of flies and other insect pests and the dangers arising from their presence is discussed. Flies are now destroyed in all their stages, many useful methods being detailed. The proper disposal of human excreta and of all refuse in camps in order to prevent epidemics of such diseases as typhoid, dysentery and cholera, is discussed at length. Various suggestions for economising public money in the use of waste products are given. An appendix contains working sketches of useful appliances that can be made from materials at hand, and the booklet is supplied with an index.

Malloch (J. R.). **A Preliminary Classification of Diptera, exclusive of *Pupipara*, based upon Larval or Pupal Characters, with Keys to Imagines in Certain Families. Part I.**—*Bull. Illinois State Lab. Nat. Hist., Urbana*, xii, Article 3, March 1917, pp, 161–407, 30 plates. [Received 4th February 1918.]

This work is based on North American material. The Sarcophagidae include some species that are true parasites, but the majority are feeders upon decaying animal and vegetable matter. All species of Muscidae are scavengers, many of them being beneficial; the Gastrophilidae, Hippoboscidae and Oestridae are all distinctly injurious. The flesh-flies and some other groups sometimes cause myiasis in man, the larvae finding their way into the stomach with food in which the flies have deposited their eggs. Among the Psychodidae, the species of *Phlebotomus* are blood-suckers and are capable of transmitting sand-fly fever and verruga to man. *Pericoma townsvillensis* has been recorded from Australia as a blood-sucking species [see this *Review*, Ser. B, iv, p. 30]. This species should be placed in either *Psychoda* or *Phlebotomus*, probably the latter. The family Culicidae is so well-known and has been so widely studied that only the principal divisions are indicated in this work. Certain species are the only known vectors of malaria, yellow fever and filariasis. A key to the sub-families is given. The family Ceratopogonidae is separated by the author from Chironomidae, to which it is closely allied, and a key to the genera is given. The imagines of the genus *Culicoides* are invariably blood-suckers. *Pseudoculicoides* is also a blood-sucking genus. This habit has not been recorded for any of the other genera, in so far as man and domestic animals are concerned, though they attack other insects.*

A key is also given to the genera of the Tabanidae. The adults of this family are among the worst of the biting pests of cattle. The genus *Tabanus* attacks cattle and other domestic animals almost exclusively, but *Chrysops* is also a persistent pest of man, at least one African species being responsible for the conveyance of filariasis.

*[In Africa species of *Ceratopogon* (*Forcipomyia*) and *Johanneseniella* have been recorded as attacking man.—Ed.]

Ozzard (A. T.). **Some Sanitation Problems of the Sugar Estates and Villages of British Guiana.**—*Trans. Soc. Trop. Med. Hyg., London,* xi, no. 2, December 1917, pp. 71–92. [Received 14th February 1918.]

A portion of this paper is devoted to a discussion of the chief diseases against which sanitary measures are required. With regard to yellow fever, it is hoped that no more serious epidemics will occur, but as cases do still arise in some of the neighbouring islands and adjoining countries a proper observance of all mosquito by-laws is necessary to prevent a recurrence of this disease. Unfortunately these by-laws are very often ignored, while the greatest faith is placed in quinine administration, which the author characterises as "possibly the weakest of all anti-malaria measures." It is an extraordinary fact that in a colony where filariasis is so painfully evident and causes a great deal of disabling sickness, much opposition occurs to even the most necessary rules for sanitation and mosquito prophylaxis.

The author is strongly of opinion that it would be wiser to devote money and energy to combating mosquitos rather than to forcing the administration of quinine on an unwilling population. The clearing of much of the bush and undergrowth in the neighbourhood of villages in British Guiana is considered a necessary accessory measure. Malaria, while showing a marked drop within recent years, has recently shown a considerable rise, further emphasising the need for mosquito control.

Walsh (J. H. T.). **The Geographical Distribution of Human Diseases and their Control.**—*Trans. Soc. Trop. Med. Hyg., London,* xi, no. 3, January 1918, pp. 105–125. [Received 14th February 1918.]

This review includes a discussion of the more important insect-borne diseases in the tropics.

Christy (C.). **Tsetse Flies and Fly-belts.**—*Ann. Trop. Med. Parasitology, Liverpool,* xi, no. 3, 31st January 1918, pp. 279–282.

It is a well-known fact that *Glossina morsitans* and its allies are rarely to be met with outside certain areas known as fly-belts. Beyond these belts there is something inimical to the fly, though what this may be is unknown. The flies migrate *en masse* from one part of the belt to another, but seldom stray beyond it even in pursuit of animals. There are two forms of migration within the belt; one is at the time when the bush is burnt in the dry season, when the flies retreat to the shelter afforded beside streams and moist places and remain there until the bush begins to grow again in the spring; the other form of migration is difficult to understand. It is not known whether the fly has definite months of migration, or what prompts its movements. The author is convinced that animals play a very unimportant part, if any, in this migration. He has observed flies swarming about a herd of buffalo one week, and in the following week, though the same herd was in the same place, not a fly was visible. Large areas of country may swarm with fly and yet contain scarcely any game; such areas are found in the Upper Bahr-el-Ghazal, where tall spear-grass is a conspicuous feature. In some districts both there and in the Eastern Welle basin *Glossina morsitans* is found in millions, apparently irrespective of whether human beings or game are present at all. The presence or absence of game depends upon grazing facilities, but these have no relation to the presence or absence of the tsetse-fly; nor has the prevalence of sleeping sickness any relation to the number of *G. morsitans* or to the number of game in any given area. Wild animals may act as hosts for the trypanosome of sleeping sickness, but the author considers it a dangerous assumption to conclude that they are the chief reservoir of the disease. Even if this were the case, the possibility of exterminating all the wild animals in any part of Tropical Africa is considered quite impracticable, nor is it considered that such a measure would have the effect of eliminating the disease. While excluding the majority of wild animals as a danger in the transmission of sleeping sickness to man, the author is inclined to suspect one or two. Of these the pig is considered the most dangerous, not only the wild bush pig and wart-hog, but more especially the semi-domesticated pigs frequently seen in native villages.

In an attempt to collect evidence in the Bahr-el-Ghazal and the Congo for or against the theory that wild animals are an important reservoir of sleeping sickness, a microscopic examination of the blood of many animals was made as soon as possible after each was shot. Of 160 animals so examined, only 5 were found to have trypanosomes in their blood and of these, only one, a wart hog, harboured a trypanosome that might be mistaken for that of the disease in man. On no occasion were trypanosomes discovered in buffalos.

DAVIES (F. C.) & WELDON (R. P.). **A Preliminary Contribution on "P. U. O. (Trench Fever)."**—*Jl. R.A.M.C., London,* xxx, no, 1, January 1918, pp. 92–94.

Since direct communication of trench fever from man to man does not appear to occur, it is probable that transmission must be effected by blood-sucking parasites. With this theory in view, one of the authors allowed himself to be bitten by lice that had been starved for three days and then fed, under a watch-glass, upon patients suffering from trench fever in an acute stage. Twelve days later the characteristic symptoms manifested themselves, and he passed through a typical attack of average severity, accompanied by the usual pains and symptoms.

The success of this experiment was so marked that the results are given without further investigation, in order that the anti-louse campaign may be prosecuted with increased vigour.

WOODCOCK (H. M.). **Note on the Epidemiology of Dysentery.**—*Jl. R.A.M.C., London,* xxx, no. 1, January 1918, pp. 110-111.

The importance of flies as a factor in the spread of amoebic dysentery has been proved by the demonstration of the passage of amoebic cysts through the intestine of the fly [see this *Review*, Ser. B, v, p. 117]. As a consequence of this there has been a tendency to regard the fly as the essential agent in the spread of this disease and to overlook the important part played by water. Amoebic cysts cannot withstand drying, but can retain their vitality in water for at least a fortnight and probably much longer; hence for amoebic dysentery to be prevalent in a particular area, the first necessity is plenty of moisture and a high degree of humidity. In a warm, dry climate amoebic cysts have little chance of survival, notwithstanding an abundance of flies. Dysenteric bacilli, on the contrary, must be capable of withstanding a much greater degree of dryness to account for the occurrence of bacillary dysentery in hot climates.

Howard (C. W.). **Insect Transmission of Infectious Anemia of Horses.** —*Jl. Parasitology, Urbana, Ill.*, iv, no. 2, December 1917, pp. 70–79

During the past ten years many different investigations have been made on the nature of the transmission of swamp fever or infectious anaemia of horses, a disease which is widely distributed, but not restricted, as its name would imply, to low-lying, wet land. Since it attacks equines only, etiological investigations are hindered by the impossibility of using small laboratory animals experimentally.

Research seems to show that infection does not take place through the digestive or respiratory organs, but through the skin, the infective agents being neither ticks, bots, mosquitos, nor Tabanids, but *Stomoxys calcitrans* (biting stable fly), though it has not yet been proved that these insects are the usual or only carriers of the disease.

Moll (A. M.). **Animal Parasites of Rats at Madison, Wisconsin.**—*Jl. Parasitology, Urbana, Ill.*, iv, no. 2, December 1917, pp. 89–90.

An examination of twenty-five examples of the so-called brown rat, *Mus norvegicus*, has shown that they all carried internal and external parasites, but in no case was any blood parasite found.

The insect parasites found were :—*Polyplax* (*Haematopinus*) *spinulosus*, Burm. (rat louse), which transmits an apparently non-pathogenic protozoan parasite, *Trypanosoma lewisi*, from one rat to another ; *Ctenocephalus canis*, Curtis (dog flea), which is the intermediate host of the tapeworm, *Dipylidium caninum* ; *Ceratophyllus fasciatus*, Bosc. (rat flea), which completes its life-cycle on the rat only, but bites man in preference to rats when possible, thus becoming an important factor in plague-infested localities ; and *Laelaps agilis*, Koch, a mite that rarely attaches itself to man or to domestic animals and is consequently of little economic importance.

Dyar (H. G.) & Knab (F.). **New American Mosquitoes (Diptera, Culicidae).**—*Insecutor Inscitiae Menstruus, Washington, D.C.*, v, nos, 10–12, October-December 1917, pp. 165–169.

The mosquitos dealt with in this paper are *Aëdes zoösophus*, sp. n., from Texas, apparently allied to *A. fluviatilis*, Lutz, and probably breeding, as that species does, in rock-holes along streams ; *A. gonimus*, sp. n., from Texas, a fierce biter ; *A. niphadopsis*, sp. n., from Utah ; *A. epinolus*, D. & K., a male from Ecuador, previously described from females from Peru ; and *A. innuitus*, sp. n., from Greenland, which is possibly identical with *Culex nigripes*, Zett., from Lapland.

Dyar (H. G.) & Knab (F.). **The Genus *Culex* in the United States (Diptera, Culicidae).**—*Insecutor Inscitiae Menstruus, Washington, D.C.*, v, nos. 10–12, October-December 1917, pp. 170–183.

In this paper the authors deal with the synonymy of the species of *Culex, sens. lat.*, of the southern United States, and correct some details of nomenclature that have appeared in their monograph. Keys to the sub-genera based on the male genitalia and to species based on colouration are given.

The following species are dealt with :—*Culex* (*Neoculex*) *saxatilis*, Grossbeck (*C. territans*, How., D. & K., nec Walk.), the larvae occurring in permanent swamps and pools in more or less wooded areas. This species, of which the adults do not bite warm-blooded animals, but attack frogs, is restricted in the west to forested areas.

The genus *Culex, sens. strict.*, is represented by *C. corniger*, Theo., with an essentially tropical distribution ; *C. tarsalis*, Coq., common in the arid regions of the west, the larvae being found in all sorts of permanent or semi-permanent stagnant water containing vegetation ; *C. stigmatosoma*, Dyar, confined to the Pacific coast and found in temporary pools without vegetation ; *C. erythrothorax*, Dyar, from the southern part of California, the larvae living in sloughs of permanent deep water ; *C. salinarius*, Coq., which is absent from Florida and has not been recorded from the Gulf coast, being elsewhere common in open marshes, especially near the sea, though it does not require even slightly saline water ; *C. palus*, Theo. (*similis*, Theo.), which inhabits the West Indies and southern Florida, the larvae being found in permanent or semi-permanent pools, especially in coral rock, but not in artificial receptacles ; *C. restuans*, Theo. (*brehmei*, Knab), extending from Canada to Florida, the larvae being found in foul stagnant water, such as in rain-barrels and old tins. Though *C. territans*, Walk., appears to be the oldest name for this species according to Edwards, Walker's description does not apply and the name has long been used for *C. saxatilis*, Grossbeck (*q.v.*) ; *C. fatigans*, Wied. (*quinquefasciatus*, Say), widely dispersed by commerce over the warmer parts of the globe, is a semi-domesticated species, the larvae being numerous in all artificial collections of water near human habitations, and less common in natural pools in the open country ; *C. pipiens*, L. (*comitatus*, D. & K.), probably introduced by commerce from Europe, the larvae being found in artificial collections of water and in stagnant pools.

The sub-genus *Melanoconion*, Theo., is represented by *Culex* (*Melanoconion*) *erraticus*, D. & K. (*abominator*, D. & K.), a species inhabiting the Mississippi valley ; *C.* (*M.*) *peccator*, D. & K. (*incriminator*, D. & K.), a species of which the larvae and life-habits are unknown ; and *C.* (*M.*) *anips*, Dyar, known only from southern California, where the larvae are found in pools of permanent water.

The sub-genus *Mochlostyrax* is represented by *C.* (*M.*) *egberti*, D. & K., from Florida, the male, larva and life-history being unknown ; *C.* (*M.*) *floridanus*, D. & K. (*cubensis*, D. & K., *agitator*, D. & K., *deceptor*, D. & K., *mastigia*, H. D. & K.), inhabiting southern Florida and Cuba, where it lives in permanent water with aquatic vegetation, either hanging itself up on leaves or lying on the bottom, seldom coming to the surface ; *C.* (*M.*) *peribleptus*, sp. n., from South Carolina ; and *C.* (*M.*) *pose*, sp. n., from Texas.

Other species are *Climacura melanurus*, Coq., a rare species found in the eastern United States in swampy regions, the eggs being laid singly and the larval stage passed in small water-holes; *Culicella dyari*, Coq., the larvae of which are found in early spring in pools left by the melting snow, the winter being passed in the egg-stage and the adults of the single annual generation appearing in May; and *Deinocerites cancer*, Theo., a species from southern Florida where the larvae live in the water in the holes of certain tropical sea-shore crabs.

Dyar (H. G.). **A Second Note on the Species of *Culex* of the Bahamas (Diptera, Culicidae).**—*Insecutor Inscitiae Menstruus, Washington, D.C.*, v, nos. 10–12, October-December 1917, pp. 183–187.

The following species are added to former records from the Bahamas: *Culex* (*Transculicia*, sub-gen. nov.) *eleuthera*, sp. n., and *C. reductor*, D. & K., found also in Jamaica, but not in Cuba and Florida, this peculiar distribution being possibly due to the West Indian hurricanes.

Bishopp (F. C.). **The Distribution of the Nose Fly and Other Species of *Gastrophilus* in the United States.**—*Psyche, Boston, Mass.*, xxiv, no. 6, December 1917, pp. 182–187, 1 fig.

The genus *Gastrophilus* is represented in the United States by three species that were introduced many years ago, and have become widely spread throughout the country. These are *G. equi*, L. (*intestinalis*, De G.), which is the best known owing to its abundance and comparatively slow flight, while its distribution, though wide, varies much locally, the insect being rare at high elevations. *G. nasalis*, L. (chin fly), a species often confused on account of its name with the nose fly (*G. haemorrhoidalis*), oviposits under the jaws, while its larvae occasionally attach themselves in the oesophagus. This species is widely distributed from east to west in the United States and also in Canada. *G. haemorrhoidalis* (nose fly), which oviposits on the lips, is economically the most important of the three species when present in abundance. Though probably introduced at an early date with shipments of horses from Europe, its appearance was first recorded in 1883 in western North Dakota, while Iowa was invaded about 1912, and other States still more recently. The fact that it has not established itself more rapidly may have been due to adverse climatic conditions, while its failure to thrive east of its present area of great abundance in North and South Dakota is possibly due to the greater humidity of the eastern area. The dissemination of this pest is largely brought about by the movement of horses, the danger being increased by their shipment from infested to uninfested areas for military and agricultural purposes. Owing to the long time that the larvae spend within the host and the rather extended period during which they leave the animal, every opportunity is given for the pest to become widely established if natural agencies do not prevent it, or steps are not taken to destroy the bots before the horses are shipped.

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SERIES B: MEDICAL AND VETERINARY.

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DYAR (H. G.). **The Larva of** *Aëdes idahoensis* **(Diptera, Culicidae).**—*Insecutor Inscitiae Menstruus, Washington, D.C.*, v, no. 10–12, October-December 1917, pp. 187–188.

From the examination of adults bred from larvae found in a road-side pool in Montana, the author concludes that *Aëdes spenceri* and *A. idahoensis* represent distinct species, the former being absent from southern Montana.

BISHOPP (F. C.) & WOOD (H. P.). **Preliminary Experiments with Sodium Fluoride and Other Insecticides against Biting and Sucking Lice.**—*Psyche, Boston, Mass.*, xxiv, no. 6, December 1917, pp. 187–189.

The very satisfactory results obtained by the authors from the use of sodium fluoride against various species of Mallophaga (biting lice) on poultry [see this *Review*, Ser. B, vi, p. 14] have led to further research on the use of this compound against the lice infesting cattle, horses and other domestic animals.

Previous experiments with the standard arsenical dip usually known as the B.A.I. formula (8 lb. white arsenic, 24 lb. sodium carbonate crystals, 1 U.S. gal. pine tar, to 500 U.S. gals. water) have proved it to be a very effective insecticide against both Mallophaga and Anoplura. One thorough spraying or dipping of cattle quite heavily infested with *Trichodectes scalaris*, Nitzsch, and *Haematopinus eurysternus*, Nitzsch (short-nosed cattle louse), completely destroyed them in two treatments at weekly intervals. One dipping with arsenical solution also destroyed all forms of *T. scalaris* and *Linognathus vituli*, L. (long-nosed ox louse). In one experiment, arsenical solution of half normal strength killed the adults, larvae and eggs of *T. scalaris*, but those of *L. vituli* were not completely destroyed. In short, arsenical solutions have an immediate effect on biting lice, but not on sucking lice or ticks.

Experiments with the following substances:—Kerosene emulsion (2 U.S. gals. kerosene, ½ lb. laundry soap, 1 U.S. gal. water) diluted 1 to 8 and 1 to 12; flowers of sulphur (½ lb. per animal); 40 per cent. nicotine sulphate (1 to 800); soap and water (1 oz. per U.S. gal.); and sodium fluoride (commercial 90–98 per cent.) as a dust and dip, proved that all of them, with the exception of soap and water, killed all stages, and even the last killed all but the eggs.

Sodium fluoride (97 to 98 per cent.) was used as a spray at the rate of 1 oz. and also ½ oz. per U.S. gal., and at both strengths immediately destroyed all stages. For application as a dust it was mixed with flour in the proportion of 1 oz. sodium fluoride to 5 oz. flour, treatment of a yearling requiring 6 oz. of the mixture. All lice were destroyed on two other animals by the application respectively of 3 oz., dredged and worked into the hair, and of 1 oz. applied with a bellows dust-gun.

In the case of dogs heavily infested with *Trichodectes latus*, Nitzsch (biting dog louse), all the lice were destroyed and consequent lesions quickly healed by the application of 1 oz. of the powder by means of a dust-can or of 1 oz. sodium fluoride dissolved in 1 U.S. gal. water used as a dip.

Owing to the comparatively high price of sodium fluoride, this substance cannot be recommended as a dip for large animals when

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other cheaper and equally effective dips can be obtained. But in winter and spring, when dipping is apt to be dangerous, its application with a dust-gun would prove effective, easy, and not expensive, having regard to the small quantity necessary for each animal. One application is sufficient, as the substance is retained in the hair long enough to destroy any lice returning to the host.

Sodium fluoride cannot apparently be relied on for use against sucking lice.

Neiva (A.) & Penna (B.). **Viajem cientifica pelo Norte da Bahia, Sudoeste de Pernambuco, Sul do Piauhí e de Norte a Sul de Goiaz.** [A Scientific Journey through the North of Bahia, South-east of Pernambuco, South of Piauhy and from the North to the South of Goyaz.]—*Mem. Inst. Oswaldo Cruz, Rio de Janeiro*, viii, no. 3, 1916, pp. 74–224, 28 plates, 1 map. [Received 12th February 1918.]

The notes on natural history, medicine and hygiene contained in this paper were made in 1912 in the course of a journey of 2,100 miles through one of the zones of Brazil suffering from drought.

The ticks collected were :—*Amblyomma cayennense*, F., from cattle, horses, dogs, *Hydrochoerus capybara*, *Tapirus americanus*, *Dasypus novemcinctus* and other animals ; *A. parvum*, Arag., from *H. capybara* and *T. americanus* ; *A. concolor*, Nm., from *Tolypeutes tricinctus*, *D. novemcinctus*, and *Conepatus suffocans* ; *A. longirostre*, Koch, from *Cercolaves vellosus* ; *A. fossum*, Nm. ; *Margaropus microplus*, Can., from cattle, horses, and *Cariacus rufus* ; *Ornithodorus talaje*, Guér., from *Cerodon rupestris*.

The following blood-sucking insects were among those met with :—

Simuliidae. *Simulium amazonicum*, Goeldi, *S. simplicicolor*, Lutz, *S. orbitale*, Lutz, *S. pruinosum*, Lutz. Ceratopogoninae. *Cotocripus* sp.

Tabanidae. *Erephopsis xanthopogon*, Macq., *E. leucopogon*, Wied., *E. pubescens*, Lutz, *Esenbeckia ferruginea*, Macq., *Chrysops costatus*, F., *C. leucospilus*, Wied., *C. fusciapex*, Lutz, *C. molestus*, Wied., *C. parvifascia*, Lutz, *Diachlorus neivai*, Lutz, *D. vitripennis*, Lutz, *D. curvipes*, F., *D. nigristigma*, *Lepidoselaga paradoxa*, Lutz, *Acanthocera anacantha*, Lutz & Neiva, *Dichelacera varia*, Wied., *D. januarii*, sp. n., *D. leucomelas*, sp. n., *Dicladocera simulans*, sp. n., *D. relicta*, sp. n., *Cryptotylus unicolor*, Wied., *Chlorotabanus mexicanus*, L., *Poecilosoma quadripunctatum*, F., *Tabanus cinereus*, Wied., *T. pseudocinereus*, sp. n., *T. importunus*, Wied., *T. valterii*, Macq., *T. mucronatus*, Lutz & Neiva, *T. trigonostichus*, Lutz, *T. cayennensis*, Wied., *T. rubrithorax*, Macq., *T. fuscofasciatus*, Macq., *Neotabanus modestus* Wied., *N. dorsiger*, Wied., *N. comitans*, Wied. [The species indicated as new are not described.]

Culicidae. *Janthinosoma discrucians*, Walk., *Melanoconion atratum*, Theo., *M. spissipes*, Theo., *M. humile*, Theo., *Anopheles* (*Cellia*) *argyrotarsis*, Rob.-Desv., *A.* (*C*). *brasiliensis*, Chagas, *A.* (*C.*) *tarsimaculatus*, Goeldi, *A.* (*C.*) *albimanus* Wied., *A. eiseni*, Coq., *A.* (*Manguinhosia*) *lutzi*, Cruz, *A.* (*Stethomyia*) *nimbus*, Theo., *A.* (*Myzorhynchella*) *lutzi*, Cruz, *A.* (*M.*) *parvus*, Chagas, *A.* (*Chagasia*) *fajardoi*, Lutz, *Stegomyia fasciata*, F., *Culex fatigans*, Wied., *C. scapularis*, Rdn., *Taeniorhynchus juxta-mansoni*, Chagas, *T. titillans*, Walk., *T. fasciolatus*, Arrib., *Sabethes albiprivatus*, Lutz, *S. longipes*, Macq., *Sabethoides purpureus*, Theo., *S. confusus*, Theo., *Cycloleppteron mediopunctatum*, Theo., *Phoniomyia pallidiventer*, Theo., *P. longirostris*, Theo., *Dendromyia personata*, Lutz, *D. paraensis*, Theo., *D. oblita*, Lutz, *Trichoprosopon compressum*, Lutz.

REDUVIIDAE. *Triatoma sordida*, Stål, *T. brasiliensis*, Neiva, *T. maculata*, Erichs., and *T. megista*, Burm.

Culicoides guttatus, Coq., and *C. paraensis*, Goeldi, were also taken. The former is very abundant in the morning and bites in full sunlight; it is less frequently met with in the evening. Observations made confirm the breeding of *Chlorotabanus mexicanus*, L., in marshes or other muddy places. *Lepidoselaga paradoxa* bites in full sunlight, disappearing at night-fall. In certain dry regions the travellers were attacked by clouds of *Chrysops parvifascia*, Lutz. *Tabanus mucronatus* is very common in some parts of Goyaz and attacks man. In no case was *Poecilosoma cinereum* observed attacking man or animals.

The dislike shown by Anophelines to light was confirmed. Anopheline larvae were collected in abundance, and it would seem that aestivation is very marked in these regions. *Anopheles albimanus* was always met with in small numbers, though any collection of water—even such as are formed by the imprint of a duck's feet in muddy ground—serves as a breeding place. In semi-uninhabited regions where water was abundant and vegetation dense, *Anopheles* (*Stethomyia*) *nimbus*, Theo., was found. This mosquito is not believed to transmit malaria. It bites the hips and legs of domestic animals, whereas *A.* (*Manguinhosia*) *lutzi*, Cruz, which also occurs in these districts, attacks the abdomen. The latter species becomes more numerous at night-fall, a time at which *A. nimbus* disappears. *A.* (*Cellia*) *argyrotarsis* and *A.* (*C.*) *albimanus* are scarce in these regions, a fact which agrees with the statement of North American writers that these species are practically the sole transmitters of malaria in the tropical parts of America, because they are only met with in inhabited localities. Swarms of Anophelines that attacked in broad daylight were at once recognised as *A.* (*Cellia*) *brasiliensis*, the only Brazilian species attacking in sunlight. If this mosquito should be proved to transmit malaria the habit of biting by day will be a serious obstacle to the settlement of the regions where it occurs. That *A.* (*Myzomyia*) *lutzi* was not found is explainable through the absence of the Bromeliaceous plants holding water, in which it breeds. Another missing species, *Anopheles mattogrossensis*, has been found only in the State of Matto Grosso. Except in the villages along the S. Francisco and Preto Rivers neither *Stegomyia fasciata* nor *Culex fatigans* occur in the interior of Brazil.

As might be expected in view of the preference of *Triatoma sordida* for the neighbourhood of streams, this species was not found in arid districts. In some localities where Chagas' disease occurred, such as Porto Nacional, it was the only species found and therefore must be held to play an important rôle in the transmission of this disease. *Triatoma brasiliensis*, *T. maculata*, *T. sordida* and *T. megista* were found in houses at S. Raymundo Nonato, though no trypanosome infection was observed. In the town of Parnaguá, *T. megista* was found infected with *Trypanosoma cruzi*, Chagas. *Triatoma* spp. were never found in the woods, and specimens considered to be *Triatoma* by the persons who collected them were found to belong to the genera *Apiomerus*, *Hammatocerus*, *Pachylis*, etc. The species of *Triatoma* found in houses were also noticed on the bark of fence posts of corrals. In places where goats and *Cerodon rupestris* both occur the goats sleep near the burrows of the rodents, and *T. brasiliensis* associated with the latter are able to feed on them.

In a region where mal de caderas was general no capybara (*Hydrochoerus capybara*) were found or known to occur. This rodent is therefore not a necessary reservoir of the virus. Near Parnaguá it was very abundant, but no mortality such as might be caused by an epizootic due to *Trypanosoma equinum* had been noticed by the inhabitants.

Dermatophilus penetrans is rare in the dry zone and unknown around S. Raymundo, because only few pigs are bred there and the people wear foot-gear on account of the thorny vegetation. In places where the inhabitants go unshod and pigs are kept, *D. penetrans* occurs and increases during the dry months. It was not possible to determine the species of a *Dermatophilus* infesting the feet of a tapir (*Tapirus*), an animal from which *D. penetrans* has not yet been recorded.

Besides *Pulex irritans*, *Ctenocephalus felis*, Bch., and *C. canis*, Curtis, two other fleas, *Pulex conepati*, Alm. Cunha, taken from *Conepatus suffocans*, and *P. irritans* var. *bahiensis*, Alm. Cunha, were collected.

Sarcoptes scabiei var. *equi*, Gerlach, was a common ectoparasite of the horse.

Chrysomyia macellaria, F., was almost solely responsible for all the human and animal myiases met with during the journey; this fly occurs throughout the year, but is less common during the colder months. *Stomoxys calcitrans*, which was imported into Brazil with the introduction of horses, enjoys a large choice of breeding places. It has been suspected of transmitting mal de caderas, which disease was found throughout the journey.

Staphylinid beetles of the genus *Paederus*, which are greatly feared for the blisters caused by them, were collected and will be dealt with in a future paper. *Dermestes cadaverinus*, L., was very common and also other similar species, the larvae of which do great damage to hides and leather.

The Muscid, *Mydaea pici*, Macq., not previously known in Brazil, was found infesting various birds. Other parasites of birds included a number of Hippoboscids, mostly belonging to the genera *Olfersia*, Wied., and *Pseudolfersia*, Coq. These transmitters of Haematozoa of the genus *Haemoproteus*, Kruse, will require to be carefully studied. A list of the host-birds is given. Not a single Tabanid was seen on the island of Meio in the Lake of Parnaguá owing to the abundance of the predaceous wasp, *Monedula signata*, L. Myiasis due to Oestrid flies occurs only sporadically in the dry zone, *Dermatobia hominis* being rare. In some parts it is said that this fly oviposits on persons or on clothes hung up out of doors, especially if the latter be wet with perspiration. If true, this may account for cases of infestation in newly born children.

Ilvento (A.). **Contributo alla Biologia ed ai Metodi di Distruzione del *Pediculus vestis*.** [A Contribution to the Biology and Methods of Destruction of *Pediculus humanus*.]—*Annali d'Igiene, Rome*, xxviii, no. 1, 31st January 1918, pp. 10–29.

The first part of this paper reviews the present-day knowledge of the biology of *Pediculus humanus*. The author's observations confirm the preference of *P. humanus* for rough or meshed fabrics. Smooth silk or linen surfaces are disliked. In the dark no preference is shown for any given colour, but in the light dark shades are more attractive.

The second section deals with the recorded methods of combating *P. humanus*. The author found that oil of anise, oil of turpentine, camphor and a 5 per cent. solution of phenol, exercise a repellent action, which gradually diminishes with evaporation and also perhaps through the insects becoming accustomed to the odour. In a closed vessel the introduction of these substances causes the insect to become comatose and it remains in this condition until fresh air is admitted. This appears to be due to sensitiveness of the respiratory organs and not to a stupefying action of the insectifuges. A strong odour will therefore prevent oviposition during the short period in which it acts at full strength. Lice die if exposed to a temperature of 144° F. for 10 minutes, while 30 minutes are required to kill the eggs; 10 minutes are sufficient for the eggs at 177° F. These data refer to experimental conditions, but in practice difficulties arise owing to the heat failing to penetrate, though both lice and eggs were destroyed in clothes hung up in a hot-air cupboard where a temperature of 212° F. was maintained for 30 minutes, a period of 45 minutes being necessary to attain that temperature.

Leger (M.) & Porry (E.). **Trypanosomes nouveaux de deux Singes de la Guyane française.** [New Trypanosomes of two Monkeys in French Guiana.]—*C. R. Soc. Biol., Paris*, lxxxi, no. 4, 23rd February 1918, pp. 180–183.

To the three trypanosomes of South American monkeys already known:—*Trypanosoma prowazeki*, *T. minasense*, and *T. mycetae*, are now to be added *T. lesourdi*, sp. n., met with in *Ateles pentadactylus*, and *T. devei*, sp. n., in *Midas midas*. None of these are pathogenic.

Place (F. E.). **Sheep Nasal Fly.**—*Jl. Dept. Agric. South Australia, Adelaide*, xxi, no. 5, December, 1917, pp. 443–444. [Received 20th March 1918.]

Oestrus ovis is here recorded from widely-separated districts of South Australia and from Queensland. The female fly oviposits on the noses of sheep, which try to avoid it by burying their noses in the dust. The larvae remain in the nasal cavities for about 10 months and on maturity pass into the nose, from which they are ejected by sneezing. After about 6 weeks in the pupal stage, they develop into the perfect insect. A severe infestation results in loss of condition, fits, or even death.

Preventive measures consist in keeping the animals away from scrub during the hot months, and in smearing their noses with fish-oil and tar.

An effective method of treatment is to draw a line across the top of the eyes and bisect it by a transverse one; a hole is then bored in each upper angle formed by these lines, when the grubs often creep out, or can be picked out with forceps or killed by injecting a few ounces of a mixture composed of 1 part benzine to 4 parts water. The skin is then brought over the holes and plastered with tar and soon heals. Another method consists in pouring turpentine and glycerine up the nostrils, while the value of a similar treatment with a mixture of 1 part gall and 6 parts milk has yet to be tested. In bad cases however slaughter is the only economical method of dealing with sheep infested with this pest.

Contra os Piolhos do Porco. [Against Pig Lice.]—*Chacaras e Quintaes, S. Paulo*, xvii, no. 1, 15th January 1918, pp. 13–15.

The following mixture is recommended against lice infesting pigs; 35 oz of oil (any kind), 17½ oz. of kerosene and 8¾ oz. of turpentine, with enough hot water added to fill a kerosene tin. Larger quantities may be prepared for use in a dipping tank. A North American invention, designed to make the animals smear themselves with an oily insecticide, is described and figured. It consists of a firmly anchored post against which the pigs can rub themselves. At the top of the post there is a tank filled with the insecticide and fitted with valves which the action of rubbing opens. One of these machines is sufficient for 250 pigs. The necessity for also disinfecting the styes is emphasised.

Leneveu (—). **L'Urémie d'Origine acarienne chez le Cheval.** [Uraemia in the Horse due to Acari.]—*Rec. Méd. Vét., Alfort*, xciii, no. 17, 15th September 1917, pp. 477–481.

This is a report of a case of uraemia in a horse directly due to dermatosis caused by Acari.

Railliet (—) & Henry (—). **Un nouveau Foyer de Gale sarcoptique (*Sarcoptes scabiei*) du Lapin.** [A new Focus of Sarcoptic Mange of the Rabbit.]—*Rec. Méd. Vét., Alfort*, xciii, no. 22 (Annexe), 30th November 1917, pp. 436–441.

In September 1917 considerable mortality among both domestic and wild rabbits in the department of Var led to the discovery that they were suffering from psoroptic otacariasis and from sarcoptic mange affecting the head and feet. Sarcoptic mange, due to *Sarcoptes scabiei* var. *cuniculi*, is rare in the rabbit, in which the usual form is caused by *Notoedres cati* var. *cuniculi*. Treatment of tame animals is easy, though much washing and bathing must be avoided. The fur on infested parts must be cut and black soap rubbed in. After a limited wash the places must be well dried and a suitable ointment applied. A mixture of 5 parts essence of caraway and 100 parts vaseline, or an ointment containing 4–5 per cent. cresyl, may be used. If the hind feet are smeared with it, the rabbits will rub in the ointment when scratching themselves.

[Jacoulet (—.)]. **Conclusions d'un Rapport de M. le Vétérinaire principal Jacoulet sur les Essais pratiques de Traitement de la Gale des Chevaux par les Gaz sulfureux selon le Procédé du Vétérinaire aide-major Lépinay.** [Conclusions of a Report of Chief Veterinary Surgeon Jacoulet on the practical Attempts to treat Horse Mange with Sulphurous Gases according to the Method of Veterinary Surgeon Lépinay.]—*Rec. Méd. Vét., Alfort*, xciii, no. 23, 15th December 1917, pp. 653–655.

These conclusions are extremely favourable to the method discussed [see this *Review*, Ser. B, vi, p. 42], which is said to be efficacious, inoffensive, rapid, prophylactic, hygienic and cheap.

Cooley (R. A.). **Economic Entomology in the Service of the Nation.** —*Jl. Econ. Entom., Concord, N.H.*, xi, no. 1, February 1918, pp. 16–28.

In the course of his Presidential address to the American Association of Economic Entomologists, the author, illustrating the importance of medical entomology, pointed out that in addition to the sickness and death occasioned by insect-borne diseases, the American nation suffers an annual economic loss of some £71,600,000 from the same cause. Under War conditions, circumstances conducive to such loss are magnified many times over, while man-power in civil life is also more than ever in need of being conserved. A very high estimate is therefore placed on the value of knowledge concerning the insects that transmit diseases as a factor in winning the War, and this is applicable not only in the army but also in civil life.

Felt (E. P.). **Insects and Camp Sanitation.** —*Jl. Econ. Entom., Concord, N.H.*, xi, no. 1, February 1918, pp. 93–106.

An unprecedented situation has arisen owing to the War, all nationalities of the human race being gathered together on the battlefields of Europe and bringing with them their blood parasites and infections, creating conditions for the dissemination of disease that are unparalleled in the history of the world. It is feared that the American troops may prove particularly susceptible, owing to the fact that their higher standards of living have in a measure reduced resistance to disease, though this may be offset to some extent by preventive inoculations. The total numbers of deaths from disease in the present and in previous wars are given and are contrasted with the number of deaths from wounds. Almost all of these diseases are insect-borne, and they account for far greater mortality than wounds. Striking instances are given of immense reductions in the number of cases of disease after the application of preventive measures. The control of certain diseases is undoubtedly determined by the solution of the insect problem: this is notably true of typhus and lice, bubonic plague and fleas, and yellow fever or malaria and mosquitos. The relation between insects and disease is less evident, though very real, in the case of flies and such diseases as cholera, typhoid, dysentery and probably tuberculosis. Insect control is considered only second in importance to the equipment and provisioning of the army and the care of the sick and wounded. The probabilities are that, as the War progresses, the medical and sanitary staffs will be so overwhelmed with the care and protection of the seriously stricken that matters of apparently minor importance, such as the control of insect pests, must of necessity be neglected to some extent. This is where the entomologist should step in and relieve the physician and sanitarian by discharging a duty for which he is particularly qualified.

Insect control under field and camp conditions presents many problems that cannot be foreseen, and these can be handled adequately only by those who have had extensive experience with insects. In the present circumstances, where thousands of lives may be imperilled, the best is none too good, and, if there be failure, the employment of experts would presuppose that every reasonable precaution had been adopted. It is suggested that a competent entomologist should be attached to every large military unit and accorded a rank that will inspire respect for his recommendations, thus ensuring the quick solution of many difficult problems without encroaching upon the services of the medical men. The main lines of effort of such entomologists would include protection against disease-carriers, which involves the elimination of opportunities for insects to become infected, and the reduction of their breeding to a minimum.

The protection of food should receive considerable attention, since by the adoption of comparatively simple precautions in handling and storage it would be possible to avoid waste and serious loss. Protection should also be extended to domestic animals. A survey would disclose the breeding places of mosquitos, horse-flies, etc. The location of the camps and the disposition of camp refuse and manure must be determined largely by local conditions, and apparently unimportant modifications may have a material effect upon the abundance of insects and the annoyance and danger resulting therefrom.

The conditions that are likely to prevail after the War must also be borne in mind. Epidemics of disease, widespread and frequently deadly, have been the inevitable sequence of previous wars, especially in those countries to which combatants returned. The most thorough precautions are necessary if such a catastrophe, affecting, as it would do, almost the whole world, is to be avoided, and certain safeguards are not possible unless there is an intimate and general knowledge of the habits of insects serving as carriers. The paper concludes with extracts from Dr. Friedrich Prinzing's "Epidemics Resulting from Wars."

In the course of the discussion following the reading of this paper, Mr. J. L. King referred to the apparent impossibility of entering the entomological service in connection with the War. Mr. E. P. Felt remarked in reply that any man who had had any experience whatever with insect work should be more competent to deal with entomological problems than the man who has had no such experience, and pointed out that work of the nature required must be taken up before the pressing need for it arises, or disaster may result. Life is too valuable and the stake too large to warrant delay. Mr. E. D. Ball summarised the chief function of the entomologist as appraising the situation in the field and devising remedies to meet each contingency that arises. Mr. G. A. Dean expressed surprise that so few medical men, bacteriologists and sanitary engineers appreciate or even recognise that entomologists can help in solving health problems, and quoted Professor Lefroy as saying that Asiatic cholera and typhus are now present in those localities in France to which many American soldiers will be sent, and unless expert entomologists are in the field the experience that the English had in the first year of their campaign will be repeated. Mr. A. F. Burgess remarked upon the difficulty of changing a system that already exists, but suggested that the American Association should take action and point out the dangers ahead, placing its members at the service of the Government. Mr. Herbert Osborn deplored the difficulties encountered by entomologists desiring to give the greatest service possible in the national emergency, and hoped that the time will soon come when men will be assigned where they are best fitted to serve. Mr. S. J. Hunter gave his experience that men will not join as entomologists unless they can be made to feel in some official way that it is a real service they are called upon to do for their country, and he suggested that this point of view required consideration. Mr. T. J. Headlee called attention to the general impression that the economic entomologists' information is of a type that cannot be put to practical use, and considered that until this impression is removed the entomologist will not have a chance to do his professional work in the United States Army. He suggested that the Association should record a resolution in which the ability of the economic entomologist to perform a real service in connection with the military establishment should be set forth. Mr. W. C. O'Kane suggested that if the matter were rightly presented to the War Department, not as a question of exemption or of preferred classification but as a question of maximum service, something might be effected. Mr. R. A. Cooley remarked that entomologists are needed in the Army for the preservation of food stores as well as in medical or preventive work. He regretted the obstruction that is placed in the way of economic entomologists from official quarters, and suggested that there should be a frank and full conference between representatives of the Association and certain government officials. Mr. W. H. Goodwin considered that the importance placed by English entomologists upon the preservation of food products is a vital point. Most people have no conception of the quantity rendered unfit for food by insect infestation. Most of the material voided by such insects is in the form of ureates of ammonia and these, when taken into the human digestive system, become soluble and cause an excess of ureates that may act as toxic poisons. Mr. C. L. Metcalf expressed the hope that the War Department would utilise the entomological knowledge of those entering the service through ordinary channels, whether they are officially recognised as sanitary entomologists or not.

It was decided that a committee of three members of the Association be appointed by the President to bring any action that the Association might take to the attention of the War Department.

Simpson (J. J.). **Bionomics of Tsetse and other Parasitological Notes in the Gold Coast.**—*Bull. Entom. Research, London*, viii, no. 3-4, February 1918, pp. 193–214.

The most important factors influencing the distribution and prevalence of tsetse-flies are the type of vegetation, the relation to game and the meteorological conditions. As regards the first, *Glossina palpalis* is found along the banks of rivers where vegetation is dense; *G. submorsitans* is seldom found near rivers and is more abundant in the savannah forest and more open country, as well as in the very open country where small water-holes exist, probably because game comes to water there, this species undoubtedly migrating by following herds of game for long distances; *G. tachinoides* is an up-country form allied to *G. palpalis,* and is found in similar localities on the higher reaches of the rivers.

The close association between *G. submorsitans* and the larger mammals all over the Northern Territories of the Gold Coast is very marked, especially in the case of *Papio sphinx* (dog-faced baboon). The chief factor influencing the numbers of tsetse is, however, that of humidity, the insects increasing greatly in numbers at the beginning of the dry season. *G. palpalis* is most strongly affected by a hot sun; *G. tachinoides* is also affected, though not to the same extent; while *G. submorsitans* will follow and attack in the open in the hottest sun, though rarely at night, the same being true of *G. morsitans,* which has been caught at a temperature of 109° and 112° F.

A variety of *G. palpalis* first met with in the upper reaches of the River Gambia, is described under the name *pallida,* var. nov.

The food of *Glossina* appears to consist wholly of blood, the proportion of mammalian to non-mammalian blood varying widely according to the species. *G. morsitans* seems to be much more dependent on mammalian blood than does *G. palpalis,* while the chief food of *G. tachinoides* appears to be reptilian blood and that of a large bat which abounds on the banks of the River Volta. The small percentage of reptilian blood found in *G. submorsitans* may be due to lack of opportunity and not to preference, since in the open country where *G. submorsitans* abounds a reptilian fauna is practically non-existent.

A marked disparity exists in the proportion of the sexes of *Glossina,* various hypotheses having been advanced in explanation of the fact, such as the size of the river on which the flies are caught, the time of capture, the number of inhabitants in a given area, the season of the year, and meteorological conditions. To these must be added the abundance of game and consequently food, which by causing the retirement of the gorged females gives rise to an apparent disparity.

Flight experiments conducted with marked individuals of *G. tachinoides* yielded the following facts:—The greatest distance covered by a single tsetse was 4 miles; all seemed to return to the water, as none were caught at a greater distance from the river than the points where they were liberated; if streams intervened between the place of liberation and the river, the flies made their way down stream to the river: if the stream bed had shady banks, but no water, the flies congregated there and did not attempt to reach the river; not a single tsetse was found in the open bush bordering the road, at a greater distance than 200 yards from it; there was practically no discrepancy in the proportion of the sexes recaptured.

In wide areas of fly-infested country, such as occur in the West African colonies, systematic trapping of *Glossina* is impracticable. Trapping with birdlime was found less satisfactory than collection with nets. Substances that acted as deterrents when applied to the clothing of collectors were beechwood creosote and beechwood oil.

Though some spiders and dragonflies have been seen devouring tsetse, by far the most important insect enemies are Asilid flies and wasps of the genus *Bembex*, the former preying chiefly on *G. tachinoides* and the latter on *G. submorsitans*.

G. tachinoides and *G. palpalis* agree fairly closely as regards their breeding places, the most common situation being in the decaying humus beneath overhanging trees, where the sun seldom or never penetrates, and the ground is never really dry. The breeding season occurs just after the rains begin and lasts till the end of the rainy season. *G. submorsitans* larviposits in similar situations and on undergrowth.

The following parasites are recorded from the pupae of *G. submorsitans* :—*Chalcis amenocles*, Walk. (also bred from *G. tachinoides*), *Dirhinus inflexus*, Waterst., and a Braconid, *Coelalysia glossinophaga*, Turn. Experiment showed that *C. amenocles* parasitised the pupae of *Sarcophaga* much more readily than those of *Glossina*. As species of *Sarcophaga* are everywhere abundant round villages and breed prolifically, it should be possible to obtain in a short time large numbers of this Chalcid for distribution.

G. tachinoides carries *Trypanosoma brucei* in its natural state in W. Africa, horses and cattle being killed by it. A scanty infection of what was apparantly *T. pecorum* was obtained from the blood of wart-hog. An undoubted infection of *T. vivax* occurred in a reed-buck. *Theileria* (*Piroplasma*) *mutans*, or a closely allied species, was found in an oribi, while the blood of a haartebeeste contained a parasite resembling *T. parva*.

The paper concludes with a list of blood-sucking Arthropods other than *Glossina*, which is supplementary to that previously published [see this *Review*, Ser. B, ii, p. 93].

TETLEY (H.). **The Structure of the Mouth-parts of** *Pangonia longirostris* **in Relation to the probable Feeding-habits of the Species.** —*Bull. Entom. Research, London,* viii, no. 3-4, February 1918. pp. 253-267.

The genus *Pangonia* has a wide distribution throughout the world. The precise economic importance of the family TABANIDAE, to which it belongs, is not fully understood at present. The trypanosome disease of dromedaries known as salaf is said to be transmitted by Tabanids, especially *Pangonia magrettii* and *P. beckeri*, in Italian Somaliland [see also this *Review*, Ser. B, v, p. 11]. *Haematopota* has been stated to carry *Trypanosoma evansi*, causing surra in horses; and Mitzmain has demonstrated the transmission of this disease by *Tabanus striatus*, F., in the Philippines. In Algeria Sergent has shown that a species of *Tabanus* can transmit three forms of animal trypanosomiasis, and in Nigeria *Chrysops* is said to convey *Filaria loa*. In view of these facts it may prove that the family is of greater economic importance than is at present suspected.

One of the characteristics of the family TABANIDAE is that the males are without mandibles and do not feed on blood to the same extent as the females, but rather on the nectar of flowers, being provided, especially in the genus *Pangonia*, with a very long proboscis for the purpose. The possible processes of blood-sucking in the species of *Pangonia* may thus be summarised :—Either the insect punctures and sucks up blood through the proboscis alone while on the wing; or the insect alights and punctures with its proboscis; or the insect alights, punctures with its other trophi, and then sucks up blood through its proboscis.

From a consideration of the structure of the mouth-parts, it must be concluded that the male could only suck blood which was flowing from a wound already present on an animal, such as might be caused by the bite of a female Tabanid. This is merely a possibility, but not a probability, since there is no authentic record of a male feeding except on the nectar of flowers. The female can likewise feed in this way, but also sucks blood, probably by the last of the methods enumerated above. It is possible that certain species feed only while hovering, and others only when settled, but further investigations are needed on this point. It is improbable that a puncture is ever effected by the proboscis itself, since in the living insect the apex is flexible, and has not the rigidity usually associated with piercing organs.

Davidson (Capt. J.). **Some Practical Methods adopted for the Control of Flies in the Egyptian Campaign.**—*Bull. Entom. Research, London*, viii, no. 3–4, February 1918, pp. 297–309, 7 figs.

Flies are present in Egypt practically all the year round, though they are less numerous during the height of the hot weather and again about December. Since they are the means of spreading diarrhoea, dysentery, typhoid and cholera, it is of the utmost importance that they should be vigorously suppressed. Flies of the house-fly type (*Musca*) are the most troublesome, although bluebottles (*Calliphora*), greenbottles (*Lucilia*) and *Sarcophaga* are found, these last being often met with in the desert in small clumps of palm trees.

During 1916–17 the work of the sanitary section consisted in the special treatment of breeding places and the destruction of flies by spraying, poisoned bait, traps, etc. The three favourite breeding places for flies of the house-fly type are (1) horse manure, (2) accumulation of camp and cook-house refuse, (3) latrine trenches; those of the bluebottle type prefer putrefying animal matter.

The disposal of horse manure was effected in three ways: by close packing and spraying, by incineration, and by spreading it to make manure roads. The first of these is specially suited to a large camp, a site about 2,000 yards away from the camp being selected and staked out in two areas, 25 yards long and 10 yards wide, separated by a strip 2 yards wide. All horse manure and burnt refuse from incinerators was deposited daily on this site, the areas being used alternately, and the load being immediately raked level. In the late afternoon this surface was thoroughly drenched with a rough emulsion made of crude tar oil, or green oil when available, mixed with water in an adjacent 300-gallon tank, and applied by means of watering cans at the rate of 1 gal. per square yard. It was then covered with large pieces of sacking sewn together, though this was later discontinued as being unnecessary. A number of empty oil-drums were placed upside down round the heaps, the bottoms, which were made concave like saucers, being filled every morning with a solution of 1 per cent. sodium arsenite in water containing 12 per cent. glycerine and 5 per cent. sugar. Flies were killed in such enormous numbers by this means that at the end of a few days hardly any remained, the treatment of the manure preventing further breeding. The wagons bringing the daily load were driven on to the heaps and unloaded and driven off from the other end, thus helping to pack the heaps tightly. Two such dumps lasted about four weeks, being then about 5 ft. high.

This method not being possible in the case of mobile units out in the desert, owing to the scattered camps and the difficulty of transport, it was necessary to have recourse to incineration, each unit being made responsible for burning its own manure. Owing to the large amount of sand mixed with it, it was found necessary to sift it before burning, the siftings, which contained a quantity of pulverised manure, being put into a deep pit and liberally treated daily with crude tar oil. It is also necessary to dispose entirely of each day's manure, any left in the neighbourhood of the incinerators affording a suitable breeding ground for flies.

During the hot weather the making of manure roads is a satisfactory method of manure disposal, especially when carefully supervised. On a road track into the desert each day's manure was laid on successive sections and spread to a depth of one inch, four days being allowed to elapse before each section received a second covering ; in this way a good road of dry pulverised manure was made.

The treatment of latrines by the establishment of the deep trench system is the practice generally adopted. When the contents of the trench reached to within 18 inches of the top, the contents and sides were thoroughly sprayed with cresol 10 per cent., or crude tar oil and the trench then filled in with sand thoroughly mixed with crude tar oil. A mound made with tibbin and sand, in the proportion tibbin 6, sand 1, mixed with water, was then formed over it, and this set quite hard and practically imprisoned all flies that might be breeding in the trench.

To prevent any larvae that might hatch from burrowing out diagonally through the loose sand, a piece of canvas soaked in crude tar oil was stretched over the trench about 6 ins. below the surface, and extending to 18 ins. all round it. A second trench about 6 ins. deep was then made round the first and about 1 ft. from the edge of it and filled in with sand liberally mixed with cresol and tightly packed, the whole being then covered with a mound. This method prevents any lateral emergence.

The methods that have proved most satisfactory for the incineration of excreta, for the disposal of camp and cook-house refuse, for the disposal of dead animals, and for the destruction of adult flies by spraying, the use of tanglefoot fly wires, fly traps and poisoned bait are fully described and illustrated by figures and plans.

Roubaud (E.). **Disparition du Pouvoir infectant chez l'Anophèle paludéen, au cours de l'Hibernation.** [Loss during Hibernation of the Power of malarial Anophelines to transmit Infection.]—*C. R. Hebdom. Acad. Sciences, Paris*, clxvi, no. 6, 11th February 1918, pp. 264–266.

Experiments with *Anopheles maculipennis* infected with the plasmodium of malignant tertian malaria have proved not only that the sporozoits are discharged from the salivary glands by a relatively small number of punctures, but also that if they are not so discharged they slowly degenerate in the glandular tissue or in the salivary medium.

Hence the prolonged infectivity of *Anopheles* does not appear to be possible. Compared with the trypanosome salivary infectivity of *Glossina,* which is generally lasting, continuing until the death of the infected fly, the plasmodial salivary infectivity of *Anopheles* is only temporary and fleeting. Therefore the salivary medium in mosquitos cannot be regarded as a hibernating medium for malarial sporozoits.

THOMSON (F.), KEOGH (F.) & TUCKER (G.). **Eradication of the Cattle Tick. Observations on the Efficacy of the Tick-destroying Mixtures approved by the Queensland Stock Department, according to the Method and the Thoroughness of their Application.**—*Queensland Agric. Jl., Brisbane,* viii, no. 6, December 1917, pp. 302–307. [Received 1st March 1918.]

The Queensland cattle tick, *Margaropus* (*Rhipicephalus*) *annulatus australis,* is a one-host tick, spending the whole of its parasitic life of 21 days on one animal. Owing to the minute size of the larval forms there is a great danger of a slight infestation being overlooked in its early stages, and since one female deposits from 1,500–3,000 eggs, a thorough treatment of tick-infested cattle is of the first importance.

Highly successful results have been obtained for many years by dipping in a solution of 8 lb. arsenic in 400 gals. water containing dissolved soap, but as there has been a tendency of late years to reduce the amount of arsenic and to substitute spraying for dipping, experimental work has been undertaken to show the necessity for the most careful preparation of dipping fluids in accordance with the Government formula.

A dip prepared according to the Department's formula of:—Commercial arsenic $8\frac{1}{2}$ lb., caustic soda 4 lb., tallow 4 lb., Stockholm tar $\frac{1}{2}$ gal., water 400 gals., gave highly satisfactory results on cattle dipped every 14 days.

A dipping-vat, which at working level held 2,800 gals., was charged as follows:—2,000 gals. of water were run into the vat; $59\frac{1}{2}$ lb. commercial arsenic was mixed with 14 lb. caustic soda in the dry state and placed in a 400-gal. tank with about 20 gals. water, the mixture being stirred for a few minutes till the ingredients boiled and the arsenic dissolved. Cold water was then added till the tank was full, when the mixture was well stirred and run into the dip. Next, 50 gals. water were run into the tank and heated to boiling point; 14 lb. caustic soda and 28 lb. tallow were then added and boiled together for $\frac{3}{4}$ hour. Cold water was then gradually added, heating being continued, but the mixture was kept below boiling point. When the tank was half full, $3\frac{1}{2}$ gals. Stockholm tar were added, and the mixture was well stirred. Heating was continued and water gradually added till the tank was full, when the mixture was thoroughly stirred and run into the dip.

It was found that there is a striking difference in the efficacy of a tick-destroying fluid according as it is used for dipping or spraying. The latter is so unreliable that its use for treating tick-infested or suspected cattle before travelling into clean country should not be countenanced when a suitable dip is available. If it is unavoidable, the cattle should be sprayed as often as necessary and held in a clean place till they are proved by the most careful inspection by an experienced person to be thoroughly clean.

Howard (L. O.) & Hutchison (R. H.). **The House-Fly.**—*U. S. Dept. Agric., Washington, D.C.*, Farmers' Bull. no. 851, August 1917, 23 pp., 15 figs. [Received 7th March 1918.]

This comprehensive bulletin deals with the house-fly (*Musca domestica*), its life-history, the danger arising from it as a carrier of disease and its control in both the adult and larval stages by means of fly papers, poisons, fly traps, maggot traps and various methods of manure disposal and treatment.

Other flies found in houses include:—*Stomoxys calcitrans* (biting stable fly); *Muscina stabulans* (non-biting stable fly), which breeds in decaying vegetable matter and in excrement; *Pollenia rudis*, F. (cluster-fly), so called from its habit of collecting in protected corners during cold periods; *Calliphora erythrocephala*, Meig. (blow-fly or meat-fly), *Phormia terraenovae* (bluebottle), and *Lucilia caesar* (green-bottle), all of which breed in decaying animal matter; *Fannia canicularis*, L. (lesser house-fly), and *F. brevis*; *Scenopinus fenestralis*, L. (window-fly), the slender, white thread-like larva of which is found in cracks of the floors in buildings, where it feeds on other small insects; and *Drosophila ampelophila* (vinegar-fly), which is attracted by the odour of over-ripe fruit in late summer and autumn.

The natural enemies of the house-fly include *Scutigera forceps* (common house centipede), which destroys it in considerable numbers; a small reddish mite; parasitic Hymenoptera, which attack it in the larval and pupal stages; and predatory ants and beetles.

Leger (A.). **Spirochétose sanguine animale à Dakar. Sa Valeur au Point de Vue epidémiologique.** [Spirochaete Infection in the Blood of Animals at Dakar. Its Value from the Point of View of Epidemiology.]—*Bull. Soc. Path. Exot., Paris*, xi, no. 2, 13th February 1918, pp. 64–66.

Since describing observations on a spirochaete in the blood of the shrew, *Crocidura stampflii*, at Dakar [see this *Review*, Ser. B., v, p. 98], an identical parasite with the same morphology and pathogenic action has been found in two individuals of *Mus decumanus* out of over 500 examined. The study of this spirochaete revealed morphological characters analogous to those of human relapsing fever; moreover, its development in various laboratory animals such as mice, rats, monkeys, rabbits, guinea-pigs, etc., enabled this virus to be compared with that of human spirochaetosis, but without the possibility of certain identification with any of the known spirochaetes, either Russian, American, African, Indian or Tonkinese. Differentiation by means of immunity reactions would have enabled the identification to be established, but the difficulty of procuring the virus from other sources has prevented this investigation. Although relapsing fever has never to the author's knowledge been recorded in man at Dakar, nor in the Senegalese districts, it is well to be on guard against its appearance. The development of this spirochaete in the various laboratory animals indicates more or less easy transmission to man. The conditions for such transmission already exist in the colony: carriers of the virus (rats, shrews, etc.) are abundant throughout the region, living in constant contact with the natives in their houses and often passing on their ectoparasites to them. Doctors giving medical assistance to the natives of Senegal should therefore be warned of the probability of the existence of human relapsing fever, while the local administrative authorities should be urged to a strenuous campaign against the animals indicated as carriers of the virus.

LEGER (M.). **Documents hématologiques relatifs au Paludisme à la Guyane Française.** [Haematological Records relating to Malaria in French Guiana.]—*Bull. Soc. Path. Exot., Paris,* xi, no. 2, 13th February 1918, pp. 67–73.

This record of malaria in French Guiana is based upon the documents of the Cayenne Institute of Hygiene, created in 1914. The blood examinations that have revealed the presence of malaria parasites are recorded in a series of tables. During the three years under review, 1916 showed a marked diminution of malarial endemicity, while in 1915 and 1917 cases of fever were far more numerous. The relative proportion of the forms of malarial parasites present have varied but little during these years. In each year the greatest abundance of parasites occurred during the dry season (August to December); there is however no season when infection does not exist. *Plasmodium vivax* has been found to reach its maximum always in the cold season, reaching 42 per cent. of the total infection during the months December-March, and falling to 34 per cent. during the rest of the year. The percentage of *P. praecox* is inversely proportional to that of *P. vivax*. *P. malariae* remains constant and in very small proportion. The forms and percentages of occurrence are contrasted among the free population of Guiana on the one hand and the penal settlement on the other; the incidence of the disease is far heavier among the latter owing to their lack of and in difference to hygienic measures.

A table compares the parasitic forms observed in infants and adults; this shows that the proportion of infestations by the parasite of benign tertian malaria decreases with age, while those of malignant tertian increase in exactly inverse proportion. The plasmodium of quartan malaria remains at a uniform level. This result is not in accordance with the unicist theory of the haematozoa of malaria. Other observations made in Guiana, without being irrefutable, are also unfavourable to the hypothesis that *P. praecox* transforms into *P. vivax*. In one case, two new arrivals in the Colony, who had had no previous malarial attacks, became infected with *P. vivax* only. The same infection occurred in the case of three infants born in the Colony. As there has been no fresh contingent of convicts sent out during the last three years, owing to the War, it would be expected that the proportion of infestations of *P. vivax* would increase, while that of *P. praecox* would decrease; the reverse has however been the case.

A record of 101 cases showing successive parasitic forms gives the following figures; *P. praecox* remaining unchanged, 27; *P. praecox* becoming *P. vivax,* 20; *P. praecox* becoming *P. malariae,* 5; *P. vivax* remaining unchanged, 18; *P. vivax* becoming *P. praecox,* 19; *P. vivax* becoming *P. malariae,* 2; *P. malariae* remaining unchanged, 1; *P. malariae* becoming *P. praecox,* 1; *P. malariae* becoming *P. vivax,* 1; mixed forms becoming simple, 7. These statistics do not corroborate the unicist theory regarding the malaria parasite.

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Lagriffoul (A.) & Picard (F.). **Mode d'Action du Climat sur la Répartition géographique du Paludisme.** [Influence of Climate on the Geographical Distribution of Malaria.]—*Bull. Soc. Path. Exot., Paris*, xi, no. 2, 13th February 1918, pp. 73–80.

The authors, continuing the discussion regarding the influence of climate on malaria [see this *Review*, Ser. B, vi, p. 81], remark upon the scarcity of mixed infections observed by them. The fact that *Plasmodium praecox* alone is found in the tropical zone, and that this form of malaria does not exist in France, while in the sub-tropical zone the two and even the three forms are found, appears to the authors to be simply explained. *P. praecox* requires a high temperature for its development in the mosquito. The conditions essential to its development are present in the tropical zone practically all the year round. In the Mediterranean region, on the contrary, *P. praecox* is at the limit of its habitat; it is only from July onwards that it finds conditions favourable for its existence. It is remarked, however, that this form can produce autumnal infestation, the oocysts, which require a very high temperature in order to reach maturity, having then produced sporozoits that can live a long time in lower temperatures. There is therefore an intermediate season when the mosquito continues to carry infection, but is no longer capable of becoming itself infected. But *P. praecox* never occasions a spring infestation, because the needs of the oocyst with regard to temperature are no longer satisfied, or only very rarely and very locally; this species cannot therefore maintain its existence. *P. vivax*, on the contrary, can develop in the Anopheline in a moderate temperature. It therefore accompanies *P. praecox* in the tropical zone, carries infection from the springtime onward in the Mediterranean region and will continue its existence alone further north, where it becomes aestivo-autumnal, as is *P. praecox* in the South.

The authors are of opinion that man can carry the crescent form of the parasite for a long time in France, even in winter, and cite several cases that have come under their observation. With regard to the rapid disappearance of *P. praecox*, it is pointed out that carriers of this form are treated in Dr. Vaillant's model dispensary with three quinine doses a week, while cases parasitised by *P. vivax* are only given quinine after positive microscopic examination; it is thought that this may explain the rapid disappearance of the one form and the persistence of the other. This is not considered as refuting the theory that the varying constituents of the liquid environment of the parasite play an important part in the control of malaria [*loc. cit.*].

The authors consider it dangerous to assume that carriers of the crescent form of the parasite become rapidly and spontaneously cured in France. These persons are capable of creating centres of infection around them, and in the south of France at least *P. praecox* might become established in this way.

M. Marchoux, in the discussion aroused by this paper, limited himself to the statement of a few positive and established facts, remarking that he has himself known cases of tertian malignant infection become cured spontaneously in France upon recovering a good general state of health. In an organism living at a constant temperature the interior environment is essentially variable in its reactions.

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Admitting that locally acquired cases due to *P. praecox* (*falciparum*) have undoubtedly occurred in France, the fear of this parasite becoming established in the country is merely a hypothesis which the future may prove to be correct, but which can equally well be opposed by other hypotheses that may or may not be correct. The geographical distribution of the three forms of Laveran's parasite obeys certain laws; as malaria due to *P. praecox* has not yet become established in the south of France, it is obvious that there are certain serious obstacles opposed to it, for it has certainly been introduced there long ago.

M. Roubaud stated his opinion that the findings of the authors, while interesting and *a priori* logical, do not appear to be quite in accordance with experimental facts. He does not consider it established that *P. praecox* requires a higher average temperature for its development than *P. vivax*. He quotes the opinion of various authors on this point, remarking that in his own observations no appreciable difference has been observed regarding the sensibility to heat of *P. vivax* and *P. praecox* in *Anopheles maculipennis*. The only fact that can, in his opinion, explain the earlier appearance of *P. vivax* in the seasonal periodicity of the two tertian forms, is the more rapid development of this parasite in the mosquito than of *P. praecox* under the same conditions of temperature. He considers it probable that it is this early invasion of *P. vivax* that limits to too short a period of time in the French climate the appearance in the blood of gametes of the tropical parasite.

LANGERON (M.). **Morphologie et Biologie de la Larve de** *Theobaldia spathipalpis*, **Rondani, 1872.** [Morphology and Biology of the Larva of *Theobaldia spathipalpis*, Rondani, 1872.]—*Bull. Soc. Path. Exot., Paris*, xi, no. 2, 13th February 1918, pp. 98–104, 8 figs.

Theobaldia longiareolata (*spathipalpis*) is a widely distributed mosquito in southern Europe and Africa, and is also found in the islands of the Atlantic Ocean and of the Mediterranean, and even in India. In 1911, larvae of this species were observed in Tunis associated with those of *Stegomyia fasciata* (*calopus*), and were reared in the Pasteur Institute at Tunis. The larvae of the two species are remarkably similar and during the period of development are almost impossible to distinguish with the naked eye, though *T. longiareolata* eventually grows to a larger size. As the larvae of *T. longiareolata* do not appear to have been previously described, they are fully dealt with in this paper and are differentiated from those of *S. fasciata*.

LEGER (M.) & MOUZELS (P.). **Dermatose prurigineuse determinée par des Papillons saturnides du genre** *Hylesia*. [Pruriginous Dermatosis due to Saturniid Moths of the Genus *Hylesia*.]—*Bull. Soc. Path. Exot., Paris*, xi, no. 2, 13th February 1918, pp. 104–107, 1 fig.

Instances are recorded of a vesiculo-erythematous eruption which is frequently observed, especially among children, at the end of the rainy season in Cayenne. These eruptions almost always occur on the exposed parts of the body, and are caused by a Saturniid moth of the genus *Hylesia*, or some closely allied genus. The wings and abdomen of these moths are covered with a pubescence composed of innumerable minute spines that become detached very easily. Experiments have shown that the eruption is due to the irritation caused by these spines penetrating the skin, and that their action is not purely mechanical, as they contain an irritant poison. The inflammation generally lasts about a week.

Bequaert (J.). **Parasitic Muscid Larvae collected from the African Elephant and the White Rhinoceros by the Congo Expedition.**—*Bull. Amer. Mus. Nat. Hist., New York*, xxxv, 1916, pp. 377–387.

Dipterous parasites of the African elephant include the larva of *Neocuterebra squamosa*, Grünb., parasitic in the sole of the foot. As the imago is still unknown, it is not possible definitely to fix the systematic position of this fly. In the stomach occur the larvae of *Cobboldia loxodontis*, Brauer, and *C. chrysidiformis*, R. & B., which, in some districts, live together in the stomach of the same individual.

From the stomach of the white rhinoceros (*Rhinoceros simus cottoni*) the larva of *Gyrostigma* (*Spathicera*) *paresii*, Corti, has been obtained.

Taylor (M.). **The Chromosome Complex of** *Culex pipiens*. **Part II. Fertilisation.**—*Qrtly. Jl. Micros. Sci., London*, no. 247 (lxii, no. 3), August 1917, pp. 287–301, 1 plate.

Culex pipiens is essentially the British mosquito that has a partiality for avian blood. After the summer female has fed once on the blood of a living bird, the eggs attain their normal size and are ready for fertilisation. They are laid almost immediately after the second feed, fertilisation having taken place in the interval between the two meals. This probably accounts for the fact that females reared in captivity and fed on fruit appear never to be fertilised.

Experiments on artificial rearing seem to show that wild birds, such as sparrows, thrushes and blackbirds are not so easily attacked as domestic ones. Egg-rafts were twice found in a wooden tub that had been stocked with larvae and placed in a small garden, a young pigeon being caged in the near neighbourhood. In previous years, only infertile eggs had been laid in the absence of this pigeon, the other conditions having been the same.

In order to obtain material in sufficient quantities for the investigation of the fertilisation processes, ponds were prepared near a farmyard in which was a stock of poultry. These ponds were four in number, one (A) being a large circular iron trough 30 inches in diameter and 24 inches deep, while another (B) was a wooden tub, 25 inches in diameter and 16 inches deep, these being placed side by side, protected on the north by shrubs, and on the east by a wall. A was exposed to all the sunshine of morning, afternoon and evening, but B was nearer the wall and more shaded, though neither was hidden by vegetation. The third (C) was an elliptical tinned iron bath, measuring 36 by 26 by $11\frac{1}{2}$ inches, surrounded on three sides by glass houses but exposed on the south side, and the fourth (D) was a rectangular porcelain sink, 20 by 14 by 10 inches, placed in the uncut grass of an open space.

By the 21st May 1916, fifteen egg-rafts were found in A, the artificial stocking of the ponds being therefore unnecessary, but no rafts appeared in B till 15th June. The preference shown by the mosquitos for the iron trough and tin bath may have been due to the higher temperature of the water in these, or to their positions allowing them to be found more easily. The porcelain trough was never popular.

The May and June rafts were evidently laid by the hibernating adults of the previous autumn, since subsequent eggs were not produced abundantly till the middle of July, when a spell of very warm, moist weather resulted in an abundant supply, which continued as long as the same type of weather lasted till the middle of August.

The deposition of rafts had been noted at about 5 a.m., but prolonged observation showed that the majority were laid between 9.30 p.m. and 12 p.m., very few between 12 p.m. and 4 a.m., and some between 4 a.m. and 6 a.m. With the advance of the season, fewer were laid in the morning hours. Numerous imagines were always found hovering over the ponds at a height of about 6 feet in the evenings, when damp heat greatly conduced to the deposition of the egg-rafts.

Although larvae of *Culex* grow more quickly in a good culture of *Chlamydomonas*, yet *Daphnia* also flourish well on this diet, to the detriment of the mosquito larvae, and this fact perhaps accounts for the more frequent occurrence of *Culex* in the fairly clean water of rain-barrels and drinking troughs, when they might have been expected to prefer a more stagnant habitat.

The act of deposition of the egg-rafts takes about 15–20 minutes. The females, which fly away after oviposition, appear to be perfectly vigorous, and are probably capable of depositing more than one raft in the course of the season.

Bacot (A.). **A Note on the Period during which the Eggs of** *Stegomyia fasciata* (*Aëdes calopus*) **from Sierra Leone Stock retain their Vitality in a Humid Temperature.**—Separate from *Parasitology, Cambridge*, x, no. 2, 22nd January 1918, pp. 280–283.

The fact that the eggs of the mosquito, *Stegomyia fasciata*, remain viable for many months when out of water has been recorded by several authors.

With a view to ascertaining whether eggs stored out of water, but in a humid atmosphere, retain their viability, the author experimented on a large number of ova from Freetown. These, laid on filter paper, were placed in a waxed card jar and kept in an unused ice chest in a cool cellar having a bricked floor, and showing a very even range of conditions, with a high percentage of humidity. Immersion tests begun 7 months after laying showed that the eggs hatched readily, not more than 10–20 per cent. of the larvae failing to emerge. Those tested 9 months after laying also hatched readily. After 10 months, there was a very noticeable rise in the percentage of failures to hatch. After 11 months, probably not more than 5 per cent. of those immersed yielded larvae, though these hatched within an hour of immersion. Tested after 12 months, only 5 larvae emerged from about 600 eggs, and then not until 5 or 6 hours after immersion, and all these lived to pupate. From a batch of 1,000 eggs immersed after 13 months, a single larva emerged within 24 hours and pupated within a week. Eggs immersed 14 and 15 months after laying all failed to hatch.

The longest period of dormancy in the case of submerged eggs was 5 months under natural conditions in West Africa.

Though it is possible that the African and American races of *S. fasciata* may differ considerably in constitution, the author considers that the extreme period of viability of eggs of West African examples stored out of water may be taken to be about a year.

Malaria in the Armies.—*Brit. Med. Jl., London,* no. 2986, 23rd March 1918, pp. 350–351.

Many districts in Macedonia being notoriously malarious it can hardly be doubted that the military operations there have been hampered throughout by the high rates of sickness, the casualty figures having been dwarfed by those of sickness due to malaria. The figures for 1917 show a maximum of 33 men per 1,000 evacuated to the base during the second week in October, and this in a year when continuous anti-malarial work had resulted in a considerable diminution as compared with the previous year. In the French army in Macedonia during the same year a considerable improvement had taken place, due to the sanitation of localities, to the free distribution of mosquito nets, and to the administration of a daily dose of quinine under supervision.

A full appreciation of the military importance of the problem should result in canalisation and similar work against the hibernating mosquito being undertaken as early as March or April, as soon as the waters begin to subside. The education of officers and men of all branches should also be considerably extended, for insufficient notice is too often taken of the failure of individuals to protect themselves and others from needless exposure to mosquito bites. A case in point is that of a camp where on a night visit it was found that only 6 per cent. of the men had taken the trouble to close their nets properly. Further it is stated that in training centres in England attendance at lectures on malaria has been optional, and this, when the incidence of the disease is severe, not only in Macedonia, but in Mesopotamia and East Africa also.

Cross (H. E.). **Experiments with Emulsions for protecting Camels against the Attacks of Blood-sucking Flies.**—*Agric. Research Inst. Pusa, Calcutta,* 1917, Bull. no. 76, 12 pp. [Received 20th March 1918.]

This bulletin describes experiments carried out to determine the efficacy of the following preparations for protecting camels against blood-sucking flies:—Kerosene oil emulsion, oil emulsion prepared from *Eruca sativa,* asafoetida solution, chir-pine oil emulsion, creosol emulsion, Jensen's emulsion, citronella oil, aniseed oil, cod liver oil, castor oil. The only one that prevented the attacks of TABANIDAE for any length of time was castor oil, the cost of which is however too high. None of the others are of any practical value, since as soon as the emulsions dry, they cease to repel the flies.

SCHÜFFNER (W.) & SWELLENGREBEL (N. H.). **De Anophelinen in Deli in Verband met de Uitbreiding der Malaria.** [Anophelines in Deli in Connection with the Spread of Malaria.]—*Meded. Burgerlijken Geneesk. Dienst in Nederlandsch- Indië, Batavia,* 1917, no. 4, pp. 1–24, 19 figs. [Received 20th March 1918.]

In the past malaria was of so little importance in Deli (Sumatra) that remedial measures were not considered necessary. Of late years, however, the disease has been increasing. On the estates of the Senembah Company, which cover about 231 square miles, blood examinations have been regularly made during 15 years, and whereas the number of cases remained at about 17 per mille up to 1906, they then slowly rose to 25 per mille, afterwards rapidly increasing until they reached 79 per mille in the first half of 1913. The unfavourable character of these figures is emphasised by the fact that the chief increase concerns the malignant type, which in 1913 was seven times as great as in 1909. The quartan form has increased four times, whereas the benign tertian form has not participated in the rise. During 1907–1913 the quartan form was mostly found in the hilly districts, whilst this was only the case with the malignant tertian form in the later years. The cause of the increase of these two forms is therefore not the same. Cases of quartan malaria increase after the rainy season, while those of benign and malignant tertian increase during it. In Deli the variations of temperature are too slight to account for these differences. There is probably a relation between the seasonal differences in the number of cases and the number of Anophelines. In Deli the mosquito-carrier of benign and malignant tertian malaria appears to develop best in autumn and winter, and that of quartan malaria about three months later, and the transmitting species are probably not the same. It is also possible, but not probable, that a seasonal immunity of the Anophelines obtains in Deli. The statistics recorded in connection with the Senembah Company refute the view that the increase of malaria is due to the great immigration of Javanese since 1909 as a result of rubber cultivation. It is therefore necessary to assume that in former times conditions were unfavourable to infection, or, in other words, that there was a lack of transmitting Anophelines. Either present-day conditions are more favourable to the indigenous mosquitos or new species have been introduced. The knowledge of the Anophelines of Deli is insufficient to allow of this point being decided. After insisting on a more detailed knowledge of Anophelines, attention is drawn to the fact that no great difficulty attends the determination of the species already known.

A description is given of the following species: *Anopheles* (*Cellia*) *kochi,* Dön., *A.* (*Myzomyia*) *rossi,* Giles, *A. ludlowi,* Theo. (*vagus,* Dön.), *A.* (*M.*) *leucosphyrus,* Don., *A.* (*M.*) *punctulatus,* Dön., *A.* (*M.*) *albirostris,* Theo., *A.* (*Myzorhynchus*) *sinensis,* Wied., *A.* (*M.*) *barbirostris,* Wulp, and *A.* (*M.*) *albotaeniatus,* Theo.

The notes given on the distribution of Anophelines in Sumatra are substantially the same as those in a paper already abstracted [see this *Review,* Ser. B, v, p. 26].

JEPSON (F. P.). **Insects injurious to Man and Animals.**—*Dept. Agric. Fiji, Ann. Rept. for the Year 1916, Suva,* 20th November 1917, pp. 23–25. [Received 1st April 1918.]

Investigations have been undertaken, and are still in progress, to determine the best way of treating stable manure so as to abate the fly nuisance caused by its use in gardens. A large number of the flies bred experimentally from the manure have proved to be other than *Musca domestica.*

The fish introduced from Honolulu in 1910 to feed upon mosquito larvae in shallow ponds and swamps are reported to be still breeding rapidly.

Scaly leg or scabies of the legs of poultry caused by the mite, *Sarcoptes mutans,* is a disease that has been under treatment during the year. The mite lives under the epidermal scales, causing an irritation that materially affects the health of the birds. All parts of the fowl-house should be thoroughly scrubbed with some standard disinfectant in boiling water, and the legs of the fowls treated to remove the crusts and prevent their reappearance. The best method is to soak the legs for a few minutes in a tepid alkaline bath made from calcium carbide refuse, washing soda or Scrubbs' ammonia in water, after which the crusts can be easily removed. When dry, the legs should be smeared with Helmerich's pomade according to the formula : sublimed sulphur 10 parts by weight, distilled water 5 parts, almond oil 5 parts, potassium carbonate 5 parts, lard 5 parts. This may be washed off with soap and water in 2 days' time, but the treated surface should be smeared with vaseline for a few days to allay any remaining irritation.

À COURT (A. W. H.). **Sub-tertian Malaria—a Report of Thirty-five Cases.**—*Med. Jl. Australia, Sydney,* 5th year, vol. i, no. 4, 26th January 1918, pp. 63–66, 8 graphs. [Received 2nd April 1918.]

The outbreak of malaria recorded in this paper occurred on board a hospital ship, on a voyage from England to Australia. The ship arrived at Sierra Leone during the height of the malaria season and anchored 2,000 yds. from the shore. During the evening of the third day, a fresh anchorage was taken up 1,130 yds. from the shore, a distance of 1,000–1,500 yds. being considered, under ordinary circumstances, a safe distance to anchor from a mosquito-infected shore. However an off-shore breeze sprang up, and many mosquitos were observed on board shortly after nightfall. Of the 690 persons on board, 35 became infected with malaria, and of these only one had landed, and that during the daytime.

In view of these facts it should be noted that ships lying off a malarial shore are not necessarily immune at a distance of 1,130 yards, and anchorage, especially at night, should be taken up as far from the shore as possible.

CAMPBELL (A. W.), CLELAND (J. B.), & BRADLEY (B.). **A Contribution to the Experimental Pathology of Acute Poliomyelitis (Infantile Paralysis).**—*Med. Jl. Australia, Sydney,* 5th year, vol. 1, no. 7, 16th February 1918, pp. 123–128, 4 figs.

The authors, as the result of careful experiment, record their conviction that epidemic poliomyelitis is not spread by means of *Stomoxys calcitrans* (biting stable fly), the negative results obtained being in accordance with recent investigations, and with the belief that the infection is local and neural and by way of the lymphatics, not general by way of the blood stream.

El *Rhinoestrus nasalis,* **De Geer.**—*Bol. Soc. Entom. de España, Zaragoza,* i, no. 3, March 1918, p. 54.

A larva of *Gastrophilus* (*Rhinoestrus*) *nasalis* infesting the human eye is recorded from Cataluña.

Roubaud (E.). **Le Rôle des Mouches dans la Dispersion des Amibes dysentériques et autres Protozoaires intestinaux.** [The Rôle of Flies in the Dispersal of Dysenteric Amoebae and other Intestinal Protozoa.]—*Bull. Soc. Path. Exot., Paris,* xi, no. 3, 13th March 1918, pp. 166–171.

The author reviews the various and conflicting theories propounded by different authors on the question of the dispersal of the intestinal Protozoa of man and in particular of the amoebae [see this *Review*, Ser. B, v, p. 151]. His own experiments have been undertaken with the object of determining within what limits flies can be efficient carriers of the principal intestinal Protozoa that they are liable to ingest while feeding upon faecal matter, including the dysenteric amoebae, *Entamoeba coli* and *Lamblia* (*Giardia*) *intestinalis.* In default of more particularly coprophagous species such as *Calliphora*, *Lucilia*, *Sarcophaga*, etc., the house-fly, *Musca domestica*, was used for these experiments. The results proved that these flies cannot act as vectors of the principal intestinal Protozoa except under very limited conditions. If the cysts ingested by the flies with human excreta are to reach the human organism with sufficient vitality to propagate the infection, the excreta of the flies must be deposited directly into a liquid or on moist food. Cysts deposited on dry matter are destined to almost immediate destruction. For this reason the flies that are carriers of the Protozoa also contribute in a large measure to their destruction, by withdrawing them from the only media in which they can exist.

Houssay (B. A.). **Sur les Propriétés hémolytiques, fermentatives et toxiques des Extraits d'Araignées.** [On the haemolytic, fermentative and toxic Properties of Extracts of Spiders.]—*Bull. Soc. Path. Exot., Paris*, xi, no. 3, 13th March 1918, pp. 217–239.

This paper describes various experiments to test the toxic properties of extracts of various venemous spiders; these include *Araneus erythromela*, Holmb., *A. audax*, Black, and *Latrodectus mactans*, F. Toxicity, while perhaps due in part to poison secreted in the glands, is nevertheless chiefly if not exclusively due to the eggs, an intravenous injection of 5 to 10 eggs being sufficient to kill a rabbit. The various effects of the bites of different species of spiders on man are reviewed.

BRUMPT (E.). **Au Sujet d'un Parasite (*Rickettsia prowazeki*) des Poux de l'Homme considéré, à tort, comme l'Agent causal du Typhus exanthématique.** [Regarding a Parasite (*Rickettsia prowazeki*) of *Pediculus humanus*, erroneously considered as the Causative Agent of Exanthematous Typhus.]—*Bull. Soc. Path. Exot., Paris,* xi, no. 3, 13th March 1918, pp. 249-258.

This paper reviews the recent studies on the louse [*Pediculus humanus*] and its connection with the micro-organism known as *Rickettsia prowazeki.* The author's investigations have enabled him to identify the organisms taken from healthy lice with those previously recorded by other authors and described by da Rocha Lima under this name. Seventy individuals of *Pediculus humanus,* of which more than fifty were thus infested, were allowed to feed on the author without producing any infection. The fact that this organism, which apparently cannot develop in culture media, is found in the blood and certain organs of patients does not prove it to be the agent of exanthematous typhus ; it might on the contrary have been inoculated by the louse without having any pathogenic action. Lice parasitised by coccobacilli remain infected all their lives. Typhus-infected lice are active from the 8th to the 10th day and it would be interesting to know how long their infective power lasts, in order to determine if there is in certain cases any relation between the development of the typhus virus and that of *Rickettsia.*

VILLENEUVE (J.). **Première Note sur Quelques Nématocères vulnérants (Dipt.).** [A First Note on Some Biting Nematocera (Dipt.)].—*Bull. Soc. Entom. France, Paris,* 1918, no. 4, 27th February 1918, pp. 96–99.

The genus *Culicoides,* Latr., is defined in this paper and *C. pulicaris,* L., and *C. fasciipennis,* Staeg., are recorded from Allier and Rambouillet respectively. Species of the genus *Simulium,* Latr., recorded by the author from France and Corsica include *S. hirtipes,* Fries, *S. ornatum,* Mg., *S. nanum,* Zett., *S. latipes,* Mg. (*aureum,* Fries), *S. maculatum,* Mg. (*lineatum,* Fries), *S. columbaczense,* Schönb., and *S. vittatum,* Zett., var. *delphinense,* var. n., described from two females captured in Dauphiné.

CHANDLER (A. C.). **Animal Parasites and Human Disease.**—*New York,* John Wiley & Sons, Inc. *London,* Chapman & Hall, Ltd., 1918, 570 pp., 254 figs. Price 21*s.* nett.

The author's object in writing this book has been, to quote the preface, " the education of the people as a whole in the subjects of vital importance with which it deals and an increased interest in this field of scientific work." He does not claim to have effected anything in this volume beyond a compilation of recorded facts, but holds the opinion that of equal importance with research work is the careful dissemination of scientific knowledge in a suitable form for the general public, so that they may not be left hopelessly behind in the progress of science. The important facts of parasitology, as related to human disease, are presented in such a manner as to make the book readable and useful to public health and immigration service officers, to physicians, teachers of hygiene and domestic science, to college and high school students, to travellers, farmers, merchants and the public generally.

A list of the sources of information consulted in the compilation of the book is given; in this the names of all the leading periodicals in which important articles on parasitology have appeared, or are likely to appear, are included, as well as books dealing with parasitology in a comprehensive manner. The book is well illustrated and contains an adequate index.

Increased Rice Acreage, Greater Malaria Problem.—*California State Bd. Health Mthly. Bull., Sacramento,* March 1918, p. 400.

During 1917, 84,000 acres of rice were harvested in California, and it is probable that this will be increased by 40 per cent. this year. Since 95 per cent. of the California rice is grown in the Sacramento valley, the malaria and mosquito problem will be of greater importance than ever, while as yet no effective method of mosquito control, without injury to the growing rice, has been devised.

HEWITT (C. G.). **Rats and Mice. Destroyers of Grain and Food.**—*Canada Dept. Agric., Ottawa,* Crop Protection Leaflet no. 7, 25th February 1918, 4 pp.

The dangers from rats, which, besides causing enormous destruction of food supplies, are carriers of bubonic plague, which is transmitted to man by fleas, are pointed out, and a vigorous campaign for their destruction is urged. It is also considered probable that the rat is an important factor in the spread of infantile paralysis or poliomyelitis.

LAMBERT (J.). **Phlebotomus Fever in Lemnos.**—*Jl. R.N.M.S., London,* iv, no. 2, April 1918, pp. 144–157.

This paper describes an epidemic of sand-fly fever in the island of Lemnos. The disease is prevalent there from May to September, the majority of cases occurring during June, July and August, when the weather is hottest. During the epidemic the commonest sand-fly present at Lemnos was *Phlebotomus papatasii.* This was very numerous on warm, close nights and could be caught in large numbers under any artificial light. It bites persistently, if undisturbed, and easily passes through an ordinary mosquito curtain. In the vicinity of Mudros there are ideal breeding-places for these midges, the native houses being of roughly cemented stone, while loose stones lie about everywhere. The camps chiefly affected lie along the foreshore between the harbour and East Mudros village, and stray gullies and an insanitary drain running down to the foreshore afford admirable shelter for the larval stages. Individuals of *P. papatasii* have been occasionally caught on ships lying about half a mile off Mudros, having been blown off the land. No investigation was made regarding the prevalence or otherwise of the disease in the inland villages. It was found that the cases of sand-fly fever were most numerous 8 to 12 days after a period of close, sultry evenings, and this is easily explained by the fact that the incubation period of the disease is from 2 to 4 days and the period of development of the virus from 6 to 8 days. Tables are given recording the number of cases occurring under various climatic conditions, the daily temperature during the period of the epidemic, etc.

Di Pace (I.). **Le basse Temperature nella Lotta contro il Pidocchio del Corpo.** [The Use of low Temperatures against the Body-Louse.]—*Annali d'Igiene, Rome,* xxviii, no. 3, 31st March 1918, pp. 130–137.

In many circumstances the usual methods of removing lice from clothing cannot be resorted to. The action of low temperatures, such as occur during 6 or more months in the year in mountainous districts on the Italian front, is a useful help that compensates for its lower efficiency by the fact that it is within the reach of all engaged in mountain warfare waged at altitudes between 6,000 and 8,000 feet. As all the men possess a second set of clothing, the one in daily use should be hung out at night and then brushed with a stiff brush on the following morning. The lice, which are numbed by temperatures beneath 42°–43° F., do not cling firmly and falling on the snow will die there within 3–4 days. The operation must be repeated from time to time in order to remove the lice that have hatched out after the first treatment, as this process affects the lice only and not the eggs. It must be remembered that incubation requires at least 40 days in clothing and that this period will be greatly prolonged if the clothes are hung out for about 14 hours in 24 at temperatures varying between 35° F. and 14° F. As in the case of other methods this process must be practised by all the men if it is to be successful. The experiments leading to the above conclusions are described in detail.

Reakes (C. J.). **Notes Regarding Ticks found on Farm Animals in New Zealand.**—*Jl. Agric., Wellington, N.Z.,* xvi, no. 2, 20th February 1918, pp. 83–86. [Received 23rd April 1918.]

The Queensland cattle-tick *Margaropus* (*Boophilus*) *annulatus australis*, the transmitting agent of tick fever, has never been discovered in New Zealand. The ticks that occur on cattle are *Ixodes ricinus* and a species of *Haemaphysalis.*

Though ticks do not cause diseases in New Zealand, yet measures for their destruction should be undertaken by stockowners, since they occasion loss through lowering of condition, decreasing the milk-yield of cows, causing deterioration in the value of hides, and causing possible mortality among animals already weakened by various forms of sickness.

The best treatment consists in spraying the infested parts of the skin with Stockholm tar, after which all dead ticks should be collected and burned. Other spraying preparations consisting of kerosene $\frac{1}{2}$ pint, linseed oil $\frac{1}{2}$ pint, and sulphur 1 oz.; or kerosene 10 oz., with lard 10 oz., tar 2 oz., and sulphur 1 oz., ultimately destroy the ticks, though their action is much slower. Very strong solutions of sheep-dips have also proved effective, though the cattle are liable to suffer from their effects, when used at the necessary strength.

PARKER (R. R.). **Data concerning Flies that Frequent Privy Vaults in Montana (Dip.).**—*Entom. News, Philadelphia, Pa.*, xxix, no. 4, April 1918, pp. 143–146.

During the fly investigations of the season 1914, experiments were conducted to determine the species of flies frequenting privy vaults. For this purpose a trap was constructed to cover the entire back of a privy, the vault of which was open in the rear, and excavated to a depth of about 3 ft. The seats were uncovered and the door always open. The flies entered by the doorway and the open seats and could leave by the same way, though if they attempted to escape by way of the vault, they were captured by the trap.

The total number of flies taken was nearly 10,000 (9676) and included 26 species comprising Muscids 13, Anthomyids 4, Sarcophagids 3, Syrphids 2, Tachinids 1, Culicids 2, Ortalids 1.

It was found that in all species the females greatly predominated, *Lucilia sericata*, Mg., being present in the ratio of 678 females to 1 male, *L. caesar*, L., yielding no males, and *Musca domestica* showing 3 times as many females as males. For this reason, any bait that will attract more females should be considered more efficient than one which attracts equal numbers of both sexes, a satisfactory one of this nature being a combination of beer and oatmeal.

As regards numbers, *Fannia scalaris*, F., was the most abundant species, being a prolific breeder in latrines. *Muscina stabulans*, Fall., was unexpectedly abundant (16·27 per cent. of the total); this is important, since this is almost the only fly found in houses at some seasons of the year, while *Musca domestica* constituted only 9·03 per cent. of the whole. *Phormia terraenovae*, Desv., *P. regina*, Mg., and *Calliphora* spp., which were all poorly represented, are numerous in houses at certain times, where, however, they do not seem to frequent food, but are found commonly on windows.

Species reared from material from the same vault during the period of the experiment were:—*Fannia scalaris, Ophyra leucostoma, Limosina* sp., *Rhegmoclema atrata*, and *Nemopoda cylindrica*; while *Desmometopa latipes* and *Leria serrata* were reared from material taken from deep vaults.

Control experiments with out-of-door traps baited with human excrement gave the following results:—*Musca domestica* 21·81 per cent.; *Muscina stabulans*, 21·26; *Lucilia sericata*, 26·07; *L. caesar*, 3·31; *Phormia regina*, 11·66; *P. terraenovae*, ·07; *Calliphora* spp., 1·34; *Ophyra leucostoma*, ·21; undetermined Anthomyids, 5·25; Sarcophagids, 8·75.

WILLOUGHBY (Major W. G.) & CASSIDY (Capt. L.). **Anti-Malaria Work in Macedonia among British Troops.**—*London*, H. K. Lewis & Co. Ltd., 1918, 68 pp., 13 plates, 1 fig., crown 8vo. Price 3*s*. 6*d*. net.

This booklet is a record of personal and practical experience in anti-malarial work carried on in and near the front in Macedonia. While this work has shown improved results in 1917 compared with those of 1916, the continued prevalence of much malaria is a matter for regret. A brief description is given of mosquitos and their connection with malaria, the species responsible in Macedonia for malaria of a malignant type being *Anopheles superpictus* and *A. pseudopictus,* while *A. maculipennis* and *A. bifurcatus* and possibly others also occur.

The scheme of organisation of the anti-malarial work is outlined. The question of labour for carrying out these measures is a serious problem ; military duties interfere to a large extent in using soldiers, and it is suggested that it would be far preferable to have a permanent squad of skilled anti-malarial workers, to be formed independently and attached for that special purpose. The author considers that for this work native labour has not been sufficiently utilised, nor its value appreciated ; and he points out that at a time when only twelve natives were allotted, after much entreaty, in an urgent period of the malarial season, more than 100 times this number were employed in repairing roads in the same district.

While the destruction of mosquitos and other malarial measures outside the fighting zone in Macedonia are matters of time, labour and expense only, some of the worst mosquito haunts lie within the fighting zone and so cannot be reached. It is thought that more could be done in the matter of choosing favourable sites for troops not actually in the front line, and that it is advisable to keep a proper sense of proportion between the importance of malaria prevention and that of military convenience, as apart from military necessity. By obtaining expert medical advice on this question the repayment in improved health might be great, while the expense of laying a pump and pipes or the carrying of water by mule labour is obviously less than the unending cost of sick men, their attendants and the reinforcements necessary to take their places.

The usual methods for destruction of the adult insect and for elimination of the breeding places are described. For killing adults in buildings and dug-outs fumigation is suggested with 1 lb. sulphur to 500 cub. ft. of space, burning of cresol, or spraying with a 1 per cent. solution of formalin. A single fumigation only deals with the insects present and unless doors or openings are screened after fumigation the insects will soon be as numerous as before. Buildings should be searched for adults about once a fortnight throughout the winter.

Methods for protection of the skin are described and the necessity for nets both for sleeping and for wear after sundown are insisted upon. Individual neglect of such precautions has undoubtedly been responsible for many cases of malaria and should not, in the authors' opinion, be lightly dealt with. A chapter is devoted to quinine prophylaxis, and the work concludes with a number of recommendations by which it is hoped that even more thorough and successful work can be carried out if Macedonia has to be occupied during another summer.

CLEGG (T.). **The Influence of Animals upon Sewage Disposal.**— *Lancashire & Cheshire Naturalist, Darwen,* x, no. 117, December 1917, pp. 271–274.

The moth-fly, *Psychoda sexpunctata,* Curt., abounds in sewage works at all seasons, eggs, larvae, pupae, and imagines being present simultaneously in the coke of the filter beds. The larvae feed on a green alga and the jelly-like fungus covering the surface of the coke, and also on part of the suspended matter deposited by the sewage. During September and October, when the supply of larvae is at its maximum, starlings visit the beds in large numbers to feed on them. In November, when the larvae become less plentiful, a green alga, probably *Stigeoclonium*, appears and increases till March.

The growth of algae and fungi interferes with percolation, and pools of water stand on the beds; the effluent from the filters is remarkably free from suspended matter, and larvae may be found in the humus tanks, evidently washed through the lower layers of the coke pile. Algae and fungi begin to vanish in March, and from March to May the suspended matter in the effluent from the sprinklers is increased. As the appearance of the vegetable growth coincides with the inactivity of the larvae, so does its disappearance with the renewed activity of the newly-hatched brood, surrounded by an abundant food supply.

The presence of these larvae is highly beneficial, as more power is required to pump the sludge during the period at which the alga is disappearing than at any other time, and if the fly did not inhabit the coke beds and check the growths, these vegetable substances would choke them.

Earthworms also play an important part in the destruction of organic matter in the filter beds, and these in their turn are attacked by carnivorous beetle larvae, and also by birds, whose presence is advantageous in controlling the number of flies, which, being bred in the sewage farm, are most probably carriers of disease germs.

TAYLOR (F. H.). **Australian Tabanidae [Diptera],** no. ii.—*Proc. Linnean Soc. N.S.W., Sydney*, xli, no. 164, 4th April 1917, pp. 746–762.

This paper deals with the following Tabanids:—*Diatomineura crocea*, sp. n., *Corizoneura kurandae*, sp. n., *Elaphromyia carteri*, gen. et sp. n., *Silvius ater*, sp. n., *S. sublividus*, sp. n., *Tabanus griseohirtus*, sp. n., *T. trypherus*, sp. n., *T. griseoannulatus*, sp. n., *T. australis*, sp. n., *T. darwinensis*, sp. n., *T. milsoni*, sp. n., *T. spadix*, sp. n., *T. mastersi*, nom. nov. (*T. gregarius*, Tayl., nec Erichson), and *T. doddi*, nom. nov. (*T. abstersus*, Tayl., nec Walker).

HILL (G. F.). **Some Notes on the Bionomics of the Buffalo-fly** (*Lyperosia exigua*, **Meij.**).—*Proc. Linn. Soc. N.S.W., Sydney*, xli, no. 164, 4th April 1917, pp. 763–768, 1 plate.

Lyperosia exigua (buffalo-fly) is a more formidable pest to cattle and horses in northern Australia than the larger and more voracious blood-sucking flies, owing to the greater number of individuals and the longer period of their seasonal occurrence. During the early part of the wet season (November and December) certain Tabanids, especially *Tabanus nigritarsis*, Tayl., cause greater annoyance and loss of blood than buffalo-flies, but their wounds heal without showing signs of inflammation, while the attacks of *Stomoxys*, *Lyperosia*, *Musca* and other flies cause characteristic sores.

Old and sickly horses and cattle are most commonly attacked, goats are rarely molested, while dogs, pigs, sheep and kangaroos appear to be immune. The parts attacked are chiefly the belly, brisket, underparts of the neck, flanks and about the eyes. Buffalos, both domesticated and wild are habitually infested, and man is occasionally bitten while riding fly-infested horses.

This pest was probably introduced with stock from the East Indies subsequent to 1824, its present distribution in Australia coinciding fairly well with that of the introduced buffalos.

The eggs are laid singly to the number of 12 to 20 in dung or foul mud, the larvae, which emerge in 18 to 20 hours, burrowing into the dung, where they pupate after 3 or 4 days. The adults appear after a pupal period of 3 to 5 days, and seek their hosts, resting during the heat of the day and at night upon the flanks and withers of horses and about the horns of cattle.

Natural enemies of the fly are few, insect predators being chiefly certain species of ants that gather the eggs for food, especially *Solenopsis geminata*, F., var. *rufa*, Sud., *Iridomyrmex detectus*, Smith, and *Odontomachus ruficeps*, Sm., var. *acutidens*, Forel. A more important enemy is a small Hymenopteron, *Sericophorus relucens*, Sm., which captures the flies while feeding or at rest.

Artificial control over the immense and thinly-populated grazing areas would be obviously impracticable, but the frequent removal of manure from milking-pens and cow-yards would prevent these places acting as sources of infestation.

CHAMBERS (F.). **Note on the Transmission of Animal Trypanosomiasis in Northern Rhodesia by Blood-sucking Flies other than *Glossina*.** —*Trop. Vet. Bull., London*, v, no. 4, p. 222. [Abstract from *Vet. Review*, i, no. 3, August 1917, pp. 222–227.]

This note summarises the observations and experiments of a number of authors who have reported the occurrence of trypanosomiasis in Northern Rhodesia and adjoining territories definitely known to be free from tsetse-flies. The author places no observations of his own on record.

In 1908 a chronic disease made its appearance amongst cattle grazing on the northern banks of the Zambesi ; the disease was confined to an area extending from Livingstone to Sesheke. A detailed reference is made to G. E. Owen's manuscript report (1912–1913) showing that the disease was caused by a trypanosome believed to be of the *dimorphon* type. Owen regarded the disease as being transmitted mechanically by means of TABANIDAE. Kinghorn and Yorke (1912) recorded a case of trypanosomiasis of a cow in a locality in North-Eastern Rhodesia where no tsetse-flies were found, but *Stomoxys* and TABANIDAE were common. Hart (1911) similarly observed cattle affected with trypanosomiasis on a tsetse-free farm in the same district ; *Pangonia* and *Stomoxys nigra* were shown to be possible transmitters. Montgomery and Kinghorn (1907) suggested that *Stomoxys calcitrans* and *Lyperosia* were capable of acting as carriers. Failure to effect cyclical transmission by means of TABANIDAE and ticks was demonstrated by Kinghorn and Yorke (1906) in the case of *Trypanosoma rhodesiense*. Reference is also made to the failure to transmit *T. gambiense* by means of *Stomoxys nigra* and *S. calcitrans* by Duke (1913).

Jowett (1910–11) described the occurrence of trypanosomiasis in a tsetse-free area in Portuguese East Africa after the introduction into a herd of some animals that had probably passed through a tsetse belt. Positive results were obtained in one feeding experiment with *Stomoxys* and *Haematopota*. Rogers as long ago as 1901 showed that TABANIDAE were capable of transmitting *T. evansi* within 24 hours after biting an infected animal.

HICKS (J. R.). **The modern Hygiene of Typhus Fever—Its Application at the Port of New York.**—*Amer. Jl. Public Health, Boston, Mass.*, vii, no. 7, July 1917, pp. 628–630.

The routine procedure adopted for the disinfection of typhus contacts at the Port of New York is based on the use of kerosene, which is considered to be the cheapest and most efficient insecticide.

The immigrants are given a preliminary bath, using soft soap and hot water. This is followed by a petroleum bath, about 6 oz. per patient being used to destroy all vermin. The clothes are disinfected by steam under pressure and dried *in vacuo*.

The inefficacy of sulphur dioxide in the case of lice was proved by these insects surviving a 15-hour fumigation with this gas, 9 lb. to 200 cub. ft. being used.

HOFFMAN (F. L.). **Malaria as a Factor in Military Efficiency.**—*Southern Med. Jl., Birmingham, Ala.*, x, no. 8, 1st August 1917, pp. 676–678.

Attention is directed to the danger of malaria to armies and to the danger of malaria from armies, and the hope is expressed that the importance of economic entomology will be recognised by the U.S. Government in the planning of permanent camps and that medical entomologists will be attached to the Army Medical Service, so that, if possible, serious outbreaks of the disease may be prevented.

SOHNS (J.C.F.) & RADEN SOETEDJO. **Infectiuze Anamie der Paarden.** [Infectious Anaemia of Horses.]—*Veeartsenijkundige Bladen voor Nederlandsch- Indië, Batavia*, xxix, no. 2, 1917, pp. 141–174.

In August 1916 there occurred among imported Australian horses a sudden outbreak of this disease which is discussed in detail. Natural infection in the Dutch East Indies is supposed to take place chiefly through eating soiled rice-straw bedding, but the possibility of infection by TABANIDAE is admitted.

NEVERMANN (L.), MIESSNER (H.) & WEICHEL (A.). **Studienreise nach dem Balkan.** [A Study Journey in the Balkans.]—*Hanover*, M. & H. Schaper, 1917, 111 pp., 80 figs. Price Marks 3.50.

This small volume describes a journey to Bulgaria and Turkey undertaken in October 1916 at the request of the German Minister of Agriculture for the purpose of studying the contagious diseases of animals of these countries and the methods employed in dealing with them.

Equine piroplasmosis, the only disease in connection with which an insect vector is mentioned, was studied at the Macedonian front, where it is said to occur chiefly from June to August, causing death in some cases. The tick, *Dermacentor venustus*, is stated to have been found on all animals. Horses picketed in damp localities suffered most. In the Second Bulgarian Army during the spring and summer of 1916 out of 1,500 horses belonging to five units about 200 were affected and about 40 died.

BISHOPP (F. C.). **Fleas and their Control.**—*U. S. Dept. Agric., Washington, D.C.*, Farmers' Bull. 897, October 1917, 15 pp., 5 figs. [Received 5th April 1918.]

The subject matter of this bulletin has already been noticed [see this *Review*, Ser. B, iv, pp. 4, 34].

BISHOPP (F. C.), MITCHELL (J. D.) & PARMAN (D. C.). **Screw-worms and other Maggots affecting Animals.**—*U. S. Dept. Agric., Washington, D.C.*, Farmers' Bull. 857, September 1917, 20 pp., 8 figs. [Received 5th April 1918.]

The screw-worm fly, *Chrysomyia macellaria*, F., which is a native of the New World, occurring from the extreme south of South America as far north as Canada, is the most important pest of cattle and other domestic animals in the south-western United States, wild deer and even human beings being often infested also.

The character of injury and losses due to this pest, together with an account of its life-history and the means to be adopted for its control, have already been noticed [see this *Review*, Ser. B., iii, p. 160]. For destroying the maggots in a wound nothing better than chloroform has been found. The dead or comatose maggots should be removed with forceps, the wound cleaned with 5 per cent. carbolic acid, and pine tar applied as a repellent. Tannic acid dusted over the wound will check bleeding and make it less attractive to flies. The former extensive use of calomel in wounds is now practically discontinued.

NICLOT (—). **A propos de la Densité Anophélienne, en Matière de Paludisme.** [Concerning Anopheline Density in Regard to Malaria.] *C. R. Soc. Biol., Paris*, lxxxi, no. 5, 9th March 1918, pp. 271–272.

In this paper, read at a meeting of the Réunion Biologique d'Athènes, the view is expressed that the density of Anopheline mosquitos is the factor that governs the incidence of malaria, at any rate in the Mediterranean basin.

The science of epidemics from the point of view of time must take into account years of severe malarial outbreak such as 1904 in Algeria, where the annual and also the multiannual Anopheline and malarial curves are found to coincide. A dense Anopheline population is necessary to cause malaria on account of the small percentage of infected females, which explains the evolution of multiannual outbreaks, though other factors must be taken into consideration, such as the relative immunity and the movements of the civil and military population.

As regards the distribution of malaria in space, centres of endemic malaria can be recognised that are more circumscribed than the corresponding Anopheline areas. These are the ancient foci of malaria, now latent, and are a standing danger to the country, since the introduction of new reservoirs of the malarial parasite is all that is needed to restore their endemicity.

Locally the length of the cycle varies ; in ancient Greece it covered many years ; at the present time in Macedonia it is three years. In 1916 malaria appeared late ; Anophelines were abundant, appearing at the end of April and in May, and malaria died out late in the year, there being a slight recrudescence in the middle of November due to an Anopheline outbreak in October, owing to the coolness of the autumn. In 1917, both Anophelines and malaria appeared late, the small numbers of the former being correlated with a mild outbreak of the latter.

MENIAUD (J.). **Les Chevaux du Haut-Sénégal et Niger.** [The Horses of Upper Senegal and Niger.]—*La Vie Agric. et Rur., Paris,* viii, no. 14, 6th April 1918, pp. 241–246.

Of the chief insect-borne diseases attacking horses in the Upper Senegal and Niger regions such as trypanosomiasis and piroplasmosis, the former is the most deadly, decimating whole regions by the end of winter, and each year causing the loss of several hundreds of horses.

Three species of tsetse-fly found in W. Africa are able to convey infection with *Trypanosoma pecaudi* in varying degrees. *Glossina longipalpis* does this to a greater extent than *G. tachinoides,* while *G. palpalis* scarcely ever transmits this trypanosome.

The dominant species of tsetse in Upper Senegal is *G. palpalis,* the examples of *G. tachinoides* that are met with being everywhere mixed with it. The former species can transmit the largest number of trypanosomes, namely sleeping sickness, caused by *T. gambiense*; souma, a disease characterised by a nasal discharge, caused by *T. cazalboui*; and baléri, caused by *T. pecaudi,* as well as *T. dimorphon,* which is however only rarely met with in Senegal, though it occurs in Guinea and the Ivory Coast. Tsetse-flies do not appear to occur north of the 14th parallel of S. latitude. They are not however the only vectors of animal trypanosomiasis, as *Stomoxys* and Tabanids are able to carry the disease from a sick to a healthy animal, and horses situated far from a tsetse area may thus become infected.

CURWEN (H.). **Report on the Public Health Division for the Year 1916.** —*Zanzibar Protectorate Ann. Rept. Pub. Health Dept. for 1916, Zanzibar,* 1917, pp. 1–25.

The mosquito conditions existing in Zanzibar are discussed and have been dealt with previously [see this *Review,* Ser. B, vi, p. 46 and v, p. 147]. The chief mosquito-borne diseases are filariasis, which is said to occur in some 30 per cent. of the native population, elephantiasis and filarial lymphangitis, which have increased within the town in recent years, and malaria. While no present records are any guide to the prevalence of malaria in the Protectorate, owing to the large number of cases treated by native doctors, there is a regular fever season among town residents ; this commences towards the end of May and lasts until about mid-August. Again at the close of the year there is an outbreak, lasting perhaps through January to February. These periods correspond to the two annual invasions of the town by Anophelines, following upon the rainy seasons. *Anopheles costalis* is the common malaria-carrier. The usual preventive measures are recommended, and include improvements in drainage and irrigation supply, the clearing of all heavy-foliaged trees and scrub, undergrowth, etc., in gardens. The necessity for anti-mosquito measures being undertaken during the first three months of each year, before the rains begin, is insisted upon. Various improvements in town sanitation, water supply and disposal of refuse are suggested as necessary measures in the reduction of this largely preventable disease.

ADERS (W. M.). **Veterinary Division Report for 1916.**—*Zanzibar Protectorate Ann. Rept. Pub. Health Dept. for 1916, Zanzibar,* 1917, pp. 26–31.

The usual number of animals infected with trypanosomiasis and African Coast fever have occurred during the year. In several instances apparently healthy cattle were found to harbour trypanosomes in their blood, the local form being included in the *T. pecorum* group. The author is of opinion that this trypanosome is carried by Tabanids and not by *Stomoxys* ; no species of *Glossina* occurs. It is hoped that next year the geographical distribution of the disease will be studied in those out-districts where Tabanids are abundant.

ADERS (W. M.). **Economic Biology. Entomology in Relation to Public Health and Preventive Medicine and Veterinary Science.**—*Zanzibar Protectorate Ann. Rept. Pub. Health Dept. for 1916, Zanzibar,* 1917, pp. 32–37.

During the year one Anophleine new to Zanzibar was captured, namely, *Anopheles squamosus*. Adults have not been taken in the town, nor were any of those captured engorged with blood. The Anopheline fauna of Zanzibar now includes *A. costalis*, *A. funestus*, which is a dominant species in certain localities and may prove to be a more important carrier of malaria than *A. costalis*, *A. mauritianus* and *A. squamosus*.

Other mosquitos taken and identified during the year include *Culex perfuscus*, Edw., *C. insignis*, Cart., *C. tritaeniorhynchus*, Giles, *Ochlerotatus fulgens*, Edw., *O. adersi*, Edw., *Eumelanomyia inconspicuosa*, Theo., *Stegomyia metallica*, Theo., *S. simpsoni*, Theo., and *Eretmopodites chrysogaster* var. *subsimplicipes*, Edw.

C. fatigans occurs in enormous numbers in cesspools, being particularly prevalent in old Arab towns. This species is the vector of *Microfilaria bancrofti*, and, filariasis being on the increase, the extermination of *C. fatigans* is a matter of great urgency. *Stegomyia fasciata* is ubiquitous and abundant, and this species has shown thoracic, but not proboscis infection with *M. bancrofti*. *Ochlerotatus pembaensis* seems to be confined to the sea littoral ; a number were dissected and examined for microfilariae with negative results. Tests were made to determine the effect of the poisonous leaves of the shrub

Tephrosia vogeli on mosquito larvae; all those placed in a 1 per cent. solution of pulp made from the leaves died in 12 hours. Before this is tried on a large scale, the effect on domestic animals must be tested.

Flies are not abundant considering the conditions prevailing, though *Musca domestica* becomes troublesome at times in the residential part of the town, while *Chrysomyia* (*Pycnosoma*) spp. and *Sarcophaga* spp. are prevalent in the markets.

Larvae of *Chrysomyia* (*Pycnosoma*) *bezzianum*, Vill., have been obtained in great numbers in sores from donkey's ears, generally associated with suppuration.

Barber (M. A.). **Some Observations and Experiments on Malayan *Anopheles* with special Reference to the Transmission of Malaria**—*Philippine Jl. Sci., Manila*, xiii, Sec. B., no. 1, January 1918, pp. 1–47. [Received 22nd April 1918.]

This paper describes experiments on the capacity of Malayan Anophelines to transmit malaria, various species being dealt with. At the time when the experiments were begun, only one form of *A. rossi*, Giles, had been reported from the Malay Peninsula, namely, *A. rossi* var. *indefinitus*, Ludl. Among the material collected it became obvious that there were two types present, though it is doubtful whether the typical form of Malaya may not be distinct from *A. rossi*, Giles, of India. The habitat of the two Malayan forms is described; *A. rossi* var. *indefinitus* most frequently occurs in muddy pools exposed to the sun, while the typical form is never found in such habitats, but frequents clear pools surrounded with grass or other vegetation. In experiments to determine the susceptibility of these two forms to malaria, the typical form was shown to be a much more important potential carrier.

A series of tables records the results of the experiments. It is obvious that the probability of infecting a mosquito depends on factors other than the number of gametes present in the carrier at the time of feeding. The explanation of the great variability in the infectivity of gamete-carriers independently of the percentage of gametes in the blood is not apparent. It is suggested that this is due to a disparity in numbers of the sexes of the gametes. It may be also that in the presence of a sufficient number of both sexes there is in the gametes some biological factor, not apparent morphologically, which determines their fertility. Possibly gametes originating in the same oöcysts, or in the same mid-gut, are less mutually fertile than those from more widely differing sources. Further data are necessary to elucidate this point.

The author summarises the conclusions regarding the infectivity of the various species as follows:—

Anopheles ludlowi. Much evidence has been adduced by Christophers and others indicating that *A. ludlowi* is an important carrier of malaria in certain coast regions. The high percentage of infections with ready formation of sporozoites observed in the experimental series described in this paper, as well as the finding of a naturally infected specimen with sporozoites in the salivary glands, would go to confirm the evidence already obtained regarding the dangerous character of this species.

Anopheles rossi. The comparatively high percentage of infections observed by the author in the brackish water type, var. *indefinitus,* would bring this form under suspicion, although sporozoites are apparently not readily formed. Epidemiological evidence in the coast regions of the Federated Malay States is at fault, since this type of *A. rossi* is there so commonly associated with *A. ludlowi* and *A. umbrosus,* both known carriers. The var. *indefinitus* collected in fresh water shows a low degree of susceptibility to experimental infection and but little tendency to formation of sporozoites. Neither experimental nor epidemiological evidence indicates that this species is an important carrier. The typical *Anopheles rossi,* Giles, of Malaya, shows a comparatively high percentage of infections in laboratory experiments, and sporozoites are readily formed. Further, as shown in the second part of this paper, this type is capable of infecting man under experimental conditions. Epidemiological evidence from other countries, India in particular, indicates that *A. rossi,* Giles, is rarely, if ever, a transmitter of malaria. But, as stated in the earlier part of this paper, there is some evidence that the typical form of Malaya may differ, biologically at least, from *A. rossi,* Giles, of India. Certainly the local type is easily infected experimentally, while the Indian type is reported to be rather refractory. It is difficult to get satisfactory epidemiological evidence in Malaya in regard to the type form, since it is there commonly associated with *A. fuliginosus, A. aconitus,* and other potential carriers. In one or two instances the author has found the larva of the typical form in the same part of a lake in which *A. maculatus* and *A. karwari* were found. The immediate vicinity of a certain extensive breeding place of the typical form near Kuala Lumpur was not particularly malarious, but the people in the vicinity, chiefly Chinese, were in the habit of protecting themselves by means of bed nets. In another group of houses half a kilometre away and situated near a breeding place of *A. maculatus* the people protected themselves in a similar way and were comparatively free from malaria. In both cases the population was relatively stable, and possibly the introduction of a susceptible and less well-protected group of people into either place might be followed by an outbreak of malaria. The typical form showed a marked avidity for blood in feeding experiments, and it is known to frequent dwellings. These characteristics, taken in connection with the experimental evidence, would bring this type under suspicion.

Anopheles umbrosus. The evidence obtained in these experiments, both in regard to the artificially and naturally infected insects, would confirm Watson's conclusion that *A. umbrosus* is an important carrier in Malaya. The susceptibility of this species under experimental conditions is relatively low, but it may breed in immense numbers, and evidence from laboratory experiments, as well as from the condition of adults caught in nature, indicates that it is a relatively long-lived species. No exact experiments were made as to its power of flight, but adults were often found in considerable numbers at some distance from breeding places, so that it is probable that *A. umbrosus* is a strong flier.

Anopheles aconitus. Stanton and James have recorded natural and artificial infection of this species. There were but small numbers in the author's experimental series, but the percentage of infections was high, and sporozoites occurred in the salivary glands. This species is often found in houses and readily takes blood. It may be found at considerable distances from its breeding places, and although a small mosquito, it is apparently capable of long flight. The evidence goes far to incriminate this species.

Anopheles kochi. No special study was made of this species, and only such specimens as happened to be collected with other species were exposed to gamete carriers. A high percentage of gut infections was obtained, but none were dissected late enough to observe any formation of sporozoites.

Anopheles fuliginosus. Stanton reports both natural and experimental infection of this species in specimens collected in Malaya. The numbers in the author's experiments were small, but in the experimental series one-third of the specimens dissected was infected. Sporozoites were found in the gut only.

Anopheles maculatus. In the author's series this species was largely used as a control of the susceptibility of other species, and he dissected none late enough to obtain sporozoites. One gut-infected specimen was found in nature. The works of Watson, Stanton, Strickland and others have established the fact that this species is one of the most important carriers in Malaya.

Anopheles karwari. The experiments indicate that this species is highly susceptible to infection under experimental conditions. The percentage of gut infections was high, and sporozoites were formed in the salivary glands. None were found infected in nature, but nearly all of the specimens dissected had probably recently emerged. It is difficult to get satisfactory epidemiological evidence, since this species is so commonly associated with *A. maculatus.*

Anopheles barbirostris and *A. sinensis.* Both are certainly little susceptible to infection experimentally. Only three infected insects were obtained in a large series of *A. barbirostris,* and only one was obtained in *A. sinensis.* Stanton has found zygotes in *A. sinensis* in nature. In view of the facts that these species may be infected with malaria, that they occur in large numbers, and that they readily visit houses and take blood from man, they cannot be wholly acquitted of carrying malaria, but the low percentage of infection and the epidimiological evidence indicate that neither species is an important carrier in Malaya.

Anopheles hunteri. The number included in the author's experimental series is too small to show anything further than that this species may be infected.

In regard to the commoner jungle species of Malaya the author has obtained no results from *A. aitkeni,* further than to prove that it will take blood when exposed to a carrier. Of those taking blood the single one that lived long enough to be dissected was negative, but the larvae had been long kept in the laboratory before they emerged, and *A. maculatus* controls bred under the same conditions were also negative. *Anopheles tessellatus* was found abundantly on one occasion, both in jungle and in pools more or less exposed to the sun, but there was no opportunity of testing them on a carrier at that time. From a small lot of larvae found later, only two adult females were obtained, and both failed to take blood.

In summary, laboratory experiments can only prove the susceptibility of a species of mosquito to malaria under more or less artificial conditions and, in a large series, the approximate degree of susceptibility. However, judging from the agreement of laboratory experiments with other evidence in the case of known carriers, it may be concluded that a high percentage of infections experimentally, with the formation of sporozoites in the salivary glands, furnishes strong presumptive evidence against a given species. The evidence adduced in connection with *A. rossi* makes it probable that some species of *Anopheles* may be readily infected with malaria parasites, but offer comparatively unfavourable conditions for their development. On the whole, the experiments included in this paper make it doubtful whether any common species of *Anopheles* in Malaya, with the possible exception of two or three jungle forms, is immune to infection and can be wholly acquitted of carrying malaria under certain conditions.

In experiments to test the infection of man with malaria by means of *Anopheles rossi* there were unfortunately no infected *A. rossi* available of which the larvae had been examined, so that we lack the crucial test as to which type was used for infecting the experimental cases. However, the evidence points very strongly to the typical form being the one concerned.

The results are shown in tables. The evidence seems clear that these experimental cases were infected with malaria as the result of exposure to *A. rossi* infected in the laboratory. The possibility of a relapse from a former infection must be always taken into account in such experiments when performed in a malarious country. But that such relapses should follow exposure to infected mosquitos in two cases, one occurring fourteen and the other seventeen days after exposure, would be a remarkable coincidence indeed, especially, in view of the fact that both patients experimented upon had been known to be free from fever many days before the tests and that both showed the same type of parasite as that which infected the mosquitos.

It also seems clear that a single individual of *A. rossi* may infect at one exposure. The fact that the case that received sporozoites from two infected mosquitos, and, presumably, the larger dose, showed an earlier appearance of parasites and the more marked symptoms may be only a coincidence, but it is worthy of note. One can do little more than guess at the number of sporozoites injected by a single mosquito, but judging from the number of sporozoites found at dissection after feeding on the experimental cases and comparing with the numbers observed in the salivary glands of many infected mosquitos of the same species, one would say that the effective number is a matter of hundreds rather than of thousands, and more probably a matter of scores.

These experimental cases serve well to show the great variety of manifestations observable in subtertian malaria.

Interim Report of the War Office Committee for the Study of Trench Fever. — *Jl. R.A.M.C., London,* xxx, no. 3, March 1918, pp. 351–353.

This paper records experiments undertaken by the War Office Committee for the purpose of determining the rôle of the louse in the transmission of trench fever. Lice bred from clean stock in England were fed at intervals on febrile and afebrile trench fever patients in all stages of the disease who had been sent over from France. The lice were then placed upon two healthy individuals who had not been in France nor contracted trench fever. Although the lice were fed freely in this way daily for one month, no fever developed in either person. As these individuals had purposely refrained from scratching the skin, infection by means of excreta or crushed bodies of the lice was to a large extent excluded. Several more individuals having volunteered for experimental purposes, a small area of skin in these cases was lightly scarified and a small quantity of the dried excreta taken from the boxes of lice which had fed on trench fever cases was rubbed in. In every one of the cases so treated a typical attack of trench fever occurred after an incubation period of several days. A small quantity of blood taken from one of these cases and inoculated into a healthy individual produced the fever after an incubation period of 5 days.

The fact that the bite alone of the infected louse does not produce trench fever, but that when the excreta taken from such lice is scratched into the skin fever supervenes, is of great importance in view of the prevention of the disease. It also explains cases of trench fever occurring in wounded men who may have had no lice on them for some weeks, as the dried excreta blown on to a raw surface would give rise to the disease. It is found that lice will readily leave a fever case and pass to an individual with normal temperature when such are available. Experiments are now in progress with the excreta of normal lice, to determine whether the disease is carried from man to man by lice or merely from louse to man. These conclusions confirm the necessity for a very determined campaign against the louse in order to eliminate, or at least reduce, the incidence of a fever which has greatly weakened our man power at the front.

LEGISLATION.

An Ordinance to amend the Gilbert and Ellice (Quarantine) Regulation 1909.—*No. 6 of 1917, Gilbert & Ellice Islands Colony, Suva, Fiji,* 25th July 1917. [Received 4th June 1918.]

By the terms of this Ordinance the Health Officer of the Gilbert and Ellice Islands Colony is empowered to demand of any passenger arriving from any vessel that has come from or called at any place or port in Samoa a certificate in writing not more than seven days old at the time of the departure of such vessel from such port or place, under the hand of a duly qualified medical practitioner, to the effect that the person presenting the certificate was, at the date thereof, free from microfilaria. Any passenger failing to produce such a certificate may be prohibited from landing. The owner or master of any vessel bringing a passenger from Samoa without such a certificate is liable on conviction to a fine not exceeding twenty-five pounds. [See also this *Review*, Ser. B, iii, p. 192.]

NOTICES.

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WRIGHT (Major R.E.). **The Distance Mosquitos can Fly.**—*Jl. Bombay Nat. Hist. Soc., Bombay*, **xxv**, no. 3, 15th January 1918, pp. 511–512.

The author records the fact that swarms of *Anopheles* (*Cellia*) *pulcherrimus* appeared on a hospital ship, when lying off Shatt-el-Arab, 15½ miles from the nearest land. Not a single mosquito had been noticed on the voyage from Bombay, and a search revealed no breeding place on board.

LUTZ (A.). **Terceira Contribuição para o Conhecimento das Especies brazileiras do Genero** *Simulium*. **O Pium do Norte** (*Simulium amazonicum*). [A third Contribution to the Knowledge of the Brazilian Species of the Genus *Simulium*: *S. amazonicum*.]—*Mem. Inst. Oswaldo Cruz, Rio de Janeiro*, ix, no. 1, 1917, pp. 63–67, 1 plate.

This paper re-describes *Simulium amazonicum*, Goeldi, of which *S. exiguum*, Lutz, *S. minusculum*, Lutz, and *S. nitidum*, Malloch, are now considered to be synonyms. The females are sometimes very eager for blood and attack man, especially canoe travellers on streams with many cataracts; in the case of those on horseback, the horse is preferred. *S. amazonicum* is sometimes met with in small numbers by night, being attracted by light. It is widely distributed in the Amazon region in places where there are cataracts and in the basins of the São Francisco and Prata Rivers. It breeds in the cataracts, but the adults are able to travel considerable distances. This fact and the large numbers found in certain places indicate that the females are long-lived. On the S. Francisco river the author found many larvae and pupae of this species on a plant resembling *Ligea*. The pupae, collected at night-fall and kept damp, yielded on the following morning specimens of both sexes.

LUTZ (A.). **Contribuições ao Conhecimento dos Oestrideos brazileiros.** [Contributions to the Knowledge of Brazilian Oestrinae.]—*Mem. Inst. Oswaldo Cruz, Rio de Janeiro*, ix, no. 1, 1917, pp. 94–112, 3 plates.

The author prefaces these notes by stating his agreement with the view that the OESTRINAE should be treated as a sub-family of the MUSCIDAE.

A key is given to the genera observed in Brazil together with the following list of South American species:—From French Guiana, *Cuterebra ephippium*, Latr. From Patagonia, *C. patagona*, Guér. From South America, *C. megastoma*, Brauer. From Trinidad, *C. funebris*, Aust. From Argentina and Brazil, *Rogenhofera grandis*, Guér. From Brazil, *Cuterebra apicalis*, Guér. (*analis*, Macq.), *C. cayennensis*, Macq., *C. rufiventris*, Macq., *C. nigrocincta*, Aust., *C. sarcophagoides*, sp. n., *C. nigricans*, sp. n., *C. infulata*, sp. n., *C. schmalzi*, sp. n., *Rogenhofera trigonocephala*, B., *R. dasypoda*, B., *Pseudogametes hermanni*, B., *P. semiatra*, Wied., *Dermatobia cyaniventris*, Macq., and *Gastrophilus asininus*, B.

The paper concludes with notes on the parasitic habits of the American OESTRINAE. *Dermatobia hominis* is of wide distribution.

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Cattle suffer most from its attack and hunting dogs less severely. Man is seldom attacked ; horses are almost immune and mules slightly less so. In the case of the other indigenous species parasitism is limited to rodents. Only a few Brazilian rodents, chiefly MURIDAE, are affected. The larger kinds, such as the capybara and introduced species of MURIDAE, seem immune. Among many thousand of *Mus decumanus* examined none were parasitised, while among a few specimens of other rats two harboured *Holochilus vulpinus*. Generally speaking females seem to predominate among the species of *Cuterebra* and *Dermatobia*. The contrary obtains in the case of *Pseudogametes*, though not to a very marked degree in *P. semiatra*.

As regards the habits of *Dermatobia*, it is confirmed that this fly sucks liquids with its proboscis. It does not appear to mate during the first few days after emergence. The eggs seem to be laid direct on blood or sweat-sucking insects, such as *Anthomyia* and not necessarily on mosquitos such as *Janthinosoma lutzi*. Typical larvae of *Dermatobia* have been hatched from eggs taken from the left side of the abdomen of a small male of *Synthesiomyia brasiliana*, B. & Berg. These larvae preferred the dry skin of a dog to the human skin.

The author also records *Oestrus ovis* from Rio de Janeiro and neighbouring States. It is not confined to the cool mountainous zones, but is also found in the tropical regions.

CHATTON (E.). **Observations et Expériences faites à Gabès sur le Ver de Guinée. Preuve expérimentale de l'Infestation des *Cyclops* par Voie intestinale.** [Observations and Experiments made at Gabes on the Guinea Worm. Experimental Proof of the Infestation of *Cyclops* through the Digestive Tract.]—*Arch. Inst. Pasteur, Tunis*, x, no. 3, March 1918, pp. 158–169.

While it does not seem likely that carriers of the Guinea worm among the native troops can infect the waters of the south Tunisian oases with the larvae of this parasite, it is recommended, in view of the customs of the inhabitants of these oases, that such carriers should be isolated and subjected to treatment. The mode of infestation of its different invertebrate hosts by the worm is described. In the case of *Cyclops* the larvae are ingested passively, the badly-wounded ones dying and being digested, others penetrating through the digestive wall into the general cavity. Larvae are similarly ingested by *Cypris* and by *Culex* larvae, with even less immediate damage, but they cannot pass into the general cavity of these hosts and pass through the alimentary canal alive.

SOPARKAR (M. B.). **A Trematode Parasite of Anopheline Mosquitos.**—*Indian Jl. Med. Research, Calcutta*, v, no. 3, January 1918, pp. 512–515. [Received 25th April 1918.]

The resemblance of the recently described Trematode parasite in Anopheline mosquitos [see this *Review*, Ser. B, vi, p. 2] to similar encysted Trematodes found by the author on the fins of certain freshwater fish, as well as in the bodies of snails, chiefly *Planorbis exustus*, led him to attempt to develop these encysted forms in mosquitos by artificial infection.

As a result of these experiments it was found possible artificially to infect Anopheline, and to a less extent, Culicine mosquitos with these encysted parasites, which, however, did not undergo any marked development in this host. Developmental forms occur in certain fresh-water fish that have become infected either naturally or artificially. The fully-mature, egg-laying stage has not yet been met with, but it probably occurs in some aquatic bird that feeds on the infected fish. The structure of the adult stage of the parasite as developed in the fish shows that it closely resembles a *Clinostomum* of the family FASCIOLIDAE; the exact species, however, has yet to be determined.

CRAGG (F. W.). **The Mouth-parts of *Ochromyia jejuna*, a Predaceous Muscid.**—*Indian Jl. Med. Research, Calcutta*, v, no. 3, January 1918, pp. 516–522, 1 plate. [Received 25th April 1918.]

Ochromyia jejuna is a large Dipteron, common in Madras, and probably in most parts of India during the hot weather. This fly has been recorded as attacking swarming Termites, but at Pusa its attention seems to be confined to ants. These it attacks when they are transferring their larvae from one place to another.

This predaceous habit accounts for the modification of the mouth-parts, which are remarkable for the specialisation of the proboscis to function as a prehensile organ and for the size and development of the dental armature.

The life-history of the fly is unknown, but in view of its predaceous habits and the similarity of its mouth-parts to those of the blood-sucking Diptera, its close relationship to *Auchmeromyia luteola,* which is a blood-sucker in the larval stage, is of interest.

MITTER (J. L.). **Note on the Method of Feeding of *Corizoneura* (*Pangonia*) *longirostris*, Hardwick, with a Description of the Mouth-parts.**—*Indian Jl. Med. Research, Calcutta,* v, no. 3, January 1918, pp. 523–528, 1 plate. [Received 25th April 1918.]

Another paper on this subject has recently been noticed [see this *Review*, Ser. B, vi, p. 99].

The conclusions here arrived at are:—That the female of *Pangonia* (*Corizoneura*) *longirostris* is a blood-sucker as well as a flower-feeder. The labium is not utilised in the sucking of blood. The insect requires to settle upon its host in order to pierce the skin and suck blood.

AWATI (P. R.). **A New Larviparous *Philaematomyia* (*Philaematomyia indica*, sp. n.).**—*Indian Jl. Med. Research, Calcutta*, v, no. 3, January 1918, pp. 529–539, 6 plates. [Received 25th April 1918.]

Philaematomyia indica, sp. n., described in this paper is the first larviparous species of the genus to be recorded. Being a rare fly it has not yet been proved to be a true blood-sucker, as have *P. crassirostris* (*insignis*) and *P. gurnei*, though the structure of its mouth-parts renders this probable. The larvae are deposited in fresh cow dung, within pupation occurs after four or five days, the fly emerging seven days which later.

A key to the genus is given, based on the form of the genital armature.

Bacot (A. W.) & Lloyd (L.). **Destruction of Nits of the Clothes Louse by Solutions of Cresol-soap Emulsion and Lysol.**—*Brit. Med. Jl., London*, no. 2991, 27th April 1918, pp. 479–480.

A precautionary measure frequently adopted at baths and wash-houses where the clothes of infected troops are treated to rid them of lice consists in steeping infected garments in a vat containing solutions of cresol-soap emulsion. Experiments to determine the strength of the solution and the period of immersion necessary to destroy the eggs of *Pediculus humanus* have established the fact that steeping for 20 minutes in a 2 per cent. solution of either lysol or cresol soap is quite effective, provided that the temperature is not below 50° F. [10° C.]. It must be noted however that hot water or dry heat at 131° F. [55° C.] destroys both eggs and active lice within 30 minutes, even when protected by a covering of khaki cloth, while if the temperature is raised to 140° F. [60° C.] 15 minutes suffice. Hence, if the garments are subjected to the above temperatures and periods during washing or drying, the use of chemical solutions is unnecessary, and, conversely, if chemical solutions are used, temperatures so high as the above for washing or drying are equally superfluous.

Further experiments are needed to prove whether solutions of cresol-soap emulsion and lysol degenerate in their effectiveness against the eggs of lice in the same way as they do against bacteria, owing to the presence of organic matter with which they become charged during use.

Holborow (A. G.). **The Restraining Influence of Cyanide upon Oxidation in Arsenical Dips.**—*Rhodesia Agric. Jl., Salisbury*, xiv, no. 6, December 1917, pp. 733–737.

This paper records research work undertaken with the object of preventing oxidation of arsenical dipping solutions, in the course of which sodium arsenite is changed into sodium arsenate, a substance having only about one-half the tick-killing power of the arsenite. One very practical method of preventing oxidation is to agitate the solution constantly by passing cattle through it at regular and frequent intervals. The cause of the oxidation however is not explained. It is evidently not spontaneous, for solutions of arsenic can be kept in the laboratory for over a year without any material change. It has been stated that micro-organisms play an important part in the process of oxidation, but the results of the author's experiments, given in a series of tables, do not bear out this view. Various disinfectants were tried, including formalin, corrosive sublimate, carbolic acid and boric acid, but all failed to arrest the oxidation. Other methods tried for arresting the action of possible micro-organisms include sterilisation in an autoclave, boiling for half an hour, and passing the original dipping fluid through a bacterial filter. It was found that while cyanide does not completely arrest oxidation, the addition of as little as 0·005 per cent. of potassium cyanide permitted an increase of oxidation of only 13 per cent., whereas the untreated dip showed an increase of 83 per cent. of oxidation in 11 days.

COGAN (E. S.). **Some Phases of Applied Entomology in South Africa.**—*S. African Jl. Science, Capetown*, xiv, no. 6, January 1918, pp. 260–262.

In the course of his remarks on this subject [see this *Review*, Ser. A, vi, p. 276], the author points out the ample opportunities for the entomologist in South Africa in the realm of humanity. The country is faced with a great number and variety of insect-borne diseases, many of which are tropical in origin. The development of modern civilisation in the continent is closely related with the progress of knowledge of insects and disease. An eminent American entomologist is quoted as remarking that the reclamation of Central Africa is a problem which the entomologist must solve. It is this phase of applied entomology that the author considers the most important so far as South Africa is concerned.

BEVAN (L. E. W.). **Report of the Government Veterinary Bacteriologist for the Year 1916, Southern Rhodesia.**—17 pp. MS. [Abstract from *Trop. Vet. Bull., London*, vi, no. 1, 30th March pp. 48–63.]

Losses owing to plasmoses of cattle have been largely reduced owing to the system of frequent dipping, but the dipped areas in the country are still far exceeded by those where the principle is not carried out, and ticks and the diseases transmitted by them are prevalent. Until the system becomes universal, there remains the necessity for a satisfactory method of inoculation for the protection of imported bulls exposed on infected ground and of young stock born upon tick-free farms, in order that they may be disposed of with safety beyond the limit of such areas. The cost of importing experimental animals from countries free from the disease has handicapped investigation in this direction.

An outbreak of disease among pigs, which caused many fatalities, was found to be due to trypanosomes of the *T. pecorum* group. Although the region where the disease occurred has long been infested with *Glossina morsitans*, no tsetse-fly had ever been encountered in the particular area where the outbreak occurred, and it was feared that the disease might be transmitted by biting flies other than tsetse, or by some other means. Experiments with some of the animals in the laboratory showed that the disease could easily be transmitted from pig to pig by artificial inoculation of small quantities of blood, giving rise to a disease that proved fatal in less than 30 days. Sick and healthy animals were kept together and were continually attacked by swarms of *Stomoxys*, which passed from one to the other. Nevertheless no infection of healthy animals occurred except by means of the syringe. While cattle in this district have been treated for trypanosomiasis with large doses of antimony and arsenic, these drugs could not be applied to pigs: a substitute was found in a combination of emetic and arrhenal, though it is feared that a complete cure was not effected, but merely a state of tolerance produced, so that the treated animals lived in apparent health until adverse conditions reduced their resistance and the trypanosome reasserted itself.

The appearance of *T. brucei* var. *rhodesiense* in donkeys working at the junction of the Umfuli and Umnyati rivers indicates that this form of infection is more widely distributed than was supposed, and in view of the possible transmission of the parasite to man by *G. morsitans* and the invariably fatal disease following, experiments were conducted with remedies for which success had been claimed by workers in European laboratories. Antimony oxide proved very disappointing, while the use of tartar emetic, though beneficial, was difficult of application and liable to cause local injuries in the animals treated with it.

Report of Committee of Enquiry on African Coast Fever, Quarter-Evil and Epizootic Diseases of Cattle.—*Salisbury, Southern Rhodesia,* 26th October 1917, 38 pp. [Received 20th May 1918.]

One of the chief objects of the Committee was to investigate and report upon the origin and circumstances attending recent outbreaks of African coast fever, but the Commissioners were unable to establish anything approaching definite proof as to their cause. The question of adequate measures to prevent and suppress the disease resolved itself mainly into tick eradication by enforcement of dipping regulations with dips maintained at efficient strength. It was unanimously agreed that the adoption of general dipping would be of the greatest advantage. Consideration was given to the best methods of maintaining dips at the necessary strength for killing the transmitting agents of African coast fever. Dipping at seven-day intervals was believed to be sufficient to kill off all ticks that are vectors of the disease. The means of providing financial help for the erection of dipping tanks were discussed, together with the fees to be levied on natives for their use. An Ordinance was proposed in which it was recommended that all owners of cattle in areas in which the "Compulsory Dipping Ordinance of 1914" is in force, and from and after a date to be fixed by the administrator, all owners of cattle in areas other than temporarily exempted native reserves should be required to clean their cattle. A scale of penalties for being in possession of tick-infested cattle is laid down.

In an appended report by L. E. W. Bevan, Government Veterinary Bacteriologist, the necessity for veterinary research in Southern Rhodesia is urged. It is pointed out that as the future prosperity of Rhodesia is considered to depend chiefly upon the progress of the pastoral industry, the present state of affairs in this respect is very unsatisfactory, owing to epizootics such as African coast fever and others, that have decimated the herds. Research on these problems is an unquestionable necessity, and the authorities should be on their guard against importing disease from the outside.

JACK (R. W.). **Tsetse Fly Investigations: Visit to Melsetter District and Portuguese East Africa.**—MS. from Colonial Office, dated 21st January 1918. [Received 13th June 1918.]

This paper records observations made in the course of a journey undertaken to determine the incidence of tsetse-fly in relation to trypanosomiasis among cattle in the Melsetter District and Portuguese East Africa. A belt of tsetse-fly, in which *Glossina brevipalpis*, Newst., and *G. pallidipes*, Aust., occur, extends along the border in Portuguese territory from about 10 miles south of Spungabera to the Lusitu

River and probably beyond it. This belt is very lightly infested. Cases of trypanosomiasis amongst cattle on farms in the Melsetter district are apparently due to an incursion of fly from this belt up the wooded river valleys during the summer months. It is suggested that infection might be avoided by using the grazing on the eastern side of the farms during the winter and by moving the cattle to the western side for the summer. The transference should be made before the commencement of the rains. There is no danger of an extensive invasion of this portion of the Melsetter district by tsetse. The Lusitu valley is sufficiently wooded in many places to become a permanent fly-belt for some miles, but owing to scarcity of game, except bushbuck, along this well populated river, the suitability of conditions there is doubtful. The fly has apparently been spreading slowly westward during recent years and it is probable that the infestation of the country near the Rhodesian border will become intensified year by year, if conditions remain as at present. It is considered that the best protection against the fly would be the clearing of the forest from and in the neighbourhood of the affected farms. There is at present no danger of an invasion of Rhodesian territory by fly moving up the Sabi river valley.

HESSE (E.). ***Caulleryella anophelis*, sp. n., Schizogrégarine Parasite des Larves d'*Anopheles bifurcatus*, L.** [*Caulleryella anophelis*, sp. n., a Schizogregarine Parasite of the Larvae of *Anopheles bifurcatus*, L.]—*C. R. Hebdom. Acad. Sci., Paris*, clxvi, no. 14, 8th April 1918, pp. 569–572.

About fifteen per cent of the larvae of *Anopheles bifurcatus*, L., collected by the author from the immediate neighbourhood of Grenoble were found to be parasitised by a new species of Schizogregarine. This organism, which so closely resembles *Caulleryella aphiochaetae*, Keilin, as to be included in the same genus under the name *C. anophelis*, is distributed throughout the entire length of the mid-gut. In the same host free sporozoites are found side by side with ripe cysts and gregarines in all stages of development.

BLAU (—). **Die planmässige Insektenbekämpfung bei den Russen.** [The Campaign against Insects in Russia.]—*Zeitschr. f. Hyg. u. Infektionskr., Leipzic*, lxxxiii, no. 3, 3rd May 1917, pp. 343–382.

This article is mainly composed of notices of measures against insects as practised and recommended not only in Russia but in Germany and elsewhere. As a measure against lice Carpathian herdsmen dip their linen in melted butter, which is supposed to act mechanically by preventing the deposition of the eggs. An insecticide recommended is a solution containing 65 parts of naphtha soap and 35 parts of cresol. This is used, diluted to 10 per cent. strength, for rinsing linen.

TAKATSUKI (A.). **An Essential Property of Petroleum for Mosquito Control.**—*Kyoto Igaku Zassi, Kioto*, xiv, no. 7, November 1917. [Japanese Text; Author's Summary p. 84.]

As a result of experiments with petroleum (kerosene, light and heavy oils) in the destruction of various species of Culicines in their larval and pupal stages, it is stated that the cause of death is not a simple mechanical suffocation such as occurs when the breathing pores are stopped. It is suggested that the surface of the siphons and respiratory organs is covered with an epithelial membrane that has a special chemical affinity for petroleum. This membrane is not stained with watery dye solutions, but is very easily stained with petroleum solutions of dyes. It is therefore quite unnecessary to cover the water with a thick layer of petroleum, 26 c.c. of kerosene per square metre being sufficient to destroy almost all larva and pupae during the summer. The larvae and pupae were more resistant in the late autumn [see also this *Review*, Ser. B, v, p. 54].

KÜLZ (L.). **Beiträge zur Pathologie und Therapie des Rückfallfiebers.** [Contributions to the Pathology and Treatment of Recurrent Fever.]—*Archiv. f. Schiffs- u. Tropen-Hyg., Leipzic*, xxi, no. 11–12, June 1917, pp. 181–188.

Observations on recurrent fever among German troops, among Turks on the Persian front, and among Rumanians in Macedonia, Serbia and the Dobrudja, are recorded. Though lice are the only known vectors, the author suggests that fleas may also be concerned. Whilst typhus was stamped out by strict measures against lice, recurrent fever on several occasions continued to occur after lice had been eradicated, the only vermin present being fleas.

DERIVAUX (R. C.), TAYLOR (H. A.) & HAAS (T. D.). **Malaria Control: a Report of Demonstration Studies conducted in Urban and Rural Sections.**—*U. S. Public Health Service, Washington, D.C.*, Public Health Bull. no. 88, September 1917, 57 pp., 30 figs, 4 maps. [Received 6th May 1918.]

The town unit selected for the demonstration of malaria control by the application of anti-mosquito measures was Crossett, a small township of 2,029 inhabitants built about 16 years ago in a rich pine region in south-eastern Arkansas. The town occupies an area of 1 mile by ½ mile and is divided into symmetrical blocks by streets and avenues, 90 ft. wide.

A sanitary census and a history index of malaria were taken at the beginning of operations, a search being made at the same time for artificial containers serving, or likely to serve, as temporary breeding places of mosquitos. Malaria has constituted about 60 per cent. of all illness in and about the township, though of recent years a progressive decrease, both in the number of cases and the severity of the type, has occurred, pernicious forms and haemoglobinuric fever being now uncommon, whereas formerly both were fairly frequent.

The town has had exceptional facilities for mosquito propagation in the form of street ditches serving as gutters and storm-sewers, artificial ponds of several acres near the lumber mills, borrow-pits along railways, numerous water-barrels placed throughout the lumber mills and yards for fire protection, and the usual containers found on private premises.

Control measures, begun in April 1916, included the treatment of old streams and ditches by the removal of all over-hanging trees, etc., for a distance of 2 to 8 ft. from both banks, the clearing and recutting of the channel and the straightening of the banks; the cutting of new ditches for the drainage of wet areas and borrow-pits; the filling, draining or oil-spraying of these latter whenever possible; the cutting of a few broad ditches to allow of the free access of small fish into the fish-pond at all times, irrespective of water-level; the treatment of artificial containers by the use of nitre-cake, consisting of anhydrous sodium sulphate and acid sodium sulphate, which is lethal to mosquito larvae and pupae, and prevents the development of ova in a dilution of 1 in 400; oiling with a rather heavy black oil, graded by dealers as next below fuel oil, applied by automatic drip-cans and knapsack pump sprayers, this oil forming a film that adheres tightly to ditch banks and is very resistant to evaporation; the use of a phenol disinfectant larvicide, costing *3s. 4d.* per gallon, in ditches in and near lumber yards where oil could not be used owing to insurance restrictions. In addition weekly routine inspections were made, monthly malaria morbidity reports were drawn up, and educational lectures with stereopticon illustrations were given in churches, schools and other meeting places to both white and coloured people at the beginning of operations, with the result that measures for the suppression of mosquito propagation were enthusiastically received.

The immediate results of the mosquito-control operations begun in April were made evident by the almost complete absence of all kinds of mosquitos, and then, from May onwards, by the progressive diminution in the incidence of malaria. Complete mosquito control was secured at the end of May, and with the exception of a few *Anopheles quadrimaculatus* taken early in July, following heavy rains, no invasions of more than occasional individual mosquitos were observed or reported.

The cost of the above control measures for the reduction of malaria worked out at about five shillings per head of the population.

The locality selected for demonstration studies in malaria prevention by the use of screening and quinine under rural conditions was a group of 10 plantations situated in the alluvial lands of south-eastern Arkansas. The less elevated portions consist largely of swamp, as yet uncleared, though the more accessible timber is being steadily removed. The water-level being very close to the surface of the ground, water accumulates in the hollows, resulting in a prolific vegetation and an almost tropical undergrowth.

As in the urban unit, preliminary operations consisted of a systematic survey, and a census to ascertain general sanitary conditions and the history index of malaria.

The measures adopted for the prevention of malaria comprised mechanical protection against mosquitos by means of carefully applied screens, and the use of quinine in immunising doses. Both these methods were supplemented by the intensive treatment of carriers with quinine in sterilising doses.

The 106 families under observation were divided into 3 groups, as follows:—A, screen group in which protection was by means of screening, quinine being administered to proven carriers only; B, quinine group, in which protection was by means of immunising doses of quinine to all occupants of unscreened houses, together with sterilising doses of quinine to proven carriers; C, combined screen and quinine group, in which protection was by means of screening and immunising doses of quinine during the first half of the summer, proven carriers receiving intensive treatment. Systematic inspections were conducted at least once in each week to determine the taking or failure to take quinine as recommended, the efficacy of the screening and the incidence of illness and its nature. At intervals of two weeks a mosquito survey of all premises was made to ascertain the variation in Anopheline incidence; and detailed explanations of the various operations and their purpose were made to all adults concerned, supplementary illustrated lectures being delivered during the early summer.

As a general result malaria has been markedly less on the controlled plantations than in adjacent areas where no prophylactic measures were in use. By the screening method a reduction in malaria of 70·6 per cent. was obtained in group A, the cost per head of screening being about seven shillings; the administration of immunising doses of quinine effected a malaria reduction of 64·45 per cent. at a cost per head of rather more than two shillings; and of the carriers to whom sterilisation doses of quinine were administered, only 3 remained infected, being a reduction in malaria of 95·17 per cent.

LEISHMAN (Col. Sir W. B.). **A Note on the Granule-Clumps found in *Ornithodorus moubata* and their Relation to the Spirochaetes of African Relapsing Fever (Tick Fever).**—*Ann. Inst. Pasteur, Paris*, xxxii, no. 2, February 1918, pp. 49–59. [Received 6th May 1918.]

Previously published papers by this author record the study of tick fever in monkeys and mice, induced by the bite of *Ornithodorus moubata*, the fever being associated with the occurrence of large numbers of *Spirochaeta duttoni* in the blood. Special points dealt with were:—The fate of spirochaetes ingested by the ticks, the nature of the hereditary transmission of the infection in the tick and the mechanism of infection by the bite of the tick [see also this *Review*, Ser. B, i, pp. 33 & 215]. The present note records recent observations which go to prove that some, at all events, of the granule clumps almost constantly found in various tissues of *Ornithodorus*, and in the eggs of the fecundated female tick, are derived from spirochaetes, and are able subsequently to develop again into spirochaete form; these clumps therefore represent a stage in the cycle of development of *S. duttoni* in the tick.

It is found that the spirochaetes, after ingestion by the tick, retain their motility for several days, the period depending chiefly on the temperature at which the ticks have been kept; but subsequently they lose their motility and tend to agglomerate into large tangles or masses. Others, however, behave differently and develop a lateral or terminal bud, which later separates and corresponds to an isolated granule clump. Later, there occurs a period of a few days during which either no spirochaetes at all can be detected, or only very rare ones that are seldom motile. Next, especially in ticks that have been kept at comparatively high temperatures, there appears a sudden re-invasion of the tissues with numerous and vigorously motile spirochaetes, often very different in size and general appearance from those which were originally ingested by the tick.

It has frequently been found that this second crop of spirochaetes disappears more or less completely, and 6 or 7 days later a repetition of the above events occurs. In other words regular relapses appear to take place in the body of the tick, corresponding with the appearance and disappearance of the spirochaetes, just as in the case of the warm-blooded host.

Carpenter (G. H.) & Pollard (F. J. S.). **The Presence of Lateral Spiracles in the Larva of** *Hypoderma*.—*Proc. R. Irish. Acad., Dublin*, xxxiv, sect. B, no. 4, April 1918, pp 73–84, 22 figs.

The larvae of most Coleoptera and Lepidoptera possess paired functional spiracles on one or more of the thoracic, and on the abdominal segments from the first to the eighth inclusive. This peripneustic type is modified in the Diptera, in which the breathing holes are restricted to a large pair at the hinder end of the abdomen, a minute prothoracic pair being also sometimes present. These metapneustic and amphipneustic types are the result of reduction correlated with the mode of life of Dipterous larvae such as those of the Culicidae and of *Eristalis*.

Hence the interest attaching to the presence of a paired series of spiracles in the fourth-stage larvae of *Hypoderma bovis*, De G. (ox warble-fly), *H. lineatum*, Villers, and *Oedemagena tarandi*, L. (reindeer warble-fly), which are typically metapneustic in accordance with their mode of life. These live just beneath the skin of the backs of cattle, the large dorso-posterior spiracular plates being situated immediately below the breathing hole bored by them through the hide and the head end being buried in the subcutaneous tissue absorbing the fluid-products of the inflammation set up in the warble induced by their presence.

Sergent (Et.). **Une Hémogrégarine de** *Vipera libetina*, **L., d'Algérie. Début de l'Evolution de cette Hémogrégarine chez un Acarien.** [A Haemogregarine of *Vipera libetina*, L., of Algeria and the Beginning of its Development in an Acarid.]—*Bull. Soc. Path. Exot., Paris*, xi, no. 4, 10th April 1918, pp. 278–281, 2 figs.

Twenty individuals of *Vipera libetina*, the blood of which was examined for Haemogregarines, were found to harbour numerous ectoparasites hidden under the scales that were identified as a Gamasid mite, *Ophionyssus natricis*, Gerv. The intestinal tubes of these mites frequently contained the red blood-corpuscles and the Haemogregarines infesting their vertebrate host. The development of the latter in the Acarid has not been followed.

Sergent (Edm.) & Sergent (Et.). **Disparition de la Virulence du** *Plasmodium relictum* **chez le Moustique après plusieurs Mois d'Hibernation.** [Disappearance of the Virulence of *Plasmodium relictum* in the Mosquito after several Months of Hibernation.]—*Bull. Soc, Path. Exot., Paris*, xi, no. 4, 10th April 1918, p. 281.

Referring to a recent paper on the loss during hibernation of the power of malarial Anophelines to transmit infection [see this *Review*, Ser. B, vi, p. 101], the authors record a case observed in Algiers in

1911–1912. Three individuals of *Culex pipiens* had a meal of blood heavily infested with *Plasmodium relictum* on 6th October 1911. Numerous observations have shown that in such conditions the mosquito always becomes infected. These three individuals were kept in the laboratory nearly 5 months without a blood meal. After that interval, two of them were allowed to bite a healthy canary, without producing any infection. An examination of the salivary glands of the third individual 10 days later showed numerous apparently normal sporozoïts. A fortnight later (the maximum duration of the incubation period), the bird received an experimental injection which caused, after the usual interval, a strong infection of the *Plasmodium* that proved fatal on the 11th day. It is therefore concluded that, under certain conditions, *Plasmodium relictum* cannot preserve its virulence in the mosquito after several months of hibernation; neither did an inoculation of the degenerated *Plasmodium* confer immunity on the bird.

CAILLE (E.). **Cas de Paludisme autochtone rennais à *Plasmodium falciparum* décelé par une Injection de Néosalvarsan.** [A Case of indigenous Malaria at Rennes due to *Plasmodium falciparum* revealed by an Injection of Neosalvarsan.]—*Bull. Soc. Path. Exot., Paris*, xi, no. 4, 10th April 1918, pp. 282–286.

A case is recorded of a woman who had never left the town of Rennes being infected with *Plasmodium falciparum*. This infection became evident only after an injection with neosalvarsan, and the irregular fever thus produced yielded to quinine treatment.

ROUSSEAU (L.). **Recherches sur l'Endémie paludéenne à Doua'a (Cameroun) en 1917.** [Investigations into endemic Malaria at Duala (Kamerun) in 1917.]—*Bull. Soc. Path. Exot., Paris*, xi, no. 4, 10th April 1918, pp. 286–291.

Investigations carried out at Duala from January to March, 1917, confirms the opinion that malaria in this district is inevitable among newly-born infants, who from their birth must receive infection again and again under the normal conditions of native life. The results are given of examinations of natives of various ages in different districts. While making these examinations, the breeding-places of Anophelines were diligently sought for. These are difficult to trace during the dry season, but as soon as the rains begin they may be found abundantly. Very few occur among vegetation; the majority are on the roads and in the yards of houses, almost all being close to inhabited places. Evidently the species in question is maintained during the dry season by breeding in the rare permanent breeding-sites, or by females that are able to live from one rainy season to another, and a dangerous increase in numbers occurs as soon as the rains begin and suitable collections of water are to be found. A long drought would be necessary to dry up the marshy land sufficiently to suppress the danger; unfortunately rain is so frequent that the ground becomes saturated and is often coated with elementary algae, thus constituting a permanent breeding-ground that can defy several days' drought and produces an abundance of Anophelines. These breeding-places were examined during a lull in the rains when the water had somewhat subsided, and many larvae and nymphs were reared to the adult stage in the laboratory; these all proved to be *Anopheles funestus*, Giles. It is evident in these circumstances that the natives are surrounded with malarial conditions from their infancy, and, in fact, many infants die from pernicious attacks or from malarial cachexia aggravated by intestinal parasitism. The natives do not apparently trace any connection between the splenic enlargement of infancy and the attacks of malaria that supervene in later life, and very seldom have recourse to European medicine. It is not surprising that Europeans living among this malarial native population should become infected, or that the percentage of cases should be high. These facts confirm the importance of prophylactic measures to protect as far as possible the health of the Europeans in the occupied territory.

LANGERON (M.). **La Larve d'*Anopheles chaudoyei* (Theobald, 1903).** [The Larva of *Anopheles turkhudi* (*chaudoyei*).]—*Bull. Soc. Path. Exot., Paris*, xi, no. 4, 10th April 1918, pp. 291–297, 8 figs.

Anopheles turkhudi, List. (*Pyretophorus chaudoyei*, Theo.) occurs in the oases of northern Africa. It has been found in both Algeria and Tunisia. Many larvae and nymphs have been found in the highly mineralised water of the Saharan and Lybian oases, where the water is clear over a sandy bottom and there is no trace of vegetation. Among several hundred individuals collected, all the larvae, except two examples of *Ochlerotatus dorsalis*, were those of *A. turkhudi*. The larvae of this Anopheline, which do not seem to have been previously studied, are described in this paper. It is hoped that these notes will be helpful in determining whether *A. chaudoyei* constitutes a good species or if it should be regarded merely as a marked sub-species of *A. turkhudi*, with which it is considered synonymous by many systematists. Whatever may be the relation between these two species, the determination of the larvae of this mosquito is of great interest because it is the principle vector of malaria in the Algerian and Tunisian Sahara.

CHATTON (E.). **Observations sur le Ver de Guinée. Preuve expérimentale de l'Infestation des *Cyclops* par Voie digestive.** [Observations on the Guinea Worm. Experimental Proof of the Infestation of *Cyclops* by the Digestive Tract.]—*Bull. Soc. Path. Exot.*, Paris, xi, no. 4, 10th April 1918, pp. 338–348.

In studying the infestation of *Cyclops* with the guinea-worm, by means of the digestive tract, no change in development of the larvae of the worm has been observed in any individuals of *Cyclops* studied, but the experiments made are not sufficient to eliminate the possibility of such evolution. Some observations have also been made regarding the behaviour of certain Arthropods of the aquatic fauna of the oases towards the larvae of *Filaria* [see p. 130].

Dyar (H. G.). **The Male Genitalia of *Aëdes* as Indicative of Natural Affinities (Diptera, Culicidae).**—*Insecutor Inscitiae Menstruus, Washington, D.C.*, vi, nos. 4–6. April-June 1918, pp. 71–86.

This paper deals with the classification of the genus *Aëdes* based on the structure of the male genitalia. This basis of classification supersedes that of adult coloration, since it shows the relationship existing between New and Old World species.

Dyar (H. G.). **A Revision of the American Species of *Culex* on the Male Genitalia (Diptera, Culicidae).**—*Insecutor Inscitiae Menstruus, Washington, D.C.*, vi, nos. 4–6, April-June 1918, pp. 86–111.

The errors in the classification of the genus *Culex* that appeared in the author's monograph are now corrected by the adoption of a new basis of classification, which has resulted in a reduction of the number of species to be recognised.

Dyar (H. G.). **A Note on the American Species of *Mansonia* (Diptera, Culicidae).**—*Insecutor Inscitiae Menstruus, Washington, D.C.*, vi, nos. 4–6, April-June 1918, pp. 112–115.

This paper deals with the genus *Taeniorhynchus* (*Mansonia*), to which a key is given. It is divided into two subgenera, *Mansonia*, Blanchard, in which the eggs are attached to the under-side of floating leaves, and *Coquillettidia*, Dyar, in which they are deposited in floating boat-shaped masses. The species included in the former are *Taeniorhynchus* (*Mansonia*) *titillans*, Wlk., *T.* (*M.*) *pseudotitillans*, Theo., *T.* (*M.*) *humeralis*, D. & K., *T.* (*M.*) *amazonensis*, Theo. Belonging to the latter are *T. perturbans*, Wlk., *T. nigricans*, Coq., *T. coticula*, D. & K., *T. fasciolatus*, Lynch A., *T. arribalzagae*, Theo., *T. juxtamansonia*, Peryassú, *T. albicosta*, Peryassú, and *T. hypocindyna*, sp. n., from Brazil.

Mote (D. C.). **Some External Parasites of Poultry.**—*Ohio Agric. Expt. Sta., Wooster*, Bull. no. 320, December 1917, pp. 139–156. 14 figs. [Received 13th May 1918.]

This bulletin deals with the usual external parasites of poultry, mention being made of some that have not yet been recorded in Ohio.

These include :—*Menopon pallidum*, Olfers (*trigonocephalum*) (small body louse) and *M. biseriatum*, Piaget (large body louse), methods for controlling which have already been noticed [see this *Review*, Ser. B, iii, p. 158]; *Lipeurus heterographus*, N. (head louse), abundant on young chickens, though not so frequently met with as the two preceding species, cannot be controlled by the same remedy, but is best dealt with by rubbing mercurial ointment into the bases of the feathers ; *L. caponis*, L. (*variabilis*) (variable hen louse) ; *Goniocotes gigas*, Tasch. (*abdominalis*) (large chicken louse) ; *G. gallinae*, Retz. (*hologaster*) (lesser chicken louse) ; *Goniodes dissimilis*, N. ; *Dermanyssus gallinae*, De G. (red mite, poultry mite) and *D. hirundinis*, Hermann (bird mite), the life-history and control measures for which have already been noticed [see this *Review*, Ser. B, v, p. 173] ; *Trombidium* sp. (harvest mites, chiggers), the larvae of which may attack young chickens, the best preventive being flowers of sulphur dusted among the feathers; *Cnemidocoptes mutans*, Rob. & Lang. (scaly leg mite), which causes a disease best treated by soaking the feet and legs in warm water for several minutes to loosen the scales and then treating the diseased surface with a mixture of oil of caraway, one part, and lard or vaseline, four parts, or with sulphur ointment; *C. laevis* var. *gallinae*, Raill. (depluming mite), controlled by the same parasiticides; *Echidnophaga* (*Sarcopsylla*) *gallinacea*, Westw. [see this *Review*, Ser. B, iii, pp. 148, 232]; *Ceratophyllus avium*, Tasch. (European hen flea), controlled by the application of crude oil to the floors, sides and crevices of the hen-house; *Cimex* (*Acanthia*) spp., especially *C.* (*A.*) *inodorus* (Mexican chicken bug), *C.* (*A.*) *hirundinis* (swallow bug), *C.* (*A.*) *columbarius* (pigeon bug), and *C.* (*A.*) *lectularius* (bed-bug), controlled by fumigating the chicken-house with sulphur, or by spraying it with a mixture of one-third gasoline and two-thirds coal oil.

REIDY (J. B.). **Cattle Tick Eradication.**—*Texas Dept. Agric., Austin*, Bull. no. 57, Proc. 7th Meeting Texas State Farmers' Institute, 1917, pp. 17–23. [Received 15th May 1918.]

An account is given of the history of tick eradication in the United States. The life-history of *Margaropus annulatus*, the only species of tick causing Texas fever, is described and the losses caused by the disease are discussed. The methods of eradication include control in the pasture and on the cattle. The former consists of excluding cattle, horses and mules from pastures until all the ticks have died from starvation, the pasture crops being rotated in the meantime. The objection to this method is the time required, during which the pastures cannot be used for cattle. The practice of dipping is described and is recommended as the most practicable and effective method of applying disinfectants to destroy ticks on cattle.

In the course of the discussion following the reading of this paper, the following formula for a dipping solution was recommended: Arsenic, 8 lb.; sal soda, 8 lb.; caustic soda, 5 lb.; pine tar, 1 U.S. gal.; water, 500 U.S. gals.

Mosquitos and the War. *Entom. News, Philadelphia*, xxix, no. 5, May 1918, p. 191.

Quoting from the *Public Ledger*, Philadelphia, it is reported that a decision was reached at a meeting of the State War Board in Harrisburg, to free the Hog Island shipbuilding zone of disease-breeding mosquitos. The work will be done under the direction of the State Department of Health, with the help of the experts who assisted in similar work in the Panama Canal Zone. Large sums for this purpose have been contributed by various public bodies, headed by the State War Board. The money will be expended in a drainage and pumping station. Two wells will be dug and two pumping stations erected and the swamp water treated with oil to kill the larvae. By this means it is hoped successfully to combat the mosquitos, which, if allowed to breed, would stop the night shifts working on the Federal ships and reduce the efficiency of the plant by half.

SCHWETZ (J.). **A Comparative Study of the Habits of** *Glossina brevipalpis*, **Newst.,** *G. fusca*, **West., and** *G. pallidipes*, **Aust. in the Belgian Congo.**—*Ann. Trop. Med. Parasit., Liverpool*, xi, no. 4, 11th May 1918, pp. 365–398, 1 map & 1 chart.

The author's summary of this paper is as follows:

The five important tsetse-flies, *G. brevipalpis*, *G. fusca*, *G. pallidipes*, *G. morsitans* and *G. palpalis*, select tree-trunks, the larger branches of trees and creepers for resting purposes. In regions where they occur, *G. brevipalpis* and *G. pallidipes* are not restricted to limited areas or belts, but, like *G. morsitans*, are found uninterruptedly, except in large clearings, over vast stretches of country.

The habits of *G. pallidipes* are intermediate between those of *G. brevipalpis* and *G. morsitans*. Like *G. brevipalpis*, *G. pallidipes* hovers over the ground when active, and is usually so only at certain fixed times, especially between 3 p.m. and 5 p.m. (4 to 6 p.m. in the case of *G. brevipalpis*), the maximum activity being reached about 4 p.m. The habits of *G. pallidipes*, however, are less well-defined than those of *G. brevipalpis*, and it not only bites more often than the latter, but is not uncommonly seen on the wing in very small numbers throughout the whole afternoon and occasionally in the forenoon. Of the examples of *G. pallidipes* captured when active, only about 15 per cent. were females. In those regions where *G. brevipalpis* occurs it accomodates itself to all types of arborescent vegetation, forest, park-land and wooded savannah, but *G. pallidipes*, like *G. morsitans*, does not inhabit forest. *G. fusca* occurs in forests only. As the region where these observations were made (northern Katanga, notably the districts between the Lualaba and upper Lomami rivers) consists of park-land and savannah, the forest only being represented, usually along rivers and streams, by belts of varying width, it is evident that in this region *G. fusca* only occurs in somewhat limited areas. Further, these areas are still more restricted owing to the fact that this species only inhabits moderately dense forest belts of a certain width (200 to 300 yards). But contrary to what has been thought hitherto, where *G. fusca* does occur, it is not at all uncommon, and sometimes is even abundant. It has however peculiar habits; it does not fly during the day, like *G. morsitans* and *G. palpalis*, and does not hover over the ground at definite times like *G. brevipalpis* and *G. pallidipes*, but always remains motionless on tree-trunks and creepers. Occasional specimens, usually one or two, are sometimes attracted by men and animals passing by. These may make their appearance at any time of the day, but prefer the cooler hours, *e.g.*, early in the morning or more often late in the evening. *G. fusca* also has a definite period of activity, namely from 7 to 8 p.m., or one to two hours after sunset, and if a haunt of the fly be passed during this time, numerous attacks are sure to be made.

Females of *G. fusca*, unlike those of *G. brevipalpis* and *G. pallidipes*, are commonly found, and form nearly 50 per cent. of the specimens captured, whether the flies be taken on the wing or resting on trees, etc. Since forest belts usually occur near water, it is in the neighbourhood of the latter that *G. fusca* is generally found, though it also occurs in forest belts where there is no water in the immediate vicinity, and may even be found in forest a few kilometres distant from the nearest water. In this respect, therefore, *G. fusca* is unlike *G. palpalis*, but resembles *G. pallidipes*, *G. brevipalpis* and *G. morsitans*. The haunts of *G. brevipalpis*, *G. pallidipes* and *G. fusca* are situated almost exclusively along roads and paths.

Particulars are also given of the relative numbers of the sexes in the species captured. It is noteworthy that of some 5,000 examples of *G. brevipalpis* only 50 were females.

Parker (R. R.). **Some Results of Two Years' Investigations of the Rocky Mountain Spotted Fever Tick in Eastern Montana.**—*Jl. Econ. Entom., Concord, N.H.*, xi, no. 2, April 1918, pp. 189–194.

Much of the subject matter of this paper has already been noticed [see this *Review*, Ser. B, v, p. 80], but mention is here specially made of four small mammals that act as hosts of the Rocky Mountain spotted fever tick [*Dermacentor venustus*].

Of these, the first in importance is the jack rabbit, the only animal known to harbour all three stages of the tick, and also able to maintain an infestation of ticks without the presence of domestic animals. Other reasons that render it important are its general distribution in all parts of eastern Montana, its wide travelling radius, its susceptibility to Rocky Mountain spotted fever, and the fact that it may play an important part in the spread of the disease both extensively and intensively. Nymphal forms of the tick may be present in large numbers and engorge in much less time on the jack rabbit than on any other host. Cottontail rabbits are also important as hosts of the immature stages. The frequent coincidence of the abundance of ticks and the abundance of jack rabbits has been noticed in seasons preceding the occurrence of cases of the fever. The interval between the epidemics is variable, but is frequently seven years, though it may be more or less. The occurrence of fever following a parallel increase in rabbits and ticks is of interest and indicates the possible control of spotted fever under eastern Montana prairie conditions by the eradication of rabbits.

There is a probability that porcupines, when numerous, might prove to be important adults hosts, as more than 20 adult ticks have been found on a single animal, and a seasonal average of 6·8 was observed in 1917.

The deer mouse is the second most important wild mammal in eastern Montana in relation to the tick. The reasons for this are that as a host of immature ticks it exceeds in abundance all other wild mammalian hosts combined, and is adaptable to all sorts of conditions. The degree of infestation of these mice varies from 125 ticks on a single mouse to ·19 under prairie conditions in a poor tick season.

Field mice are not in any way comparable to deer mice as hosts, being of importance only where very favourable habitat conditions occur. In recording the infestation of mice allowance must be made for the fact that the mice are trapped before 11 o'clock at night, or even earlier, leaving ample time for the ticks to leave the hosts before the traps are examined in the morning.

As regards domestic animals the data for 1917 show that horses, cattle and pigs are efficient as tick hosts in the order named, and that pigs running at large will pick up large numbers of ticks.

The factors that determine the species of host-animals and their relative abundance are the character of the ground, whether rocky or clear, and the nature of the vegetation. For example, in prairie country, only prairie animals can become sufficiently numerous to become a real factor in tick abundance. It has been found that certain animals, which under prairie conditions are found both in rocky and rock free areas, always yield more ticks when taken in the rocky situations.

COCKERELL (T. D. A.). **The Mosquitoes of Colorado.**—*Jl. Econ. Entom., Concord, N.H.*, xi, no. 2, April 1918, pp. 195–200.

The necessity of establishing a number of military recuperation camps in the most favourable localities led the author to begin a mosquito survey of Colorado, as, according to the data in the monograph of Howard, Dyar and Knab, the only area in the United States free from *Anopheles* consists of eastern Colorado, Wyoming, Nebraska and the Dakotas. It is not probable that Anophelines are actually absent from the whole of this area, but even if locally present, they can often be readily exterminated owing to the limited possible breeding places.

The species so far definitely identified from Colorado or Wyoming are the following:—*Anopheles quadrimaculatus*, Say, recorded only from the far western part of the State; *Culex tarsalis*, Coq.; *C. pipiens*, L.; *Theobaldia inornata*, Willist.; *T. incidens*, Thoms.; *Aëdes aerophilus*, Dyar; *A. aldrichi*, D. & K.; *A. cinereus*, Mg.; *A. curriei*, Coq.; *A. idahoensis*, Theo.; *A. mimesis*, Dyar; *A. nigromaculis*, Ludl.; *A. pullatus*, Coq.; *A. sansoni*, D. & K.; *A. stimulans*, Walk.; *A. triseriatus*, Say, var. *hendersoni*, n.; and *A. vexans*, Mg.

EWING (H. E.) & HARTZELL (A.). **The Chigger-mites affecting Man and Domestic Animals.**—*Jl. Econ. Entom., Concord, N.H.*, xi, no. 2, April 1918, pp. 256–264, 1 fig.

Chigger-mites, which are the larvae of the brightly coloured harvest mites, though pests of economic importance have hitherto escaped thorough investigation on account of their minute size.

The species here dealt with are:—*Metathrombidium poriceps*, Oud., the summer chigger of Europe, a very small, egg-shaped mite, not more than ·4 mm. when unengorged. It has been frequently reported from man, and has been taken from the dog, and from chickens. Among the invertebrate hosts are *Musca domestica* (house-fly) and other insects belonging to many orders. It has also been recorded from spiders, rodents and various mammals. It has been collected in June, July, August and September, and is found in the Netherlands, France and Germany, and doubtless occurs in other parts of Europe.

Microthrombidium pusillum, Herm. (European harvest mite) was long known under the name of *Leptus autumnalis* and gives rise to a severe rash or itch. Unengorged, these mites are brick-red in colour, but so minute as to be scarcely visible to the naked eye. For long it was believed that they lived on the juices of plants and only under certain conditions became blood-suckers. They, however, live normally upon invertebrate hosts, especially insects, and are only accidental parasites on higher animals. *M. pusillum* attacks man very severely and is troublesome also to horses, cattle, sheep, rabbits, dogs and cats. It has been reported from England, France, Belgium, Holland and Germany, occurring during September, October and November.

Thrombidium striaticeps, Oud. (striated European chigger-mite) is not so common or important a pest as the two above-mentioned, but has been found on man, the dog, cat and domestic fowl in France, Belgium and Holland, its normal hosts being chiefly species of Diptera.

Microthrombidium [*akamushi*] (kedani mite), the adult form of which is unknown, is an orange-red chigger-mite, which in certain parts of Japan has been associated with a fatal disease known as river fever. It appears that the lesions caused by its attacks afford a point of entrance to the bacteria which cause the fever [see this *Review*, Ser. B, vi, pp. 21, 50].

M. wichmanni, Oud. (Ceram chigger-mite), an East Indian species which by its bites covers the body with inflamed lumps and produces a serious disease. Besides being found on man, this mite has been recorded from a bird, *Goura coronata*.

Schöngastia vandersandei, Oud., is a bright red mite which in New Guinea climbs shrubs and bushes whence it is brushed on to the bodies of the larger animals as they pass by. It gets under the skin, causing a disease known as shrub-itch. It has also been found on *Goura coronata*.

Microthrombidium tlalzahuatl, Murray (Mexican chigger-mite) is an oval, bright orange-yellow mite that attacks the eyelids and axillae. The natural hosts of this mite have not been determined and there is no record of it attacking mammals other than man.

The American chigger-mite, which has long been recorded under the name of *Leptus americanus*, though it belongs to an undescribed genus and species, is barely visible to the naked eye and infests chiefly the scalp and axillae. Nothing is known of its natural hosts or of its occurrence except in the upper Mississippi valley.

The irritating chigger-mite, also belonging to an unknown genus and species, which has frequently been mentioned in American literature under the name *L. irritans*, is of minute size. It is most troublesome, causing intense irritation and swelling on all parts of the body. It has been thought that it may be identical with the common locust-mite frequently found on the wings of grasshoppers in the upper Mississippi valley, but the fact is not established.

Euthrombidium trigonum, Herm. (locust mite) was first reported in 1868 on the Rocky Mountain locust. An adult has been successfully reared from a larva infesting *Melanoplus bivittatus*. The adults show a decided preference for grasshopper eggs. The larvae cannot be induced to attach themselves to man, and have never been reported from man or domestic animals in Europe. So far as is known, the hosts of the locust mite are confined to four families of Orthoptera, namely :—ACRIDIIDAE, TETTIGONIIDAE, GRYLLIDAE and MANTIDAE. In America it has been found on the following species :—*Melanoplus differentialis, M. spretus, M. angustipennis, Sphoragemon bolli* and

Schistocerca americana. *E. trigonum* is generally distributed throughout the basin of the Missouri and in Oregon, and has also been found in Germany and Holland. The common locust mite in the United States is of the same species as the European one, hence *Thrombidium locustarum*, Walsh, is a synonym of *Euthrombidium trigonum*, Herm., of the old world.

Thrombidium muscarum, Riley (house-fly mite) is confined to a single host, *Musca domestica*, and has never been induced to attach itself to man. It is generally distributed throughout the United States, in some seasons scarcely a house-fly being found that is not infested with a number of these larvae. Adults of this species have been successfully reared.

DUNN (L. H.). **Studies on the Screw-worm Fly, *Chrysomyia macellaria*, F., in Panama.**—*Jl. Parasitology, Urbana, Ill.*, iv, no. 3, March 1918, pp. 111–121. [Received 14th May 1918.]

Chrysomyia macellaria, F. (screw-worm fly), which occurs in great abundance throughout the Canal Zone and the Republic of Panama, is of considerable economic importance owing to its dangerous habit of ovipositing in living, as well as on dead, tissues of man and animals. The number of eggs laid in one batch by each individual fly varies considerably, but under favourable conditions averages 190. When ovipositing in inanimate animal substances, the females exhibit a tendency to lay their egg-masses all together in a heap. The time required for the eggs to hatch varies from 11 hours to 23, the average being about 14 hours. Surrounding conditions of temperature and moisture being so nearly constant in Panama exert but slight influence on the incubation period, though it may be shortened by the body heat when eggs are laid in living tissues.

The growth of the larvae is very rapid, maturity being reached on the fifth or sixth day. The pupal period is about 4 or 5 days, though it may be as little as 3, or as much as 10. The adults, both sexes of which emerge in about equal proportions, exist on fluids or semi-fluids in material that can be reduced to a semi-liquid food, such as that found in garbage cans, refuse heaps and in decaying plant and animal substances in the woods and jungle away from habitations.

The females oviposit by preference in the late afternoon or evening, but it is not known whether they remain active after nightfall in search of places for oviposition. Most flies become inactive at nightfall, but this species has been known to deposit eggs during the night in captivity, and gravid females oviposit much more readily in breeding jars when these are covered with a dark cloth. The females are very active, always searching either for food or for a place to deposit their eggs, and are quickly attracted to any animal, probably by its odour, or perhaps by its motion.

Throughout the Isthmus of Panama this fly by means of its larvae causes more damage and suffering to cattle, horses and other animals than any other Dipterous pest, and if the disease-bearing mosquitos be excepted, the same thing applies to man.

Eggs are deposited on man in the nasal and aural cavities and in other natural openings of the body, as well as in every exposed wound, ulcer and bleeding surface, the infestation usually occurring while the victim is sleeping in some exposed place, such as woods, jungle and unscreened houses. The nasal cavity is the favourite and most dangerous point of attack especially in persons subject to nose-bleeding, or suffering from nasal catarrh with an offensive discharge. The fly, which has a very keen sense of smell, oviposits in the nostril, into which the young screw-worms further migrate, tearing the mucous membrane and feeding on the resulting blood and serum. They soon penetrate into the sinuses of the nasal fossae, where, with plenty of liquid food, warm temperature and a constant supply of fresh air, they grow rapidly, devouring the lining membranes and burrowing into the surrounding muscles and cartilages.

In but few of the many cases of human myiasis caused by *C. macellaria* and reported from the United States and Central and South America does the patient remember having been attacked by flies, but since a mass of 100 eggs is about the size of a small pea it is highly improbable that he could have been unaware of their presence until they hatched out, except under certain conditions. Such conditions are those of :—(1) a person falling asleep in the late afternoon or early evening and sleeping till morning, thus allowing time for eggs to be deposited and hatch, and the larvae to ascend into the nostrils ; (2) an intoxicated person lying out of doors in a drunken stupor for several hours ; (3) a person suffering from nose bleeding being unconscious of the presence of eggs if deposited in a blood-clot ; (4) a person suffering from leprosy or any other disease liable to give rise to anaesthesia of the nasal mucous membrane, in which case the first intimation of infestation would be due to the larvae burrowing into sound tissue. In the interior, cases which terminate fatally are not uncommon among the natives, and in these, infestation has usually occurred when the individual was returning from some place where he had been drinking heavily.

Aural myiasis is somewhat less frequent than nasal, but does occur in the case of infants, and persons with a discharging affection of the ear, causing considerable suffering and sometimes death.

Infestation of the genitalia takes place occasionally, usually in the case of naked children or of old people suffering from senile decay who cannot keep themselves always properly protected with clothing, while a case of umbilical myiasis has been met with, the subject being a Spanish labourer.

All kinds of domestic animals are subject to attack by this fly, cases being recorded of a deerhound belonging to a hunting pack, which became infested, with the resultant loss of bones and teeth in the right upper jaw and the sense of smell ; also of three tame deer kept in a laboratory yard. Cats are practically immune, owing to their habit of constantly licking and cleaning their wounds.

Experiments to investigate the depth at which larvae in carcases may be buried and still emerge as flies, showed that 56 per cent., mostly females, emerged when buried at a depth of $2\frac{1}{2}$ ft., the number emerging from a lesser depth being of course proportionately greater.

No positive proof is yet forthcoming of *C. macellaria* being a disease-transmitting agent, but research is necessary into its power of transmitting anthrax among cattle. Reasoning from the facts that a thin blood-stained fluid is ejected from the mouth and nostrils at death from this disease, and that decomposition with its attendant odours rapidly sets in, attracting a veritable swarm of screw-worm flies, it seems probable that they must be capable of infecting any animal they may visit shortly afterwards, provided it has any skin abrasion, such as an unhealed brand mark. Since it has been proved that *Bacillus anthracis* is able to survive the rays of the tropical sun in the soil of Panama for several years, it should certainly be able to live on the feet and proboscis of the screw-worm fly for a few hours or even days. It is therefore not improbable that this fly may be one of the principle carrying agents in tropical and subtropical countries.

Other flies, though to a lesser extent, have the habit of depositing their eggs or living larvae in open wounds or exposed parts of the body, and it is much to be regretted that in a great many cases of human myiasis the larvae have never been identified or bred out. If this were done in all cases of cutaneous myiasis, it might incriminate other flies in the Canal Zone, hitherto unsuspected, though *C. macellaria* is certainly the chief cause of nasal myiasis.

As regards remedial measures little can be done in Panama owing to the existing peculiar conditions and the great diversity of the breeding habits of the fly. In treating animals with infested wounds, spraying all open lesions with chloroform or carbon tetrachloride has proved efficacious. Of these, carbon tetrachloride is as fatal to the maggots as chloroform, if not more so; it is equal in penetrating power, does not evaporate more quickly, produces no more irritation to the tissues, does not retard healing any longer, and is much cheaper. It is better than carbon bisulphide, as its odour does not attract the flies and it is non-inflammable.

Deeply punctured wounds should be sprayed first with glycerine to induce the maggots to approach the opening of the wound and then with carbon tetrachloride to destroy them. If they are killed in deep-seated wounds, they remain as a foreign body causing suppuration. After cleansing, the wound should be dressed with some repellent such as pine tar. An excellent protective dressing may be made by mixing equal parts of beeswax, fish oil, and carbon tetrachloride, and working in enough vaseline to give it the proper consistency. The use of this on animal wounds, both those that are fresh and those from which screw-worms have been removed, will prevent egg deposition, and save the cattle from damage, as well as reduce the number of the flies.

All fresh meat should be screened to prevent its becoming blown. All persons camping in the jungle should sleep under mosquito netting, and this should always be used for siestas during the day, being then even more important than at night.

DOVE (W. E.). **Some Biological and Control Studies of *Gastrophilus haemorrhoidalis* and other Bots of Horses.**—*U.S. Dept. Agric., Washington, D.C.*, Bull. no. 597, 9th April 1918, 51 pp. 5 plates, 4 figs.

Preliminary investigations in the summer of 1915 upon the European Oestrid, *Gastrophilus haemorrhoidalis* (nose-fly), have shown that the concentration of horses in pastures by breeders, due to the great demand for army horses, has developed a serious fly nuisance, by providing ideal breeding conditions for this bot-fly. Other species implicated are *G. intestinalis* (*equi*) and *G. nasalis.* A key to these is given, based on wing venation, as well as one to the larvae of this genus.

All these species occur in the United States, *G. intestinalis* and *G. nasalis* being widely distributed, while *G. haemorrhoidalis* is confined to the north-central and northern Rocky Mountain States. They are all a source of considerable injury to horses, owing to the worry caused by the flies at the time the eggs are laid, and by the attachment of the larvae in the alimentary tract.

G. haemorrhoidalis (nose-fly) is by far the most annoying to horses at the time the eggs are laid, the effects of oviposition on pastured animals being loss of flesh and mechanical injuries due to subsequent rubbing against posts and barbed wire. In the case of unprotected work animals the results are often complete loss of self-control, leading to accidents, which are especially serious when the horses are being used for mowing. The eggs are deposited singly in the pores of the minute hairs on the lips, and those near the edges which are kept moist and receive friction hatch in from 5 to 10 days. The larvae are ingested with food or water and attach themselves to the walls of the stomach, where they remain till the following winter or spring and then migrate to the rectum, where they re-attach themselves. Before leaving the host they usually attach close to the anus, and protrude from it, becoming accustomed to the air temperatures and assuming a greenish colour. At this time their mobility increases. After remaining in this position for from 40 to 71 hours they drop, but not with the manure, as is supposed, for when this is dropped during their attachment they seem to use more effort in clinging and are only pushed aside during its passage. After dropping to the ground the bots penetrate into the soil to a slight depth for protection and pupate 18 to 170 hours later. After a pupal stage of 21 to 68 days the adults appear, early in June, reaching the maximum of abundance during the first half of the season and disappearing with the frosts. The length of life is only 1-7 days, during which time they take no food, but are very active, the females ovipositing throughout their existence, the average number of eggs being about 150.

G. nasalis, L. (*veterinus*, Clark ; *salutiferus*, Clark ; *clarkii*, Leach ; *duodenalis*, Schwab) (throat bot-fly) deposits its eggs on the hairs under the jaws and to some extent on the shoulders and other parts of the host. The larvae attach themselves to the walls of the pharynx, in which position they cause paralysis of the muscles of deglutition, resulting in inability to take food and drink and in extreme cases in death. They also attach themselves to the walls of the stomach and duodenum, but do not re-attach in the rectum or at the anus. Pupation occurs in 1½ to 2 days after the larvae have passed from the host in its droppings, and adults emerge 20-56 days later. The adults are rather longer lived than those of *G. haemorrhoidalis*, and though they cause considerable annoyance to horses during oviposition, it is not so great as is the case with that species.

G. intestinalis, De G. (*bovis*, L. ; *equi*, Clark ; *gastricus major*, Schwab) (common bot-fly) usually appears later in the season than *G. haemorrhoidalis* and becomes most abundant just before frosts set in. The eggs are deposited on all parts of the body, but preferably on the fore-legs. They hatch upon the application of moisture and friction supplied by the rubbing and licking of the horse, which also results in the ingestion of the larvae, this taking place usually 9 to 11 days after oviposition, though it may be as early as 7 days or as late as 96. They attach themselves to any part of the stomach, but the last-stage bots are found mostly in the left sac. They continue to drop from the host for a long period of time, and pupate in protected places on the surface of the soil during a period of 40-60 days.

The larvae of these three species are surprisingly resistant to chemicals, the usual remedies for intestinal parasites giving negative results, though soap solutions and nicotine sulphate are more effective. Since contact substances capable of killing the larva would seriously injure the stomach membranes of the horse, treatment for internal use must necessarily be in the form of a fumigant. The use of carbon bisulphide internally has been tried and approved by many veterinarians, being originally administered in 12-gram capsules surrounded by aloes, the whole contained in 48-gram gelatine capsules.

The Bureau of Animal Industry recommends the following procedure :—A small amount of hay and a moderate amount of oats should be given in the morning of the day preceding the treatment ; in the evening food is withheld and a purgative given consisting of Barbados aloes 1 oz., or raw linseed oil 1 pint. Next day at 6 a.m., 3 drams of carbon bisulphide in a gelatine capsule is given, the dose being repeated at 7 a.m. and at 8 a.m. This is especially satisfactory if administered in the autumn, spring treatment being less effective, as the full-grown larvae are more resistant and many of the nose-fly bots have left the stomach and passed back to the rectum by that time.

Larvae of *G. haemorrhoidalis* may be removed from the anus mechanically, but this is laborious and causes discomfort and soreness. The use of enemas is ineffective.

As a repellent, pine tar mixed with other material gave good results against *G. intestinalis* and *G. nasalis*, and such mixtures may be used to induce the flies to oviposit on parts of the body less accessible to the horse's mouth.

Various nose protectors are in use against *G. haemorrhoidalis*, but there are objections to many of them. The simplest and best is a piece of leather 4 to 6 inches wide suspended below the lips from the bit rings. For animals in pastures a halter with a box-like arrangement and throat cover has been devised to protect horses against infestation by all three species.

Kerosene oil, used as a wash, is ineffective in destroying the eggs, but carbolic acid containing 2 per cent. phenol gave good results in destroying eggs when applied to the infested parts of the host.

Some investigators believe that the larvae of *Gastrophilus* are able to cause swamp fever, by the excretion of a specific toxin, since symptoms of typical swamp fever have been observed after the administration of extracts of these larvae. This hypothesis is strengthened by the fact that the distribution of the genus coincides with that of the disease. Experimentally the most virulent reactions have been obtained with the larvae of *G. haemorrhoidalis.*

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Imes (M.). **Cattle Lice and how to eradicate them.**—*U. S. Dept. Agric., Washington, D.C.*, Farmers' Bull. no. 909, February 1918, 26 pp., 14 figs. [Received 17th May 1918.]

The cattle lice dealt with in this bulletin are *Haematopinus eurysternus* (short-nosed cattle louse), *Linognathus vituli* (long-nosed cattle louse) and *Trichodectes scalaris* (common biting louse of cattle). The life-histories of these species have been previously dealt with [see this *Review*, Ser. B, v, p. 168]. When separated from their hosts the biting lice live about 7 days, the sucking lice only about 4 days. Newly hatched lice live only 2 or 3 days, unless they find a host. The longevity of the lice and the viability of their eggs when separated from the host have an important bearing on the problem of eradication. Parasites becoming dislodged from animals drop in stables and pastures, and though they die within a week or so, eggs so dislodged may continue to hatch if the weather is mild and thus be the means of temporarily infesting the premises. All infested stables should be cleaned and then disinfected by spraying with any of the coal-tar creosote dips diluted to suitable strength.

There are many insecticidal dusting powders containing naphthaline and pyrethrum that are helpful in keeping the parasites in check during the season when the weather is too cold for dipping or spraying, but they are not recommended as successful remedies for eradicating cattle lice. Hand application may be useful when a few animals only have to be treated; effective remedies of this description include: (1) cottonseed oil and kerosene in equal parts; (2) $\frac{1}{2}$ pint kerosene to 1 lb. lard; (3) crude petroleum; (4) any of the dips recommended for use in dipping.

Spraying and dipping operations are described; the necessary apparatus is explained and a plan of dipping plant is included. Instructions are given for preparing an arsenical dip composed of 4 lb. caustic soda (85 per cent. pure), 8 lb. white arsenic (99 per cent. pure) in fine powder; 8 lb. sal soda crystals; 1 gal. pine-tar; water sufficient to make 500 U.S. gals.

One treatment with arsenical or coal-tar creosote dip is usually sufficient to eradicate *L. vituli* and *T. scalaris*, but for *H. eurysternus* the animals should be given two treatments at 15-16 days interval. After the second dipping the cattle should be examined frequently, and if any lice remain alive, a third treatment should be given about 16 days after the second.

Creel (R. H.) & Simpson (F.). **Rodent Destruction on Ships.**—*U.S. Public Health Service, Washington, D.C.*, Reprint no. 423 from the *Public Health Reports*, 7th September 1917, 7 pp. [Received 6th May 1918.]

Tests recently carried out at New Orleans under natural conditions to determine the relative efficiency of sulphur dioxide and cyanide gas as fumigants for destroying rats in ships showed that cyanide fumigation resulted in the destruction of 95 per cent., whereas sulphur dioxide destroyed only 77 per cent., notwithstanding the fact that the duration of the exposure to sulphur fumes was 6 hours, compared with $1\frac{1}{4}$ hours or less when the cyanide was used. The method by which these data were obtained was that of trapping the rats on

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board subsequent to the fumigation. Snap traps were used, the number varying from 20 to 140 according to the size of the vessel.

In the treatment of superstructures, cyanide gas showed far greater effectiveness, due to its greater penetrating powers, as well as toxicity. Probably also the sulphur dioxide, on account of its odour, may give more warning to the rats, enabling them to reach a place of safety; the cyanide on the other hand, being without physically irritating properties, and having less odour, may poison them before they are aware of its presence. Results showed similarly that cyanide gas is far the more effective in the fumigation of loaded holds.

Judging from the results of these observations it would appear that the fumigation of engine and fire rooms can, under ordinary conditions, be omitted without materially reducing the effectiveness of the destruction of rats on vessels, since the omission of this extra fumigation—carried out at the cost of increased detention of the vessels and delay in relighting the fires and getting up steam—resulted in the escape of only $1\frac{1}{2}$ per cent. of the rodent inhabitants. In exceptional cases, such as when demonstrable plague infection exists on board, the engine and fire rooms should be included in the treatment.

CARTER (H. R.). **Breeding of *Anopheles quadrimaculatus* in Deep Water at a Distance from Shore.**—*U.S. Public Health Repts., Washington, D.C.*, xxxiii, no. 16, 19th April 1918. pp. 571–572.

A remarkably heavily infested breeding place of *Anopheles quadrimaculatus* is recorded in two creeks near Quantico, Virginia, where there were large masses, acres in extent, of floatage over wild celery (*Vallisneria spiralis*). The plant was growing in water from $2\frac{1}{2}$ to 6 feet deep and extended in places from $\frac{1}{4}$ to $\frac{1}{2}$ mile from shore. The floatage was formed of broken blades of the plant, which rested just level with the surface of the water, and was in some cases bound together by a growth of algae. A camp situated about half a mile from one of the creeks was heavily infested with mosquitos, as well as the houses at Quantico, the source evidently being the floatage in the creeks. The floatage would prevent breaking of the waves, and would afford a good food supply and at the same time a complete protection from fish. The problem of the control of such a breeding place is a very difficult one.

CARTER (H. R.). **Effect of *Anopheles punctipennis* on the Natural Conveyance of Malarial Fever.** — *U.S. Public Health Repts., Washington, D.C.*, xxxiii, No. 16, 19th April 1918, pp. 572–575.

Anopheles punctipennis is undoubtedly capable of conveying malaria, but to what extent this species transmits the disease in nature is not determined. It is not often found in houses in the day-time, but it is possible that it might enter at night, feed and leave before morning. It is a significant fact that malaria in the district of Maryland surveyed was reported in practically all the places where *A. quadrimaculatus* or *A. crucians* were found, while in those parts where *A. punctipennis* alone occurred, only one house reported malaria. These facts confirm observations made in many other parts of the United States. While the author has never found malaria prevalent where only *A. punctipennis* breeds, an outbreak has been reported in Virginia where this was the only species known. This report is made in order to encourage other investigators to record their experiences, so that the status of this species as a vector in nature may be determined and compared with that of *A. quadrimaculatus* and *A. crucians*. If it is not a vector of serious sanitary importance, a very large amount of work necessary for its control may be avoided.

Roubaud (E.). **Précisions sur *Phormia azurea*, Fall., Muscide à Larves hémophages parasites des Oiseaux d'Europe.** [Facts concerning *Phormia azurea*, Fall., a Muscid with blood-sucking Larvae parasitic on Birds in Europe.]—*Bull. Biol. France et Belgique, Paris*, li, no. 4, 15th December 1917, pp. 420–430, 1 plate. [Received 28th May 1918.]

Phormia azurea, Fall., has been taken from the nests of swallows, larks and sparrows, and is probably parasitic on various other birds. It is an intermittent blood-sucking parasite and does not live on the skin of the unfledged birds, but after a meal retires to the sides of the nest. Experimentally the larva can be induced to feed on human blood, a bite on the fore-arm obtained in this way causing a local eruption comparable to a severe mosquito bite, still painful after the lapse of a week. Young birds, when attacked, attempt to rid themselves of the parasite, and in cases of severe infestation of the nest some of the brood may even succumb to the attacks of the larvae. During feeding, the larva attaches itself to the skin by means of a suctorial disk on the first post-cephalic segment, the presence of which distinguishes the larva of this species from that of *Passeromyia heterochaeta*, Vill., a blood-sucking parasite of birds in the Congo, and that of the African flies, *Auchmeromyia luteola* and *Choeromyia* spp. The larvae of *P. azurea* are not able to withstand a prolonged fast and died in the laboratory when kept without food for 4 or 5 days.

P. azurea is parasitised by the Chalcid, *Nasonia brevicornis*, Ashm., the only parasite known to attack this Muscid, the pupae of which from a swallow's nest were found to be heavily parasitised. Probably in nature a great number of the pupae of *P. azurea* are destroyed in this way.

Freeborn (S. B.). **Mosquito Abatement Districts in California.**—*California State Bd. Health Mthly. Bull. Sacramento*, xiii, no. 10, April 1918, pp. 455–459, 2 figs.

This paper gives a brief outline of the establishment of mosquito abatement districts in California since 1903, and gives a list of nine such districts organised during the past three years.

Headlee (T. J.). **Some Recent Advances in Knowledge of the Natural History and the Control of Mosquitoes.**—*New Jersey Agric. Expt. Sta., New Brunswick*, Bull. no. 306, 17th October 1916, 26 pp., 10 figs. [Received 30th May 1918.]

The bulk of this bulletin consists of descriptions of ditching and draining operations carried out in New Jersey for the purpose of control of the salt-marsh mosquitos, *Aëdes cantator* and *A. sollicitans* and other marsh and sewage species. Attempts were made to find some larvicide that would be an improvement on those known, but sulphuric acid, chlorine and solutions of nitre cake (a by-product of gun-cotton) all proved less successful than oil. Electrolysis of pools was tried without any success.

FANTHAM (H. B.). **Parasitic Protozoa in Relation to the War.**—*S. African Jl. Science, Cape Town*, xiv, no. 7, February 1918, pp. 297–311, 23 figs. [Received 30th May 1918.]

This paper reviews the intestinal diseases caused by Protozoa that have been prevalent in the war zones, especially in the tropics, and mentions the principal Protozoan parasites of the blood that are conveyed by insects.

VAN DER HEYDEN (N. H.). **Mededeelingen over Onderzoekingen naar den Gezondheidstoestand der Arbeiders in de Lampongsche Districten.** [Communications on Investigations regarding the Health of Labourers in the Lampong Districts.]—*Meded. Burgerlijk. Geneesk. Dienst in Nederlandsch-Indië, Batavia*, 1918, no. 2, pp. 1–36, 9 plates, 1 map, 1 diagram.

During the period from March to October 1914, malaria was of slight importance compared with dysentery and ankylostomiasis, but it remains a subject demanding more attention than in Deli and other districts.

The following mosquitos were collected: *Anopheles* (*Cellia*) *kochi*, Dön., *A.* (*Myzomyia*) *rossi*, Giles, *A.* (*M.*) *ludlowi*, Theo., *A.* (*M.*) *leucosphyrus*, Dön., *A. aconitus*, Dön. (*albirostris*, Theo.), *A.* (*M.*) *punctulatus*, Dön., *A.* (*Myzorhynchus*) *sinensis*, Wied., *A.* (*M.*) *barbirostris*, Wulp, *A.* (*Nyssorhynchus*) *fuliginosus*, Giles, *A.* (*N.*) *schüffneri*, Stant.

VAN DER HEYDEN (N. H.). **De Malaria te Telok-Betong.** [Malaria at Telok-Betong.]—*Meded. Burgerlijk. Geneesk. Dienst in Nederlandsch-Indië, Batavia*, 1918, no. 4, pp. 1–40, 1 plate, 24 figs.

This paper details an investigation of the drainage and other sanitary measures at the malaria-infected port of Telok-Betong, which was formerly expected to become the southern terminus of the Sumatran railway system, but is now superseded by the neighbouring port of Sepandjang.

The following mosquitos were collected in the Lampongs: *Anopheles* (*Cellia*) *kochi*, Dön., *A.* (*Myzomyia*) *rossi*, Giles, *A.* (*M.*) *ludlowi*, Theo., *A.* (*M.*) *leucosphyrus*, Dön., *A.* (*M.*) *aconitus*, Dön., *A.* (*M.*) *punctulatus*, Dön., *A.* (*Myzorhynchus*) *sinensis*, Wied., *A.* (*M.*) *fuliginosus*, Giles, *A.* (*M.*) *schüffneri*, Stant., and *A.* (*M.*) *barbirostris*, Wulp.

A. rossi is not very particular in the choice of breeding sites, but *A. aconitus* and *A. fuliginosus* exhibit a preference for clean water which is changed regularly. *A. barbirostris* was found during several weeks in roadside pools. On one occasion one single specimen of *A. ludlowi* was taken from a pool in the hinterland. Whereas at

Sepandjang a search in the bed curtains of coolies always yielded female specimens of *A. ludlowi*, it was very seldom that this species was bred from larvae taken in fresh and brackish water pools there. Either the larvae of this species soon die in captivity or their breeding places are difficult to find. Dr. Schüffner's recommendations regarding drainage at Sepandjang form an appendix to this paper.

LEGENDRE (J.). **Biologie des Anophelines de Tananarive.** [Biology of the Anophelines of Antananarivo.]—*C. R. Soc. Biol., Paris,* **lxxxi,** no. 9, 11th May 1918, pp. 493–495.

The favourite breeding-ground for Anophelines near Antananarivo is the rice-field under cultivation. In October, after the planting out of the rice, Anopheline larvae are found in the terraced fields watered by streams and in the plains irrigated by canals. Before the rains begin, the level of water may sink until the life of the larvae is threatened; development during this period is very slow and the first adults are not seen before the end of November. Uncultivated rice-fields, where field grasses are growing, are never infested until the end of February or March, when the Anophelines have become so abundant that they spread beyond their favourite breeding-grounds. The sites chosen for breeding, in order of predilection, are: rice-fields, cress-beds, fields of yams (*Colocasia esculenta*), swamps and market-gardens. The cress-beds in particular are dangerous on account of their proximity to dwellings; those of the upper town are rich in Culicine larvae and those of the lower town abound in Anopheline larvae.

On certain nights in the summer the houses in the vicinity of the rice-fields are invaded by swarms of Anophelines. The numbers of these decrease in April and they disappear in May. It is evident that they hibernate both in the larval and adult stages, although they are very difficult to find during the winter. The most widespread species are *Anopheles* (*Cellia*) *pharoensis*, Theo., and *A.* (*C.*) *squamosus*, Theo.

FERRIS (G. F.). **An Apparently New Species of *Leptinillus* (Coleoptera, Leptinidae).**—*Canadian Entomologist, London, Ont.*, **l,** no. 4, April 1918, pp. 125–128, 3 figs.

Leptinillus aplodontiae, sp. n., a parasite of *Aplodontia* sp., a genus of rodents peculiar to the Pacific Coast, is described. The only other Leptinids that are known to be, or suspected of being, ecto-parasites are *Leptinus testaceus*, Müll., frequently found in the nests of bumble bees and small mammals, and once recorded from mice and once from shrews, and *Leptinillus validus*, Horn, about which very little is known, except that it has once been taken from the skins of Alaskan beavers.

The only other Coleoptera that are found as ecto-parasites are *Platypsyllus castoris*, Rits., taken from beavers in both larval and adult stages, and the Silphid, *Lyrosoma opaca*, Mann, found in the nests of certain maritime birds which it probably uses for purposes of transportation. [Several species of South American Staphylinids of the genus *Amblyopinus* have been recorded as being parasitic on rodents, and a species of *Myotyphlus* has been found on a rat in Tasmania.—ED.]

HUTCHISON (R. H.). **Overwintering of the House Fly.**—*Jl. Agric. Research, Washington, D.C.*, xiii, no. 3, 15th April 1918, pp. 149–169, 1 plate.

Experiments and observations on the method of over-wintering of the house-fly, *Musca domestica*, L., have shown that it cannot pass the winter in the adult state when exposed to outdoor conditions, nor when in heated buildings, where it is particularly liable to attack by the fungus, *Empusa muscae*. It may be kept alive much longer in such places as attics and stables that are only slightly heated. Experiments with the house-fly do not support Dove's theory, based on experiments with *Lucilia* sp., that the fungus, *E. muscae*, develops principally in sexually mature and fertilised flies, which do not oviposit on account of low temperatures or the absence of suitable media for their eggs. In the latitude of Washington, D.C., *M. domestica* may over-winter from November to April in two ways :—(1) by continued breeding in warm places where food and breeding-places are available, the individuals present in March and April being the offspring, and not the survivors, of those present in autumn ; (2) in the larval and pupal stages in or under large manure heaps; though whether this method of over-wintering or that by continued breeding is the more common or successful cannot now be stated. Judging from the fact that flies do not appear in large numbers till late in May or early in June, it is probable that only a very small percentage of the larvae present in manure heaps in autumn live through the winter and give rise to adults in the spring.

On the other hand it is probable that the method of over-wintering by continued breeding is much more wide-spread than is now realised, especially in cities, where there must be numerous foci, such as kitchens, dining-rooms, restaurants, bakeries, animal houses and the like, from which flies escaping on warm days in March and April survive to produce the hordes that begin to appear in May.

Research has shown that *M. domestica* does not exhibit any retardation of ovarian development such as that met with in *Pollenia rudis*, in which the ovaries remain undeveloped until spring, and which hibernates in the adult state, being able to withstand the effects of considerable cold.

LEBŒUF (A.) & GAMBIER (A.). **Sur deux Cas de Spirochétose humaine observés à Brazzaville (Moyen-Congo).** [On two Cases of Human Spirochaetosis observed at Brazzaville (Middle Congo).]—*Bull. Soc. Path. Exot., Paris*, xi, no. 5, 8th May 1918, pp. 359–364.

This paper records clinical observations on two cases of human spirochaetosis, due presumably to *Spirochaeta duttoni*, the symptoms observed being characteristic of relapsing fever.

CHATTON (E.) & BLANC (G.). **Large Eclectisme parasitaire de la Punaise des Lits. Son Entretien aux Depens des Reptiles.** [Wide Choice of Hosts by the Bed-bug. Its Maintenance on Reptiles.] —*Bull. Soc. Path. Exot., Paris*, xi, no. 5, 8th May 1918, pp. 382–387.

There are three species of the genus *Cimex* or its allies that especially attack man: *C. lectularius*, L., *C. hemiptera*, F. (*rotundatus*, Sign.), peculiar to hot climates, and *Leptocimex* (*C.*) *boueti*, Brumpt, discovered by Bouet in French Guinea. A fourth species, *C. pipistrelli*, Jenyns, has been found on bats in England, India and South Africa. Three others attack birds, viz. :—*C. hirundinis* infesting the nests of swallows; *C. columbarius* in dovecots and hen-houses; and *C. inodorus* in hen-houses.

While man is undoubtedly the preferred host of the first three species, it is nevertheless known that these bugs also attack the domestic animals that live with man, such as rats, rabbits, guinea-pigs, calves, dogs, cats and monkeys. The authors have found that *C. lectularius* can exist and reproduce independently of man, and have observed it establish and propagate itself far from any human habitation in the laboratory kennels, where only small rodents or cats could have supplied blood-meals. The possibility of its subsistence on cold-blooded animals has been suspected, and while the authors have not known this to occur spontaneously, they have easily and repeatedly produced the conditions experimentally. Geckos (*Tarentola mauritanica*) have been largely experimented with, three successive feeds at intervals of 15 to 20 days having been given to individuals of *C. lectularius*, which have developed to the adult form and oviposited, giving rise to larvae, without other food than the gecko. Chameleons, sand-lizards (*Gongylus ocellatus*) and a frog (*Rana temporaria*) have also furnished blood-meals. The only conditions necessary in nature to induce these insects to bite reptiles is that the latter should be at hand, and in hot climates the species dealt with are found inhabiting the walls or verandahs of dwellings.

On account of its domestic habits and the predilection shown for it by certain species of *Phlebotomus*, the gecko has been suspected of being a reservoir of the virus of Oriental Sore. The hypothesis that *Phlebotomus* are the vectors has not as yet been confirmed and it seems likely that bed-bugs may play this rôle. The fact that the bugs more readily bite geckos when the temperature is high, and that they first attack those parts of the host where the skin is thinnest, would explain two peculiarities of cutaneous leishmaniasis, namely, its seasonal incidence and its localisation in unprotected parts. The wide choice of hosts by the bed-bug forms a contrast to the strictly limited choice of fleas and lice. While these are carriers of a virus that passes rapidly from man to man, the bed-bug must be considered to be among those insects in which the virus seems to be maintained without the presence of man, but nevertheless in his vicinity and in relation with the local fauna, especially domestic animals.

CHATTON (E.) & BLANC (G.). **Culture du Trypanosome du Gecko chez la Punaise des Lits.** [Culture of the Trypanosome of the Gecko in the Bed-Bug.]—*Bull. Soc. Path. Exot., Paris*, xi, no. 5, 8th May 1918, pp. 387–390.

It has been shown [see previous paper] that the bed-bug readily bites reptiles and especially geckos. Experiments to determine whether the bugs are able to carry any of the different haematozoa that infect geckos showed that none of these, with the exception of certain leishmaniform bodies that are insufficiently known, appears *a priori* to find in the bed-bug a host in which it can accomplish its normal development. The geckos examined were taken far away from any human dwelling and in all probability had never been bitten by bugs. It is the more interesting to note that the trypanosomes harboured by them showed themselves capable of developing readily in the intestines of these insects, and much more easily than in artificial media. The surest method of discovering the existence of trypanosomes in a gecko is to have them bitten by bugs and to recover the parasite in the stomach of these insects on the 2nd to 8th day. The trypanosomes undergo no developmental change in the intestine of the bug. The culture appears to reach its maximum towards the 5th or 6th day and obviously degenerates when the digestion of blood is complete. The development of the trypanosome of the gecko in the bug is a simple temporary culture in the blood withdrawn from the gecko, which constitutes a favourable medium so long as it is not completely digested. The rôle of the bug is merely to prevent the putrefaction of the blood by means of its intestinal secretions. This fact illustrates the power possessed by certain trypanosomes of developing in some animal quite distinct from their normal intermediate host, and the impossibility of ascribing with certainty the rôle of natural vector to the insect that lends itself to such development.

An infection by *Trypanosoma cruzi* lasting 5 months was obtained by Brumpt in 1912 in the bed-bug with transformation of the trypanosomes into crithidial bodies and a return to small trypanosomes capable of causing infection; this was a case, not of a simple culture, but of true development.

These observations indicate that the favourable host is not necessarily the natural host, nor even an allied species, and may be an animal that cannot be described as a host in the parasitic sense of the word.

LEGER (M.). **Contribution à l'Etude de la Faune culicidienne de la Guyane française.** [Contribution to the Study of the Culicid Fauna of French Guiana.]—*Bull. Soc. Path. Exot., Paris,* xi, no. 5, 8th May 1918, pp. 397–400.

Mosquito-borne diseases are of such importance in French Guiana that they have seriously impeded repeated attempts at colonisation, periodical outbreaks of malaria, filariasis and yellow fever having retarded the development of the colony throughout the 19th century. The species of Anophelines and Culicines found in the colony are reviewed, with the type of locality in which they are found. Only two Anophelines are known to occur, namely, *Anopheles* (*Cellia*) *argyrotarsis,* Desv., and *A.* (*C.*) *albimanus,* Wied. (*cubensis,* Agr., *albipes,* Theo.), the latter being the more abundant species.

Culicines identified by the author include: *Culex fatigans,* Wied., *C. digitatus,* Rond., *C. mathisi,* Nev.-Lem., *C. flavipes,* Macq., *Aëdes* (*Culicelsa*) *taeniorhynchus,* Wied., *Taeniorhynchus fasciolatus,* Arri., *T.* (*Mansonia*) *amazonensis,* Theo., *Melanoconion atratum,* Theo., *Stegomyia fasciata,* F., and *S. luciensis,* Theo., a variety of the last-named.

Van Saceghem (R.). **La Peste du Cheval ou Horse Sickness au Congo Belge.** [Horse Sickness in the Belgian Congo.]—*Bull. Soc. Path. Exot., Paris*, xi, no. 5, 8th May 1918, pp. 423–432.

The tick, *Amblyomma hebraeum*, is known to be the vector of heartwater; this tick, however, does not occur in Zambi, though *A. variegatum* and *A. splendidum* are present. Experiments recorded in this paper indicate that horse-sickness and heartwater are two varieties of the same virus, heartwater in sheep being transmitted to horses in the form of horse-sickness, but being non-transmissible to cattle. The carrier concerned in fatal cases of both these diseases was found to be *Rhipicephalus appendiculatus* and *R. evertsi* var. *albigeniculatus*; but it was also observed that the epizootic of horse-sickness spread in troops of horses that were carefully freed from ticks and kept in a tick-free region, thus proving that other agents can transmit the disease.

It has in fact been proved that *Stegomyia* spp., *Anopheles* spp., *Lyperosia* spp. and *Stomoxys* spp. can act as vectors. In all probability ticks maintain the disease in an endemic form in a country, while the above-named insects are the agents by which it is rapidly transmitted from horse to horse, thus producing epidemics.

This transmission occurs at such short distances that horses in general use have safely traversed the whole region during an epizootic, the only precaution taken being to keep them away from infected kraals. From this the author concludes that the principal vector in Zambi is a species of *Culicoides*, closely allied to *C. neavei*, Aust. These small blood-sucking midges are never far distant from troops of horses, but are very difficult to find; they can only be observed flying from animal to animal very early in the morning. Numerous individuals of *Tabanus pluto* present during the epidemic at Zambi were also probable vectors. A strong dose of camphorated oil given as a subcutaneous injection has yielded good results in cases of horse-sickness. It seems possible to confer immunity on horses by progressive injections of virulent serum mixed with glycerine in equal volume and subjected for 12 hours to ¼ the volume of sulphuric ether.

Pestico (J. F.). **La Mosca domestica.** [The House-Fly.]—*Rev. Agric., Bogotá*, iv, no. 2, February 1918, pp. 98–101, 1 fig. [Received 7th June 1918.]

This article briefly describes the various measures available against *Musca domestica*, against which the municipality of Medellín, Colombia, is beginning a campaign.

Hegh (E.). **Comment nos Planteurs et nos Colons peuvent-ils se protéger contre les Moustiques qui transmettent des Maladies ?** [How can our Planters and Colonists protect themselves against Disease-bearing Mosquitos ?]—*Royaume de Belgique, Ministère des Colonies, Service Agriculture, London*, Etude Biol. Agric., no. 4, 1918, 200 pp., 105 figs. [Received 12th June 1918.]

This booklet has been compiled to meet the need for a concise and methodical account, in the French language, of the most recent methods of destroying mosquitos and eliminating mosquito-borne diseases. The style is simple and clear, with many illustrations, and the information given should be of value to colonists and planters in all parts of Africa.

The various chapters are devoted to an explanation of the mosquito danger, a description of the morphology and biology of mosquitos, methods of protection against them and recommendations for combating them, etc. The successful results of recent control campaigns, and notably that in the Panama Canal Zone, are quoted. A two-page summary indicates the most essential precautions against mosquitos that should be taken by every inhabitant of the country. A comprehensive bibliography of recent literature on the subject is included, and an appendix contains a key to the African species of Anophelines, with their geographical distribution.

WATERSTON (J.). **On the Mosquitos of Macedonia.**—*Bull. Entom. Research, London*, ix, part 1, May 1918, pp. 1–12, 5 figs.

This is a preliminary report dealing with the species of mosquitos met with in Macedonia by the British Malaria Commission during the latter half of 1917. Natural enemies of mosquitos observed during these investigations include swallows, some of the smaller waders, such as *Tringa* (*Totanus*) *ochropus*, *T. hypoleucus* and *Aegialitis minor*, and various small species of fish. Under laboratory conditions many insect larvae collected with those of mosquitos were predatory on the latter, *e.g.*, various Odonata, Ephemerids, *Chrysops*, *Nepa cinerea* and *Notonecta glauca*. Adult dragonflies also destroyed a good many mosquitos. Towards the end of the season larvae become badly overgrown with colonies of *Vorticella* and occasional mosquitos with acari on them were captured.

Anopheles maculipennis, Mg., was found everywhere throughout the season, the numbers varying considerably. Towards the end of August and throughout September, this species gradually declined, giving place to *A. palestinensis*, but whether the abundance of the latter species has any direct relation to the rise in the incidence of subtertian malaria is still undetermined. The larvae of *A. maculipennis* proved to be very resistant to cold, and after immersion in water that froze into a solid block of ice, were resuscitated on exposure to sunshine. *A. bifurcatus*, L., was discovered in a variety of localities, but was nowhere numerous. In its early stages this species is cannibalistic, full-grown larvae devouring those of the 1st and 2nd instars. *A. palestinensis*, Theo. (*Pyretophorus nursei*, Theo., *P. cardamitisi*, Newst. & Cart.), of which *A. superpictus* var. *macedoniensis* [see this *Review*, Ser. B, vi, p. 72] is also a synonym, according to Cot and Hovasse is the chief autumnal species in some localities and probably throughout Macedonia generally. *A. sinensis*, Wied. (*pseudopictus*, Grassi) is essentially a lacustrine breeder and is only occasionally taken at any distance from standing water. This species breeds until late in the season.

Stegomyia fasciata, F., is said to be exceedingly abundant within the town of Salonika, particularly in buildings. How far inland this species occurs is not known. *Ochlerotatus dorsalis*, Mg., is annoying and persistent in houses, hospitals, etc., although no breeding-places were discovered within a distance of ¾ of a mile. *Taeniorhynchus* *richiardii*, Fic., was taken only occasionally near Karasouli. Two species of the genus *Theobaldia* were found; the first was unmistakably *T. longiareolata*, Mcq.; the second is provisionally identified as *T. annulata*, Schrank. *Culex mimeticus*, Noé, a stream-breeder, was found in various nullahs but has not been known to bite. *C. pipiens*, L., is apparently the most widely distributed mosquito in Macedonia, and is found in both clear and foul water. A reserve tank of water that had been stored throughout the summer had been oiled from the early months till August. In September chlorinating was substituted for oiling, and shortly afterwards larvae were observed moving at the surface. *C. pipiens* was also found breeding in low marshy ground near the sea, but exact tests have not yet been made of the salinity of the water in which it occurred. *C. hortensis*, Fic., was found in tents, etc., with *C. pipiens*, though on one occasion only was an apparently blood-gorged female observed; this has been previously recorded as a sylvan species, not attacking animals or man, nor occurring in houses.

Uranotaenia unguiculata, Edw., has been observed in several localities. It is the only species of this genus found in the Palaearctic region, and these records form a considerable extension westward of its ascertained range.

ILLINGWORTH (J. F.). **The Australian Sheep-fly in Hawaii.**—*Proc. Hawaiian Entom. Soc. for the Year 1917, Honolulu*, iii, no. 5, April 1918, p. 429.

The author records having bred a screw-worm fly in abundance from dead cats and rats in Hawaii, which has proved to be identical with *Chrysomyia* (*Calliphora*) *rufifacies*, the common sheep-fly of Australia. The development of this species is very rapid in Hawaii; in an animal exposed on 16th July, larvae hatched on the following morning and were ready to enter the soil and pupate 3 days later. The pupal stage lasts about 6 days.

BRIDWELL (J. C.). **Certain Aspects of Medical and Sanitary Entomology in Hawaii.**—Separate from *Trans. Med. Soc. Hawaii for 1916–17, Honolulu*, March 1918, pp. 27–32.

Before the advent of the Polynesian race, the Hawaiian Islands possessed no mammalian land fauna except a bat and possibly a rat, and consequently were entirely free from insects and ticks that could transmit human disease. All the present insect enemies of man have been introduced into these islands by man himself.

Only three species of mosquitos are at present known in the Islands, viz.:—*Stegomyia fasciata*, the transmitter of yellow fever; *S. albopicta* (*scutellaris*); and *Culex fatigans*, believed on good evidence to be the transmitter of dengue, and one of the transmitters of filariasis.

It is noteworthy that in the Islands there exist the mosquito of yellow fever, but not the pathogenic organism; the organism of malaria in the blood of many of the residents, but not the mosquito; and in the case of dengue and filariasis both the organism and the mosquito. Much valuable anti-mosquito work has recently been done in the introduction of top minnows and the extensive destruction of breeding places. Further work might be done with no great difficulty or expense by the introduction of some of the smaller beetles, *Rhynchota* and dragonflies known to be enemies of mosquito larvae.

The fleas of the Islands have been little studied as yet, the species present being unknown except for a few of the cosmopolitan ones.

In the better residential sections of Honolulu, the house-fly (*Musca domestica*) is conspicuous by its absence, the reasons for this being the fact that horses and cattle are but rarely stabled there, owing to the motor having superseded them as a means of transport; the prompt removal of manure from the few existing stables by Chinese gardeners, while the garbage is removed from houses by Japanese pig-breeders with equal promptness. The beneficial effect of the removal of manure will be evident on comparison with the country manure heaps formed of refuse brought from the town, these districts literally swarming with flies. Further the climate and nature of the feed given to horses results in the speedy fermentation of the manure produced, with the development of such high temperatures that the larvae of *M. domestica* cannot exist in it. Manure heaps and isolated horse and cow droppings are further very generally penetrated by the ant, *Pheidole megacephala*, which destroys a large part of the eggs, larvae, pupae and newly-emerged adults. The better residential districts largely escape the fly nuisance owing to the fact that climatic conditions and abundant food and water serve to keep the adults in the open, where they may be found in numbers on hibiscus hedges and on the foliage of ornamental shrubs and trees.

Food contamination may be effected by several species of flesh flies (*Sarcophaga* spp.), bluebottle flies such as *Chrysomyia* (*Pycnosoma*) *dux*, *Calliphora* spp., and *Lucilia sericata*, and by *Synthesiomyia brasiliensis*, all of which feed in the larval stage in carrion or dung and as adults upon animal matter. Several of these have been known as pests of cattle and sheep, producing serious myiases, and they may be expected to give rise occasionally to nasal and traumatic myiases in man.

None of the ticks transmitting human diseases have as yet appeared in the Islands.

ADAMS (H. A.). **The Blow-Fly Pest. Another Fly-Trap.**—*Queensland Agric. Jl., Brisbane*, ix, no. 4, April 1918, p. 136.

A fly-trap, easily and cheaply made from a kerosene tin, to be hung by wire from a tree or fence, is described. In the lower part of the trap is placed the bait, consisting of decomposed sheep's entrails, and in the upper part an arsenical solution, sweetened with sugar. Two strips of flannel about 2 inches wide are placed so that they dip into the liquid at the top and rest on the bait at the bottom, which is thus always kept moist by the poison. The bait must be thoroughly decomposed before use, as the action of the arsenic tends to prevent decomposition.

JONES (L. G.). **Sheep Maggot Fly Pest.**—*Queensland Agric. Jl., Brisbane*, ix, no. 4, April 1918, p. 137.

The author strongly advocates the practice of leaving the dags on sheep and poisoning them by submergence in a very strong arsenical solution, instead of removing them, as is the usual custom.

The arsenical solution is made by heating 4 gals. rain water with $\frac{1}{2}$ lb. washing soda nearly to boiling point, adding 1 lb. commercial arsenic, bringing quickly to the boil and boiling for about 15 minutes. Then, just as it is being taken from the fire 4 pints of cold water should be added and the whole stirred for 5 minutes, as arsenic that has been boiled in water goes more completely into solution if suddenly put off the boil.

It is contended that the use of poisoned-offal fly-traps and the poisoning of carcases defeats its own ends, as the flies are repelled and search for the living sheep in consequence. Similarly the poisoned dags will act as repellents to the relief of the sheep.

The sheep should also be provided with an arsenical salt lick, the arsenic from which would not all be absorbed into the system, but would pass out with the droppings, which would thus be in a condition to greatly retard the development of the maggots.

If the fly should attack the sheep on any part of the body other than the tail, it is probably due to the yelk being diseased, owing to a bad state of health in the sheep, for which iron is the appropriate remedy.

NEILL (M. H.). **The Problem of Acute Infectious Jaundice in the United States.**—*U. S. Public Health Repts., Washington, D.C.*, xxxiii, no. 19, 10th May 1918, pp. 717–726.

In discussing the problem of the rat as a carrier of *Spirochaeta icterohaemorrhagiae*, the organism causing infectious jaundice, the author remarks that there is no adequate evidence that any insect plays a part in the transmission of the disease in nature, though the experimental evidence is by no means complete. The epidemiology of the disease seems to point rather definitely to moist soil at an equable temperature as a means of keeping alive the virus.

The Parasite of Icterohaemorrhagic Jaundice.—*Brit. Med. Jl., London*, no. 2998, 15th June 1918, pp. 675–676.

The researches of Noguchi on the cultural conditions of *Spirochaeta* (*Leptospira*) *icterohaemorrhagiae*, the causative organism of icterohaemorrhagic jaundice, formerly called Weil's disease, have shown that an animal or human serum is an essential medium for it. Further, it has been proved that the faeces of normal or jaundiced persons destroy the organism within 24 hours, and in polluted water and sewage it does not remain alive for more than 3 days. It is therefore improbable that the spirochaete can survive long after it leaves its host, and to explain cases of human infection in which the carrier rodents are not in contact with man, the question of insect vectors has been investigated by Reiter, with negative results in the case of certain biting flies, fleas and bed-bugs, and by Noguchi, who found that the larvae and adults of *Culex*, the larvae of the house-fly and bluebottle, wood ticks and leeches failed to become carriers when fed on infected guinea-pigs or their organs.

HADWEN (S.). **A Note on the Occurrence and Significance of Anophelinae in B.C.**—*Proc. B. C. Entom. Soc., Victoria, B.C.*, no. 5, January 1915, pp. 81–82. [Received 17th June 1918.]

The Anopheline mosquitos are never as numerous in British Columbia as the Culicines, and are often hard to find. One species only, *A. punctipennis*, Say, occurs on the lower mainland, and this only in small numbers and in spring, out of doors. During the summer it practically disappears, to reappear in autumn on the walls of houses and in cellars. *A. maculipennis*, a well-known carrier of malaria, probably has the same seasonal prevalence as *A. punctipennis* and was reported for the first time during the summer of 1915 in a part of the province that is very hot and dry. The presence of this mosquito does not necessarily imply the existence of malaria; in Eastern Canada the disease is now of rare occurrence, though *A. maculipennis* is comparatively common.

HADWEN (S.). **A Description of the Egg and Ovipositor of *Cuterebra fontinella* Clark (Cottontail Bot).** — *Proc. B. C. Entom. Soc., Victoria, B.C.*, no. 5, January 1915, pp. 88–91, 7 figs. [Received 17th June 1918.]

The egg of *Cuterebra fontinella* bears a general resemblance to that of *Gastrophilus equi*, having a deep groove on one side showing that it is meant to be attached to a hair, and probably moisture and friction are necessary for the emergence of the larva, as in the case of that species. The subsequent life-history of Cuterebrine larvae must differ considerably, however, since the larvae show a selective faculty for different parts of the body. Thus *C. emasculator* selects the scrotum of *Tamias striatus lysteri* for its final habitat, while another undetermined species is reported from the backs of field mice. Two mature larvae were taken from the costal region of a domestic cat, though probably this was not the natural host, as the larvae may have been swallowed when the cat was feeding on a squirrel. The larvae of *C. fontinella* found in rabbits show no selective faculty for any special part of the body.

A comparison of the eggs of the OESTRIDAE shows that those of *Hypoderma bovis* and *H. lineatum* are smooth, attached by a pedicel and without an operculum. That of *Oedemagena tarandi* (reindeer warble-fly) differs from these in the possession of a rudimentary operculum. The egg of *G. equi* is curved, grooved and possesses an operculum, strongly resembling in these respects the egg of *Cuterebra fontinella*. Hence it is reasonable to suppose that the mode of entrance of their larvae into their hosts is somewhat similar, a view which is strengthened by the fact that rodents are continually licking themselves.

The reputed host of *C. fontinella* is *Lepus artemisia* (cottontail rabbit), but possibly it has another one, probably a mouse, as no parasitised rabbits have been found in western British Columbia. Cuterebrine larvae have the habit of emerging from their host-animal after it has been killed, in which respect they differ from those of *Hypoderma*. A description of the ovipositor of *C. fontinella*, which is unusually short, concludes this paper.

Guitel (F.). **Entomologie économique. Parasites de l'Homme.** [Economic Entomology. Human Parasites.] *Insecta, Rennes,* vii, no. 73–84, pp. 38–40. [Received 17th June 1918.]

The work done by the Entomological Station at Rennes during 1916 included the preparation of an 8-page bulletin entitled "Insects harmful to soldiers in the field," copies of which were sent to the men at the front, together with sachets of flowers of sulphur for use against *Pediculus humanus* (*vestimenti*) (body louse).

Borthwick (J. D.). **Veterinary Division. Annual Report, 1916-17.** —*Union S. Africa Dept. Agric. Rept., Cape Town,* 1918, pp. 29-38. [Received 17th June 1918.]

The chief disease with which the Veterinary Division has had to deal is African Coast fever. The position in respect of this disease, taking the Union as a whole, has improved. In the Cape Province no fresh outbreak occurred, and it is hoped that shortly it may be declared entirely free. In the Transvaal there have been several new outbreaks, due to the lack of co-operation of the farmers ; while in Natal the progress towards total eradication has been slow, owing to the fact of there being so many absentee landowners. As the majority of cases are not discovered till they have been in existence for some time, and consequently the adult brown tick [*Rhipicephalus appendiculatus*] is prevalent and infected, five-day dipping is being rendered compulsory in preference to three-day dipping, hand-dressing in both cases being essential.

A few cases of trypanosomiasis have been reported in Natal, the infected animals including cattle, donkeys and one mule.

Enslin (B.). **Division of Sheep. Annual Report, 1916-17.**—*Union S. Africa Dept. Agric. Rept., Cape Town,* 1918, pp. 39–43. [Received 17th June 1918.]

A further and most important step in the eradication of sheep-scab has been gained by the proclamation of protected areas, within which and out of which free movement of stock is permitted, but into which none may be moved without a clean certificate from the Inspector of the area.

In one district at the request of the local Farmers' Association, who were very anxious to have the district freed from scab and proclaimed a protected area, arrangements were made to dip all the sheep in the district within a limited period under the supervision of an inspector. The results of the operations will be dealt with in the next annual report.

Scab was unfortunately spread as the result of the drought experienced over nearly the whole of the Union, which necessitated an unusually extensive movement of stock in search of better grazing. The poor condition of such animals often made quarantining en route impossible, and hand-dipping had to be resorted to till their condition had improved, and the usual dippings could be administered. During the year, 1,239 dipping tanks were constructed, the recommended circular type gradually superseding the long and narrow one.

Mosquito Control in New Jersey.—*Proc. 2nd, 3rd & 4th Ann. Meetings New Jersey Mosquito Extermination Assoc.*, **1915, 1916, & 1917**, *Trenton, N.J.*, 500 pp. 35 figs. [Received 24th June 1918.]

These papers discuss the problems of mosquito control peculiar to the various counties of New Jersey, and while many of them deal with purely local measures, such subjects as the general principles of salt-marsh drainage, circulation of water on drained salt-marshes, essential steps in upland mosquito control in both city and country, may be quoted as being of general interest. The problems are being attacked with the greatest energy and thoroughness; above all, the need for education of the general public in the essential measures of control is insisted upon.

CARTER (H. R.). **The Malaria Problem of the South.**—*Proc. 4th Ann. Meeting New Jersey Mosquito Extermination Assoc., Trenton, N.J.*, 1917, pp. 81–93.

In those parts of the south and south-western States where malaria is prevalent, it is the most important sanitary problem that exists, and stands foremost in the list of diseases injuring the community. It is in the loss of efficiency rather than in the loss of life that the greatest danger of malaria lies, a death from malaria generally corresponding to from 2,000 to 4,000 days of sickness, as compared with a few hundred days in other serious illnesses such as typhoid or even tuberculosis, The extent of an epidemic of malaria and the number of people attacked is appalling as compared with other diseases. One per cent. of typhoid is considered a bad epidemic, but 40 to 60 per cent. of a population per annum is not uncommon for malaria. Yet the importance of its control has only recently been recognised. The area in which malaria prevails is steadily decreasing, chiefly owing to prosperity among the farming classes, which entails better clearing and better draining of the land, and also to the fall in the price of quinine. The author considers drainage, and especially tile drainage, to be the key to the rural malaria problem.

He postulates the objects of malaria control as the elimination of Anopheline mosquitos, the protection of man from the attacks of Anophelines, elimination of malaria parasites from all communities, and the immunisation of men against infection by means of quinine. Of these, the first method alone is absolutely effective, but is not always economically possible. The control of Anopheline breeding-places is practically the same everywhere and differs only in that different species occur in different localities. In the author's opinion this method is the most effective, as although it entails a heavy initial outlay, it is the safest to the community and the expense is very soon justified by the results obtained. Several instances are given illustrating the enormous increase in efficiency and the consequent economy resulting from mosquito extermination. Demonstrations in the United States have shown that the control of malaria is not only feasible but profitable, and when this is widely known and believed it is hoped that each unit will work for itself and that the problem of malaria control will be solved.

NOTICES.

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THE REVIEW OF APPLIED ENTOMOLOGY.

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Malloch (J. R.). **A New Species of *Johannsenomyia* (Ceratopogonidae, Diptera).**—*Entom. News, Philadelphia*, xxix, no. 6, June 1918, pp. 229–230.

The author describes *Johannsenomyia annulicornis*, sp. n., taken in Illinois in 1916.

Fitch (C. P.). **Animal Parasites affecting Equines.**—*Jl. American Vet. Med. Assoc., Ithaca, N.Y.*, liii (N.S. vi), no. 3, June 1918, pp. 312–330.

The more common external parasites affecting the horse are flies, ticks and lice, as well as mosquitos in swampy localities.

Of the biting flies attacking horses, the largest and most voracious are the Tabanids, especially *Tabanus atratus* and *T. lineola*, both of which are widely distributed, and the less common *T. costalis*, *T. stygius*, *T. punctifer* and *T. striatus*, the last-named being found in the Philippines. These insects may transmit mechanically diseases such as anthrax, and also Protozoa such as *Trypanosoma evansi*, the cause of surra. Other less common Tabanid pests are *Haematopota pluvialis* and *Chrysops coecutiens*. *Stomoxys calcitrans* (stable-fly) is probably the most widely distributed of the biting flies, and, like the Tabanids, may mechanically transmit the causes of infectious diseases. *Lyperosia irritans* (*Haematobia serrata*) (horn fly) is sometimes found on horses, though it is more common on cattle.

The bot-flies of horses are widely distributed, *Gastrophilus equi* and *G. nasalis* being the most common, while *G. haemorrhoidalis* occurs less frequently, and *G. pecorum* is said to be absent from the United States. Death may result from the presence of their larvae, which have been also alleged to be the cause of swamp fever or infectious anaemia. The best treatment seems to be turpentine in rather large doses followed by an aloes ball and carbon bisulphide administered in capsules.

Equines are not so much attacked by flesh-flies as are sheep and cattle, though wounds on horses and mules are occasionally infested by the larvae, especially of *Chrysomyia macellaria* (screw-worm fly), *Calliphora vomitoria* (bluebottle), *Lucilia caesar* (greenbottle). *Sarcophaga carnaria* (flesh-fly) and sometimes *Musca domestica*. These larvae frequently have to be removed from wounds by means of forceps, cleansing with disinfectants proving ineffectual.

Simuliids are especially troublesome in certain parts of the United States and by attacking animals in swarms often lead to death. The most important are *Simulium pecuarum* and *S. venustum*; these are to some extent repelled by oil of citronella, smudges, etc.

Equines have few important tick parasites, especially in the north-eastern States. In the southern and western parts, however, they are quite common, especially *Ornithodorus megnini* (spinose ear tick), *Dermacentor electus* (dog tick), and *Ixodes ricinus* (castor-bean tick).

Haematopinus macrocephalus (*asini*) is the only species of sucking louse that attacks equines, though there are two species of biting lice, *Trichodectes pilosus* and *T. equi* (*parumpilosus*). The treatment for these consists of clipping followed by the application of insecticide dusting powders or ointments. The commonest dusting powders are

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those containing pyrethrum, sulphur, or naphthaline, while sodium fluoride is very efficient against biting lice, but is of no value in destroying sucking lice.

Sarcoptic mange caused by the mite, *Sarcoptes scabiei* var. *equi*, is widely distributed and very difficult to cure, because the mite lives so far beneath the outer layers of the skin. The principle to be observed in the treatment of mange is first to soften the scabs and scales by washing and then apply a parasiticide so that it will penetrate to the mites. One treatment that has given good results consists in turning the animals out to grass for 2 or 3 months, at the same time providing plenty of good water, grain and hay.

Preventive measures include attention to grooming; frequent inspection of *all* animals; isolation of newly joined remounts for 21 days; all cases of skin irritation to be isolated till cured, as these may be due to neglected grooming, lice or mites from other sources, such as bedding, forage, or buildings occupied by fowls; and the disinfection of all stalls before putting animals into them.

Symbiotic mange caused by *Chorioptes bovis* var. *equi*, and psoroptic mange caused by *Psoroptes communis* var. *equi* are much less common, and easier to cure than sarcoptic mange, the same treatments being applicable.

HOLLISTER (W. L.). **Parasites of Swine.**—*Jl. American Vet. Med. Assoc., Ithaca, N.Y.*, liii, (N.S. vi), no. 3, June 1918, pp. 330–334.

Lice are common on pigs, the hog louse, *Haematopinus suis*, being the largest of all species infesting domestic animals. In some localities pigs are also infested with fleas. Lice are easily controlled by the use of recognised dips and by the application of crude oil through the agency of patented rubbing posts. Keeping the bedding and styes well dusted with naphthaline powder is the cheapest and most satisfactory method of control.

Demodectic mange caused by *Demodex folliculorum suis* is a type of mange that spreads very slowly and is very difficult to treat. The most practical method is to get rid of the infested animals and clean and disinfect the premises.

Sarcoptic mange caused by *Sarcoptes scabiei suis* may be successfully treated with a lime and sulphur dip or nicotine.

KNOWLES (A. D.). **Parasites of Sheep.**—*Jl. American Vet. Med. Assoc., Ithaca, N.Y.*, liii (N.S. vi), no. 3, June 1918, pp. 334–344.

Oestrus ovis causes a parasitic affection in sheep owing to the adult ovipositing in the anterior nares. The larvae, having migrated to the frontal sinuses, set up symptoms of disease several months later. Treatment is practicable only in valuable sheep and in small flocks, and is not followed by satisfactory results as a rule. Preventive measures are to be preferred, such as smearing the sheep's nose daily with fish-oil, oil of tar, or a mixture of sulphuric acid 6 drachms, turpentine 2 oz. and cottonseed oil 2 pints. The methods of dealing with the larvae in the frontal sinuses include inhalations of sulphur fumes, steam inhalations of turpentine or the coal-tar disinfectants, or trephining and extracting the larvae with forceps.

The commonest ecto-parasite of the sheep is the Hippoboscid fly, *Melophagus ovinus* (sheep tick), which is a blood-sucker and also destroys the wool-fat. It is easily killed by dipping in any of the commonly used dips, such as those made from coal-tar.

Sheep are infested with two varieties of lice, blood-sucking and wool-eating, both of which yield readily to treatment with the ordinary commercial sheep dips, two applications with an interval of 10 days being necessary.

Scabies in sheep is difficult to diagnose, but it may be successfully treated by dipping in a lime and sulphur or tobacco and sulphur solution at a temperature of 100° to 105° F., in which the sheep must remain for at least 3 minutes. This treatment must be repeated after 10 to 14 days, to destroy the newly hatched parasites. The sheds, etc., where infested sheep have been should be disinfected and all woodwork and floors saturated with the solution. All litter should be burned and the infected range should not be used for several months. The time required to kill these parasites from want of animal nourishment is unknown.

NOGUCHI (H.) & KUDO (R.). **The Relation of Mosquitoes and Flies to the Epidemiology of Acute Poliomyelitis.**—*Jl. Exptl. Medicine, Baltimore,* xxvi, no. 1, 1st July 1917, pp. 49–57.

The authors' summary of this paper is as follows:—1. *Culex pipiens* raised from the larval stage in water experimentally contaminated with an abundance of poliomyelitic virus were found to be incapable of causing the infection when allowed in large numbers to bite normal *Macacus* monkeys. 2. *Culex pipiens* fed on infected poliomyelitic monkeys during different stages of the disease were found to be incapable of transmitting the infection when allowed in large numbers to bite normal *Macacus* monkeys; a previous disturbance of the meninges by an injection of horse serum into the intrathecal space did not alter the result, which was negative. 3. The offspring of the mosquitos which were either reared in the infected tanks or fed on infected monkeys were found to be entirely harmless when allowed to feed in large numbers on a normal monkey; there was no hereditary transmission of the virus from one generation to another. 4. No trace of the virus of poliomyelitis was demonstrable in the filtrate of an emulsion of adult flies and pupae of the common house-fly and bluebottle fly which were reared in the laboratory on slices, emulsion, or filtrate of monkey brain containing the poliomyelitic virus. The intracerebral injection of the filtrate produced no poliomyelitic infection in the normal monkey.

CUMMING (J. G.). **Rocky Mountain Spotted Fever in California.**—*Jl. Infectious Diseases, Chicago, Ill.,* xxi, no. 5, November 1917, pp. 509–514, 4 figs.

In June 1916 the results of animal inoculations in cases described in this paper definitely established the occurrence of Rocky Mountain spotted fever in California. The finding of the tick, *Dermacentor venustus,* in Ventura County and the occurrence of a case there marks that region as a new area of possible prevalence of this disease in California.

GALLI-VALERIO (B.). **Beobachtungen über Culiciden.** [Observations on CULICIDAE.]—*Centralbl. Bakt., Parasit. u. Infektionskr. Ite Abt. Orig., Jena,* lxxix, no. 3, 28th February 1917, pp. 139–143, 1 fig.

The observations made near Lausanne, Switzerland, in 1914–1915 [see this *Review,* Ser. B, v, p. 42] were continued in 1915–16. Both Culicine and Anopheline larvae were abundant during the winter, as the pools were frozen over for a few days only in November and January. On 9th November 1915 a pupa of *Theobaldia annulata* was found. In March and April larvae were scarce, many pools having dried up, but living larvae of *Anopheles bifurcatus* and *Culex* were found in damp moss. As the first young Culicine larvae and a pupa and some larvae of *A. maculipennis* were taken on 21st April, it is very probable that larvae of the latter species also over-wintered. From June to September Culicid larvae were rare in most of the pools, but in some of them several thousand larvae and pupae of *Culex pipiens* were collected from July to September. In September and October larvae of *Ochlerotatus* (*Culex*) *nemorosus, T. annulata* and *A. bifurcatus* were very abundant.

In wooded areas, larvae of *Anopheles plumbeus* (*nigripes*) and *Ochlerotatus* (*Culex*) *ornatus* were always present during the winter, accompanied by *Chironomus,* first found on 19th July 1916 : the pupae of the first two species were abundant in summer and autumn. Figures are given of six different kinds of tree-holes in which *O. ornatus* and *A. plumbeus* were found. These species were never found in pools and confirmation was obtained of their dislike for light. It is probable that the larvae of *Culicoides pulicaris* also live in tree-holes, for on 7th May 1916, in the forest of Revéréaz—where pools are lacking—the author was bitten by several adults of this midge.

Observations at Estavayer (Lake of Neuchâtel) confirm the fact that small collections of water are more favourable to CULICIDAE than large swamps. In towns where mosquitos are a pest it is better to deal with water in gardens, yards, etc., instead of spending large sums on neighbouring swamps. Pools, etc., should be completely filled up, as any remaining small collection of water will teem with larvae and pupae.

During 1916 the author was not bitten by *Theobaldia annulata* and suggests that at Vidy it has become accustomed to bite animals instead of man.

This paper concludes with brief notes on the distribution of CULICIDAE in Switzerland.

VAGO (H. A.). **Eine leicht herstellbare Entlausungsanlage zur Abtötung der Kleiderläuse durch überhitzten Dampf.** [An easily constructed Arrangement for killing Clothes-Lice by superheated Steam.]—*Bull. Inst. Pasteur, Paris,* xv, no. 20, 30th October 1917, p. 635. (Abstract from *Med. Klinik,* 1916, p. 240.)

In this apparatus the steam is generated in an ordinary kitchen boiler and led to a trench in the ground, where the infested clothing has been placed. At 212°–230° F. [100°–110° C.] disinfection requires half an hour. In this manner a company of soldiers can be dealt with in 2 or 3 hours.

WALDOW (—). **Kurzer Bericht über die Entlausung durch Sand.**—[A short Report on destroying Lice with Sand.]—*Bull. Inst. Pasteur, Paris,* xv, no. 20, 30th October 1917, p. 635. (Abstract from *Centralbl. Bakt., Parasit. u. Infektionskr., Ite Abt., Referate, Jena,* lxv, no. 19–20, February 1917.)

The destruction of lice may be effected by covering infested clothing, matresses, etc., with sand heated to 750° [*sic*]. At 110° C. [230° F.] lice are killed in a few minutes.

HENDLEY (Col. H.). **Report on Malaria in the Punjab during the Year 1916, together with an Account of the Punjab Malaria Bureau.**—Supt. Govt. Printing, *Lahore,* 1917, 18 + xxxiv pp., 3 charts, 4 maps. Price *Rs.* 2 or 3*s.*

The year 1916 is considered to have been unfavourable to Anophelines. The great heat of July and August hindered development, and the breeding places formed during those months quickly dried up in September, which was exceptionally dry. The heavy rains in the first two months disturbed the breeding places and the heavy fall on 6th October flushed them out. It would therefore appear that an excessive monsoon is, in itself, not sufficient to cause a malaria epidemic, but that there must be breaks in it and moderate rainfalls to provide suitable climatic conditions. To determine the infectibility of *Anopheles rossi* innumerable dissections were made, with a negative result. It should be noted, however, that at Khewra (Jhelum District), where the spleen-index is as high as 64·46, the only species known is *A. rossi.* An attempt was made to decide if Anopheline larvae could breed in the brackish water of a stream running at the foot of the salt range, or in the waters of small lakes found within the salt mines. No larvae, but two imagines of *A. rossi* were found after an exhaustive search. This absence of Anophelines is puzzling in view of the high spleen-rate and a parasite-rate of 14·87. At Katas, in the sacred tank, larvae were found to abound side by side with innumerable fish (*Cirhina latia* and *Barbus terio*) which, especially when young, are destroyers of mosquito larvae. A similar result was met with at the Shalamar Gardens at Lahore, where larvicidal fish had been specially introduced.

In order to test the value of ducks in the reduction of Anopheline larvae two ponds were chosen in the Lawrence Gardens, Lahore. In spite of their presence Anopheline larvae were found to breed in large numbers, and, with a very few exceptions, were those of *Anopheles culicifacies* and *A. fuliginosus.*

FISCHER (J. C. H.). **Maatregelen tegen Malaria.** [Measures against Malaria.]—*Koloniaal Instituut te Amsterdam.* Meded. no. 10. (*Afdeeling Tropische Hygiene,* no. 5), xii + 176 pp., 18 figs., 14 plates. J. H. de Bussy, *Amsterdam,* 1917. Price *Fl.* 2. [Received 23rd July 1918.]

This book gives a very clear and complete account of the various modern measures adopted for the prevention of malaria. It is innocent of technical and scientific terminology and should prove invaluable to settlers (with a knowledge of Dutch) in any part of the globe. The various methods suggested are made clear by examples, and to guard further against incorrect working some failures are explained.

The introduction briefly defines malaria, its transmission and importance. In an unhealthy district in Batavia the deaths from malaria in 1912 were 7·3 per cent. of the total, while its incidence was 39·8 per cent. of the general diseases. A chapter is devoted to Anopheline and other mosquitos, with particulars of their habits and a list of the species of south-eastern Asia. The destruction of the malarial parasite in man is discussed, and various methods for destroying mosquitos and for filling up and draining land are described. Drainage is dealt with very fully and clearly, many illustrations being given, so that colonists will find this section of practical value. The protection of individuals and communities is discussed. In one chapter the relation of malaria to agriculture is considered, attention being devoted to rice cultivation. It is pointed out that some regions where rice is grown on an extensive scale suffer very little from malaria. Another chapter deals with anti-malarial organisation, while the concluding one records the notable instances where anti-malarial measures have proved highly successful, *e.g.*, the Beni-Ounif Oasis in Algeria, where malarial infection in the garrison fell from 85 per cent. to 3·7 per cent.; Formosa, where the deaths among the troops fell from 21·4 per thousand in 1899 to 2·1 per thousand in 1907; and the town of Ismailia, where the number of cases decreased from 1,800 in 1885 to 55 in 1905.

The volume closes with an alphabetical list of 119 works on the subject.

HASE (A.). **Die Bettwanze (*Cimex lectularius*, L.), ihr Leben und ihre Bekämpfung.** [The Bed-Bug, its Life-history and the Methods of combating it.]—Paul Parey, *Berlin*, 144 pp., 6 plates, 131 figs. Price *M.* 6.50. [Notice in *Zeitschr. Forst- u. Jagdwesen, Berlin*, l, no. 4, April 1918, p. 188.]

This monograph forms supplement No. 1 to Vol. iv of the *Zeitschrift für angewandte Entomologie* and begins a series dealing with applied entomology. The life-habits of *Cimex lectularius* are described at length with the remedial measures dependent on them.

WILHELMI (J.). **Die gemeine Stechfliege (Wadenstecher); Untersuchungen über die Biologie der *Stomoxys calcitrans*, L.** [The common Biting-Fly; Investigations on the Biology of *Stomoxys calcitrans*.]—Paul Parey, *Berlin*, 110 pp., 28 figs. Price *M.* 6.50. [Notice in *Zeitschr. Forst- u. Jagdwesen, Berlin*, l, no. 4, April 1918, p. 188.]

This monograph is the second of the series mentioned above and forms supplement No. 2 to Vol. iv of the *Zeitschrift für angewandte Entomologie*. The author's own work on the biology of *Stomoxys calcitrans* was carried out in Germany and most of the results are given here.

FIORITO (G.). **Su di alcune Particolarità del Reperto emoparassitologico dell' Infezione malarica.** [Some Peculiarities in the Haemoparasitology of Malaria.]—*Ann. Med. Nav. e Colon., Rome* (year 28) II, no. 7–8. July-August 1917, pp. 583–596.

The studies recorded in this paper were made at Valona, Albania. The mosquitos collected were *Anopheles maculipennis*, *A. bifurcatus* and *A. pseudopictus*. Of these the first-named was the most common. *A. superpictus* was not observed.

SALM (A. J.). **Nématocères hématophages de Java.** [Blood-sucking Nematocera from Java.]—*Bull. Soc. Zool. France, Paris*, xlii, no. 8–10, 15th March 1918, pp. 135–139, 9 figs.

The species dealt with in this paper are:—*Ceratopogon raphaelis*, n. n. (*blanchardi*, Salm, *nec* Iches); *Culicoides esmoneti*, sp. n., a small species found near running water in bright sunshine; and *C. javanicus*, sp. n., of which only the female is known.

LANG (W. D.). **A Map showing the known Distribution in England and Wales of the Anopheline Mosquitoes, with Explanatory Text and Notes.**—*British Museum* (*Natural History*), *London*, 1918, 63 pp. and map. Price 2*s*. 6*d*.

This pamphlet gives a key to the Anophelines, *Anopheles maculipennis*, Mg., *A. bifurcatus*, L., and *A. plumbeus*, Stephen (*nigripes*, Staeger), found in the British Isles, together with a list of the localities, 671 in number, where their presence has been recorded in England and Wales, in addition to various records from Scotland and Ireland.

TREADGOLD (Capt. C. H.). **Malaria in Macedonia with especial Reference to the Use of Prophylactic Quinine.**—*Jl. R.A.M.C., London*, xxx, no. 6, June 1918, pp. 571–586.

Both clinical and theoretical considerations lead to the conclusion that the general course of malaria may be noticeably affected by the previous taking of quinine, and that the sum of such influences is frequently unfavourable. So far as the Allied Armies in Macedonia are concerned, there is every reason to suppose that quinine taken daily over periods of many months has increased the severity and chronicity of the disease in a certain proportion of cases, and that in Macedonia at any rate, the disadvantages of quinine prophylaxis outweigh the advantages.

Small doses of prophylactic quinine, not too long continued, are however of proved utility to the natives of malarial countries, both in the absence of anti-mosquito measures, and when such measures are incomplete. Quinine may also be given to immigrants under the following conditions:—during short journeys when conditions with regard to mosquito prophylaxis are less favourable than usual; as an occasional dose after an unusually tiring day; as an occasional course to nervous people for an additional precaution.

Owing to this failure of quinine prophylaxis to protect non-immune armies operating in high y malarial countries, efforts must be directed to the destruction of mosquito larvae by:—Subsoil drainage, which is the ideal method, but often impracticable owing to finance and labour difficulties: the oiling of surface water, obviously a good method when sufficient oil can be obtained, as in Panama, where the whole area for about half a mile round all dwelling places was thoroughly oiled once a week; the piping of fast-running, but temporary, streams to within half a mile of camps in ravine country where associated pools act as mosquito breeding places.

In countries where such measures are difficult, the importance of mechanical prophylaxis can hardly be exaggerated. Such measures include the screening of dwellings by means of double doors and windows protected with copper-bronze screens, 18 mesh to the inch, a method by which the malaria incidence may be reduced by at least one-third in a locality where malaria is endemic; the supervised use of mosquito nets by troops; the use of veils and gloves with gauntlets by those employed on sentry duty, etc.; the use of citronella oil, either pure or in the form of ointment by men on night duty, a method, however, which is said not to be very successful; the employment of African or Greek troops for sentry duty and all forms of night work during the summer and autumn months, a plan, the advantages of which might be found to outweigh the disadvantages; and the education of officers and men as to the habits of the mosquito and the means of avoiding infection.

To this paper is appended a bibliography of 95 works.

MacCormac (Major H.) & Small (Capt. W. D. D.). **The Scabies Problem on Active Service.**—*Jl. R.A.M.C., London*, xxx, no. 6, June 1918, pp. 601–605.

Scabies is rarely contracted except after long and intimate contact with infected material, since Acarid mites do not wander far afield like lice. All the evidence points to blankets as the chief means of disseminating infection, and these should be therefore frequently disinfected by means of the Clayton sulphur-vapour apparatus, or some other accepted form of sterilisation. Since some few cases seem to be contracted from horses, these also should receive efficient treatment. Infected men should be segregated and treated as speedily as possible, as each undetected case acts as a carrier.

The method of treatment most suitable to service conditions on account of efficiency, simplicity and cheapness, is inunction with sulphur ointment, but to be effective this must be carried out in a methodical and thorough manner, and with careful attention to the necessary details.

Treatment by means of sulphur vapour, a method long ago discredited, but recently re-introduced, is often harmful to the patient and always dangerous to the community, in that it manufactures a class of scabies "carrier." In the interests of the Army it should be discontinued.

Bahr (Capt. P. H.). **On the Transmission of the Subtertian Malaria Parasite** (*Plasmodium falciparum*, **Welch, 1897) by Egyptian** *Anopheles*.—*Jl. R.A.M.C., London*, xxx, no. 6, June 1918, pp. 606–608.

The species of Anophelines recorded as occurring in Egypt are:—*Anopheles* (*Cellia*) *pharoensis*, which is known to transmit *Plasmodium* *vivax*, the parasite of benign tertian, but in which the transmission of *P. falciparum*, the sub-tertian parasite, has not been worked out; *A.* (*Myzomyia*) *turkhudi*, which has been regarded as one of the carriers of *P. falciparum* in India, where zygotes of the parasite have been found in its stomach; *A. palestinensis* (*sergenti*), a common carrier in Algeria and Spain, and in January 1917 found breeding abundantly in the warm wells in the Dahkla Oasis (water temperature 80°–120° F.), the adults being then abundant in camp and capable of transmitting the subtertian parasite to freshly arrived troops, some of whom contracted the disease within 10 days after arrival; and *A.* (*Myzorhynchus*) *mauritianus*, a rare mosquito and one not regarded as playing any actual part in the transmission of malaria in Egypt.

Experiments carried out in the autumn of 1916 at Cairo with *A. pharoensis* and *A. turkhudi* showed that the former can act as an inefficient and occasional definitive host for the subtertian parasite, a fact which is of interest in view of the prevalence of its congener *A. pulcherrima* in Mesopotamia, where it is regarded as a probable carrier; on the other hand *A. turkhudi* proves to be an efficient, definitive host of *P. falciparum* in Egypt.

VILLENEUVE (J.). **Sur *Phormia sordida*, Zett. (Dipt.).** [Regarding *Phormia sordida*, Zett. (Dipt.).]—*Bull. Soc. Entom. de France, Paris*, 1918, no. 10, 22nd May 1918, pp. 158–159.

The author having previously described *Phormia sordida*, Zett., as a form distinct from *P. azurea*, Fall. [see this *Review*, Ser. B, iv, p. 16], it has been contended that the former is merely the female of *P. azurea*. This paper points out that *P. sordida* is a distinct variety, differing in both sexes from the typical form of *P. azurea*, the differences having probably arisen under the influence of biological conditions.

FEYTAUD (J.). **Les Moustiques.** [Mosquitos.]—*Bull. Soc. Etude Vulg. Zool. Agric., Bordeaux*, xvii, nos. 6–7, June–July 1918; pp. 49–56, 67–71, 4 figs.

These articles deal in a popular manner with the general characters of mosquitos and the special danger of the Anophelines, as well as with methods of personal protection and of anti-larval measures of control.

BODKIN (G. E.). **Report of the Economic Biologist.**—*Brit. Guiana Dept. Sci. & Agric., Rept. for the Year 1916, Georgetown*, 10th May 1917, 14 pp. [Received 11th July 1918.]

Important investigations were made during the year into the prevalence and control of *Musca domestica* (house-fly), particularly in Government institutions and public buildings, where breeding places had been allowed to accumulate with but little attempt to locate or eradicate them. The danger of using lime-peel refuse from lime factories as a top-dressing for young lime plants growing close to dwellings is pointed out, thousands of fly larvae having been discovered in the decaying mass of peel.

A number of poison-baits were tried, including various mixtures of formalin, molasses and vinegar. All these proved attractive, but were inferior to fly-papers. The most successful of these was made with paper rendered oil-proof by a solution of 1 oz. ordinary glue in 3 oz. water. This should be applied with a fine brush all over the surface. After this has dried, the adhesive mixture consisting of 3 oz. resin and 1 oz. cotton-seed oil is brought to boiling point and immediately applied to the paper. The cost of fly-papers prepared in this way is about half that of the commercial article. There is apparently some seasonal variation in the flies, and while it is too early to draw conclusions, it seems probable that some relationship exists between the prevalence of the house-fly and relative humidity. The temperature also should be taken into consideration. It was found that outbreaks of diarrhoea and dysentery follow the rise and fall of the flies to a large extent. The numbers of flies will never be reduced until their breeding places are eliminated and better sanitary conditions exist in British Guiana.

A study has been made of the biology of the tick, *Amblyomma dissimile*, Koch. Investigation into the life-history has proved beyond doubt that the female of this species is able to produce fertile eggs parthenogenetically. Further researches are being carried on and a report on the experiments will eventually be issued.

LEA (A. M.). **Notes on Small Flies of Genus** *Simulium*.—*Trans. Proc. R. Soc. S. Australia, Adelaide*, xli, 24th December 1917, p. 663. [Received 13th July 1918.]

A species of *Simulium* is recorded as very abundant in the south-eastern parts of S. Australia, occurring in thousands and causing serious annoyance to horses and cattle.

CAMERON (A. E.). **Some Blood-sucking Flies of Saskatchewan.**—*Agric. Gaz. Canada, Ottawa*, v, no. 6, June 1918, pp. 556–561, 6 figs.

A preliminary survey of the blood-sucking flies attacking domestic animals and man in Saskatchewan has shown that as regards mosquitos the great majority of the north-west prairie species belong to the genus *Aëdes*, which have only one annual brood. The eggs are laid in late summer on the ground where they remain till the following spring, when they hatch in the water from the melting snow. Larvae have been found in alkali swamps and ditches in May and June, and sometimes *A. canadensis*, Theo., and *A.* (*Ochlerotatus*) *sansoni*, D. & K., have been found in these localities in July. *A.* (*O.*) *mimesis*, D., *A.* (*O.*) *vexans*, Mg., and *A.* (*O.*) *aestivalis*, D., all species more or less persistent in their attacks on man, are peculiar to swampy creeks and ravines. The most widely distributed species on the prairies are *A.* (*O.*) *spenceri*, Theo., *A.* (*O.*) *fletcheri*, Coq., and *A.* (*O.*) *curriei*, Coq., the first two of which are particularly vicious in their habits, entering the porches of houses on the outskirts of the towns and attacking the occupants, and proving so troublesome to stock that the provision of fly-nets on horses is now general.

The question of mosquito control on the prairies is a very difficult one, but much could be done in the vicinity of townships by oiling the temporary pools of early spring, or by filling them in with refuse during the summer and autumn in preparation for the spring thaw. A larvicide, prepared according to the formula: resin 150–200 lb., caustic soda 30 lb., carbolic acid 150 gals., has been successfully used as a substitute for the more expensive kerosene. It emulsifies readily in water, but unfortunately cannot be used in brackish and alkaline waters as they neutralise it.

The SIMULIIDAE are chiefly represented by the abundant species, *Simulium similis*, Mall., which is capable of causing extensive losses among live-stock, 100 head of cattle having died from its attacks in one locality in 1913. The first swarms generally appear about June, though infestations may recur as late as September and October. The eggs are laid on the exposed surfaces of stones or weeds in the rapids of streams and rivers. The whole life-history occupies about six weeks.

At present the only measure of control is to burn smudges, the dense smoke from which protects the cattle, or to dress their coats with a repellent such as fish-oil, or a mixture of three parts fish-oil and one part kerosene, which should be renewed once a day during the season. The destruction of the larvae by toxic substances in streams and rivers is impossible, owing to the danger to stock and human beings, and to the fact that the fish are thereby killed.

Of the TABANIDAE the most commonly occurring species is *Tabanus septentrionalis*, Lw.; other species are *T. illotus*, O.S., *T. hirtulus*, Big., *T. phaenops*, O.S., *T. rhombicus*, O.S., *T. captonis*, Marten, and *T. eristatus* [? *epistates*, O.S.]. None of these are troublesome to human beings, but are persistent in their attacks on grazing cattle and horses. Working horses may be amply protected by the use of fly nets. *Chrysops moerens*, Wlk., and *C. fulvaster*, O.S., are common round sloughs in summer, attacking human beings when disturbed. *Haematopota americana*, O.S. (breeze fly) is occasionally found round horses and readily settles on human beings.

Horses may be protected from those flies that attack the ears by the use of nets, and from those attacking the eyes by smearing the skin round the eyes and ears with a repellent composed of pine-tar 1 gal., kerosene, fish-oil or crude carbolic acid 1 qt., powdered sulphur 2 lb.; a mixture that may also be applied to wounds to prevent oviposition therein. The method of destroying the adults by oiling their drinking pools has already been dealt with [see this *Review*, Ser. B, iii, pp. 195–196].

VAN ZWALUWENBURG (R. H.). **Report of the Entomologist.**—*Rept. Porto Rico Agric. Expt. Sta. for 1916, Mayaguez*, 5th February 1918, pp. 25–28. [Received 15th July 1918.]

Two varieties of ticks infest cattle in Porto Rico, *Margaropus annulatus australis* and *M. annulatus*, the latter being present in much smaller numbers than the former. *M. annulatus australis* requires from 20 to 22 days for its development on the host during the autumn months. Hence if local eradication of the tick is to be attempted, applications of dips, sprays or smears should be renewed about every three weeks to prevent the maturing of fresh generations.

The minimum length of the egg period under natural conditions was found to range from 36 days in February to $23\frac{1}{2}$ days in September. The maximum starvation period of ticks hatching in April was found under natural conditions to be 94 days, while seed ticks protected from rain and direct sunlight had a maximum starvation period of 108 days.

Buckeridge (G. L.). **Some Observations on an Epidemic of Sand-fly Fever, occurring in one of H.M. Ships.**—*Jl. R. N. M. S., London*, iv, no. 3, July 1918, pp. 310–312.

This paper records an epidemic of sand-fly fever that broke out in a ship shortly after leaving an East Indian port, where it had been undergoing a refit. The majority of the persons attacked were those who slept between decks in badly ventilated compartments and on the side of the ship most exposed to the sun. The presence of sand-flies [*Phlebotomus*] in the ship was verified, they having presumably invaded her during the period of refitting.

Panisset (M. L.). **Le Traitement de la Gale du Cheval. Les Méthodes adoptées durant la Guerre.** [The Treatment of Horse Mange: Methods adopted during the War.]—*La Vie Agric. et Rur., Paris*, viii, no. 28, 13th July 1918, pp. 31–34, 2 figs.

Horse mange is essentially a disease occurring among armies in the field. Its contagious nature and wide diffusion soon led to the establishment of special veterinary hospitals during the present war, and collective treatment on a large and economical scale is now possible by either of the two methods now employed: dipping or fumigation. Both the system of dipping and the dip formula recommended here are well-known [see this *Review*, Ser. B, iv, p. 165] and this also applies to the method of fumigation, sulphurous anhydride being used [see this *Review*, Ser. B, vi, pp. 42–43]. Individual cases may be treated with lotions containing 2 per cent. of cresyl or with Sabadilla oil, which is the best specific for horse mange, but requires careful preparation and is at present difficult to obtain.

Massini (P. C.). **Instituto Biológico de la Sociedad Rural Argentina. Resúmen de los Trabajos efectuados durante el Año 1917.** [Summary of the Work done in 1917 at the Biological Institute of the Rural Society of Argentina.]—*Anales Soc. Rural Argentina, Buenos Aires*, lii, no. 3, March 1918, pp. 141–147. [Received 19th July 1918.]

In the report of the Parasitological Section, it is stated that a complete anatomical and histological study has been made of ticks in all stages of development and that this is being used as a basis for the experiments now being conducted with cattle and equines.

Tonnelier (A. C.). **Las Moscas.** ***Musca domestica*, L. Métodos de Destrucción.** [Methods of destroying *Musca domestica*.]—*Anales Soc. Rural Argentina, Buenos Aires*, lii, no. 3, March 1918, pp. 170–174, 6 figs. [Received 19th July 1918.]

This paper reviews the various methods used against *Musca domestica* and contains no fresh information.

PORTER (C. E.). **Notas de Acarología. Un Caso de Otocariasis en el Norte de Chile.** [Acarological Notes: A Case of Otacariasis in the North of Chile.]—*Anales Zool. Aplicada, Santiago de Chile*, iv, no. 2, 31st July 1917, p. 30. [Received 31st July 1918.]

Ornithodorus talaje, Guér., is recorded as having been taken from the ear of a cowherd in northern Chile.

Las Garrapatas y nuestro Ganado. [Ticks and our Live-Stock.]—*Rev. Agricultura, Santo Domingo* (*Haiti*), xiv, no. 3, 30th June 1918, pp. 88–91.

A dipping-tank being in course of construction at the Agronomical Station at Haina, the publication of this paper on ticks is thought advisable. It contains information about ticks and the methods of combating them and states that eradication could be completed in the Republic within six months, if all proper measures were taken.

MORRIS (H.). **Blood-sucking Insects as Transmitters of Anthrax or Charbon.**—*Louisiana State Univ. Agric. Expt. Sta., Baton Rouge*, Bull. no. 163, March 1918, 15 pp., 2 figs. [Received 18th July 1918.]

This paper deals with experiments conducted to test the possibility of anthrax transmission through the bites of blood-sucking insects, the carriage of anthrax bacilli on the proboscis of an insect after feeding on an infected animal being considered possible.

Guinea-pigs inoculated by the subcutaneous injection of anthrax spores of a very virulent strain were used as sources of infection, death occurring in adult animals 28 hours after inoculation, or sooner in younger individuals. In the laboratory examples of *Lyperosia* (*Haematobia*) *irritans*, L. (horn-fly), confined in a wooden box, the top of which was composed of fine wire gauze, were allowed to feed through it on a previously inoculated guinea-pig for one minute, and then on a healthy one for from one to three minutes. In order to determine at what stage in the development of the disease the virulent organisms could be transmitted by flies, the time that elapsed between the feeding on the infected host and its death was noted. The results showed that the greatest number of transmissions took place a short time before the death of the infected host, owing to the anthrax bacilli becoming generalised in the circulation. *Lyperosia irritans* would not however feed satisfactorily on an infected carcase. Transmission seemed to be mechanical, the bacillus being carried on the proboscis of the fly and producing in some cases the internal form of anthrax, but more generally the external or carbuncular form.

Experiments similarly conducted with a species of *Tabanus*, closely allied to *T. nigrovittatus*, Macq., and with the mosquitos, *Janthinosoma* (*Psorophora*) *sayi*, D. & K., and *Aëdes sylvestris*, Theo., showed that they can transmit anthrax in the same manner as flies.

The results also indicated that the disease is not usually spread in the excreta of these insects after feeding on the blood of an animal suffering from anthrax. They also show the necessity of protecting infected animals from blood-sucking insects, and of keeping valuable animals in screened buildings during outbreaks of this disease.

SINCLAIR (J. M.). **Abridged Report of the Chief Veterinary Surgeon.**—*Southern Rhodesia Abridged Rept. Director Agric. for the Year 1917*, [*sine loco*], 1918, pp. 4–6. [Received 19th July 1918.]

The number of fresh outbreaks of African coast fever during the year was 13, with a mortality of 43 head, as compared with 20 and 382 respectively for the previous year. A new and very severe outbreak occurred in the southern part of the Umtali district, due to the movement of cattle from the southern part of Melsetter district two years previously, the existence of infection during this period having been masked by the use of a dipping tank.

The supplementary report of the African Coast Fever Committee, in dealing with the question of universal compulsory effective dipping, emphasises the fact that though such dipping may prevent any noticeable number of deaths when the disease exists, yet cattle moved from such areas may, and have, carried infection with them.

WESENBURG-LUND (C.). **Anatomical Description of the Larva of *Mansonia richiardii* (Ficalbi) found in Danish Freshwaters.**—*Videnskabelige Meddelelser Dansk Naturhist. Kjøbenhavn, Odense*, lxix, 1918, pp. 277–328, 37 figs. [Received 22nd July 1918.]

The larvae of *Taeniorhynchus* (*Mansonia*) *richiardii* were found by the author in some small ponds in September 1914. Only two larvae of this genus have been described, viz :—Those of *T.* (*M.*) *titillans*, Wlk., from S. America, and *T.* (*M.*) *perturbans*, Wlk., a North American species known from Canada to Florida and westward as far as British Columbia, and if not identical with, closely related to, *T. richiardii.*

The larvae of this genus differ from those of *Culex* in having the siphon modified into a piercing organ by means of which living plant-tissues are perforated and the inter-cellular air contained in them is used for respiration. Hence the mode of life is quite different from that of other mosquito larvae, since they are not free swimming but sedentary, remaining attached to water-plants at the bottom of shallow water, about one foot deep.

Owing to the ponds being drained, the author was unable to rear the adults, and it was not until three specimens were accidentally found on the same spot, three years later, that the present paper could be completed.

Culicid larvae may be referred to four groups, according to their method of respiration :—(1) Larvae that hang down from the surface by means of the siphon and in this attitude breathe the atmospheric air ; to this group belongs the great majority of Culicid larvae. (2) Larvae that breathe the contained air of submerged plants by means of different organs (the siphon in *Taeniorhynchus*, the antennae in *Aëdomyia*). (3) Larvae that live a pelagic life and mainly or exclusively breathe dissolved air by means of the outer skin (*Corethra*, *Mochlonyx*). (4) Larvae that possess air-tubes, but live mainly on or near the bottom of stagnant pools and are furnished with very large gills.

HALL (M. C.) & WIGDOR (M.). **Notes on the Acanthocephalid and Arthropod Parasites of the Dog in North America.**—*Jl. Amer. Vet. Med. Assoc., Ithaca, N.Y.*, liii, no. 4, July 1918, pp. 493–500.

This paper gives a summary of the Arthropod parasites of the dog in North America. The ticks include *Ornithodorus megnini* and *Ixodes scapularis*, reported from the southern United States; *I. kingi* from the western United States; *I. ricinus* and *I. pratti* from Canada; *I. cookei* from Canada and the United States; *Rhipicephalus sanguineus* (brown dog tick) from Texas and Mexico; *Margaropus annulatus* (cattle tick) reported on dogs in the southern United States, but very rare on this host; *Amblyomma americanum* from Texas, *A. maculatum* from Texas and Louisiana, and *A. cajennense* from Panama; *Dermacentor venustus* (*andersoni*) from the western United States, *D. occidentalis* from the Pacific coast region, and *D. variabilis* common throughout the Union and recorded in Canada.

Sarcoptes scabiei canis is much less common in the United States than *Demodex folliculorum canis*. *Haematopinus* (*Linognathus*) *piliferus* (sucking louse of the dog) appears to be more common on the west coast of the United States than in the east, and *Trichodectes latus* (biting louse of the dog) is also fairly common. Sodium fluoride is an effective remedy and no bad results have been noticed from its use, but the possibility of trouble from poisons ingested by licking the hair must be borne in mind. A 15-grain dose, given in a gelatine capsule, was found to kill a 20-lb. dog in 4 days.

The fleas, *Ctenocephalus canis* and *Pulex irritans*, are common on dogs in the United States, and *Echidnophaga gallinacea* is often found on the ears of dogs in the southern and south-western parts.

Gastrophilus equi (*intestinalis*), *G. nasalis* and *G. haemorrhoidalis* have been reported in experimental infestations. *Chrysomyia macellaria* (screw-worm) is a common parasite of domesticated animals in the south-eastern States and has been recorded from the dog in Panama. *Cuterebra emasculator* (rabbit bot) has been collected from the dog in North America, and *Dermatobia hominis* has been recorded from Tropical America. Myiasis, due to infestation with various Dipterous larvae, is not uncommon. *Simulium molestum* is stated to attack the Newfoundland dogs in Labrador, driving them to take to water for protection. *S. pecuarum* has been reported from the United States. *Stomoxys calcitrans* has been recorded as attacking dogs in Canada, and *Tabanus lineola* and *T. trijunctus* from southern Florida.

FREEBORN (S. B.) & ATSATT (R. F.). **The Effects of Petroleum Oils on Mosquito Larvae.**—*Jl. Econ. Entom., Concord, N.H.*, xi, no. 3, June 1918, pp. 299–308.

Various theories of the lethal action of petroleum oils on mosquito larvae have been advanced, including the following:—That the oiling of a water surface so changes its physical conditions that the larvae can no longer keep the surface by surface tension and quickly drown; that the oil layer acts as a definite mechanical barrier between the larvae and the outside air and thus leads to their suffocation; that a part of the oil or some of its dissolved or suspended material goes into solution in the water and poisons the larvae; that respiration is stopped by the oil entering and blocking the siphon and tracheal tubes; that the oil acts directly on the tissues as a contact poison on entering the siphon and trachea; that it is the oil vapour from the inspired oil, which by its extremely rapid penetration of the tracheal tissues produces the lethal effects.

Experiments to test these theories were conducted with full-grown larvae of *Theobaldia* (*Culiseta*) *incidens*, the oils used being a series of standard commercial Californian oils including crude, 15·4° Bé.; low-grade stove distillate 29°; high grade stove distillate 33·3°; commercial engine oil distillate 38·5°; kerosene 39·7°; gasoline 55.5°; and a by-product obtained from the stills after distillation, with a reading of 20·3°. Besides these toxic petroleum oils, a standard non-toxic liquid petrolatum of 27° was used.

The results showed:—That as regards surface tension, so far from this being annulled, the larvae remained at the surface for a considerable time, either quiescent or in a definite attempt to pierce the film; that suffocation is but a slight factor in the larvicidal action of the oils, since larvae kept from the air by simple mechanical means lived for 30 hours, while those under a layer of kerosene died in 45 minutes; that the solubility of kerosene in water is not a toxic factor in the killing of larvae by its application to the medium in which they live; that the blocking of the respiratory tubes, even to their very finest subdivisions, which actually does take place by the entrance of the oil into their siphons, is not in itself the cause of the efficiency of the larvicide, for in that case, all oils effecting this would have equal lethal action, whereas kerosene caused death in 45 minutes, while non-toxic petrolatum required 4½ hours; that the direct action of the oil on the tissues as a contact poison is not the cause of death, because, though it enters and penetrates the tracheal system with great rapidity, the larvae were always dead long before it penetrated the tissue. [Cf. this *Review*, v, p. 54.]

Finally, experiments to test the toxic action of oil vapours took the form of exposing the various oils to a temperature of 28° C. ± 2° (82° F.) for 103 hours in a constant circulation of air, and using the evaporated residues to make films in the usual manner. It was found that the lethal effect of the oils had decreased in proportion to the percentage of the weight lost through evaporation; thus kerosene, which had previously given rise to the greatest death rate, now had become the least efficient in its larvicidal properties. Further direct experiments, in which vials containing larvae in water were plugged with absorbent cotton on which were poured 3 c.c. of the various oils, showed that the vapours of gasoline and kerosene confined in the spaces above the water killed the larvae in 153 and 185 minutes respectively, while the vapours of crude petroleum had no ill effects at the end of 72 hours.

Hence it may be concluded that the practical toxicity of the petroleum oils as mosquito larvicides increases with an increase in volatility, and that the volatile constituents of the oils contain the principles that produce the primary lethal effects. It is possible that the lethal action of oils having a higher boiling point than 250° C., the volatile constituents of which are practically negligible in quantity, may be due to the effects of stoppage, actual contact and even suffocation.

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NEWSTEAD (R.). **Polypneustic Lobes in the Larvae of Tsetse-flies (*Glossina*) and Forest-flies (Hippoboscidae).**—*Ann. Trop. Med. Parasit., Liverpool*, xii. no. 1, 25th July 1918, pp. 93–107, 7 figs.

This preliminary paper records the discovery that the innumerable papillae on the exterior of the prominent anal lobes of the larvae of tsetse-flies are actually respiratory openings, evidently functioning as such during the intra-uterine life of the larva.

Similarly, in *Hippobosca maculata* the less prominent anal lobes are distinctly polypneustic in character, but differ in that the supernumerary stigmata are fewer in number and more regularly placed, a very similar arrangement occurring in *H. equina* and *Lynchia maura*; while in *Melophagus ovinus* the respiratory system is much reduced.

There are also other puparia among the Diptera Cyclorrhapha that have been found to possess similar appendages, though whether these are in any way homologous with those in *Glossina* is unknown.

BRAIN (C. K.). **Storage of Manure and Fly Suppression at Durban Remount Depot.**—*Jl. Econ. Entom., Concord, N.H.*, xi, no. 3, June 1918, pp. 339–341.

This paper describes the author's visit to the Transport and Remount Mobilisation Depôt, established at Durban in November 1915, chiefly in connection with the military operations in East Africa, which up to the present has dealt with approximately 100,000 animals, mostly horses, mules and donkeys, the average number generally maintained being about 3,300, with a maximum at any one time of 10,000.

Entomological interest centres in the fact that this depôt, situated on reclaimed swamp within fifteen minutes' walk of the heart of the town, has not caused the slightest inconvenience to the inhabitants from odours or house-flies.

The depôt is located on a low-lying site within half a mile of the sea and occupies approximately 60 acres. Over this whole area, drains and roads, top-dressed with cinders, were constructed, and paddocks were enclosed.

The methods of fly-control consisted in the manure and litter from stalls and paddocks being collected and carted every day to huge trenches previously prepared in the sand-dunes. These were dug to a depth of about 10 ft. down to the clay underlying the sand, and were often 20 ft. wide and 70 ft. long. The average amount of manure removed was approximately 150 to 160 Scotch-cart loads per day. This was spread out in the trench to an average depth of about one foot, and then covered with a thin, $\frac{3}{4}$ in., layer of sand, ashes or earth, the whole being tightly rolled or rammed down by the loaded carts passing over it on following days. When a trench was full, it was covered with a foot or so of earth or sand, and thoroughly rolled for 2 or 3 days, no lime or disinfectant being added. This method of storing results in the formation of a dense, peaty mass of manure of particularly good quality, one large deposit of which has recently been sold.

The large number of flies that occurred in the stalls were constantly sprayed by means of a garden syringe with a solution composed of :— Caustic soda 2 lb., boiling water 50 gals. paraffin and hycol [? lysol], 5 gals. of each, added while hot. In addition, baits consisting of sodium

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arsenite 5 lb., and black sugar 5 to 20 lb., boiled in 25 gals. water, and distributed on branches of blue-gum or pieces of sacking, were placed and constantly renewed in all latrines, dormitories, cook-houses and stores.

CHANDLER (A. C.). **The Western Newt or Water-Dog (*Notophthalmus torosus*), a Natural Enemy of Mosquitoes.**—*Oregon Agric. Coll. Expt. Sta., Corvallis,* Bull. no. 152, June 1918, 24 pp., 6 figs.

Observations and experiments undertaken for the purpose of discovering to what extent the salamander, *Notophthalmus torosus*, might be regarded as a natural enemy of mosquitos, have shown that under suitable conditions it is a highly efficient destroyer of their larvae. Its employment for this purpose may be recommended for the following reasons:—(1) Its almost entire freedom from natural enemies; (2) its ability to live in almost any kind of water that is not too filthy, and in almost any kind of a receptacle from a glass bowl to a lake; (3) its relatively enormous capacity for food, combined with the ability to go for long periods without it. The chief objection to its use commercially is that it breeds slowly and requires a long time to reach maturity, but this is counterbalanced by the ease with which the adults can be obtained and distributed in a moist box, and further, that such collection would ensure the development of the eggs and larvae, many of which are normally destroyed by the adults themselves.

The similarity between the habits of *N. torosus* and those of the eastern form, *N. viridescens*, points to the latter being equally useful as a mosquito larva destroyer in the north-eastern United States, where *N. torosus* could not thrive.

It is therefore recommended that one or two individuals should be kept in each rain barrel, water-barrel, and water-trough, in the last of which, however, the water level would have to be kept three or four inches below the top of the trough, and the outflow holes would have to be screened with coarse wire netting. Borrow-pits are among the most important mosquito breeding places, being large enough to breed enormous numbers, but too small to be successfully stocked with fish. If possible, they should be drained and filled in, but if this is not feasible, stocking them with *N. torosus* would prove cheaper and more efficacious than oiling. It has been shown that reservoirs, mill ponds, garden pools, and large sluggish irrigation ditches are kept free of mosquitos by this means, and in view of the seriousness of the situation due to the breeding of *Anopheles* and consequent malaria in the rice-fields of California, the introduction of *N. torosus* seems to be an experiment worth trying.

Department of Entomology.—*43rd Ann. Rept. (1917) Ontario Agric. Coll., Toronto,* 1918, pp. 19–20.

Cuterebra cuniculi (rabbit bot fly) was found to be infesting many rabbits, producing large tumours under the skin, but seldom proving fatal. Experiments with repellents for use against the horn-fly [*Lyperosia*] and the stable-fly [*Stomoxys calcitrans*] showed the following home-made solution to be satisfactory. One gal. fish-oil soap is thoroughly mixed into 1 gal. hot water in which half a cake of ordinary laundry soap has been dissolved; 1 gal. kerosene oil is then mixed with 1 gal. slightly sour milk. These two solutions are then mixed and thoroughly agitated, and when cold, 6 oz. oil of citronella are stirred in. This forms a stock solution and is used in spraying in the proportion of 1 part to 2 parts water. The spray should be applied each morning, by means of a hand garden sprayer, and in this way a herd of 30 cows may be treated in less than half an hour.

JOHNSTON (T. H.) & BANCROFT (M. J.). **Tick-resistance of Cattle.**—*Agric. Gaz. N.S.W., Sydney*, xxix, no. 5, 2nd May 1918, pp. 319–320. [Received 29th July 1918.]

Owing to the fact that for several years past animals resistant to the attacks of the cattle tick, *Margaropus* (*Boophilus*) *australis*, have been found to occur in very many herds in New South Wales, investigations on the tick resistance of cattle are now being conducted. Such resistant individuals, though never dipped, sprayed, or treated in any way, and though running in infested paddocks, remain practically free from ticks; and the possibility of spreading this peculiarity is the aim of the present investigation.

Authentic observations are consequently desired from dairy-farmers and cattle-raisers on the following points:—The particular breed of these animals; the length and texture of the hair; the colour, texture and oiliness of the skin; the general condition and stamina of the animals; the length of time they have been resistant, whether from birth, or from a subsequent date of acquisition; whether this peculiarity has been transmitted to their progeny; the nature of the country where such animals are running; the influence (if any) of food; the effect (if any) of dipping upon such resistant animals; whether the exudate or so-called serum found on certain tick-resistant cows has ever been noticed on these cattle.

TEODORO (G.). **Il Ciclo di Sviluppo dell' *akamushi* secondo le recenti Ricerche dei Giapponesi Miyajima e Okumura.** [The Developmental Cycle of *Trombidium akamushi* according to the recent Researches of the Japanese Investigators, Miyashima and Okumura.]—*Redia, Florence*, xiii, no. 1–2, 23rd July 1918, pp. 105–114.

Notices have already been given [see this *Review*, Ser. B, v, p. 160 and vi, p. 21] of previous papers by these Japanese authors. In the larval stage *Trombidium akamushi* lives on man, on the field mouse, *Microtus montebelli*, and on other small mammals, such as the monkey, dog, cat, rabbit and guinea-pig; unlike many other allied mites it does not attack insects or spiders. The larva remains on its host for 3 or 4 days and migrates underground when engorged. In warm climates metamorphosis takes 5 or 6 days. The nymph is neither a parasite nor a blood-sucker, but feeds on vegetable juices, acid juices being disliked. A certain degree of humidity is essential for development. The adult does not differ materially from the nymph, but visible sexual characters only appear when full growth and maturity are reached. The adult also feeds on the juices of plants, such as *Imperata arundinacea* and *Artemisia vulgaris*.

A description is given of the various developmental stages and their morphological characteristics. The eggs are laid singly in the sand and the larva hatches out in 3 weeks—at least this was the case in September when the observations were made. The larva closely resembles *Leptus autumnalis*, Shaw. To demonstrate the transmission of Japanese river fever 28 larvae were placed on a monkey, on which they remained for 4 days. Only 2 of the 28 bites produced small ulcers. On the seventh day the monkey began to show symptoms typical of the fever. After the seventeenth day the condition of the animal improved rapidly. The Japanese authors believe that *T. akamushi* is so closely related to *Leptus autumnalis* that it should be placed in the latter genus.

In the second part of this paper the Italian author reviews the instances where Acari, especially Ixodids, are known to transmit disease ; references to existing literature are given in each case.

PAOLI (G.). *Ixodes loricatus*, **Neumann, e** *Ixodes coxaefurcatus*, **Neumann.**—*Redia, Florence*, xiii, no. 1–2, 23rd July 1918, pp. 193–196, 7 figs.

After studying some examples of *Ixodes* from Argentina, the author has come to the conclusion that *Ixodes coxaefurcatus* and *I. loricatus* are identical, the latter name having priority.

WARBURTON (C.). **Annual Report for 1917 of the Zoologist.**—*Jl. R. Agric. Soc. England, London*, lxxviii, 1917, pp. 217–218. [Received 7th August 1918.]

The treatment for cattle attacked by warble-flies [*Hypoderma*] recommended by Mr. R. Stratton, consists in the injection of a few drops of paraffin into the warble holes, by which means the grub is said to be killed and quickly absorbed, without pain to the animal. Stress is laid on the uselessness of the troublesome and expensive custom of smearing cattle as a preventive against these flies.

Army veterinary surgeons report the attacks in horses of a warble-fly which causes swellings similar to those in cattle, but occurring in different parts of the body, chiefly about the withers and in places where the galling of the harness increases their painfulness. Though probably a true *Hypoderma*, very little is known about it, and at present it is obviously impossible to keep infested horses idle, so that its life-history may be worked out, all animals being returned to work as rapidly as possible.

WARD (H. B.). **The Value of Zoology to Humanity.**—*Science, Lancaster, Pa.*, xlvii, no. 1213, 29th March 1918, pp. 302–306.

Researches in the field of protozoal diseases transmitted by insects have resulted in the adoption of communal and individual habits that have freed the world from the menace of malaria, a disease that in all ages has exacted a heavy toll from the great nations, and which, at a very recent date, claimed 200,000 victims annually in Italy alone.

The demonstration of the rôle of the mosquito in transmitting yellow fever rendered possible the building of the Panama canal, while the discoveries of the insects inoculating and spreading sleeping sickness and bubonic plague have led to the formulation of measures of control for two diseases, the former of which had annually claimed very numerous victims in Africa, and the latter more than 1,000,000 in India in the course of six months.

Guarding Soldiers' Camps against Flies and Mosquitos.—*Science, Lancaster, Pa.*, xlviii, no. 1229, 19th July 1918, pp. 63–64.

In order to protect troops stationed in camps and cantonments from mosquito- and fly-borne diseases, there have been assigned to each camp a divisional surgeon, sanitary inspector and sanitary engineer, together with a staff of from 100-200 enlisted men, whose duty is to clear up all mosquito breeding places by the usual draining, ditching and oiling methods, the Federal Public Health Service carrying out a similar programme for a distance of one mile around all camps.

To prevent the breeding of flies, all buildings in which food is prepared and stored are screened, more than 22,700,000 sq. ft. of screening having been used for this purpose. The entrances of such buildings have also been vestibuled, while the number of fly-traps in use is 6,000.

MOORE (W.). **Methods of Control of the Clothes Louse** (*Pediculus humanus* [*vestimenti*]).—*Jl. Lab. & Clin. Med.*, [*sine loco*], iii, no. 5, 1918, pp. 261–268. (Abstract in *U.S. Dept. Agric. Expt. Sta. Record, Washington, D.C.*, xxxviii, no. 8, June 1918, p. 765.)

Investigations show that sachets of naphthaline, camphor, sulphur, paradichlorbenzene and various other chemicals are not successful in eliminating *Pediculus humanus* (body louse). A powder that is said to be six times as effective for this purpose as the well-known N.C.I. powder consists of 20 gm. talc, 1 cc. creosote, 5 gm. sulphur. This is a dry powder, easy of application and is not irritating. Impregnation of underwear does not appear promising, but a cheesecloth suit impregnated with saturated solution of sulphur in creosote could be successfully worn outside the underwear. Chlorpicrin can be used as a fumigant, penetrating the clothing and killing the lice in all parts of the clothing in 15 minutes and the eggs in 30 minutes. By increasing the heat in the fumigation chamber, the time required to kill the eggs could be reduced.

TOWNSEND (C. H. T.). **Note on Oviposition of** *Gastrophilus nasalis*, **L.**—*Canadian Entomologist, London, Ont.*, l, no. 7, July 1918, pp. 246–248.

This note states that *Gastrophilus nasalis*, L., does not deposit its eggs in the region of the throat of the horse, as has been previously asserted, but hovers directly under the animal's throat and then darts suddenly at the muzzle, where the eggs have been found in the skin of the upper lip.

LUDLOW (C. S.). *Trichoprosopon*, **Theobald (Diptera; Culicidae).**—*Psyche, Boston, Mass.*, xxv, no. 3, June 1918, pp. 66–68.

This paper describes *Trichoprosopon wilsoni*, sp. n., from the Panama Canal Zone. It is closely allied to *T. nivipes*, Theo., and may possibly be identical with *T.* (*Culex*) *digitatus*, Rond. This species is markedly cannibalistic, the larvae eating not only those of other mosquitos, but even the smaller members of their own species.

Walden (B. H.). **Mosquito Work in Connecticut during 1917.**—*17th Rept. Connecticut State Entomologist for 1917, Conn. Agric. Expt. Sta., New Haven,* Bull. no. 203, 1918, pp. 345–356, 2 plates. [Received 20th August 1918.]

The State law of 1915 providing for the elimination of mosquito breeding places [see this *Review*, Ser. B, iv, p. 95] has been amended by an Act passed in 1917, which is given verbatim. The new law provides for a more adequate method of notifying property owners regarding the ditching of their marshes, and provides for assessing benefits and damages in case the owners wish to apply to the Courts. The measure carries an appropriation of £1,000 towards the cost of new work done under this law. The maintenance of the work is placed under the Director of the Experiment Station instead of under the towns as hitherto. Particulars are given of ditching and drainage operations in various localities in the State.

Feytaud (J.). **Sur la Présence des Moustiques dans la Ville de Bordeaux.**—*Procès-Verb. Soc. Linn., Bordeaux,* lxx, no. 2, July-December 1917, pp. 63–66. [Received 3rd September 1918.]

The danger of malaria due to the presence of *Anopheles maculipennis*, Mg., and *A. bifurcatus*, L., is particularly great in a town like Bordeaux where the buildings are scattered and cover an area large in proportion to the population. The existence of public and private gardens with their numberless potential breeding places renders antimalarial measures, other than those undertaken by the community as a whole, ineffectual, while the necessity for these, undertaken either voluntarily or compulsorily, is imperative.

Zammit (T.). **Rats and Parasites in Plague Epidemics.**—*Archivum Melitense, Valletta,* iii, no. 3–4, March-May 1918, pp. 141-143. [Received 10th September 1918.]

Laboratory observations on rats, made during a small outbreak of plague in Malta in 1917, showed the most numerous species to be *Mus norvegicus* (sewer rat), taken chiefly in the neighbourhood of the grand harbour. Other species were *M. rattus* (black rat), of more recent introduction and found also on the shore, and the variety *M. rattus alexandrinus*, which is fairly common in the island.

The fleas associated with these proved to be :—*Xenopsylla cheopis* 60, *Ctenopsylla musculi* 38, *Ceratophyllus fasciatus* 3, and *Ctenocephalus* 1, out of 102 fleas taken from *M. rattus*; while 180 taken from *M. decumanus* consisted of *X. cheopis* 118, *Ctenopsylla musculi* 49, *Ceratophyllus fasciatus* 3, and *Ctenocephalus* 10.

Several mites were found on the rats, the most common being *Laelaps echidninus*, which however does not bite man.

VOGEL (R.). **Bemerkungen über das Vorkommen von Anophelesmücken in Pferdestallen und über die Vertilgung von Anopheleslarven.** [Remarks on the Occurrence of *Anopheles* in Stables and on the Extermination of their Larvae.]—*Münchener Med. Wochenschr., Munich*, lxiv, no. 46, 13th November 1917, p. 1509.

It has been recently stated that whilst Anophelines are found in cowsheds, they avoid stables. The author has however often found them in stables on part of the Western Front. They were always present in dark unclean stables where there were many wooden beams. In a small area, with a radius of about 400 yards, infestation had arisen owing to the presence of numerous fire buckets, which proved excellent breeding places. By covering the water with a layer of Saprol all the larvae were killed and further oviposition was prevented.

DOFLEIN (F.). **Ueber mazedonische Anophelinen und ihre Bedeutung für die Verbreitung der Malaria.** [Macedonian Anophelines and their Rôle in the Spread of Malaria.] — *Münchener Med. Wochenschr., Munich*, lxv, no. 1, 1st January 1918, pp. 17–18.

Owing to the mountainous character of the country Anophelines are found throughout the warm weather in Macedonia, since water is found in the hills when all pools lower down have dried up. *Anopheles maculipennis*, Mg., occurs everywhere, and *A. palestinensis*, Theo. (*superpictus*, Gr.) is very abundant in certain regions, especially in the Vardar valley. The former is the commoner and the usual malaria carrier. *A. palestinensis* breeds not only in pools and rain tanks, but also in streams, and the larvae are found both in running water and still pools.

It is probable that all European species of Anophelines occur in the Balkans. In Rumania *A. maculipennis*, *A. sinensis* var. *pseudopictus* and *A. bifurcatus* have been found.

SIKORA (H.). **Zur Kleiderlaus-Kopflausfrage.** [The Body- and Head-Louse Question.] — *Arch. f. Schiffs- u. Tropen-Hygiene, Leipzig*, xxi, no. 16, September 1917, pp. 275–284, 3 figs.

Careful measurements of head- and body-lice of different strains were made in order to ascertain the morphological differences between these two species. The average dimensions of *Pediculus capitis* are smaller than those of *P. humanus* (*vestimenti*). Furthermore there are differences in the shape of the abdomen and in the colouring, and in the formation of the femora, tibiae and tarsi of the first pair of legs in the males.

Normal head-lice, bred on the human arm, showed after the fourth and fifth generations the morphological peculiarities and average dimensions of the body-louse. It is difficult to say why lice living on the head should become smaller, but it may possibly be due to slight differences in the character of smooth and hairy skin which affects nutrition, or to differences in temperature. The author does not believe it possible to find long-haired persons infested with body-lice, who are free from head-lice.

Espinosa-Tamayo (L.). **Ueber die pathologische Geographie von Ekuador.** [The Pathological Geography of Ecuador.]—*Arch. f. Schiffs- u. Tropen-Hygiene, Leipzig*, xxi, no. 17, September 1917, pp. 285–291.

This paper briefly summarises the results of a study of the distribution of disease in Ecuador. The first section deals with diseases due to insect parasites. In the damp coast regions *Stegomyia fasciata*, the yellow fever mosquito, and *Anopheles* (*Cellia*) *albimanus*, Wied., a malaria carrier, are abundant: they are not found elsewhere. *Dermatophilus* (*Sarcopsylla*) *penetrans*, L., is very common on the coast, while other fleas are found both there and in the Andean regions. The human flea, *Pulex irritans*, the rat fleas, *P. dugesi*, Baker, and *Xenopsylla cheopis*, Roths., and the dog flea, *Ctenocephalus canis* (*serraticeps*, Gerv.), were among the specimens sent from Guayaquil. Among the Rhynchota was a species of *Triatoma* (*Conorhinus*). *Cimex hemiptera* (*rotundatus*, Sign.) is common in ill-kept houses in Ecuador. Lice are to be met with everywhere and constitute a real plague. Specimens of *Pediculus humanus* and *P. capitis* were received. The latter were dark brown when taken from Indians and light brown when from Europeans. *Phthirius pubis* also occurs in all parts of the country. Ticks are very common on the coast. Some specimens received were determined by Nuttall as *Amblyomma cajennense*, *A. maculatum* and *Dermacentor nitens*.

Pielsticker (F.). **Die Malaria in Rumänien und ihre Bekämpfung bis zum Jahre 1916.** [Malaria in Rumania and Anti-malarial Measures up to 1916.]—*Arch. f. Schiffs- u. Tropen-Hygiene, Leipzig*, xxi, no. 19, October 1917, pp. 317–329, 1 sketch map.

This paper is compiled from Rumanian records for the twelve years ending 1916. The whole country has been malarious for centuries. The mountainous districts are not very much affected, while the region between the Sereth and Pruth suffers most, and the Danube districts and Dobrudja nearly as much. The mortality is decidedly less than that in Italy and this is due to the predominance of the benign tertian form, though quartan and malignant tertian also occur. In Wallachia fresh cases appear about mid-June and three weeks later in northern Moldavia. The carriers are *Anopheles maculipennis* and *A. sinensis* var. *pseudopictus*, the former predominating. Measures against malaria were first planned in 1894, but have remained a dead letter. Prophylactic quinine is said to have given excellent results.

Brack (—). **Pappatacimücken und Pappatacierkrankungen.** [Sand-flies and Sand-fly Fever.]—*Arch. f. Schiffs- u. Tropen-Hygiene, Leipzig*, xxi, no. 23–24, December 1917, pp. 381–398.

The observations recorded here were made on the Turkish coast. The author believes wind to be an important factor in the prevalence of sand-flies [*Phlebotomus*]. When strong winds blow on the coast, very few are to be seen, and they are also absent in high situations, none being found for weeks on a 600-foot height on the coast nor on a much lower hill, partly rising out of the sea. Other observers have found *Phlebotomus* at altitudes of 3,000 feet, and the explanation of their absence in this case appears to lie in the continual winds, for sand-flies abounded in a neighbouring valley. These pests dislike tobacco smoke and the Turkish habit of cigarette smoking is an excellent means of repelling them. A fine-mesh net also affords real protection.

The floors of buildings should be of concrete, and doors and windows must be screened with fine gauze. The air should be in constant motion and ventilators must therefore be fitted where necessary.

The paper concludes with a note that in the fever season several horses were attacked with a fever which lasted two days.

Mense (C.). **Handbuch der Tropenkrankheiten.** [Handbook of Tropical Diseases.]—*Leipzig,* Joh. Ambros. Barth, 1917, 2nd Edition, vol. v, 1st Half. Price *M.*32. [Review in *Arch. f. Schiffs- u. Tropen-Hygiene, Leipzig,* xxi, no. 22–24, December 1917, p. 404.]

In this first half of Vol. V of Mense's Handbook, H. Ziemann treats of malaria in detail. The book contains 500 pages, numerous coloured plates and text-figures and is said to be quite up to date.

de Raadt (O. L. E.). **Trockene Hitze als Mittel zur Abtötung von Rattenflöhen.** [Dry Heat as a Means for killing Rat Fleas.]—*Arch. f. Schiffs- u. Tropen-Hygiene, Leipzig,* xxii, no. 1, January 1918, pp. 1–3.

Rat fleas are very susceptible to heat, and this was confirmed by experiments which the author made at Malang, Dutch East Indies. *Xenopsylla cheopis* is killed in 15 minutes by dry heat at 50° C. [122 F.]. If the fleas are hidden in natural shelters, heating must be continued for not less than 45 minutes. This is necessary because evaporation from the skin of the rat considerably lowers the temperature round the flea. For anti-plague work the author advises the use of dry heat to kill fleas on rats that have succumbed to fumigation with carbon monoxide.

Regendanz (P.). **Beitrag zur Kenntnis der Malaria in Rumänien.** [A Contribution to the Knowledge of Malaria in Rumania.]—*Arch. f. Schiffs- u. Tropen-Hygiene, Leipzig,* xxii, no. 3, February 1918, pp. 33–40.

After the German army of occupation had taken up its quarters in Rumania early measures were adopted against the probable outbreak of malaria in summer. This paper records the observations made in connection with them and describes the occurrence of malaria on the lower reaches of the Sereth river. In this region, and also between it and the mountains, tertian malaria is endemic. The only Anopheline found was *Anopheles maculipennis.* It is not abundant in this region; but is more frequently met with near and on the Sereth. The temperature needed for the plasmodia to develop in the mosquito was reached at the end of June, when the day temperature was usually over 25° C. [76° F.] and the night temperature only exceptionally fell below 16° C. [61° F.]

VON SCHMIDT ZU WELLENBURG (H.). **Dipteren-Larve als Ursache eitriger Chorioretinitis mit Netzhautablösung.** [A Dipterous Larva as the Cause of suppurating Chorioretinitis with Loosening of the Retina.]—*Zentralblatt f. prakt. Augenheilkunde*, January-February 1917. [Abstract in *Arch. f. Schiffs- u. Tropen-Hygiene, Leipzig*, xxii, no. 3, February 1918, p. 45.]

Inflammation of the eye in a 5-year-old child due to a first-stage *Hypoderma* larva in a fold of the retina is recorded.

ROTH (O.). **Zur Kenntnis der Dermatomyiasis.** [A Contribution to the Knowledge of Dermatomyiasis.]—*Dermat. Wochenschr.*, lxv, no. 46, 17th November 1917, pp. 1031–1035, 2 figs. [Abstract in *Trop. Dis. Bull., London*, xi, no. 6, 15th June 1918, p. 397.]

This is a report of a case of a man being attacked by the larvae of *Lucilia caesar*, a fly that frequently lays its eggs on the bodies of dead animals, but very seldom on living human beings. The patient had for three weeks slept on the bare ground in a wood. Over a hundred larvae were removed with forceps from the genital area; in some cases they were found buried entirely under the skin. Larvae removed from the patient were found to have the stomach and intestines filled with fresh blood.

CHALMERS (A. J.) & KING (H. H.). **Blister Beetles as a Public Nuisance.**—*New Orleans Med. & Surg. Jl., New Orleans*, lxx, no. 5, November 1917, pp. 445–455, 6 figs.

This paper describes an epidemic of eruptions on the skin that occurred in Khartoum in August 1916, and was caused by the Cantharid beetles, *Epicauta sapphirina*, Maeklin, and *E. tomentosa*, Maeklin. A third species, *Mylabris nubica*, de Marseul, was present at this time, but was so rare that its share in the epidemic must have been negligible. Europeans were those chiefly affected; there were also some cases among Egyptians, but none among natives of the Sudan. The best treatment was to prick the blister and apply a dressing of 1 in 80 carbolic acid, though in the majority of the victims the lesions were allowed to heal untreated. It is only in August that these beetles are seen in Khartoum, as this is their breeding season.

HATA (H.). **Plague Dissemination through the Agency of Fleas.**—*Saikingaku Zasshi* (*Jl. Bacteriol.*), no. 257, 10th February 1917, pp. 131–148. [Abstract in *China Med. Jl., Shanghai*, xxxii, no. 1, January 1918, p. 51.]

The idea that plague is perpetuated by rats eating the carcases of other individuals that have died of the disease would presuppose a larger percentage of mesenteric gland infection in rats than has been found in the author's experience. The results of examinations in Hyogo Province, Japan, lead to the conclusion that the infection must have reached the glands through the skin and not through the intestines, thus strengthening the view that it was conveyed by fleas rather than by anything the rat had eaten.

Koizumi (T.), Yamaguchi (K.) & Tonomura (K.). **A Study of Dengue Fever. Part 2.**—*Taiwan Igakukai Zasshi* [*Jl. Formosa Med. Soc.*], no. 177, 28th July 1917, pp. 432–463. [Abstract in *China Med. Jl., Shanghai,* xxxii, no. 4, July 1918, pp. 357–359.]

As regards the mosquito transmission of dengue, Kojima and Akagi reported in the negative after experimenting with *Taeniorhynchus* (*Mansonia*) *uniformis* and *Armigeres* (*Desvoidya*) *obturbans* on ten patients and obtaining only one positive result. The present authors used *Stegomyia albopicta* (*scutellaris*), which bites chiefly in the evening, *Culex fatigans*, *C. impellens*, *Armigeres obturbans*, which is seldom found in villages, and *Taeniorhynchus uniformis* (which is also rare near human habitations). Seven experiments were made and positive results were obtained with *S. albopicta* in one of two experiments with this species, and with *A. obturbans.* All the experiments were open to the objection that the volunteers were not under observation in confinement for a sufficient time before the work began, and while the mosquito theory is thus strengthened, so far as mechanical transmission is concerned, it is not absolutely proved.

Gill (Major C. A.). **Report on Malaria in Amritsar, together with a Study of Endemic and Epidemic Malaria, and an Account of the Measures necessary for their Control.**—Supt. Govt. Printing, Punjab, *Lahore,* 1917, ii + 98 + vii pp., 4 maps, 8 charts. Price *Rs.* 3.

This report on the malaria survey carried out from December 1913 to October 1914 in Amritsar and its immediate environs gives a detailed account of the survey and illustrates the numerous factors requiring study before a useful application of the general principles of malaria prevention can be made.

The local history of malaria is reviewed for 44 years. The Anopheline mosquitos found were *Anopheles culicifacies,* perhaps the most important malaria carrier in the Punjab and found in spring and autumn, but relatively rare; *A. fuliginosus,* most common in spring, but met with throughout the year and the only one found in winter; *A. stephensi,* fairly numerous in spring and autumn; *A. listoni*; *A. rossi*; *A. pulcherrimus*; and *A. nigerrimus.* The first four are known carriers of malaria, while the part played by *A. rossi* has yet to be determined. This last occurs essentially in autumn, at which season it is the largely predominant species; its breeding-places include almost every water collection in Amritsar. These species are the ones usually met with in the Punjab plains in contra-distinction to certain others, such as *A. maculatus* and *A. willmori,* the geographical distribution of which is limited for the most part to the immediate vicinity of the water-courses in the submontane hill tracts of the Punjab. Watson has suggested that the great epidemics of malaria may be due to the migration of the hill species to the plains, but the combined observations of Christophers and the author have failed to discover a single specimen of the hill species in Amritsar, where they are ill-adapted to live. No observations however have yet been made at the time of an epidemic.

The Culicines captured in the course of the investigations included *Culex fatigans*, *C. pipiens*, *C. concolor*, *Stegomyia fasciata* (*calopus*), *S. albopicta* (*scutellaris*), *S. thomsoni*, *Armigeres* (*Desvoidya*) *obturbans*, and *Chrysoconops pygmaeus*.

The seasonal prevalence of Anophelines in the Punjab is now well known and is dealt with very briefly. With regard to the periods of relatively increased prevalence in Amritsar in the spring and autumn, it is pointed out that the spring rise is much less marked than the autumn one, which is also longer sustained. The monthly incidence of deaths from fever shows a considerable correlation with the occurrence of Anophelines. Breeding-places in and around Amritsar are extraordinarily plentiful. Temporary collections of rain water and puddles contained *A. fuliginosus* in spring and *A. rossi* in autumn, in which latter season the shallow open rain-water pools harboured *A. culicifacies*, found in spring in permanent waters only. The usual permanent breeding-places were ponds with shallow grassy and weedy edges, storm-water channels, and irrigation channels after the flow of water has been cut off. Well-filled reservoirs with walls of masonry used for washing and shallow wells in constant use did not harbour larvae to any extent, the former probably on account of the presence of soap and other materials. *A. rossi* was least affected by organic pollution, while *A. culicifacies* preferred water of a fair degree of purity. *A. culicifacies* was not found breeding in wells, whereas *A. rossi*, *A. stephensi* and *A. fuliginosus* were found there as well as in the other permanent waters.

A systematic search for adult mosquitos was made in houses, mostly uninhabited, stables and cowsheds. In June 1914 the result was completely negative, but observations made in November 1913, April and September 1914, agreed roughly with the larval survey. In April 1914 *A. fuliginosus* was abundant in parts of the civil station. In one cowshed over 200, all females, were taken in about half an hour, though no breeding place was discovered at that time. In the autumn adults of *A. rossi* everywhere predominated, but *A. stephensi*, *A. fuliginosus* and *A. culicifacies* were captured in fair numbers, with a few *A. pulcherrimus*.

The last part of the report deals with the prevention of malaria. The local application of drainage, control of irrigation, water supply, treatment of breeding-places, screening and quinine administration are considered. Stress is laid on the fact that attention to the elementary principles of domestic hygiene and urban sanitation is an anti-malarial measure of considerable importance.

Bentley (C. A.). **Experimental Anti-Malarial Measures.**—*Tenth Triennial Report on Vaccination in Bengal for the Years 1914–15, 1915–16 and 1916–17*, *Calcutta*, The Bengal Secretariat Book Depot, 1917. Price 9 *annas* or 10*d*. [Abstract in *Trop. Dis. Bull.*, *London*, xi, no. 5, 15th May 1918, pp. 376–377.]

In the Bengal Presidency a beginning has been made with three out of four schemes designed by the author as experiments in anti-malarial operations. In two of the schemes the silt-laden waters of certain rivers are to be taken in during the floods so as to reduce areas of mosquito breeding edges by converting a large number of small pools into a big sheet of water, the silt also enriching the agricultural land. The third experiment is to be made at a tea estate in the submontane region and is based on a system of subsoil drainage that has been successful in Panama and the Federated Malay States. A fourth experiment will be carried out in the rolling upland country that covers a large area in West Bengal. It consists in a thorough surface drainage of the experimental area and in the periodical flushing of a small river in which malaria-carrying mosquitos breed.

VERDUN (P.) & FEYTAUD (J.). **Organisation pratique de la Lutte contre les Moustiques.** [Practical Organisation of Mosquito Control Measures.]—*Bull. Soc. Etude Vulg. Zool. Agric., Bordeaux*, xvii, no. 8, August 1918, pp. 86–89.

This paper describes the habits of Culicine and Anopheline mosquitos and discusses the various remedial measures with regard to their suitability for different types of breeding-places.

Travaux et Résultats de la Mission antipaludique à l'Armée d'Orient. [Work undertaken and Results achieved by the Antimalarial Mission to the Balkan Armies.]—*Bull. Soc. Path. Exot., Paris*, xi, no. 6, 12th June 1918, pp. 456–469, 1 map.

The mission undertaken as the result of the joint action of the Under Secretary of State of the French Public Health Service and the Pasteur Institute, in agreement with the military command and the medical authorities of the French Balkan army, aimed at removing some of the causes to which were due the numerous and severe cases of malaria that broke out in the Balkan armies in 1916. The chief of these was the ignorance on the part of officers, men and even doctors of the need for instituting anti-malarial measures against both the mosquito and the blood parasite.

The mission, the headquarters of which was at Salonica, divided the whole district into sections of varying size, according to the density of the military population, one doctor, or more, being assigned to each section. The first step was to establish the splenic indices of the localities occupied or traversed by the troops of the Allies, and following this, the usual anti-malarial measures were instituted. These were :—The elimination of ponds by filling in or by drainage ; the maintenance of a steady current in waterways by removing with a sickle or spade the vegetation growing on the banks and in the bed, or by making the banks steeper and the bed of the stream smoother ; the deflection of mosquito-breeding streams either permanently, by means of canals, or temporarily [see this *Review*, Ser. B, v, p. 190] ; the oiling of stagnant water ; the protection of the troops from the attacks of the adult mosquito by the use of gauze screening and mosquito nets, and from the effects of the virus by a system of quininisation ; and, finally, propaganda work among the natives.

The results of this work may be summarised in the statement, that for every 60 cases of primary malaria in 1916, there were only 7 in 1917.

Blanc (G.) & Heckenroth (F.). **Répartition du Paludisme dans la Région de Koritza (Basse Albanie). Carte des Indices spléniques.** [Distribution of Malaria in the Region of Koritza (Lower Albania). Splenic Index Map.]—*Bull. Soc. Path. Exot., Paris*, xi, no. 6, 12th June 1918, pp. 470–483, 1 map.

An investigation into the distribution of malaria in the Koritza region of lower Albania, undertaken between June and September 1917, showed that this locality is highly malarial, the centre of infection lying around Lake Malik. On the plains, the percentage of infection falls in proportion to the distance from the lake, becoming very small in the mountain villages. Lakes Ochrida and Presba being deep, and without marshy surroundings, have little influence on the malarial index of their basins, the variations met with in the river-side villages being dependent on local conditions created by the water-courses themselves.

A consideration of the Anopheline fauna, taken in conjunction with the plasmodial form met with, leads to the conclusion that the type of malaria existing in the Koritza region is that characteristic of a temperate climate.

Delamare (G.) & Robin (—). **Carte du Paludisme des Confins albano-macédoniens.** [Map of Malarial Distribution on the Albano-Macedonian Frontier.]—*Bull. Soc. Path. Exot., Paris*, xi, no. 6, 12th June 1918, pp. 483–503, 1 map.

The whole region of the Macedonian frontier is only slightly malarial, with the exception of the valley of the Presba lakes. Here the endemic index is relatively high, some severe cases of enlarged spleen occur, adult Anophelines and cases of primary malaria are numerous, and a large expanse of water and considerable marshes exist; in the other valleys Anophelines are few or absent, cases of primary malaria are scarce and the water area is at a minimum.

Cases where the low endemic index is associated with the existence of numerous breeding places and the presence of Anopheline larvae, are doubtless explained by climatic conditions, chiefly cold at night, which is unfavourable to the development both of mosquitos and of the malaria parasite.

Martin (L.). **Aperçu technique sur les Travaux antilarvaires à exécuter sur le Terrain.** [A Technical Review of the proposed Anti-larval Operations in Macedonia.]—*Bull. Soc. Path. Exot., Paris*, xi, no. 6, 12th June 1918, pp. 503–516, 15 figs.

This paper gives technical and practical advice on the subject of the control of mosquito larvae. The beds of rivers, if sandy, must be kept free from bushes likely to form islets, and from stakes and bridges that cause patches of stagnant water in the midst of the current. The banks, especially after rain, must be kept free from pools, either by filling-in or by drainage into the river at a point lower down, by means of open ditches. Trees bordering rivers should be cut down, and useless vegetation burned. A measure, based on the fact that the mosquito is a nocturnal insect, can be adopted when the river banks are almost vertical and easily accessible. Holes about

2 ft. deep and about 8 ins. wide are cut horizontally into the banks, in which the mosquitos shelter from the wind during the day, when they may be easily destroyed by inserting a torch of flaming straw. In cases where rivers are bordered by dense thickets of tall weeds and brushwood, beneath which pools of stagnant water lie hidden, pathways should be cut through the undergrowth to allow of oiling these dangerous spots.

In the case of streams it is often necessary to construct dams to provide drinking ponds and washing pools. When the nature of the ground will allow of it, the banks should be straightened and the bed of the stream cleared of vegetation. Stony torrent-beds should be channelled in summer time when they are nearly dry, a narrow cutting, 6–12 inches deep, being made at the lowest level of the bed, and bordered with stones. Similarly a stream may be deflected into a channel at a lower level, a method simpler than that of straightening its own bed.

Mill streams, when badly kept, cause sheets of stagnant water to form at the lowest level as the result of infiltration. Remedies suggested for this are: reinforcing the bed of the canal (which must previously have been run dry) with clay well stamped and rolled in after each addition; the heightening of the banks; the lowering of the bed; the widening of the bed if possible, thus diminishing the depth of flow and reducing erosion; and the planting of vegetable gardens, which are frequently able to absorb much surface-water.

Useful stagnant waters can be treated in various ways. Wells should be provided with covers, either solid or formed of a framework covered with fine metallic gauze, such covers to be raised only during the drawing of water. The ground surrounding wells should slope downwards by at least as much as one inch in the yard, to allow spilt water to drain away; or a mosaic-like pavement of pebbles or stones should be made round the well. Irrigation waters are best rendered harmless by the periodic alternation method [see this *Review*, Ser. B, v, p. 190]. The borders of drinking ponds should be kept well-trimmed, the beds free from vegetation, and a metalled-road approach should be maintained, these precautions being doubly necessary since oiling is an impossibility.

Useless stagnant waters, such as those caused by the feet of animals, and also those of greater extent, should be filled in. In some ponds stagnation is due to the accumulation of sediment at the bottom, or to the presence of a thin layer of clay, the remedy being to perforate the bed of the pond by a crow-bar or by dynamite to allow the water to permeate into the subsoil, the aperture being covered with loose stones to maintain percolation. Cess-pools made of stones and about 5 to 6 feet deep and 3 feet in diameter have proved of great utility in the country, in the courtyards of houses, as receptacles for the waste household liquids. The best treatment for surface waters is the suppression of the initial cause of the inundation, and, failing this, drainage by means of open drains. Cultivation methods also yield good results, crops such as oats and maize being grown on the ridges separating the water-filled furrows.

Technical instructions for the making of open ditches and faggot drains, formulae for calculating the rate of flow of currents, and instructions for levelling, conclude this useful paper.

Bussière (F.). **Paludisme et Drainage.** [Malaria and Drainage.]—*Bull. Soc. Path. Exot., Paris,* xi, no. 6, June 1918, pp. 517–530, 12 figs.

This paper describes in detail certain drainage operations carried out under the direction of the anti-malarial mission. These were begun during the second half of July and completed by the end of October, and had for their aim the amelioration of malarial conditions in the region occupied by the troops.

The immediate benefits derived from these operations were :—The maintenance of the great Rudnick Marsh at its low-water level, involving the reclamation of about 2,500 acres ; the elimination of a small marsh of about 10 acres, by utilising the land for the raising of garden vegetables for the use of the troops ; the filling-in of a marshy stream about $3\frac{1}{8}$ miles long, and its replacement by a rapid-flowing canal, thus destroying an important centre of malarial infection.

Laveran (A.). **Boutons d'Orient experimentaux chez un Chimpanzé.** [Oriental Sore experimentally produced in a Chimpanzee.]—*Bull. Soc. Path. Exot., Paris,* xi, no. 7, 10th July 1918, pp. 561–562.

A chimpanzee, inoculated with *Leishmania tropica* from a mouse, showed typical examples of Oriental sore at the points of inoculation. A second inoculation, made after recovery from the effects of the first, produced the malady in a markedly less degree, showing that the animal had acquired a certain degree of immunity since the first inoculation.

Sergent (Edm. & Et.), Foley (H.) & Lhéritier (A.). **De la Mortalité dans le Debab, Trypanosomiase des Dromadaires.** [Mortality from Debab, the Trypanosomiasis of Dromedaries.]—*Bull. Soc. Path. Exot., Paris,* xi, no. 7, July 1918, pp. 568–570.

In two cases of natural infection that have been carefully followed, debab has proved fatal to dromedaries in the space of four months. A case of artificial infection by the inoculation of infected blood apparently recovered spontaneously in a year and a half. Debab diminishes the powers of resistance of infected dromedaries and renders them more susceptible to other infections and to the ill-effects of privation and overwork. In this respect the disease resembles malaria.

Chatton (E.). **Microfilaire du Chat domestique dans le Sud-Tunisien.** [Microfilaria of the domestic Cat in South Tunisia.]—*Bull. Soc. Path. Exot., Paris,* xi, no. 7, July 1918, pp. 571–573, 1 fig.

The author records the finding in 2 domestic cats, out of 26 examined, of microfilariae the identity of which cannot be definitely determined. The parasite seems closely allied to the filaria of the dog, *Dirofilaria immitis*, the existence of which in Tunisia has previously been recorded. This is, to the author's knowledge, only the second time that microfilariae have been discovered in the domestic cat.

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JOYEUX (C.). **Note sur les Culicides de Macédoine.** [Note on Macedonian Culicidae.]—*Bull. Soc. Path. Exot., Paris*, xi. no. 6, 12th June 1918, pp. 530–517, 33 figs.

The distribution of the Macedonian species of mosquitos determined from material collected in 1917 is as follows :—*Anopheles maculipennis*, Mg., very common everywhere, being practically the only species captured in houses, tents, and military works such as dug-outs ; *A. bifurcatus*, L., a species usually difficult to find, though it becomes more prevalent in certain places and at certain times ; *A.* (*Pyretophorus*) *palestinensis*, Theo., widely but irregularly distributed, its larvae co-existing with those of *A. maculipennis*, *Culex pipiens* and *Ochlerotatus dorsalis* in rivulets with clear water and herbaceous vegetation ; *A.* (*Myzorhynchus*) *sinensis*, Wied., var *pseudopictus*, Grassi, fairly common in lower Macedonia, its larvae co-existing with those above-mentioned ; *Stegomyia fasciata*, F. (*calopus*, Mg.) ; *Ochlerotatus dorsalis*, Mg., the larvae of which are cannibals in their later stages and not particular in their choice of breeding-places, being found in clear streams containing vegetation in company with Anophelines and *Culex pipiens*, and on the other hand in pools of stagnant water in the vicinity of dung-heaps and filled with Eristalid larvae, the adults being found in houses together with *A. maculipennis* ; *Taeniorhynchus richiardii*, Fic. ; *Theobaldia longiareolata*, Mcq. (*spathipalpis*, Rond.), found in the valley of the Struma and the plain of Monastir ; *T. annulata* Schrank ; *Culex pipiens*, L., very common everywhere ; *C. hortensis*, Fic., rare ; *C. mimeticus*, Noé, rather rare and sometimes confused with *Anopheles palestinensis*, the larvae of the two species also co-existing ; and *Uranotaenia unguiculata*, Edw., the larvae of which occur with those of *A. maculipennis* and *C. pipiens* in clear weed-grown streams, and are cannibals.

The larvae of *U. unguiculata* and of *Ochlerotatus dorsalis* are described in detail.

The dissection of mosquitos from various regions of Macedonia discloses the fact that only about two per cent. are infective, a surprisingly small number when compared with that found in other countries, such as West Africa. The common occurrence of malaria in Macedonia is therefore explained by the fact that almost all the mosquitos found in enormous numbers in the houses are Anophelines.

FOLEY (H.). **A propos de la Larve d'*Anopheles chaudoyei*.** [Concerning the Larva of *Anopheles chaudoyei*.]—*Bull. Soc. Path. Exot., Paris*, xi, no. 7, 10th July 1918, pp. 549–550.

The author, referring to Langeron's description of the larva of *Anopheles chaudoyei*, which, it was suggested, might be merely a subspecies of *A. turkhudi* [see this *Review*, Ser. B, vi, p. 141] points out that *A.* (*Pyretophorus*) *chaudoyei* was recorded in 1908 as being probably the principal, if not the only, vector of malaria in the oases of the northern Sahara, the larval and nymphal forms being particularly adapted to the biological conditions of those regions. This species has on several occasions been the subject of biological studies. It

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is also pointed out that Langeron's description of the larvae from Tozeur coincides with the author's description of larvae from Beni-Ounif-de-Figuig and clearly differentiates this species from *A. turkhudi.*

BOUFFARD (G.). **Sur un Cas de Fièvre jaune à Porto-Novo.** [A Case of Yellow Fever at Porto-Novo.]—*Bull. Soc. Path. Exot., Paris,* xi, no. 7, 10th July 1918, pp. 553-557.

The history is recorded of a single case of yellow fever occurring in Dahomey in 1917, the patient being a European and the malady proving fatal. Stringent measures were at once taken to prevent the spread of the disease. The necessity is urged for a permanent campaign against yellow fever, which has undoubtedly been endemic in the Territories of the Bight of Benin for the last 15 years. The only way to prevent serious epidemics is an increasing warfare against the larvae of the insect vector, *Stegomyia* [*fasciata*]. In the principal centres of the Colony sanitary brigades are working constantly and have succeeded in diminishing the numbers of this mosquito until serious epidemics are no longer to be feared. Isolated cases cannot be avoided, but their spread can be prevented. In western Africa, where the temperature varies between 78° and 86° F., the aquatic life of the mosquito occupies about 10 days. It is wise therefore for the sanitary inspection of any particular settlement to be completed within a week. If the surveillance were relaxed, a few weeks would suffice to change completely the sanitary situation of a town that would be at the mercy of a single unnoticed or tardily recognised case of yellow fever.

VAN SACEGHEM (R.). **Cause étiologique et Traitement de la Dermite granuleuse.** [Etiological Cause and Treatment of Granular Dermatitis.]—*Bull. Soc. Path. Exot., Paris,* xi, no. 7, July 1918, pp. 575–578.

Recent experiments have confirmed the statement that the larvae of *Habronema muscae,* which in summer cause sores in horses, are carried by the house-fly, *Musca domestica* [see this *Review,* Ser. B, vi, p. 13]. The infection of *M. domestica* by the larvae of *H. muscae* can only take place during the larval stage of the house-fly. Larvae of *H. muscae* isolated from flies can live more than 12 hours when kept in a liquid medium. When placed on the hair or skin of the horse they die rapidly and seem quite incapable of piercing the skin; on any place where the skin is broken, however, or on the mucous membranes they at once become active and cause an irritation which results in the animal rubbing and increasing the wound and thus giving access to a greater number of parasites.

Prophylactic treatment consists in the control of *H. muscae* in the stomach of the horse, which is effected by doses of arsenic, given at the rate of 1 to 2 g. [*sic*] a day. The destruction of the larval stage of *H. muscae* is secured by frequent renewal of the bedding of horses and by burying the fresh dung daily in the fermenting manure-heap, in the manner advocated by Roubaud [see this *Review,* Ser. B, iii, p. 197]. In the heat generated by the manure-heap the larvae of

Spiroptera are killed, as well as the larvae of the flies that might be parasitised by them. The protection of these summer sores from flies is recommended during hot weather. The wound should be first carefully disinfected and then treated with a powder consisting of 100 parts plaster, 20 parts alum, 10 parts naphthaline, and 10 parts quinine, or any other bitter powder in sufficient quantity. Sores so treated should heal rapidly, provided that care be taken to renew the powder as long as any lesion remains.

M. Roubaud, commenting upon the author's communication, remarked that the method described for the destruction of the larvae of *M. domestica* is equally successful in the destruction of the eggs and larvae of the intestinal Nematodes of the horse.

BLANCHARD (R.). **Larves de Nevroptères éventuellement hématophages.** [Larvae of Neuroptera as occasional Blood-suckers.]—*Bull. Soc. Path. Exot., Paris*, xi, no. 7, July 1918, pp. 586–592, 5 figs.

The case is recorded in the province of Buenos Aires of an insect that fell from a tree on to the neck of a man who was severely bitten by it. It was identified as the larva of a Hemerobiid, and is fully described. The larvae of this family are carnivorous; certain species wander about the branches and leaves of trees searching for Aphids and evidently the larva in question belonged to one of these. Similar cases of men being attacked by Neuropterous larvae have been recorded, although they are rare. No ill-effects have ever followed from such attacks, but they are considered worth recording in view of the fact that they may not always prove inoffensive.

CHATTON (E.) & BLANC (G.). **La *Leptomonas* de la Tarente dans une Région indemne de Bouton d'Orient. Observations et Experiences.** [The *Leptomonas* of *Tarentola mauritanica* in a Region free from Oriental Sore. Observations and Experiments.]—*Bull. Soc. Path. Exot., Paris*, xi, no. 7, July 1918, pp. 595–607.

In view of the fact that species of *Phlebotomus* have been considered the inoculators of Oriental sore, and that *Phlebotomus africanus* has shown a decided predilection for the gecko, an attempt was made to find in this lizard (*Tarentola mauritanica*) the virus of cutaneous leishmaniasis, which is apparently unable to maintain itself upon man from one period of endemicity to another. At the height of a season of endemicity 229 individuals of *T. mauritanica* were examined, but no parasite corresponding to *Leptomonas* was discovered, though 10 per cent. showed the *Trypanosoma platydactyli* of Catouillard.

The investigations recorded in this paper have been of necessity very fragmentary, but they are published in their present form owing to the impossibility of continuing experiments at the present time.

Oriental sore is found to be non-existent in south Tunisia. The examination of 1,093 individuals of *T. mauritanica* showed no leishmaniform bodies in the blood, but the cultures obtained included *Leptomonas*, *Crithidia* or *Trypanosoma* and *Trichomastix*. A table shows the essential characteristics of *Leptomonas* and *Leishmania*, and the difficulty of differentiating the two forms is pointed out.

The results are given of various experiments in inoculation with cultures of *Leptomonas* and *Leishmania*. It is known that the bed-bug, *Cimex lectularius*, bites geckos freely, especially at high temperatures. The authors have found in bed-bugs taken from geckos a few examples of *Leptomonas*, but these do not seem to increase in number in the gecko. A development of *Leishmania tropica* has been obtained in *Cimex lectularius*, but the percentage of bugs that become infested from cutaneous lesions is small, and apparently the flagellate continues to survive in the insect without true development. It would be interesting to discover whether the gecko is a suitable medium for the development of leishmaniform bodies.

In the district of south Tunisia where the authors have been working, they have collected numbers of *Phlebotomus papatasii*, as well as a few *P. perniciosus* and *P. minutus africanus*. Generally speaking, *Phlebotomus* seemed less abundant than at Metlaoui, which is a centre for Oriental sore, and *P. minutus africanus* relatively scarcer than *P. papatasii*, but this impression has not been verified by any statistics. The abundance of *Phlebotomus* varies considerably according to the locality. The flies do not travel far, and are seldom found except in proximity to their breeding-places, that is, cesspools that are in a condition to encourage their development. In other words, the only way to obtain any exact idea of the abundance of *Phlebotomus* in any locality during the hot weather is to visit many houses and inspect the cesspools in various quarters during the night or early morning, which has as yet been impossible. *Phlebotomus minutus africanus* is not the only species that attacks geckos; at Metlaoui, *P. papatasii* readily bites these lizards when afforded the opportunity, even in the height of summer. No parasite develops in their digestive tract, but the fact is recalled that a *Leptomonas* has been observed at Aleppo to infect spontaneously *Phlebotomus papatasii*.

In discussing the recorded facts, two statements seem to be in contradiction; the non-existence of the leishmaniform bodies of Metlaoui in the geckos of a southern locality free from Oriental sore, and the frequent infection of geckos of the same locality by *Leptomonas* of Biskra. This geographical discrepancy between the two parasites suggests the idea that they are not identical. The authors of the present paper are convinced that in the etiology of Oriental sore the geographical element is an essential one, and do not conceal their satisfaction at not having found the leishmaniform bodies in a region free from Oriental sore. Another equally essential element is that of the season. It appears obvious from investigations that geckos are infected with *Leptomonas* all the year round. In that case, it is to *Phlebotomus* only that the autumnal predominence of Oriental sore is due. These midges, including *P. minutus*, occur abundantly in southern Tunisia from the month of May until November. Attention has been drawn by previous writers to the coincidence between the beginning of hibernation of the gecko (September-October), that is, the moment when *Phlebotomus* can attack them most easily without having ceased to find nourishment from man, and the appearance of cases of Oriental sore. But if this were the factor determining their occurrence, it would be expected that an outbreak of boils, at least as important as the autumn outbreak, would occur at the beginning of the hot season, at the moment when *Phlebotomus*, saturated with gecko blood, and consequently with *Leptomonas*, would begin to seek out men for attack. These views, considered together with the comparison of the cultural forms, and the as yet entirely negative results from inoculations of *Leptomonas* into susceptible animals, tend to show that this parasite is not identical with *Leishmania tropica*. It is not illogical to maintain that the differences found between the flagellate of the gecko and that of Oriental sore are due to the influence of the invertebrate vector.

Gros (H.). **L'Unité des Protozaires du Paludisme.** [The Protozoa of Malaria all one Species.]—*Bull. Soc. Path. Exot.*, *Paris*, xi, no. 7, July 1918, pp. 624–641.

Reviewing recent investigations on the various protozoa causing malaria, and as the deduction from his own experiences, the author draws the following conclusions:—There is only one haematozoon of malaria, and this can assume varying forms according to the climate, the season and the reactions peculiar to the organism. Experiments have shown that it is transmissible to man in all its forms and that it can at the first onset take clinically and microscopically one of the three forms. This form can be transformed into another under the influence of different conditions; *Plasmodium praecox* may become *P. vivax* and *vice-versa*. So-called primary malaria does not occur, and this expression should never be used. There is no reason for thinking that a special and as yet unknown form of the haematozoon is present in malarial splenomegaly.

Sergent (Edm.) & Sergent (Et.). **La Prophylaxie antipaludique d'une Armée en Campagne. (Armée d'Orient 1917.)** [Anti-malarial Prophylaxis of an Army in the Field (Balkan Army, 1917).]—*Bull. Soc. Path. Exot.*, *Paris*, xi, no. 7, July 1918, pp. 641–648.

This paper enumerates and briefly describes the principles of the prophylactic measures that have been adopted with great success in protecting the Balkan Army from malaria during 1917, under the auspices of the Pasteur Institute. These measures include a preliminary study of the epidemiological conditions that would enable any expeditionary force in a malarial country to possess a seasonal chart of the malaria of that country, in which the breeding-places of the Anophelines are described and the reservoir of the virus indicated. The next step is the removal of troops as far from the reservoir of the virus as is compatible with military necessities. Quinine should be served out to the troops as a preventive every day and the greatest care should be observed in ensuring that this measure is carried out, as the effects of the quinine upon the system last for a few hours only and one day's negligence will nullify the benefits of a long course of preventive treatment. The best daily dose is 6 grains of chlorhydrate of quinine in the form of a tablet. This quinine treatment in Mediterranean countries should last for 7½ months, from 15th April to 1st December. Individual mosquito nets should be provided for every man and the importance of keeping these absolutely mosquito-proof is pointed out. Anti-larval measures should be carried out in all the localities occupied by the troops and the reservoirs of the virus improved as far as possible by quinine treatment. All possible mechanical protection should be given to buildings inhabited by the troops. These measures should be carried out by experts under the direction of the sanitary service. It is pointed out that the whole campaign against malaria consists of a multitude of minute efforts and that care must be unremitting in convincing both officers and men of the importance of the control measures, which should be regarded as part of their military duties.

CARDAMATIS (J. P.). **Mode d'Action de la Quinine sur les diverses Formes d'Hématozoaires ; Traitement prophylactique et curatif le plus efficace du Paludisme.** [The Action of Quinine on the various Forms of Haematozoa; the most efficacious Prophylaxis and Cure of Malaria.]—*Bull. Soc. Path. Exot., Paris*, xi, no. 7, July 1918, pp. 648–662.

The conclusions reached in this paper are based upon eight years' work (1890–1897) in the malarial districts of Greek territory and upon the reports of sanitary missions and experiences stretching over a number of years. The questions discussed include the manner in which quinine causes the destruction of each of the three species of haematozoa, according to their age and their morphology; the quantity of quinine necessary to ensure the complete disappearance of all forms of haematozoa from the blood, the best time for administration of quinine as a preventive, and the length of time necessary for the treatment to be continued in order to produce a complete cure.

BLANCHARD (C.). **Sur un nouveau Type larvaire du Groupe des Anophélinés.** [Concerning a new Type of Anopheline Larva.]—*Bull. Soc. Path. Exot., Paris*, xi, no. 7, July 1918, pp. 669–677, 2 figs.

This paper describes a mosquito larva new to the valley of the Oise, where previously only *Anopheles maculipennis* and *A. bifurcatus* have been observed. The species was identified as being in all probability *A. plumbeus* (*nigripes*), which occurs in northern and central Europe, but has not previously been observed in France. It may be noted that the larva of this species is not confined to holes in trees containing a little water, as has been previously stated, the individuals described in this paper having been collected from marshy ground.

A further note records the finding of this species at Melun, on the Seine.

GRIFFITHS (J. A.). **A Note on Piroplasmosis of the Donkey.**—*Jl. Comp. Path. Therapeut., London*, xxxi, part 2, June 1918, pp. 131–133. [Received 12th August 1918.]

Observations on piroplasmosis of donkeys in Nyasaland and East Africa show that the disease chiefly affects the white Zanzibar donkey and crosses of this breed with the native grey donkey, the latter breed having a high degree of natural immunity. Many animals recover, but always remain in poor condition, a few parasites appearing intermittently in the blood.

Priestley (H.). **The Value of various Chemicals as Mosquito Larvicides.** *Australian Inst. Trop. Med., Townsville, Queensland.* Half-Yearly Rept. from 1st July to 31st December 1916, p. 12. [Received 6th August 1918.]

Experiments to determine the value of various chemicals as mosquito larvicides have produced no results of practical importance, except to show that the addition of very small quantities of sulphuric acid increases the efficiency of potassium cyanide as a larvicide. It does not seem possible to find any chemical or combination of chemicals that will fulfil the requirements of being cheap, effective in concentration, and relatively innocuous to animals in the concentration used and in the higher concentration that may result from evaporation of the water.

An apparatus for producing cresyl vapours for destroying adult mosquitos has been investigated. It was found that vaporising $\frac{1}{4}$ to $\frac{1}{3}$ fluid oz. of cresyl per $1\frac{1}{3}$ cub. yard of room space is sufficient to kill all the mosquitos present if they are not in too well protected places. The effect on mosquito larvae or pupae and on other insects is not so good. The advantage of cresyl over sulphur dioxide for fumigation is that the process is simpler and no injury is done to the room. Experiments with this substance are to be continued.

Cornwall (J. W.) & Menon (T. K.). **A Contribution to the Study of Kala-Azar (iv).**—*Indian Jl. Med. Research, Calcutta*, v, no. 4, April 1918, pp. 541–547. [Received 12th August 1918.]

Having shown that the bed-bug cannot transmit kala-azar or Oriental sore by its bite, since it is unable to regurgitate the contents of its stomach in the act of feeding [see this *Review*, Ser. B, vi, p. 1], the authors have turned their attention to the contents of the rectum. In cultures made with material obtained from the rectum of bugs between 3 and 33 days after a feed of blood containing *Leishmania donovani*, no growth of flagellates occurred. This indicates that even if a very few flagellates of *L. donovani* do survive the passage from the stomach to the rectum, they lose their power of multiplication. When the rounded forms of *L. donovani* and of *L. tropica* enclosed in leucocytes are transferred to certain nutrient media and maintained at a temperature between 61° and 78° F., they develop flagella, free themselves from their enclosing cells and multiply profusely, this multiplication continuing until the nutriment is exhausted or until inhibited by the products of metabolism. In a test-tube culture the acme is reached after about 30 days; degeneration then sets in, scarcely any flagellates remaining alive after 60 days. If transferred to a fresh tube before this stage is reached, multiplication begins again. In the stomachs of bugs the culture tends to die out as time goes on for reasons not apparently directly connected with the amount of nutriment present. The limit of survival that has been observed is 29 days, though a second feed of blood will in some cases enable the remaining flagellates to multiply further.

Since the bug does not transmit flagellates in the act of biting, and flagellates rarely, if ever, pass in the dejecta, the only apparent ways in which *Leishmania* can be transmitted are by the rupture of an individual containing flagellates in the neighbourhood of a puncture or abrasion or by the passage of cystic forms in the faeces. There is no direct evidence in favour of the first hypothesis and no evidence of the existence of cystic forms in the faeces. If it be supposed that kala-azar is transmitted by the bug in a similar manner to the trans-transmission of spirochaetosis by lice, it might be expected that the disease would be more common and spread more rapidly. The difference in habits of the two insects must however be borne in mind, as well as the fact that *L. donovani* does not survive very long in any one bug and is not transmitted to its offspring. It is clear that a reservoir of kala-azar must be at hand in the shape of a human being suffering from the disease if the bugs in a dwelling are to remain dangerous. It is considered unlikely that the bed-bug is responsible for the spread of *Leishmania tropica* and some other blood-sucking insect is probably concerned.

KNOWLES (R.). **Notes on Some Results in Kala-azar.** *Indian Jl. Med. Research, Calcutta*, v, no. 4, April 1918, pp. 548–566. [Received 12th August 1918.]

The second part of this paper comprises a discussion on the intestinal parasites present in cases of kala-azar. *Ankylostoma duodenale* is suggested as a possible carrier, though investigations have as yet given only negative results. The question of possible hereditary transmission of the flagellate or some developmental form of *L. donovani* either in the bed-bug or the hookworm is considered worthy of study.

BAINI PRASHAD. **The Thorax and Wing of the Mosquito (*Anopheles*).** *Indian Jl. Med. Research. Calcutta*, v, no. 4, April 1918, pp. 610–640, 5 plates. [Received 12th August 1918.]

This anatomical paper discusses the technique of dissecting mosquitos and describes the structure of the thorax and its appendages. *Anopheles willmori*, James, is the species studied in respect of the thorax and base of the wing, and *A. lindesayi*, Giles, as regards the venation. Other mosquitos used in the investigation were *A. maculipennis*, Meig., *Theobaldia longiareolata*, Macq., and *Culex fatigans*, Wied.

BAINI PRASHAD. **The Development of the Dorsal Series of Thoracic Imaginal Buds of the Mosquito, and Certain Observations on the Phylogeny of the Insects.**—*Indian Jl. Med. Research. Calcutta*, v, no. 4, April 1918, pp. 641–654, 5 plates. [Received 12th August 1918.]

In this paper the dorsal series of thoracic imaginal buds of the larva of *Anopheles willmori*, James, is described at length and the further development of these into the various organs of the imago is traced. Larvae and pupae of *Culex fatigans*, Meig., and *C. mimeticus*, Noé, were also examined for comparison. Some observations on the larval growth, the larval moults, the formation of the pupa and the emergence of the adult are also recorded. The paper concludes with a discussion of the phylogeny of the insects.

Cleare (L. D.). **The House-fly. How it lives, how it spreads disease, and how to destroy it.**—*Jl. Brit. Guiana Bd. Agric., Georgetown,* xi, no. 2, April 1918, pp. 13–27, 3 figs.

This paper is a popular résumé of recent information on the subject of the house-fly (*Musca domestica*, L.).

Rawnsley (G. T.), Cunningham (R. A.) & Warnock (J.). **The Prophylaxis of Malaria.**—*Jl. R.A.M.C., London,* xxxi, no. 1, July 1918, pp. 60–75.

It is the opinion of Col. Rawnsley, who contributes the first part of this paper, that prophylactic quinine as now given is useless, if not dangerous, in the prevention of malaria, frequently only serving to mask the disease. He considers the proper prophylactic dose to be 30 grains daily, but this cannot be given for a longer period than four weeks. Prophylaxis should aim chiefly at destroying the mosquito and its larvae and protecting man from its bites, and, when man becomes infected, destroying the parasite by suitable doses of quinine, especially during the post-malarial season. The dose should be 15 grains of quinine morning and evening, and 3 minims of liquor arsenicalis hydrochloricus added to each dose increases its efficiency.

Van Es (L.) & Schalk (A. F.). **Sur la Nature anaphylactique de l'Intoxication parasitaire.** [On the Anaphylactic Nature of Parasitic Poisoning.]—*Ann. Inst. Pasteur, Paris,* xxxii, no. 7, July 1918, pp. 310–362.

Research work on pernicious anaemia of the horse in connection with the investigations of Seyderhelm, has led to the conclusions:—(1) That equine pernicious anaemia can be artificially induced in all its details by the injection of aqueous extracts of larvae of *Gastrophilus equi* and *G. haemorrhoidalis* [see this *Review*, Ser. B, v, p. 185, and vi, p. 44]. (2) From its mode of action, and its behaviour towards physical and chemical influences, the active ingredient is an animal poison, called by the authors oestrine. (3) The toxic action of oestrine is exclusively specific for equines. (4) Oestrine is uniformly absorbed by the gastro-intestinal canal of the horse. (5) Oestrine occurs in the natural excretions of *Gastrophilus* larvae. (6) The toxic action of *G. haemorrhoidalis* is several degrees stronger than that of *G. equi*. (7) Pernicious anaemia, artificially induced by extracts of Oestrid larvae, can be transmitted to healthy horses, the blood of these latter being also able to transmit the disease. (8) Pernicious anaemia of horses, occurring in nature, is not caused by an ultra-visible micro-organism, but by the oestrine excreted by the larvae of *Gastrophilus*, especially those of *G. haemorrhoidalis*.

Cort (W. W.). **Dangers to California from Oriental and Tropical Parasitic Diseases.**—*California State Bd. Health Mthly. Bull., Sacramento,* xiv, no. 1, July 1918, pp. 6–15.

The diseases dealt with in this paper are mostly those due to various intestinal worms, for the control of which the Division of Parasitology of the State Board of Health is instituting a system of faecal examination.

The prevalence of malaria, which is one of the most serious diseases in California, is being reduced by local campaigns against the breeding grounds of Anopheline mosquitos.

Filariasis is undoubtedly present in the State, where suitable mosquito hosts exist, and though there is no evidence of its spread, the extent of its prevalence cannot be definitely stated in view of the absence of recorded blood examinations necessary for its diagnosis.

A Power Sprayer for Mosquito Eradication.—*California State Bd. Health Mthly. Bull., Sacramento,* xiv, no. 1, July 1918, pp. 20–21, 1 fig.

An apparatus for oiling mosquito breeding pools is here described. This consists of an air-compressor mounted upon a motor truck and operated by the engine of the same, enabling oil to be sprayed under compressed air ; a long hose line permits of a wide radius of operation.

Smith (E. I.). **Organising and Conducting State-wide Tick Eradication in Louisiana.** *Jl. American Vet. Med. Assoc., Ithaca, N.Y.,* liii, no. 5, pp. 639–645, 7 figs.

This paper gives an account of dipping cattle for the control of ticks in Louisiana under the Act of 25th July 1917, making such dipping compulsory.

Malaria Control.—*U.S. Public Health Repts., Washington, D.C.,* xxxiii, no. 28, 12th July 1918, pp. 1154–1158.

In 1917 the control of malaria by measures against Anopheline mosquitos, undertaken by a local community following anti-mosquito demonstration studies in 1916, resulted in a decrease in the number of cases reported of 85·5 per cent. Based on the total number of professional visits for the disease in 1916 and 1917, the reduction in the latter year was 73 per cent., an important result in view of the increased economic efficiency made possible by this reduction. The total cost of the two years' work was about £75,633, the relative cost of the second year over the first showing a reduction of about 50 per cent.

Garman (H.). **Household Pests and their Treatment.**—*Univ. Kentucky Agric. Expt. Sta., Lexington,* Circ. no. 15, June 1917, pp. 63–90, 14 figs. [Received 21st August 1918.]

This circular gives the usual control measures against the commoner household pests such as ants (*Monomorium minimum* and *M. pharaonis*) ; house-flies (*Musca domestica*) ; mosquitos, including *Stegomyia fasciata* (*Aëdes calopus*), *Culex fatigans* (*quinquefasciatus*) and *Anopheles maculipennis* ; fleas, including *Pulex irritans*, *Ctenocephalus canis*, *C. felis* and *Xenopsylla cheopis* ; the clothes moths, *Tineola bisselliella* and *Tinea pellionella* ; the bed-bugs, *Cimex* (*Acanthia*) *lectularius* and *C. hemiptera* ; cockroaches, including *Phyllodromia germanica* (croton-bug), *Blatta orientalis* (Oriental cockroach) and *Periplaneta americana* (American cockroach) ; termites ; and silver fish (*Lepisma saccharina*).

Parasitic Mange: Important to Horse Owners. —*Jl. Bd. Agric., London*, xxv, no. 5, August 1918, pp. 581–584.

This paper, which is also issued as Leaflet No. 8 of the Joint Committee of the Board of Agriculture and Ministry of Food, is written for the benefit of owners of horses. The importance of notifying the disease, in accordance with the Order of 1911, is emphasised, and useful recommendations are given for the prevention of the disease and the care of infected animals.

CIAVALDINI (J.). **Six Ans de Campagne antipaludique à Robertville.** [Six Years' Anti-malarial Work at Robertville.] Separate from *La Malariologia, Naples*, x, no. 1–2, 1917, 4 pp. [Received 29th August 1918.]

The results of anti-malarial work during the years 1910–1915 in the Constantine Department of Algeria, carried out on the lines advocated by the Pasteur Institute, have been very encouraging. Each year the number of cases diminished, complications disappeared, pernicious and fatal attacks ceased to occur, and the mortality became nil. The mortality due to malaria at Robertville during the years 1910–1915 is tabulated.

SERGENT (Ed.). **Rapport sur le Fonctionnement de l'Institut Pasteur d'Algérie en 1917.** [Report on the Work of the Pasteur Institute of Algeria in 1917.] *Algiers*, 1918, 20 pp. [Received 29th August 1918.]

An account is given of anti-malarial measures in Algeria during the epidemic of 1917. As the sanitary staff was insufficient to cope with all the districts concerned, only the most severely infected localities were dealt with. Results showed that the districts so protected invariably became more healthy than the surrounding region.

A brief review of recent investigations and literature on the subject is included in the report.

BRESSLAU (E.). **Vorbemerkung zu Beiträge zur Kenntnis der Lebensweise unserer Stechmücken.** [Preliminary Note to Contributions to the Knowledge of the Life-histories of our Mosquitos.] —*Biol. Zbd.*, xxxvii, pp. 507–509.

BRESSLAU (E.). **Ueber die Eiablage der Schnaken.** [The Oviposition of Mosquitos.] —*Ibid.*, pp. 509–531.

GLASER (F.). **Ueber die Vermehrungsfähigkeit von *Culex pipiens*.** [The Capacity for Reproduction of *Culex pipiens*.]—*Ibid.*, pp. 531–533, (Abstracts in *Arch. f. Schiffs- u. Tropen-Hygiene, Leipzig*, xxii, no. 7–8, April 1918, pp. 146–147.)

These three papers begin a series of reports on studies of the mosquitos found in Germany. The work was carried on for several years in Alsace on behalf of the army medical authorities. In the prefatory paper a description of the work is given together with a list of the mosquitos found near Strasburg. These include 18 out of the 19 or 20 species hitherto recorded in Germany, as well as a new one, *Ochlerotatus* (*Culicada*) *nigrinus*, Eckstein. The systematic part of the work, in which the arrangement of American authors has been followed, will be dealt with later by Eckstein.

In the second paper it is stated that all the members of the genera *Aëdes* and *Ochlerotatus* (*Culicada*), appear to oviposit on dry ground which is only temporarily covered with water. *Ochlerotatus dorsalis* and *O. nigrinus* use meadows that are temporarily flooded; *O. nemorosus*, *O. diversus*, *O. geniculatus* (*lateralis*), *Culex cantans* and *Anopheles cinereus* use forest pools that dry up in summer; while *Ochlerotatus vexans* oviposits in both these situations. *Culex ornatus* breeds in tree-hollows containing water. Whereas certain species, such as *C. cantans*, have only one annual generation, others have several. On the completion of the development of the embryo wetting the eggs will cause them to hatch. Around Strasburg there are therefore two broods a year, which correspond with the two floodings of the meadows in spring and late summer. The duration of the flooding is just suited to the development of the larvae and pupae, which require 2 weeks at about 20°–25° C. [68°–77° F.]. The newly emerged adults then oviposit on the ground, which is then drying.

The author has devised a simple method of combating these insects in connection with the fact that there are several generations. In mid-October he flooded the infested meadows for the third time in the year, and thus killed the larvae, which owing to the low temperature could not complete their development by the time the water had disappeared. This method, which is practicable in the Breusch valley near Strasburg, did not damage the meadows.

In the third paper Glaser gives data regarding the great capacity for reproduction of *Culex pipiens*. It is stated that in two channels leading away from a leather manufactory and each measuring about a mile in length, about 167,760 egg-rafts were destroyed as a result of cleaning the channels twice weekly, the time employed on each occasion being three hours. At the very moderate estimate of 200 eggs per raft no less than 33,000,000 eggs were thus destroyed each week.

PRELL (H.). **Biologische Beobachtungen an *Anopheles* in Württemburg.** [Biological Observations on Anophelines in Wurtemburg.] —*Zeitschr. f. wiss. Ins.-Biol.*, xiii, 1917–1918; pp. 242–249, 257–272. (Abstract in *Arch. f. Schiffs- u. Tropen-Hygiene, Leipzig*, xxii, no. 7–8, April 1918, p. 148.)

This paper records observations on the distribution and bionomics of Anophelines in Wurtemburg obtained as a result of an investigation required by the military authorities. Only a few localities in the alpine districts and Black Forest are uninfested, otherwise *Anopheles maculipennis* is found almost everywhere, whereas *A. bifurcatus* is more especially met with in the mountain regions.

MAYER (M.). **Ueber den Dauerparasitismus von** *Schizotrypanum cruzi* **bei** *Ornithodorus moubata*. [The lasting Infection of *Ornithodorus moubata* with *Trypanosoma* (*Schizotrypanum*) *cruzi*.]—*Arch. f. Schiffs- u. Tropen-Hygiene, Leipzig,* xxii, no. 9, May 1918, pp. 158–160.

In 1914 Rocha-Lima and the author recorded the lasting infection with *Trypanosoma cruzi* of *Conorhinus megistus*, *Cimex lectularius* and *Ornithodorus moubata*. The infection lasted for more than two years in *C. megistus* and for several months in the bed-bugs and ticks. The work had to be discontinued, but it was found possible to keep the infested ticks under observation, and even after five years, the presence of virulent parasites in their gut was proved by inoculation. It was never possible to obtain infection from their progeny, nor could any flagellates be discovered in them, so that there was no inheritance of infection.

CLELAND (J. B.) & BRADLEY (B.), assisted in the Inoculation Experiments by MCDONALD (W.). **Dengue Fever in Australia. Its History and Clinical Course, its Experimental Transmission by** *Stegomyia fasciata*, **and the Results of Inoculation and other Experiments.**—*Jl. Hygiene, Cambridge,* xvi, no. 4, January 1918, pp. 317–418, 9 charts.

A preliminary report on dengue in Australia has already been abstracted [see this *Review*, Ser. B, iv, p. 196] and records all the facts concerning transmission by *Stegomyia fasciata*. In the present paper the work is dealt with in detail.

OLITSKY (P. K.), DENZER (B. S.) & HUSK (C. E.). **The Isolation of the** *Bacillus typhi-exanthematici* **from the Body Louse.**—*Jl. Amer. Med. Assoc., Chicago, Ill.,* lxviii, no. 16, 21st April 1917, pp. 1165–1168.

Since 1910 many observers have reported finding an organism in typhus-infected lice which they believe to have a causal relationship to typhus fever. The authors have been able to cultivate this organism in Mexico and show that it is identical with *Bacillus typhi-exanthematici*.

SALM (A. J.). **Muskieten in de Bandoengsche Hoogvlakte.** [Mosquitos in the Bandoeng Plateau.]—*Geneesk. Tijdschr. v. Nederlandsch-Indië, Batavia,* lvii, no. 6, 1917, pp. 749–752, 2 plates.

A collection of mosquitos from the Bandoeng plateau, where one locality is known to be malarial, included the following Anophelines:—*Anopheles* (*Myzorrhynchus*) *barbirostris*, *A.* (*M.*) *albotaeniatus*, *A.* (*M.*) *sinensis*, *A.* (*Myzomyia*) *ludlowi*, *A.* (*M.*) *rossi* var. *indefinitus*, *A.* (*M.*) *punctulatus*, *A.* (*M.*) *aconitus* (*albirostris*), and *A.* (*Cellia*) *kochi*.

Other mosquitos included *Culex* spp., *Stegomyia fasciata* (*calopus*), *S. pipersalata*, and *S. albopicta* (*scutellaris*). One of the plates illustrates characters of the last-named species, while the other figures *Stegomyia pipersalata*. Details of the latter are also given in the text.

CITROEN (S.). **Anophelinensoorten te Soerabaja.** [Anophelines found at Soerabaya.]—*Geneesk. Tijdschr. v. Nederlandsch-Indië, Batavia*, lvii, no. 6, 1917, pp. 763–766.

In his preliminary report on Anophelines at Soerabaya van Breemen gave a certain prominence to *Anopheles rossi* [see this *Review*, Ser. B, vi, p. 53] which may lead to mistaken conclusions being drawn. Early in 1917 the author found in this district not only *Anopheles rossi*, *A. rossi* var. *indefinitus*, *A. sinensis*, *A. barbirostris* and *A. kochi*, but also *A. ludlowi*, *A. aconitus* and *A. fuliginosus*.

A. ludlowi is very abundant; its breeding places are nearly always the salt-water fishponds along the coast. In water where *A. rossi* was breeding only 30–40 per cent. of *A. ludlowi* was present, but in neighbouring houses the adults of *A. ludlowi* predominated, a fact confirmed by Swellengrebel, who considers this mosquito to be more especially a domestic species. A larva of *A. ludlowi* was only found once in brackish water in a bucket. Where the breeding places of this mosquito surround markedly malarial districts and it predominates in the houses there, it is clear that it must be regarded as the most important malaria carrier. As some specimens have been taken in parts of Soerabaya far removed from known breeding places, this mosquito probably breeds also in collections of brackish water. It would also appear to breed in fresh water during the temporary disappearance of salt-water breeding places in the dry season, so that the existence of temporary breeding places on high, scantily watered ground must be taken into account. *A. aconitus* occurs in various places, and though not proved to have a marked influence on the malarial incidence, it requires to be closely watched. Only one breeding place of *A. fuliginosus* was discovered. This species was not found indoors. Without disputing the importance of van Breemen's discovery that *A. rossi* was found infected with malaria, it is pointed out that there is no statement to the effect that the salivary glands were involved, and an examination of only fifteen specimens is insufficient to warrant the conclusion that this species is an important carrier.

SWELLENGREBEL (N. H.). ***Myzomyia flava*, n. sp., een nieuwe Anopheline voor Ned.-Indië.** [*M. flava*, sp. n., a new Anopheline in the Dutch East Indies.]—*Geneesk. Tijdschr. v. Nederlandsch-Indië, Batavia*, lvii, no. 6, 1917, pp. 807–809.

A description is given of *Anopheles* (*Myzomyia*) *flavus*, sp. n., from adults taken near Soerabaya together with *Anopheles rossi*, *A. rossi* var. *indefinitus* and *A. ludlowi*. The breeding places are unknown. An Anopheline received from Penjaboengan appears to be identical with this species, which is possibly an unmarked variety of *A. rossi* var. *indefinitus*.

NEUFELD (F.) & SCHIEMANN (O.). **Experimentelle Untersuchungen über eine läusesichere Schutzkleidung.** [Experimental Investigations regarding a Louse-proof Dress.]—*Deutsche Med. Wochenschr., Berlin*, xliv, no. 9, 28th February 1918, pp. 231–233.

This paper describes experiments with a view to obtaining a louse-proof dress for doctors and others exposed to infestation. The best materials were found to be yellow or black oilskin or oiled silk, and overalls of these materials should therefore considerably lessen the danger of infestation. In the case of a short visit a jacket with close-fitting wrist-bands will suffice, especially in the case of military surgeons wearing top-boots or leather leggings. The suitability of any material may be tested by placing it at an angle of 45 degrees, and if lice placed on it are unable to move either up or down, it may be accepted as satisfactory.

BLAU (P.). **Ueber Pappatacifieber.** [*Phlebotomus* Fever.]—*Wiener Klin. Wochenschr., Vienna,* xxxi, no. 3, 17th January 1918, pp. 89–90.

This is a clinical paper, based on the experience gained in treating some six hundred cases of sandfly fever in the Mediterranean area in the summer months of 1916 and 1917. The majority of the cases occurred in June and July. *Phlebotomus papatasii* was present in great abundance and the bites were generally on the face, hands and feet.

WIESE (O.). **Zur Uebertragung des Rückfallfiebers.** [The Transmission of Recurrent Fever.]—*Deutsche Med. Wochenschr., Berlin,* xliv, no. 3, 17th January 1918, pp. 60–62.

In order to test the part played by bed-bugs [*Cimex lectularius*], 45 individuals were examined for spirochaetes eight days after they had been allowed to feed upon a case of recurrent fever during the attack. This examination proved entirely negative. Furthermore the author never found a single bug in infected houses during an epidemic of recurrent fever. He considers the destruction of lice to be the most important of the measures to be taken against this disease, of which *Pediculus humanus, P. capitis* and perhaps also *Phthirius pubis* are transmitters. Observations clearly showed that the disappearance of the disease coincided with that of these insects. In the epidemic observed only isolated cases occurred at first, and a sudden increase afterwards among persons whose infested hair had been cut some seven days previously is believed to have been due to the operation causing abrasions of the skin, which then became infected from crushed lice.

TOEPFER (H.). **Zur Uebertragung des Erregers des europäischen Rückfallfiebers durch die Kleiderlaus.** [Transmission of European Recurrent Fever by *Pediculus humanus.*] — *Deutsche Med. Wochenschr., Berlin,* xliv, no. 9, 28th February 1918, pp. 239–240.

The author considers that no developmental forms of the spirochaetes of recurrent fever are to be found in lice. He confirms his finding that infection is conveyed mechanically by crushing the lice [see this *Review*, Ser. B, v, p. 112]. In a severe epidemic the doctors and most of the orderlies remained free from the disease though often exposed to the bites of infected lice, and the orderlies who contracted it did so only after a considerable time and after becoming very verminous. To test the possibility of inheritance of infection an examination of ovaries and young lice for the presence of spirochaetes was made. The result was negative, but the author does not accept this as definitely settling the question.

Italie.—Instructions, en date du 21 février 1918, du Ministre de la Marine pour intensifier la Prophylaxie antimalarique sur le Front de Mer. [Instructions, dated 21st February 1918, of the Italian Minister of Marine for intensifying Antimalarial Prophylaxis on the Naval Front.]—*Bull. Office Internat. Hygiène Publique, Paris,* x, no. 4, April 1918, pp. 372–377.

The desirability of carrying out malarial prophylaxis more thoroughly has led to the appointment of special officers in the maritime sectors of Venice, Taranto and Valona. Their duties include the inspection of irrigation works in course of construction and the arrangement of such working hours as will enable the labourers to return before sunset to healthy localities; the cleansing of existing irrigation channels in spring and autumn; the search for Anopheline breeding places; the organisation of regular oiling every fifteen days; the fitting of covers to wells; the registration of persons who are suffering from malaria or have suffered in the preceding twelve months; quinine prophylaxis and other personal measures; and the execution of any small works that may be needed to protect the military posts against malaria.

Pino Pou (R.). **Aclaraciones oportunas. Historia del Descubrimiento de la Fiebre recurrente en Venezuela (Relapsing Fever).** [The Discovery of Recurrent Fever in Venezuela.]—*Gaceta Med. de Caracas,* xxv, no. 9, 15th May 1918, pp. 93–97.

A case is recorded of a patient whose blood showed numbers of spirochaetes resembling those from Colombia, Panama and North America. This Venezuelan form gave negative results when inoculated into monkeys, rabbits, guinea-pigs, dogs and fowls, while a positive result was obtained with mice and rats. Rats were infected by using the bed-bug [*Cimex lectularius*] as a transmitter, but fleas from rats and mice did not convey the infection. Tick transmission was negative and lice were not tested.

Pittaluga (G.). **Informe sobre las Medidas que conviene adoptar para impedir el Desarrollo de Epidemias de Infección palúdica en el Pantano de la Sotonera y en el Recorrido del Canal de los Riegos de Alto Aragón, durante los Trabajos que allí se efectúan.** [A Communication on the Measures required to check Malarial Epidemics in the Sotonera Marsh and along the Canal of the Irrigation System of Upper Aragon during the Execution of Works now in Progress there.]—*Bol. Inst. Nac. Higiene Alfonso XIII, Madrid.* xiv, no. 54, 30th June 1918, pp. 103–116.

This report was drawn up after a visit to the district in January 1918. Among the labourers employed are a number of malaria carriers and mosquitos are present in abundance. *Anopheles maculipennis* and various Culicines were found. The measures advised are those obtaining in modern practice, but as the destruction of the larvae cannot conveniently be effected with petroleum and aniline larvicides owing to the cost and the lack of trained operators, the breeding of the common carp, *Ciprinus carpio*, and its varieties is advised in suitable waters. This measure however cannot be expected to give much result in the first season. Advice will shortly be given as to the aquatic plants that should be encouraged and those that should be destroyed.

ADRIEN (C.). **Dengue méditerranéenne observée à l'Ile Rouad (Syrie). Etude des Conditions locales de Réproduction des Insectes dans cette Ile.** [Mediterranean Dengue observed in the Island of Rouad, Syria. A Study of the local Conditions of Insect Reproduction in the Island.]—*Archives Méd. & Pharm. Navales, Paris*, cv, no. 4, April 1918, pp. 275–307.

In 1915 a naval detachment of about 100 men was landed on the Island of Rouad. A fever of short duration was endemic there and 47 cases occurred from September to January. The author considers that it was possibly a modified form of dengue and uses the term "Mediterranean dengue" proposed by Sarrailhé, who holds that three day fever and dengue are one and the same disease [see this *Review*, Ser. B, v, p. 37]. In this case *Phlebotomus* acts as the original carrier, while *Stegomyia* and *Culex* are agents in mechanical transmission. If on the other hand three day fever and dengue are held to be distinct, as has been thought up to now, then both of these are present in the Island of Rouad, the former transmitted by *Phlebotomus* and the latter by *Stegomyia* and *Culex*. The mosquitos found in the island have been identified as *Stegomyia fasciata*, *Culex fatigans* and *C. laticinctus*. During the seven hot months of 1916 these mosquitos occurred together with many cases of the disease. During the cold months the species of *Culex* seem to disappear and cases are very rare. A few *S. fasciata* are still to be found indoors, and their breeding in cisterns is not entirely arrested. They do not then attack in the open, but do so indoors, especially by night. Their larvae are only found in fresh or very slightly brackish water, while those of *Culex* are chiefly met with in brackish water. No Anophelines were observed on the island. *Phlebotomus perniciosus*, Newst., was present, but not *P. papatasii*, Scop. A campaign against the mosquitos was carried out by means of screening, oiling and by covering all cisterns; but though breeding is thus prevented, the introduction of wind-borne mosquitos from the coast, about one and a half miles distant, cannot be stopped.

VILLELA (E.). **Fórma aguda da Doença de Chagas. Primeira Verificação no Estado de S. Paulo.** [The Acute Form of Chagas' Disease. The first Case reported from the State of S. Paulo.]—*Brazil-Medico, Rio de Janeiro*, xxxii, no. 9, 2nd March 1918, p. 65, 1 fig.

Triatoma megista having been reported to be present in a house in the State of S. Paulo, Brazil, an examination of the inmates revealed the acute form of Chagas' disease in a child, whose blood harboured numerous trypanosomes possessing all the morphological characters of *Trypanosoma cruzi*.

MENDY (J. B.). **La Sarna humana y la Sarna bovina. Su Naturaleza, Curación y Extirpación.** [Human and Bovine Scabies. Its Nature, Cure and Extirpation.]—*Anales Soc. Rural Argentina, Buenos Aires*, lii, no. 4, April 1918, pp. 216–226, 12 figs. [Received 23rd September 1918.]

This paper is a résumé of the facts relating to the Acarids producing mange in man and cattle. Formulae for the usual remedial solutions are given, together with practical instructions for erecting dipping tanks.

SINCLAIR (J. M.). **Management of Dipping Tanks.**—*Rhodesia Agric. Jl., Salisbury*, xv, no. 1, February 1918, pp. 32–33.

Experience has shown that many owners and managers of dipping-tanks find a considerable difficulty in adding water, or dip, to the liquid in the tank, so as to bring it back to any desired strength. Further, the tendency being to err on the side of safety, it often follows that the strength of the dip is diminished to such an extent as to be ineffective.

Attention to the following practical points should render easier the management of a tank:—(1) On filling the tank, the water should be measured by a 200-gal. or other convenient measure; (2) from the 3 ft. 6 in. level, the volume, inch by inch, should be carefully recorded and marked on the wall of the tank, or, preferably, on a measuring rod; (3) the level should be recorded after each dipping and again before the following one; (4) loss due to evaporation should be replaced by water only; (5) increase due to rain or flood-water should be standardised by the addition of dip; (6) the quantity of solution in the tank should be carefully estimated at the time when a sample is taken for analysis, otherwise the alteration in strength required as the result of analysis will be impossible; (7) in forwarding samples of dipping solutions for analysis, care should be taken that the bottles and utensils used for filling them are free from extraneous arsenic.

THIBAULT, Junr. (J. K.). U.S. Bur Entom. **Vegetable Powder as a Larvicide in the Fight against Mosquitoes.**—*Jl. Amer. Med. Assoc., Chicago, Ill.*, lxx, no. 17, 27th April 1918, pp. 1215–1216.

Experiments made in order to find a larvicide cheaper than crude oil and available in water-gardens, outdoor fish-pools, rice-fields and other places where oil is unsuitable, have resulted in the discovery of a material which is an efficient substitute under most conditions. This larvicide consists of various vegetable powders, including pyrethrum. The latter is too expensive, and as its action is purely mechanical, experiments were made with weeds and grasses of nearly every species growing in the neighbourhood; these dried and reduced to a sufficiently fine powder gave very good results. No particular species need be chosen. A good powder should spread quickly and evenly even if thrown in by the handful. It is however more potent when applied in the form of a spray. The covering capacity should be from 3,500 to more than 4,000 square feet per pound of powder. It is only effective for a few minutes, but is so deadly to the larvae that they die in a few minutes, even when immediately removed to another receptacle. When thoroughly wet the powder loses its effectiveness. Species with short, thick air tubes are easily killed, *Culex* spp. with long, slender tubes being more resistant, *C. abominator* proving to be especially so.

NUTTALL (G. H. F.). **Combating Lousiness among Soldiers and Civilians.** — *Parasitology, Cambridge*, x, no. 4, May 1918, pp. 411–586, 13 plates, 26 figs.

In this paper infestation by *Pediculus humanus* and *Phthirius pubis* is dealt with in detail. Emphasis is laid on the prevention of these pests by means of education, cleanliness and frequent inspection. The best methods for the mechanical removal of lice from the head, body and clothing are described, and the various remedies and repellents in use are discussed. The destruction of lice by heat is entered into fully, numerous illustrations and plans of steam disinfectors and hot-air disinfection huts being given. A report of experiments with pediculicides and reputed remedies, and an alphabetical list of insecticides with statements regarding their efficacy, are also included in this work, which concludes with a copious bibliography.

DENNYS (Col. G. W. P.). **Destruction of Rats as a Means for the Prevention of Plague.**—*Indian Med. Gaz., Calcutta*, lii, nos 1 & 5, January & May 1918, pp. 1–5 & 164–168.

The statement in the Annual Report of the Sanitary Commissioner with the Government of India to the effect that experience in Satara indicates that continuous rat-trapping carried out intelligently and with enthusiasm is sufficient to keep a town free from plague is criticised in this paper. A previous note by the author on the subject of the merits or demerits of an anti-rat campaign, written in 1915, is quoted in full. The view adopted is that it is the rat-flea rather than the rat that must be exterminated if plague is to be entirely eliminated from large towns in which there are conditions favourable for rat-breeding, and that so long as rat-fleas have rats to feed upon they will not attack man. It is also stated that where chronic flea infestation is present, plague becomes endemic, and where seasonal infestation occurs, there are epidemics of plague.

In the second of these articles the author analyses the results of anti-rat campaign in a number of districts, and alleges that not only do the figures show rat destruction to be useless as a means for the prevention of plague outbreaks, but in several of the towns referred to there is strong reason for thinking that the attempt to reduce the normal rat population of a town has tended to increase the chance of that town becoming plague-infected. They also seem to show that towns previously plague-infected at which no rat destruction was attempted are not more prone to a recrudescence of the disease than those in which vigorous and systematic rat campaigns were conducted. The author admits that he has no alternative suggestions for combating plague, but hopes that those who are now in a position to do so may be able to devise some method whereby the unlimited multiplication of the rat-flea may be controlled or checked, or the number reduced that each rat is able to harbour. It is considered that the use of tobacco in some form might be well worth consideration in this connection.

WHITE (Major F. N.). **Plague and Rat Destruction.**—*Indian Med. Gaz., Calcutta,* liii, no. 8, August 1918, pp. 281–284.

This paper criticises severely the views advanced in the preceding one. The chief points of Col. Dennys' argument are enumerated and are met with the assertion that "every single one of these statements is incorrect in the context in which it is placed and the vast majority of them are absolutely and fundamentally wrong." It is pointed out that there is no season in any part of India where *Xenopsylla cheopis* (rat-flea) is "conspicuous by its absence," and figures are quoted giving the average number of fleas per rat in various parts of India where well-marked epidemics of plague occur. These figures are considered as sufficient refutation of the theory that where chronic flea-infestation is found plague becomes endemic, and where there is seasonal infestation, epidemic plague occurs. The statement that the eggs of fleas laid in one spring hatch in the following spring, while not true even in the low temperatures of England, can certainly not be applied to any locality in plague-infected India. In the Bombay Presidency and in the Punjab, for instance, *Xenopsylla cheopis* lays eggs at all seasons of the year; these hatch in a few days, in Bombay in about two days. The author remarks that all who have given any time to the study of *X. cheopis* will appreciate the fact that the only practical way of dealing effectively with that parasite is by attacks on the rat, its definitive host, a proceeding that Colonel Dennys stigmatises as useless and dangerous. It is pointed out that the extent to which previous scientific work on the subject is ignored by Colonel Dennys makes it extremely difficult to frame a conclusive reply to his arguments. Many important results, a few of which are summarised in this paper, have been obtained by observations on thousands of rats and fleas carried on over a period of several years. While this work is ignored by Colonel Dennys, not a single fact is deduced to support his original ideas about the epidemiology of plague.

Criticising the second of the papers reviewed above, the author maintains that the information given is not nearly sufficient to enable the reader to draw any such conclusions as are deduced therefrom. While admitting that indiscriminate rat destruction, as it is too often carried out, effects very little good and frequently ends in failures such as those enumerated by Colonel Dennys, the conclusion arrived at is that the methods employed were ineffective, and not that rat destruction in itself is a harmful measure. The author concludes the present paper with his own views upon the measures to be taken in a plague-infested town, and the best method of conducting an anti-rat campaign. To start rat destruction measures only after an epizootic has started, and to give them up directly the epidemic begins to decline, naturally leads to disbelief in rat-extermination measures. The present attempts to increase the efficacy of rat-destruction methods are said to be yielding promising results. It is admitted that the complete eradication of the rat is impossible in any Indian town, but that does not mean that rat destruction energetically carried out in the non-epidemic season cannot diminish or eradicate altogether foci of plague infection; in most parts of India such foci are not numerous in favourable years.

This paper is followed by a memorandum on plague preventive measures which has been circulated widely, in the hope that some of the suggestions therein may be of assistance to the practical plague worker.

MALLANAH (S.). **Tobacco, Fleas and Plague.**—*Indian Med. Gaz., Calcutta*, liii, no. 2, February 1918, pp. 53–56.

The author of this paper is convinced of the efficacy of tobacco in the destruction of fleas as an anti-plague measure, and enumerates the advantages of its use. The leaves of tobacco spread on the floors of houses are said to kill fleas practically instantaneously. It is suggested that stitching the leaves on to a piece of cloth, which is then laid on the floor, is a good method of keeping them in place. Sprinkling water on the tobacco once a day keeps it from crumbling and renders it more effective. Powdered tobacco should be introduced into rat holes, which can then be firmly closed up with brick and mortar. The results of various experiments with this method are given.

KING (Capt. H. N.). **Some Unusual Methods of Disposal of Excreta in Camps.**—*Indian Med. Gaz., Calcutta*, liii, no. 2, February 1918, pp. 74–75.

Some methods of disposal of excreta that have been used in East Africa with success and that are not usual elsewhere are described. The smoke latrine consists of a cesspit or trench with a special opening for the introduction of a smoking wood fire in a perforated kerosene tin, which hangs half way down the pit suspended by wires from a board that closes the opening when the fire is let down. The fire will need renewal twice in a day, and if care is taken to keep the latrine openings closed, this arrangement needs very little attention and prevents the breeding of flies. An ordinary latrine trench dug at least two feet deep, instead of being filled in with earth is filled at least once daily with dry grass and leaves and burnt out. This is a good substitute for proper incineration. The burning not only kills the eggs and larvae of flies, but keeps away the adults as they dislike the odour of burnt grass. Another method adopted in South West Africa consisted of deep trenches into which no earth was thrown but which were daily sprayed with a sodium arsenite solution in the proportion of 1–2 lb. sodium arsenite and 10 lb. sugar to 1 gal. water. Flies are killed by this method just when they are most dangerous, that is after visiting the latrines. This plan promises success in dry climates and might possibly be equally useful in moist ones. It is especially a method for use where fuel is scarce.

Hehir (Col. P.). **The Prevention of Malaria in Cantonments.**—*Indian Med. Gaz., Calcutta*, liii, no. 4, April 1918, pp. 130–134.

Malaria is in India the dominating cause of inefficiency in troops in both peace and war; while the majority of cases are relapses, the initial infection is frequently acquired in cantonments. The necessity for a thorough preliminary enquiry into the malaria conditions of a cantonment is insisted upon, while the breeding habits and bionomics of local Anophelines generally should be studied and a determination made as to the species that are the local natural carriers. Fresh breeding places for Anophelines are constantly being created in many cantonments. Borrow-pits are still being formed in the process of road making, in the course of military training and for other purposes.

The chief anti-mosquito measures in cantonments include rough canalisation of streams, irrigation canals and water-courses generally; levelling, grading and embanking of rain-water channels, ditches and roadside drains; filling up of tanks, borrow-pits, excavations and depressions; covering of disused wells; covering with mosquito-proof material or periodical emptying of water cisterns; filling up excavations for bullock runs; treating all small collections of water that cannot be abolished with some larvicide once a week; preventing where possible excavations for building purposes within cantonments; removal of brick factories from cantonment limits, and disuse of grass farms within half a mile of barracks when these are near the breeding grounds of Anophelines, or are themselves such breeding grounds. The cantonment mosquito gangs, which are chiefly engaged in treating collections of surface water with kerosene, should be employed in doing much of the work, which should be carried out systematically under the supervision of the malaria officer, senior medical officer and medical officers of units. It is considered possible to reduce both Anophelines and malaria in cantonments if a thorough and continuous anti-malarial policy be adopted from year to year.

The life-cycle of the malaria parasite in the blood and its relation to relapses are discussed and the effect of quinine prophylaxis is dealt with. Records indicate that in those malarious stations in which curative quinine treatment is more persistently carried out, relapses are decidedly fewer than in those in which quinine treatment is adopted in a half-hearted way. The best anti-malarial results so far have been obtained in places where all preventive measures have been put into operation more or less simultaneously and continued over a long period.

Richardson (E. R.). **Malaria Prevention in Malacca.**—*Indian Med. Gaz., Calcutta*, liii, no. 7, July 1918, pp. 270–274.

These notes on the subject of reduction of mosquitos and their breeding grounds have been written in the hope of promoting co-operation between the medical officers and others concerned in Malaya. The problem is dealt with chiefly from an engineer's point of view; the three main methods discussed are subsoil drainage, oil-spraying and the retention of close vegetation on water-laden areas, or re-afforestation. Attention is drawn to the fact that mosquitos are able to change their habits. In areas in Johore where there were very large numbers of *Anopheles maculatus* it was found that after heavy rain or oiling this species was found in potsherds and pans. This indicates the importance of storm flushing in nature. Drainage is considered the most important measure in anti-mosquito work. The importance of destruction of larvae is emphasised, and particularly of those bred in the side drains, which can be most economically controlled by flushing. A trap for destroying adult mosquitos is described. This consists of an artificial pond, the water-level of which is raised to flood grass and shrubs to any depth required, and the flow through the pond conveyed away through an underflow gate, which may, if necessary, be converted into an underflow flushing gate. The surface of the water is oiled, and when first put into operation quickly becomes covered with mosquitos that settle on the surface. Such a trap should be made in the vicinity of existing breeding-grounds, and side drains might be excavated to drain these into the trap.

Breinl (A.). **Half-yearly Report from 1st July to 31st December 1917.**—*Australian Inst. Trop. Med., Townsville, Queensland,* 15th May 1918, pp. 6–8. [Received 4th September 1918.]

During the month of July 1917, a malaria survey was undertaken of the township of Cairns, a low-lying coastal town with a white population numbering 5,193. The town is surrounded on three sides by ground gradually ascending to high hills, densely covered with shrub, while the township is intersected by swamps, several of them containing salt water, others fresh. The former are covered by a dense growth of mangroves and the latter by fairly dense scrub, while the swamps surrounding many of the houses hardly ever dry up.

The mosquito, *Anopheles* (*Nyssorhynchus*) *annulipes*, which most probably acts as a malaria carrier has peculiar breeding habits. The larvae are practically never found in deep water and do not require it to be clear and fresh, but prefer shallow pools of dirty water containing vegetable growth, or brackish and even salt water. This species is not a house mosquito, and does not deposit its eggs in rain-water tanks or water receptacles in dwellings, but it flies from the swamp into houses, and, after feeding, returns to oviposit.

A collection of 657 blood samples from families that had recently suffered from fever, and from apparently chronic cases, showed that 88 were infected with malarial parasites, 45 of which were those of benign tertian fever, and 43 those of malignant tertian. No parasites of quartan malaria were encountered. Of the individuals whose blood was examined, 13·5 per cent. were found to be malaria carriers, thus proving that malaria is widely spread in Cairns and that the problem of eradication is one that requires immediate and vigorous measures.

Cockerell (T. D. A.) & Scott (J. T.). **Culicidae of Colorado.**—*Jl. Econ. Entom., Concord, N.H.*, xi, no. 4, August 1918, pp. 387–388.

Aëdes cinereus, Mg., new to the State of Colorado, is here recorded, and other species already known are reported from new localities, including *Aëdes curriei*, *A. vexans*, *A. nigromaculis*, and *A. aldrichi*.

KINOSHITA (S.). **Chosen-san Kiuketsu-sei *Culicoides* ni tsuki te.** [On a Korean blood-sucking *Culicoides.*] — *Dobutsugaku Zasshi* [*Zoological Magazine*], *Tokyo*, xxx, no. 354, April 15th 1918, pp. 155–160, 1 fig.

At Moppo, in Korea, there occurs a small blood-sucking Dipteron, the attacks of which not only cause swelling of the affected part, but also give rise to fever, especially in young children. As it is very small, an ordinary mosquito net does not afford protection from it. It belongs to the family CHIRONOMIDAE, and is a new species, which the author describes in detail under the name *Culicoides miharai.* The complete life-cycle is not yet known, but it appears twice a year in large numbers, first during June and secondly from August to the middle of September. In the towns it attacks man towards evening, but in the field throughout the day. It occurs chiefly along the sea-shore or riverside, so that it is not improbable that the larva is a mud-dweller in tidal areas.

SANBORN (C. E.) & PAINTER (H. R.). **The Chicken Tick** (*Argas miniatus*, **Koch**).—*Agric. Expt. Sta.*, *Stillwater, Oklahoma*, Bull. no. 118, May 1918, 8 pp., 3 plates. [Received 19th September 1918.]

Argas persicus (*miniatus*) (chicken tick) is dealt with at length in this bulletin, which, however, contains no new information except records of the experimental exposure of these ticks to extremely low temperatures, which have little or no effect upon them.

HILL (B. J.). **Note on the Analysis of Soda-Sulphur Dips.**—*S. African Jl. Sci.*, *Capetown*, xiv, no. 11, June 1918, pp. 474–476. [Received 12th September 1918.]

One of the many soda-sulphur concentrates sold in South Africa for use as a sheep-dip for the eradication of scab, is described as lime-sulphur dip, although calcium is practically absent. Since sodium polysulphide is just as valuable as calcium polysulphide (if not more so) in the treatment of scab, nothing is to be gained by such confusion of specification.

Carbonate, hydroxide, and polysulphide (tetra or penta) can co-exist in solution without immediate interaction. A little carbonate is therefore of no consequence in a freshly-made dip, but it is possible that on prolonged storage, a slow reaction with polysulphide may take place with possible formation of depilatory hydrosulphide. This point however has not yet been specifically investigated.

In reporting upon the efficacy of a soda-sulphur concentrate in relation to the eradication of scab, the content of polysulphide sulphur should be made the basis of calculation. Other constituents, such as thiosulphate, are of negligible parasiticidal importance, and need not be considered in evaluation. The dilution recommended for tank strength should be such that the polysulphide does not fall below 0·6 to 0·7 per cent.

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CONNAL (A.) & COGHILL (H. S.) **Medical Entomology.**—*Rept. Med. Research Inst. for 1916, Lagos, Nigeria.* [n. d.], pp. 26–28. [Received 6th September 1918.]

The mosquitos recorded during the year were:—*Anopheles costalis, A. funestus, A. mauritianus, A. theileri, A. nili, Stegomyia fasciata, S. africana, S. luteocephala, Culex rima, C. insignis, C. fatigans, C. thalassius. C. decens, C. grahami, C. duttoni, C. consimilis, C. pruina, C. tigripes, Ochlerotatus irritans, O. nigricephalus, Uranotaenia annulata, Culiciomyia nebulosa, Micraedes inconspicuosa, Mansonioides uniformis, M. africanus, Mucidus mucidus* and *Banksinella lineatopennis* (*luteolateralis*).

Tabanids taken included:—*Tabanus taeniola, T. thoracinus, T. socialis, T. ruficrus, T. sagittarius, T. kingsleyi, T. secedens, T. quadrisignatus, T. fasciatus, T. combustus, T. besti, Chrysops silacea, C. longicornis* and *Hippocentrum versicolor.*

Other Diptera recorded were:—*Culicoides grahami, Simulium damnosum, Glossina palpalis, G. caliginea, G. tachinoides, Stomoxys omega, Hippobosca maculata* and *Cordylobia anthropophaga.*

The flea, *Ctenocephalus canis*; the bed-bug, *Cimex hemiptera* (*rotundatus*), and the ticks, *Margaropus* (*Boophilus*) *annulatus, Rhipicephalus sanguineus,* and *Amblyomma variegatum,* from horses and dogs, were also taken.

BYAM (Major W.), CARROLL (Capt. J. H.), CHURCHILL (Lieut. J. H.), DIMOND (Capt. L.), LLOYD (Lieut. Ll.), SORAPURE (Capt. V. E.), and WILSON (Lieut. R. M.). **Trench Fever—a Louse-borne Disease.**—*Trans. Soc. Trop. Med. Hyg., London,* xi, no. 7, June 1918, pp. 237–284. [Received 10th September 1918.]

The evidence obtained from experimental work may be summarised as follows:—(1) The whole blood from febrile trench fever cases, up to the 51st day of disease, when injected intravenously, is capable of reproducing the disease, the incubation period in such infections varying greatly, from 5 to 20 days; (2) the virus as contained in the circulating blood is destroyed by the addition of distilled water in large quantities; (3) the bites alone of infective lice do not produce trench fever; (4) the excreta of infective lice when applied to a broken surface of skin do readily produce trench fever, the incubation period of such infections being remarkably constant and averaging eight days; (5) the excreta passed by lice fed on trench fever patients are not infective till the expiration of not less than five days from the beginning of the feeding on trench fever blood, thus indicating a development cycle in the louse or a period during which the organism multiplies; (6) once lice are infective, they remain so till at least the 23rd day from the date of their infection; (7) the virus of trench fever, as contained in infected louse excreta, is capable of withstanding drying at room temperature, exposure to sunlight, keeping for not less than 16 days, and heating to 133° F. for 20 minutes; (8) a temperature of 176° F. for 10 minutes destroys the virus, which is therefore not a spore-bearing organism; (9) the bodies of infected lice when crushed upon the broken skin are capable of producing trench fever, the period at which lice become thus infective being not yet determined; (9a) active trench fever blood equivalent to the content of 11 lice does not produce trench fever when rubbed into the broken skin; (10) infection probably does not take place by the mouth or by inhalation; (11) the excreta of lice are not normally capable of producing trench fever; (12) lice infected with trench fever do not transmit the disease to their offspring; (13) there is a possibility of some attacks of trench fever being afebrile throughout; (14) the percentage of individuals naturally immune to trench fever is exceedingly small; (15) old age is no bar to infection; (16) such immunity as results from an attack of trench fever is not permanent, and may only persist for so long as the individual shows evidence of the disease; (17) even as late as the 79th day of disease a patient's blood may remain infective, and be capable of infecting lice fed on such a patient while febrile; (18) the different varieties of trench fever result from differences in the persons infected rather than in the source of infection. Some of these findings may be modified by future work, as the number of experiments made has been but small.

Since trench fever is conveyed by lice, there is the possibility of its being carried to all parts of the world where conditions favour the spread of louse-borne disease. A map has been compiled showing the distribution throughout the world of the three louse-borne diseases, typhus exanthematicus, relapsing fever and trench fever. Strict accuracy is not claimed, however, owing to the scantiness of information from the less civilised parts of the world, and to doubt concerning the nature of certain epidemics; and further, no account has been taken of the war epidemics, information about these being too fragmentary.

Typhus fever is now very rare in Western Europe, though once common and still lingering in endemic form in parts of Ireland, Brittany and possibly southern Portugal. It occurs frequently in Austria, especially Galicia, is very prevalent throughout Russia and the mainland of Asia from about 25° N. latitude, and before the War, was often met with in Turkey. In Japan, and Asia south of 25° N. latitude, it is less frequent, being apparently absent from Central and Southern India, the East Indies, the Malay Peninsula, and Australasia, with the exception of Celebes. In Africa, it is very prevalent north of the Sahara, and south of this, it is epidemic in parts of Cape Colony. It has occurred as localised outbreaks in Canada and the United States, being generally traceable to Irish immigrants, but has never become endemic there. In Mexico and the South American Andes it flourishes on the high ground in both endemic and epidemic form, and has been recorded from the greater part of South America, but not recently in Guiana or the West Indies.

In Europe and northern Africa the distribution of recurrent fever corresponds exactly to that of typhus. In Asia it is less prevalent to the east of the Obi and Ural rivers than to the west of them, while it has not been definitely reported from Japan, the East Indies, Malay Peninsula and Australasia (with the possible exception of a single death in W. Australia). It has been reported from the greater part of India, and, as spasmodically occurring, over the greater part of North America. The form occurring in Central and South America is possibly tick-borne, as is also that occurring in Africa south of the Sahara, *Ornithodorus moubata* being the vector.

So far as is known, trench fever has been reported only from the War zones and neighbouring regions, such as Flanders, France (from the Vosges to the sea), the Italian front, at Salonika, and, to a small extent, in Mesopotamia. It has not been reported from Egypt, Syria or East Africa. It has prevailed in Poland, Galicia and the Bukovina.

It is probable that lice occur in every inhabited part of the world, though the fact cannot be definitely asserted, in the present state of our knowledge, but they are undoubtedly less plentiful in hot than in cold climates. The distribution of louse-borne diseases, therefore, by no means corresponds with the distribution of lice, the former being peculiar to cold, rather than to hot climates, to mountainous, rather than to low-lying countries, and prevailing in winter rather than in summer. They appear to have originated in the Old World and to have been carried by the Spaniards to Mexico and Peru, where they have become endemic on the high ground. In Australasia, the tropical belt seems to have imposed a barrier that they have been unable to cross, with the curious exception of Celebes. In view of these facts, the introduction of louse-borne disease into any country should be carefully guarded against.

Organised prophylactic measures are not a difficult matter in civilian life, but such is not the case among armies, where the important thing is to remove every possible source of re-infestation. Lice have a proclivity for wandering, and are able to exist, without feeding, for a week at ordinary room temperatures and longer under cooler conditions, 10 days at 41° F. being the longest recorded period.

The disinfestation of troops by means of bathing and the use of ointment (of which the most satisfactory is composed of crude, unwhizzed naphthaline from the coke oven 4 parts, and soft soap 1 part) and that of their clothing (including blankets and kits) by means of heat or insecticides are measures that should be carried out at the same time for every set of billets, huts, or dug-outs.

TAYLOR (F. H.). **Report of Entomological Department.**—*Australian Inst. Trop. Med., Townsville, Queensland, Half-Yrly. Rept. from 1st July to 31st December 1917*, 15th May 1918, pp. 10–12. [Received 4th September 1918.]

The mosquitos collected and bred out during the malaria survey in Victoria and S. Australia furnish additional records for previously known species, especially *Anopheles* (*Nyssorhynchus*) *annulipes*, Wlk.

A preliminary list of the mosquitos taken at Cairns includes :—*Anopheles* (*Myzorhynchus*) *barbirostris* var. *bancrofti*, Giles, *A.* (*Nyssorhynchus*) *annulipes*, Wlk., *Stegomyia fasciata*, F., *Pseudoskusea similis*, Theo., *Ochlerotatus* (*Scutomyia*) *notoscriptus*, Skuse, *Macleaya tremula*, Theo., *Ochlerotatus* (*Culicelsa*) *vigilax*, Skuse, *Culex fatigans*, Wied., *C. sitiens*, Wied., *Mansonia* (*Taeniorhynchus*) *uniformis*, Theo., *Finlaya poicilia*, Theo., *Skusea funerea*, Theo., *S. uniformis*, Theo., *Uranotaenia* (5 spp.), *Lophoceratomyia* sp. and *Hodgesia* (2 spp.), the last two genera having only recently been discovered on the mainland of Australia, though known from Africa, Malaya and Borneo, one species of *Hodgesia* having also been described from Papua.

A list of Australian Tabanids is given, for one of which, *Pelecorhynchus mirabilis*, Tayl., a new genus may be required. Other species are

Diatomineura violacea, Macq., and *Silvius montanus*, Ric., from South Queensland, the former having previously been known only from the Cairns hinterland.

COCKERELL (T. D. A.). **New Species of North American Fossil Beetles, Cockroaches, and Tsetse Flies.**—*Proc. U.S. Nat. Museum, Washington, D.C.*, liv, no. 2237, 1918, pp. 301–311, 2 plates, 5 figs.

Up to the present time 17 species and 4 recognisable varieties of tsetse-flies are known from Africa. The only exception to the rule that these flies are peculiar to the African continent is *Glossina tachinoides*, which has been found in southern Arabia.

In 1892 and 1907 specimens of a fossil tsetse-fly from the Miocene shales were found in Colorado and described as a new genus and species, *Paloestrus oligocenus*, though this is now recognised as a true *Glossina*. This discovery gave rise to the theory that the disappearance of so many large mammals formerly inhabiting America may have been due to the prevalence of a tsetse-fly, carrying disease-producing organisms. Other specimens, representing additional species, that have subsequently been discovered at the same place are:—*G. osborni*, *G. veterna*, and *G. armatipes*. Of these fossil species *G.* (*Paloestrus*) *oligocena* is the largest, the wings being 16 mm. long. Whether *Glossina* originated in the eastern or western hemisphere is doubtful, since there are no closely related genera known, and no true Muscids have been found in the Colorado Miocene shales.

DERIVAUX (R. C.). **The Relation of the Railroads in the South to the Problem of Malaria and its Control.**—*U. S. Public Health Repts., Washington, D.C.*, xxxiii, no. 31, 2nd August 1918, pp. 1267–1271.

Public works, and more especially railroad construction operations, have long been notorious for their incidental contributions to malarial problems, by creating conditions favouring the development of Anopheline mosquitos. Among such conditions are:—Badly located and undrained borrow-pits, sometimes traversing thickly settled communities; right-of-way ditches, improperly cut and without outlets; improperly placed culverts and crossings installed with the idea of saving in pipes or masonry, preventing the flow of normal and storm waters, or even interfering with a whole system of natural drainage; inadequate provision for drainage behind or through embankments; installation of leaky water-towers, or failure of provision to carry off their overflow.

Railroad construction is also responsible for the dissemination of infection through labour gangs, which, often badly infected, are moved from place to place and housed in cars permitting the unrestricted access of mosquitos.

Much can be done towards the solution of this great problem by gradually improving existing conditions, and by doing everything possible to prevent their occurrence in connection with new works.

Work undertaken by railroads in dealing with the malaria problem naturally falls into two groups, that of the engineering departments and that of the medical and sanitary ones. In the former group is included the correction of old construction conditions such as:—Drainage or filling of borrow-pits and low areas where practicable;

proper provisions for drainage (in a sanitary sense) behind embankments etc.; the replacing of culverts to true gradient, where necessary; drainage or other provision for disposal of overflow waters at tanks and towers; clearing of weeds and refuse at regular intervals from right-of-way ditches (supplemented by oiling if necessary) especially in, and adjacent to, settlements; and also the consideration of sanitary features in connection with new construction works.

Work of the medical and sanitary departments should include:—The encouragement of, and participation in, intensive mosquito-control campaigns in the communities through which railroads pass; careful and thorough treatment of actual cases of malaria among employees, so as to prevent the development of chronic cases and relapses as far as possible; statistical observations through morbidity reports, furnishing data indispensable for accurate guidance in the establishment of prophylactic measures; systematic educational work; prevention of malaria among transfer gangs by the use of screens for the windows, doors and other apertures of their sleeping cars, supplemented, if necessary, by the use of prophylactic quinine; the thorough treatment of active cases of malaria before returning them to their units; the intensive control of mosquito production in communities of shop mechanics, repair men and car builders.

Good results have been obtained by the use of such measures in the case of the Rome-Solomona Railway in Italy, and of the St. Louis and South-western Railroad, preventive work on the latter resulting, in 1917, in the reduction of malaria cases by 59·4 per cent.

SERGENT (Edm.) & SERGENT (Et.). **Sur le Paludisme des Oiseaux dû au** *Plasmodium relictum* **(vel** *proteosoma***).** [Malaria of Birds due to *Plasmodium relictum* vel *proteosoma.*]—*Ann. Inst. Pasteur, Paris*, xxxii, no. 8, August 1918, pp. 382–388, 2 figs.

The experimental inoculation of birds with *Plasmodium relictum*, either by the bites of infected Culicines or by intraperitoneal inoculation with the blood of an infected bird, has shown that the infection is practically the same in both cases, the incubation period lasting for from 3 to 10 days, and the resulting mortality being 61·3 per cent [see this *Review*, Ser. B, vi, p. 140]. In fatal cases the spleen was found to be enormously enlarged and blackened, the same being the case in individuals exhibiting relative immunity.

The mosquitos in which the complete evolution of *P. relictum* can take place are:—*Culex sergenti*, Theo., *Theobaldia longiareolata*, Mcq. (*spathipalpis*, Rond.) and *Acartomyia mariae*, Serg. & Theo., all being species the larvae of which can live only in salt water in excavations on the cliffs of the Mediterranean coast. The incubation period of the infection transmitted by the bite of *Acartomyia mariae* is 11 days instead of 3 or 4 days. *Culex pipiens* retains the power of transmitting infection for 5 months at a temperature of from 46°–77° F., and immunity is never acquired by this species.

A trypanosome is also described, but not named, from the blood of a canary (*Serinus canarius*). The sparrow (*Passer domesticus*) in two cases out of several hundreds was also found to be infested with this trypanosome.

Caffrey (D. J.). **Notes on the Poisonous Urticating Spines of *Hemileuca oliviae* Larvae.**—*Jl. Econ. Entom., Concord, N.H.*, xi, no. 4, August 1918, pp. 363–367.

The urticating spines borne by the larvae of *Hemileuca oliviae* (New Mexico range caterpillar) are first developed during the second instar, but during the fourth and succeeding instars their presence is so noticeable that it is impossible for a susceptible person to come in contact with them without serious injury. The same is true of the pupae and cocoons, the spines of the last-moulted larval skin being incorporated during the process of pupation. The effect of the poisonous agent contained in these spines appears to be cumulative, second year workers on *H. oliviae* suffering far more severely than those to whom the work is new. The same phenomenon has been found to occur in the case of the brown-tail moth, *Nygmia phaeorrhoea* (*Euproctis chrysorrhoea*). The injury may be internal or external, the latter varying in severity according to the part of the body affected, and even leading to partial disability for short periods. Internal injury, which is much more severe in nature, may result, in advanced cases, in typical bronchial or asthmatic symptoms, or other disorders of the respiratory tract.

The ill-effects of these spines on the tender mouths of grazing cattle are such as to cause these animals to avoid all grass in the vicinity of the larvae of *H. oliviae*, this fact being an important item in the total loss occasioned by the pest.

The larvae of the closely allied New Mexican species, *H. nevadensis*, Stretch, feeding on willow, and a species that is perhaps a variety of *H. maia*, Busck, feeding on scrub-oak, have the same poisonous properties as those of *H. oliviae.*

Roubaud (E.). **Recherches sur la Transmission du Paludisme par les Anophèles français de Régions non palustres (Yonne et Région parisienne).** [Investigations into the Transmission of Malaria by *Anopheles* in the non-malarial Regions of France (Yonne and the Paris District).]—*Ann. Inst. Pasteur, Paris,* xxxii, no. 9, September 1918, pp. 430–462, 2 figs.

The occurrence of Anophelines throughout the whole of the Paris district is a well-established fact; the chance capture, on several occasions, of individuals of *Anopheles maculipennis* in and about Paris proves the latent existence of the vector of malaria in the very heart of France. The occurrence of large numbers of Anophelines, in the absence of any malarial epidemic, has been noticed in various parts of Europe, but the real causes of the discrepancy between the geographical distribution of hosts and parasites are not known. This might be explained by the fact of non-introduction of the virus, but it is difficult to sustain this theory in France where the germs of infection are liable to be brought at any moment into contact with existing Anophelines by malaria-carriers from the Colonies or elsewhere. A more likely hypothesis advanced by several authors is that of the existence of races of Anophelines resistant to malarial infection. Hopes have even been raised of an artificial distribution of such races in malarial regions as a prophylactic measure. In the present circumstances, when trooops that include many malaria-carriers are being constantly brought into France, it has been thought well to study the value of these theories regarding the immunity of races of Anophelines. The author, by means of experiments which are here detailed, has demonstrated the receptivity of Anophelines in the Paris district to the two forms of tertian malaria ; infection has been produced by *Plasmodium vivax* in 9 individuals of *A. maculipennis* out of 23, and by *P. praecox* in 8 out of 15. Further experiments have proved that these Anophelines are capable of transmitting the infection they have received. It is therefore obvious that the absence of malarial infection in the region studied is not due to immunity of the mosquitos occurring there.

The author's observations have led to certain deductions concerning the sexual development of malarial organisms of the tertian type. The varied conditions of humidity and temperature in which his experiments have been conducted show that the infection of mosquitos is not influenced by exterior circumstances if the temperature necessary to the development of the forms is maintained. The infection contracted by the mosquitos has been no more intense in moist than in dry air. While dryness in the air is directly harmful to Anophelines and does not admit of their prolonged existence, the sporocystic development of the parasites continues unimpaired. The action of temperature is apparent in the rapid development of the parasites. The only conditions that seem to influence development in the mosquito depend upon the state of the parasites in the blood of the malaria patient. Certain gamete-carriers are infective to mosquitos, others are not ; and while there is no exact explanation of this, it apparently depends upon the age and sex of the gametes. When a malarial subject harbours gametes capable of sexual development, it may be said that all healthy Anophelines that draw blood from that source contract infection. This is borne out by the author's experiments. In one case of malignant tertian malaria, none of the five mosquitos fed upon the patient became infected. It was found impossible to discover the existence of male crescent forms among the numerous female crescents in the blood of this patient. It may be admitted therefore that the elimination of one sex of the gametes, if it could be obtained by suitable treatment, would render great service in prophylaxis in the absence of a more effective cure. According to Ziemann, male crescents can easily be destroyed by quinine, to which the female crescents are resistant. This theory has not, however, met with universal acceptance.

The infection obtained in the Parisian Anophelines has in general been more intense with *P. praecox* than with *P. vivax*. All infections with the latter have been weak ; with the former, infection of the mosquito has been severe, the salivary glands being overcharged with sporozoïtes. The study of the sexual evolution of *P. vivax* and *P. praecox* affords valuable evidence in support of the question of the specific difference of these forms. While in human blood the epidemiologic succession of the two tertian forms has been so striking as to lead many authors to regard them as two varieties of the same parasite, in the mosquito, on the contrary, the cycle of each form exhibits a constant individuality, both in morphological and physiological characters. The characteristics of the living young zygotes of the two tertian forms are easily differentiated. The physiological differences are also described and the cycle of development of the two forms contrasted. At a constant temperature of 77° F. the author has obtained the complete development of *P. vivax* in 11 days, while the parasite of the malignant tertian form required a minimum of 14 days. The constant differences in these sexual cycles, which have been observed by various authors, do not support the theory of the specific identity of the two parasites [see this *Review*. Ser. B, vi, p. 205]. Considered together with the morphological differences referred to above, they afford, on the contrary, a weighty argument in favour of the view that *Plasmodium vivax* and *P. praecox* are distinct species.

The following explanation is offered of the seasonal and geographic differentiation of the two tertian parasites, based upon the duration of the sexual cycle. It is known that in temperate climates where the two organisms co-exist, it is *P. vivax* that appears first in the spring attacks of fever, while *P. praecox* is dominant in the summer and autumn. Recent observations made in regard to the Balkan army have confirmed this periodicity [see this *Review*, Ser. B, v, p. 98]. The earlier appearance of *P. vivax* is recognised as a direct consequence of its more rapid development in the Anopheline. At that season the sporozoïtes of *P. vivax* are largely infecting the salivary glands of the Anophelines and it is therefore the benign tertian form that appears. The early activity of *P. vivax* is followed by a premature invasion of human habitations; it is therefore easily understood how *P. vivax* is earlier discovered in the blood. When *P. praecox*, having completed its sporogonic development, begins to be disseminated by the Anophelines, it finds its human victims already infected to a great extent by the parasite of benign tertian malaria. In the majority of cases it is therefore a mixed infection that is produced, but owing to the previous invasion of the human blood by asexual generations of *P. vivax*, it may be assumed that the presence of *P. praecox* passes for a time unnoticed. It is only later in the summer and autumn that, owing to their increased virulence and perhaps to many re-infections, the asexual generations of *P. praecox* take up the dominant rôle and mask the primary infection. The final re-appearance of *P. vivax* in the winter, in the case of secondary malaria, is doubtless a result of the reverse phenomenon, *P. vivax* reappearing in patients attacked by a mixed infection when *P. praecox* has spent its first violence. This preponderance of *P. vivax* over *P. praecox*, owing to its more rapid development, explains the almost exclusive occurrence of the benign tertian form in temperate countries where malaria is not intense, such as France. The locally-acquired malignant tertian form is so rare in France that the question of its possible transmission by the Anophelines found in the country has been disputed by various authors.

While it may be assumed that the temperature conditions in France in summer and early autumn are perfectly compatible with the development of *P. praecox*, and while this theory is confirmed by observations on cases of malignant tertian malaria, it is nevertheless obvious that some factor must exist that limits the extension of that parasite in France. The explanation of this seems to be the competition of *P. vivax*, with its more rapid development, which masks and counteracts the asexual generations of *P. praecox* in a manner disadvantageous to the establishment of the endemicity of the malignant tertian form. Another factor to be considered is the small number of Anophelines occurring in the regions where malaria is not intense. In hotter climates, on the contrary, the higher exterior temperature accelerates the sporogonic cycle of the two forms, tending to reduce the differences in duration of the cycles, and equilibrium is thus rapidly re-established to the benefit of the more virulent form. The author is therefore led to a similar conclusion to that of Lagriffoul and Picard [see this *Review*, Ser. B, vi, pp. 70 & 105], who ascribe the preponderating influence to climatic action, but in a more complex and less direct manner, the action of temperature alone being recognised as insufficient to explain the facts. The physiological competition of the two forms in the human system must also be considered as an important factor.

In discussing the mixed infection of Anophelines with the two tertian forms, the author records an experiment proving that an Anopheline already infected by one of the two forms can simultaneously contract an infection of the other form. It may be presumed therefore that the sporozoïtes of the two tertian types can co-exist in the glands of the same mosquito, which can thus in one bite confer a mixed infection. If the specific unity of the two forms be admitted, this experiment proves also that a first malarial infection does not confer immunity upon the mosquito. This fact had previously been established by Sergent with regard to malaria in birds. The theory of acquired immunity cannot therefore be taken as explaining the existence of races of Anophelines resistant to malaria, as some authors have suggested.

The question of the duration of infectivity in the salivary glands of the mosquito has received but little attention. It has been found in the case of birds that infection can be carried to more than one canary by successive attacks of the same Culicine. The existence has also been proved of old sporozoïtes, dating back to an infection of one or two months previously, in Culicines in a state of hibernation. This leads to the supposition that the sporozoïtes may be maintained throughout hibernation in the salivary glands of mosquitos. Most authors who have dealt with the epidemiology of malaria in Europe are of opinion, however, that the winter preservation of malaria parasites is due not to Anophelines but to man [see this *Review*, Ser. B, vi, p. 5]. The absence of infection in Anophelines during the winter seems due primarily to the arrested development of the zygotes under the influence of cold [see this *Review*, Ser. B, v. p. 183]. But the observations of Mitzmain throw no light on the fate of the sporozoïtes that have been formed and have reached the salivary glands of the mosquito before the winter. Anophelines infected in October by the author and kept without other food than water until March or April have no longer any trace of infection. Experiments conducted by the author lead to the conclusion that not only do the salivary glands discharge the majority of their sporozoïtes in the course of a few punctures, but that any sporozoïtes that have not been ejected degenerate gradually in the tissue of the glands or in the salivary medium and become incapable of transmitting malaria. The same conclusion has been reached in the case of the disappearance of the virulence of *P. relictum* of birds in Culicines after several months' hibernation [see this *Review*, Ser. B, vi, p. 139]. It is evident from these facts that the salivary medium of the mosquito cannot be regarded as the true hibernating medium of malarial sporozoïtes, which may remain for months in the salivary glands without being ejected because no meal of blood is taken. The rôle of winter host of the malarial parasite devolves upon man.

This paper concludes with a discussion on the subject of the presence of Anophelines without malaria and the danger of the spread of malaria in France. Experience has justified, in principle, the fears expressed by several writers of the spread of malaria in France as a consequence of the War. Isolated cases of infection and even slight epidemics of locally-acquired malaria have been notified from various parts of France; generally the infection was due to *P. vivax*, but in some cases *P. praecox* was equally the cause. There is therefore some ground for the fear that the tropical tertian form may become established in France. The author does not think such a contingency likely to occur. He points out that the three factors necessary for the dissemination of the disease, namely, man, the virus and the Anopheline carrier, are not in themselves sufficient to give rise to endemicity; a further necessary condition is the establishment of frequent and continuous relations between man who is the reservoir of the virus and the local Anophelines. Temporary or exceptional relations between the two hosts break the continuity of the cycle and tend to suspend the endemicity, which can only be established when the mosquitos become domesticated and appear constantly in human habitations. The author points out the analogy of these conditions with those he has described as essential for the endemicity of human trypanosomiasis in Africa; sleeping sickness is not rife wherever *Glossina palpalis* and possible carriers of trypanosomes occur; the endemicity is established preferably where tsetse-flies live permanently at the exclusive expense of man in the absence or scarcity of other hosts capable of furnishing their nourishment.

The conditions producing such close relations between man and Anophelines in France are as yet but little understood. Attention has previously been drawn to the scarcity of *A. maculipennis* in the houses around Paris and in the valley of the Essonne, a region where malaria is absent, in contrast to their relative abundance in the houses of the villages and boroughs of Vendée, where endemic malaria is rife. The fact is that in the French climate the local Anophelines are not markedly blood-suckers; this is important, since it furnishes a logical explanation of the much-discussed problem of their presence in the absence of malaria. The author is decidedly not of the opinion, expressed by some writers, that in non-malarial regions the Anophelines have lost the habit of biting man. Observations have led him to the conclusion that *A. maculipennis*, and doubtless *A. bifurcatus* also, do not take chance flights even at a short distance from their breeding-places for the purpose of finding nourishment in houses, but that they have definite and constant zones of flight, within which they travel in search of any suitable source of nourishment, whilst outside these zones their attacks are not to be feared. The extent of these zones of flight varies according to exterior conditions and the facilities for obtaining meals of blood. The same observations have been made in the case of the Anophelines of the Panama Canal Zone. The ideal conditions for intimate relations between man and mosquitos in France seem to be the existence of low, isolated habitations built at ground level in the midst of a moist wooded or swampy zone. Such conditions of life, which are primitive, have become exceptional in France, but have been renewed during the war by the establishment of camps and more or less permanent buildings within the zone of flight of mosquitos. In this way there have arisen, and will still arise under the influence of a fresh introduction of the virus, small foci of locally acquired malaria. This invasion by man of the zones of flight of Anophelines will cease with the War, and then these temporary centres of endemic malaria will automatically become extinct.

It is obvious from the foregoing that the presence of Anophelines without malaria in France is explained by the organisation of human settlements outside the zones of flight of Anophelines, and it is equally clear that malaria can be controlled, at least in temperate climates, by the simple precautions necessary for the prevention of continued intimacy of life between man and Anophelines, without attempting the complete destruction of the latter. Further knowledge of the biology of Anophelines will be necessary in order to reach a definite understanding of the conditions capable of encouraging or suspending the relations between mosquitos and man.

Abridged Report of the Chief Veterinary Surgeon for the Year 1917.—*Rhodesia Agric. Jl., Salisbury,* xv, no. 4, August 1918, pp. 339–343.

Thirteen fresh outbreaks of African coast fever were reported during the year. It is realised that without ticks there would be no coast fever, but under local conditions the complete eradication of ticks is considered impossible, though the complete elimination of infection is possible. If every area carrying infected ticks could be accurately defined the disease could be eradicated within two years by present methods. In the majority of cases, however, the disease has been in existence for several months before it is brought to notice and meantime infection has been disseminated, which is not manifest for another extended period, and so the disease is always ahead of the control. To remedy this state of affairs universal compulsory dipping of cattle throughout the Territory has been proposed. Whilst the value of this method is fully appreciated, it is stated that weekly dipping, however efficiently practised, will neither eradicate coast fever nor prevent its spread. While dipping reduces the number of ticks, it also serves to mask the disease for an indefinite period, with the result that recrudescences occur where the disease was regarded as stamped out and fresh outbreaks occur on previously clean areas.

Hirst (S.). **On Four New Species of the Genus *Demodex*, Owen.**—*Ann. Mag. Nat. Hist., London,* (9) ii, no. 8, August 1918, pp. 145–146.

The four new species dealt with are :—*Demodex soricinus*, sp. n., from *Sorex vulgaris* ; *D. apodemi*, sp. n., and *D. longior*, sp. n., from *Apodemus sylvaticus* ; and *D. nanus*, sp. n., from *Rattus rattus* (black rat).

Reports and Papers on Malaria contracted in England in 1917.—*Repts. to Local Govt. Bd. on Public Health & Med. Subjects, London,* New Series no. 119, 1918, 85 pp., 6 plates, 1 map.

The papers contained in this report deal with military, naval and civil cases of malaria contracted in England in 1917; practical points in the study of malaria and its diagnosis, treatment, and prevention, including mosquito control measures, which are fully described; English mosquitos, by A. J. Grove; tables showing recorded observations of Anophelines in England; reports on the mosquito surveys of various districts; and a map showing the localities in which Anopheline mosquitos have been recorded in England and Wales, which has already been noticed [see this *Review*, Ser. B, vi, p. 175].

The Etiology of Trench Fever.—*Brit. Med. Jl., London,* no. 3005, 3rd August 1918, p. 120.

A commission under Major R. P. Strong appointed by the American Red Cross Research Committee reports the following further results of experiments on the transmission of trench fever:—(1) The disease is caused by a filterable virus. (2) It can be conveyed by the bites of the louse alone, as well as by other means. (3) Infection appears to be conveyed by such bites for at least twelve days after the louse has ceased to feed on a patient with trench fever. (4) The virus is present in the urine, and the disease can be transmitted experimentally by inoculation with urinary sediment on a scarified area of the skin. (5) Similar results have been obtained with the sputum and saliva.

HUNTER (Col. W.). **New Methods of Disinfection for the Prevention and Arrest of Lice-borne Diseases (Typhus, Relapsing, and Trench Fevers).**—*Brit. Med. Jl., London,* no. 3008, 24th August 1918, pp. 198–201, 3 figs.

This is an account of the methods devised by the British Military Sanitary Mission sent to Serbia in 1915, in their attempt to deal with the appalling conditions there, due to typhus and relapsing fever. The urgent need was for extended measures, of disinfection on a large scale against body vermin, and these were made possible by the use of a railway-van disinfector devised to effect the disinfection of troops in large numbers.

The disinfector, which was made from a steel van and a small, old railway engine for the combined purpose of locomotion and production of steam, is described. Clothes placed in this apparatus, at the end of an hour, were found to be full of steam at a temperature of 212° F. to 220° F., which rapidly evaporated on the clothes being shaken in the air, leaving them dry in a minute or two.

Such a disinfector with a double van is capable of disinfecting 500 kits with 1,000 blankets and 500 overcoats every two hours, or 10,000 kits and overcoats and 20,000 blankets every four days.

The important factors in this process are: (1) The disinfecting power of steam in continuous motion at ordinary atmospheric pressure; such steam is the simplest and most potent disinfectant. (2) The great force under which the steam is driven into the van enables it to penetrate even the largest bundles of clothes. (3) The great volume of steam available from the boiler of even a small engine.

Another important factor is the possible action of the extra heat of condensation of steam, which is set free when the steam, generated in the boiler under a pressure of 4–7 atmospheres, is suddenly reduced to atmospheric pressure on entering the van. This source of additional heat continues throughout the whole period of disinfection, and rapidly penetrates to the centre of even the largest bundles, where a temperature of 215° F. to 220° F. is registered.

Arkwright (J. A.), Bacot (A.) & Duncan (F. M.). **Preliminary Note on the Association of *Rickettsia* Bodies in Lice with Trench Fever.**—*Brit. Med. Jl., London,* no. 3012, 21st September 1918, pp. 307–309.

Small bodies resembling diplococci or bipolar bacilli have been described in the blood of patients and in the tick that carries Rocky Mountain spotted fever [*Dermacentor venustus*], in typhus fever and in trench fever, that occurring in connection with typhus fever being named *Rickettsia prowazeki.* The form found in lice believed to be infected, or in trench fever patients has been called *R. pediculi.*

The conclusions reached by these authors are:—(1) The constant presence, after a suitable lapse of time, of these bodies in lice that have been fed on a trench fever patient has been confirmed. (2) The absence of the bodies from lice bred in captivity and fed only on healthy men has been shown in these experiments, in contra-distinction to observations made on the Continent where the population is much more exposed to infection and a clean stock of lice is more difficult to procure than in England. (3) A very close correlation has been shown to exist between the presence of *Rickettsia* bodies in lice or the excreta of lice, and the virulence of these materials when inoculated into men.

Bacot (A.). **The Unreliability of Sulphur for the Destruction of Lice in Clothing.**—*Brit. Med. Jl., London,* no. 3017, 26th October 1918, p. 464.

Experiments undertaken to test the efficiency of the sulphur fumigation process as applied in the London Borough casual wards gave somewhat divergent results. The greater success obtained in one trial may have been due to some variation in the heat of the live coal, causing the sulphur to burn more rapidly, and so producing a higher concentration of gas, quick combustion being possibly more effective than slow combustion continued over a longer period. Previous experiments had shown that in cases where sulphur vapour is effective, a few eggs may hatch at a somewhat later date than those of the control. This may be explained on the supposition that eggs at some stages of development are relatively immune as compared with others.

Greater reliance may be placed upon heat, half an hour's exposure to a temperature of 131° F. being amply sufficient with either dry or moist heat, provided that the clothing or other articles are suspended, and not left in bundles.

TAYLOR (F. H.). **Studies in Australian Tabanidae.**—Separate, dated 31st May 1918, from *Records Australian Museum, Sydney*, xii, no. 5, pp. 53–70. [Received 21st October 1918.]

This paper records the results of an examination of the TABANIDAE of the Australian Museum. The new species described include *Pelecorhynchus distinctus*, *P. tillyardi*, *Erephopsis neotricolor*, *E. vicina*, *E. vicina* var. *georgii*, *Diatomineura cydister*, *D. regis-georgii*, *D. bicolorata*, *Silvius minor*, *Ectenopsis vulpecula*, Wied., var. *nigripennis*, *Tabanus musgravii*, *T. rainbowi*, *T. pseudobasalis* and *T. indefinitus*.

MENDY (J. B.). *Gastrophilus duodenalis*, **Parasitos del Estómago del Caballo.** [*Gastrophilus duodenalis*, Parasites of the Stomach of the Horse.]—*Anales Soc. Rural Argentina, Buenos Aires*, lii, no. 7, July 1918, pp. 429–440, 16 figs. [Received 21st October 1918.]

The method of attack of *Gastrophilus duodenalis* on horses, the life-history of the pest within the body of its host and the damage it causes are discussed. From a few establishments in the south of the province of Buenos Aires *G. duodenalis* has spread with alarming rapidity during the last ten years until it has become a serious problem in many of the South American States. It does not yet occur to any extent in Uruguay, and the author advocates as the best prophylaxis against its spread constant spraying during the embryonic stage of the parasite and frequent baths during the summer for all horses infested with eggs. The use of commercial specifics against this pest is deprecated on the ground that they are frequently not only ineffective, but even may have some irritating if not dangerous effect on the horse. The treatment recommended consists of the administration by ingestion of carbon bisulphide, which should be given after a five-hours' fast in the form of 3 or 4 capsules of 10 grammes each at intervals of one hour. Immediately afterwards a purgative of sodium sulphate in the proportion of 1 lb. to $\frac{1}{5}$ gal. tepid water should be given. As it is known that the larvae have the habit of closing their posterior respiratory apertures against the action of a toxic gas or liquid, the author suggests that a capsule of 10 grammes of sulphuric ether or of chloroform should be administered before the carbon bisulphide, so that the parasite may be anaesthetised with the stigmata open, thus permitting the penetration of the poison into the respiratory system.

LAHILLE (F.). **Atlas de la Garrapata transmisora de la Tristeza.** [Review of the Tick transmitting Tick Fever.]—*Bol. Ministerio Agricultura de la Nación, Buenos Aires*, xxii, no. 2, July-December 1917, pp. 243–257, 7 plates, 4 figs. [Received 18th October 1918.]

In view of the fact that a commission has been appointed under the auspices of the Ministry of Agriculture, to undertake a campaign for the suppression of the tick [*Margaropus* (*Boophilus*) *annulatus microplus*] the transmitter of tick fever to cattle, the author has written this condensed account of its life-history and habits. The biology of the tick is graphically represented in a chart showing the various stages in the life-cycle. Attention is again drawn to the necessity for one or two experts to devote themselves entirely to the problems in the biology of the tick that have not yet been solved.

WILLCOCKS (F. C.). **Notes on some Insects found in Egypt of Medical and Veterinary Interest.**—*Bull. Soc. Entom. d'Egypte, Cairo,* x, no. 3, July-September, 1917, pp. 79-90. [Received 22nd October 1918.]

Attention is drawn to the fact that Egypt has as yet contributed very little to the subject of medical, veterinary or economic entomology, and very little is known in Egypt regarding the biology of any insect of importance to that country. This paper contains notes on various Diptera, including *Phlebotomus papatasii*, Scop., which is the vector of three-day or sand-fly fever. The females apparently lay their eggs deep down in the soil, where the larvae are found ; these also occur in drains, damp cellars and such places. Mosquitos in Egypt require further study. Information is desirable regarding the summer habits and breeding-places of Anophelines, in order that it may be known whence the areas flooded by infiltration from a high Nile become so quickly infested by hosts of *Anopheles* (*Cellia*) and several species of Culicine larvae that are found in such situations. Information is also required as to which of the 4 or 5 species of *Anopheles* inhabiting Egypt are malaria carriers. It is recorded that *Theobaldia longiareolata* (*spathipalpis*), a giant mosquito, has recently been found to bite fiercely and painfully. The only Simuliid known to occur in Egypt is *Simulium griseicollis*, recorded from Assuan. The Simuliids have been connected with the disease known as pellagra in Italy, but it is not definitely known whether they are vectors of the disease. While pellagra is by no means unknown in Egypt, Simuliids are very rare, possibly owing to the fact that they require running water for the immature stages to live in. Chironomids include *Leptoconops kerteszi* and *Culicoides* sp., both of which are abundant in certain localities, and may possibly have some connection with pellagra. Tabanids include *Tabanus agrestis*, *T. sufis*, *T. taeniola* and *T. ditaeniatus.* In the oases of Western Egypt there is a disease of camels that causes much trouble at certain seasons when Tabanids are common. About Cairo *T. taeniola* and *T. agrestis* are most numerous, the former being the most abundant species in Egypt. Oestrids include *Gastrophilus equi* and *G. equi* var. *asininus*. *Cephalomyia maculata* is found in the camel, the larvae living in the pharynx. The life-history of this species is not known. *Oestrus ovis* and *Rhinoestrus* (*O.*) *purpureus* are nasal bot-flies the larvae of which live in the nasal passages of sheep and horses, respectively. *Hypoderma bovis* occurs, but whether it is a common pest is not known. Muscids include *Stomoxys calcitrans*, *Muscina stabulans*, a species of *Fannia* (*Homalomyia*) very similar to if not identical with *F. canicularis*, *Musca domestica* and a species near to or identical with *M. autumnalis* (*corvina*). The house-fly problem requires investigation in Egypt, especially in the large cities, where insanitary conditions prevail and fly-borne diseases are rife. *Calliphora* sp. and *Lucilia* sp. both occur without being particularly abundant. Sarcophagids include *Wohlfartia magnifica*, which is recorded as attacking man in Egypt, and *Sarcophaga falculata*, Pand., which may possibly be one of the species that oviposits in wounds on animals. Hippoboscids include *Hippobosca equina*, on horses, mules, donkeys, and cattle ; *H. camelina* on the camel ; and *H. capensis* on dogs.

Jasschke (V. J.). **La Garrapata Común del Ganado Bovino en la Republica Argentina.** [The Common Cattle Tick in the Argentine Republic.]—*Anales Soc. Rural Argentina, Buenos Aires*, lii, no. 6, June 1918, pp. 346–358. [Received 21st October 1918.]

In this paper the various stages of the common cattle tick of Argentina [*Margaropus* (*Boophilus*) *annulatus microplus*] are described and its life-history and habits on the host are discussed.

Scott (E. W.), Abbott (W. S.) & Dudley, Junr. (J. E.). **Results of Experiments with Miscellaneous Substances against Bedbugs, Cockroaches, Clothes Moths, and Carpet Beetles.**—*U. S. Dept. Agric., Washington, D.C.*, Bull. no. 707. 26th August 1918, 36 pp.

Experiments to test the value of various materials as insecticides against *Cimex lectularius* (bed-bug) were made both in jars and rooms. Trials on a practical scale were made by thoroughly dusting badly infested rooms or beds with the material to be tested, one examination only being made, usually 4 or 7 days after treatment.

The liquids tested included 27 different hydrocarbon-oil preparations, composed largely of kerosene and gasoline oils mixed with varying amounts of nitrobenzene, phenols, essential oils, etc., which were found to be very effective against bed-bugs, owing to their power of penetration, killing in most cases 100 per cent. within 48 hours. Coal-tar cresote emulsions were effective, when used undiluted. Mercuric chloride in a 6 per cent. solution and also as a dust was found to kill 100 per cent. of the treated insects within 24 hours. Acetic acid, ammonia water, coal-tar oil (chlorinated), cotton-seed oil, glycerol, kerosene, linseed oil, nicotine, oil of pine needles and turpentine also proved effective.

Of dry preparations sabadilla seeds used as dust were very effective, killing from 95 to 100 per cent. in 48 hours. Pyrethrum was also very effective, but pyrethrum stems, and also tobacco powders containing as much as 5·26 per cent. of nicotine had little or no value.

Absolutely ineffective substances were :—hellebore, allspice, alum, angelica root, arsenious acid, borax, boracic acid, chamomile flowers, colocynth pulp, eucalyptus leaves, formaldehyde, lead acetate, Paris green, red pepper, quassia chips, sodium bicarbonate, sodium fluoride, and pastes formed of sugar, water, and starchy material and containing either 1·91 per cent. or 2·21 per cent. of phosphorus.

Fumigation with sulphur at the rate of 1 lb. to 1,000 cubic feet of room space, was found to kill 100 per cent. of the bugs as well as their eggs. As these are often deposited in inaccessible cracks and holes or behind wall-paper where it is impossible to reach them with a dust or spray, this quality of sulphur is very important.

Kerosene oil was the only substance found to be completely effective against the eggs, but mercuric chloride, though it had no effect on the eggs themselves, immediately killed all the newly-hatched insects.

The remainder of this bulletin is noticed elsewhere [see this *Review*, Ser. A, vi, p. 531].

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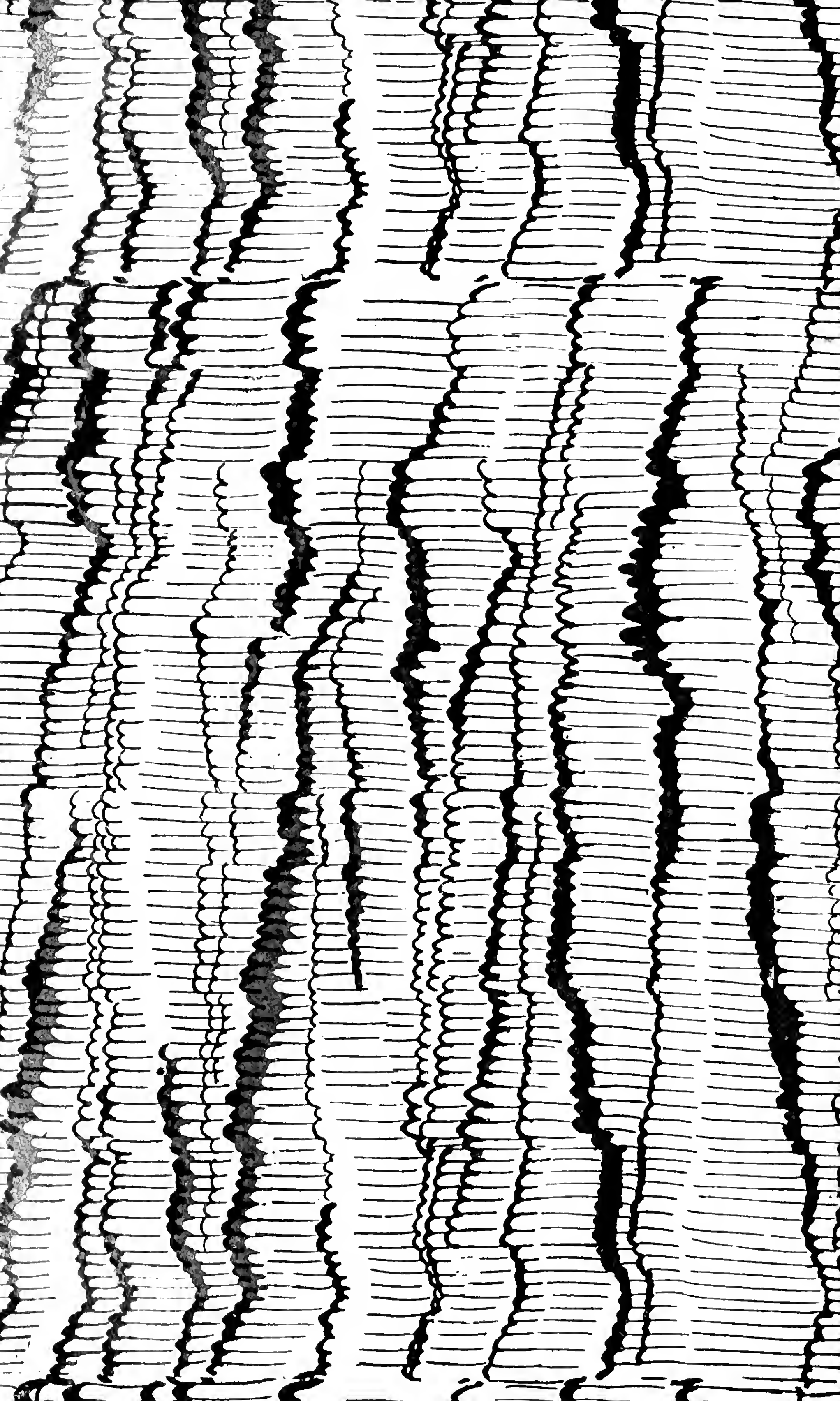

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