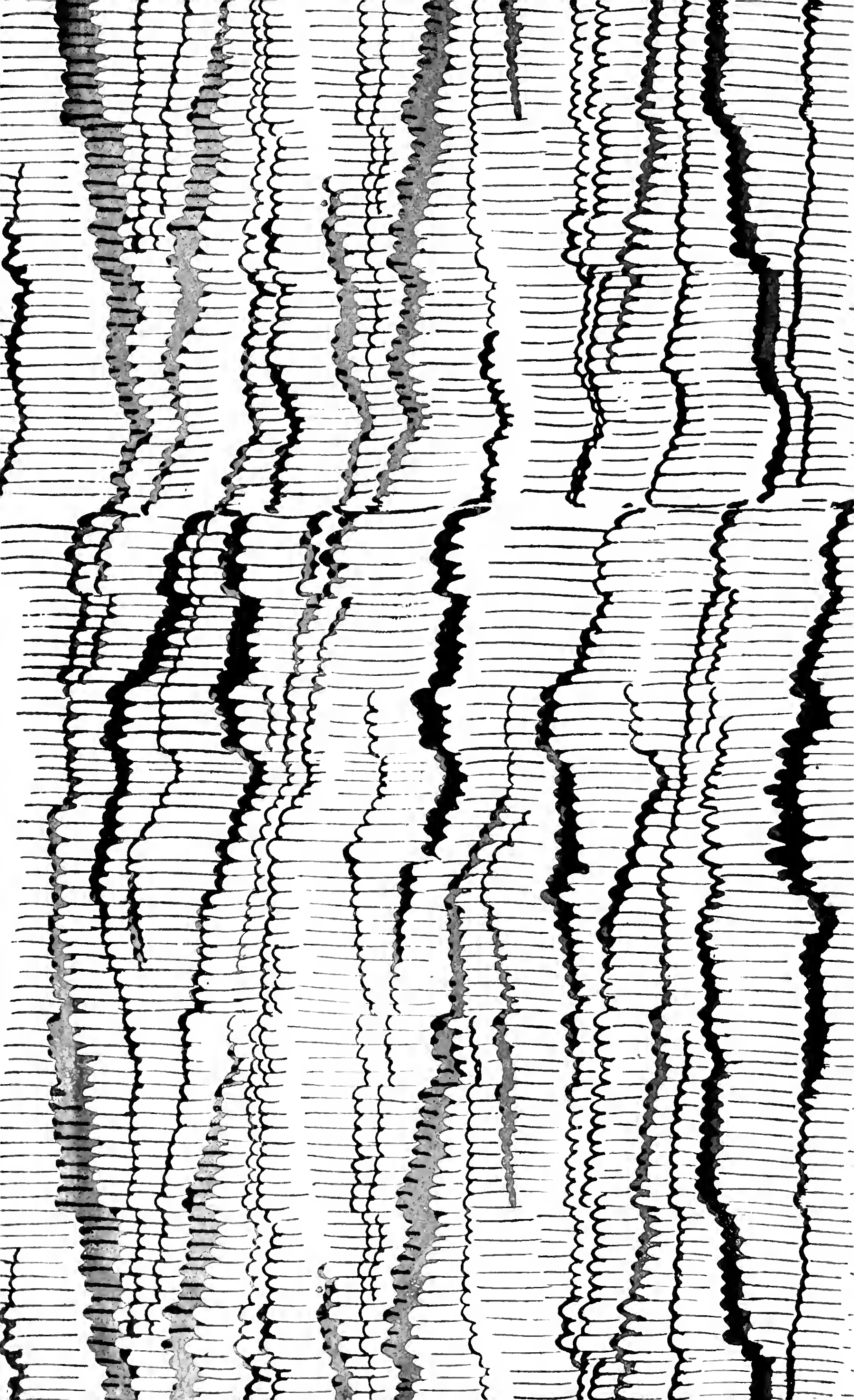

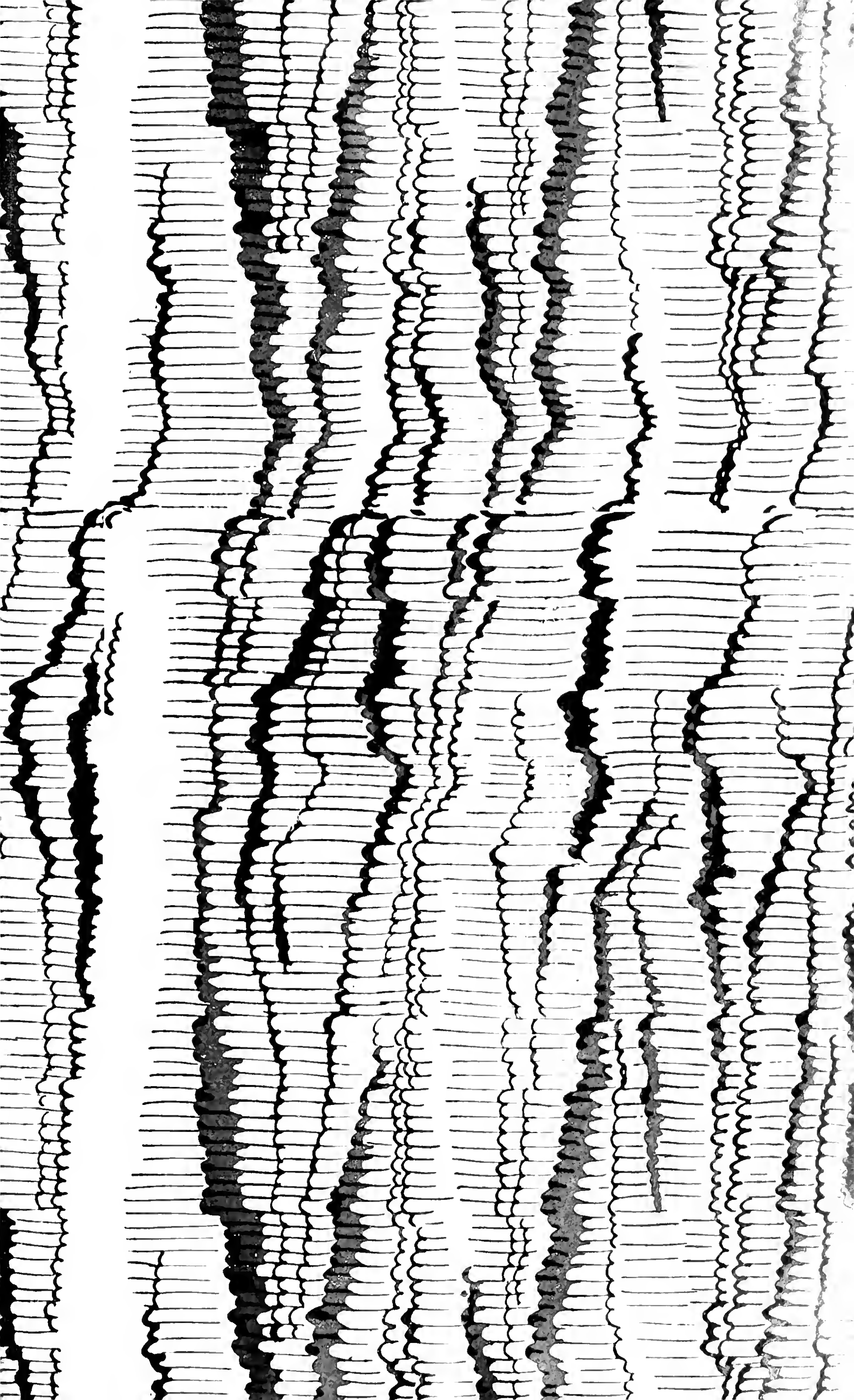

THE REVIEW OF APPLIED ENTOMOLOGY.

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VOL. V.

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ERRATA.

Page 6	line 7	for "Froggatt (W. W. & T. L.)"	read "Froggatt (W. W. & J. L.)."
,, 9	,, 8	,, "Phelps (E. B.)"	,, "Phelps (E. B.) & Stevenson (A. F.)."
,, 45	,, 39	,, "hartebeeste"	,, "haartebeeste."
,, 60	,, 20	,, "*idliota*"	,, "*ioliota.*"
,, 60	,, 20	,, "*Acdeomyia*"	,, "*Aëdomyia.*"
,, 74	,, 19, 20	for "*cornicinia*"	,, "*cornicina.*"
,, 78	,, 15	for "Bozeman"	,, "Helena."
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,, 91	,, 30	,, "Cumming (J. D.)"	,, "Cumming (J. G.)."
,, 102	,, 35	,, "Headlee (T. H.)"	,, "Headlee (T. J.)."
,, 104	,, 9	,, "*Haptochilus*"	,, "*Haplochilus.*"

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The Subject Index to the first three volumes of Series "A" is now in the press and will be ready sh rtly. Cories, price 5/- each post free, may be obtained from the Assistant Director, as above.

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REVIEW
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SERIES B.

VOL. V.] [1917.

Mosquito Extermination in the State of New York.—*U.S. Public Health Repts., Washington, D.C.*, xxxi, no. 41, 13th October 1916, pp. 2910–2919.

In a new article added to chapter 49 of the laws of 1909, dealing with mosquito extermination in the State of New York, provision is made for the appointment of County Commissions, who shall use every means feasible and practicable to exterminate mosquitos of every variety found within the county for which such Commission is appointed. Any accumulation of water in which mosquitos are breeding, or are likely to breed, is declared a nuisance. Members are to serve unpaid, though actual expenses in connection with the meetings are allowed for.

ZETEK (J.). **Reducing Malaria by reducing the Number of Anopheles within Buildings.**—*Ann. Entom. Soc. America, Columbus, Ohio*, ix, no. 3, September 1916, pp. 275–283, 1 fig., 2 charts. [Received 4th November 1916.]

The observations recorded in this paper were made during 1912 at Mira Flores construction camp, Canal Zone. Five possible extensive breeding places of *Anopheles* were found in the vicinity. The predominant species was *A. albimanus*, Wied.; *A. pseudopunctipennis*, Theo., was present in small numbers during the dry season, and a few specimens of *A. apicimacula*, D. & K., *A. argyrotarsis*, R.-D., and *A. malefactor*, D. & K., were captured.

Two camps are compared to illustrate the effect of external traps on the number of mosquitos entering them. In one provided with four traps, the number of mosquitos captured inside was 33 per cent. of the total for the two camps; in the other which was further away from the breeding ground and was without traps, the number was 67 per cent of the total. The second camp further showed a much higher malarial rate than the first.

This method of reducing the numbers of mosquitos by trapping is applicable to other temporary camps in malarious regions and, together with screening and collecting indoors, should keep malaria at a low rate. It should, however, be supplemented by measures against the larvae. Traps should be placed on that side of the building to which mosquitos are attracted; in the region under discussion, Anophelines entered the traps on the lee side. Doors should be placed on the windward side of buildings and should be opened as little as possible after dusk. Houses should be well screened with 18-mesh wire screen. Mosquitos in buildings should be caught and killed daily. For this purpose, if all windows except one are darkened at dawn, the Anophelines will be found to collect on this window.

Tifo esantematico (Tifo petechiale, Dermotifo). [Exanthematous Typhus.]—*Malaria e Malattie dei Paesi Caldi, Rome*, vii, no. 4, 20th August 1916, pp. 263–281, 4 figs.

This is one of a series of monographs on diseases of troops in war time, published by the School of Exotic Diseases attached to the Government Medical Department in Rome. Transmission by lice is accepted as the means by which typhus is spread, and preventive and curative control measures are briefly described.

WATERSTON (J.). **Notes on African Chalcidoidea—V.**—*Bull. Entom. Research, London*, vii, no. 2, October 1916, pp. 123–132, 5 figs.

This paper includes a description of the male of *Eupelminus tarsatus*, Waterst., a parasite of *Glossina morsitans* [see this *Review*, Ser. B, iv, p. 65] with some additional notes on the sub-apterous female.

TURNER (R. E.) & WATERSTON (J.). **A new parasite bred from *Glossina morsitans* in Nyasaland.**—*Bull. Entom. Research, London*, vii, no. 2, October 1916, pp. 133–135, 2 figs.

A description is given of a Bethylid, *Prolaelius glossinae*, sp. n., bred from the pupa of *Glossina morsitans* in Nyasaland.

EDWARDS (F. W.). **Ten new African *Haematopota*.**—*Bull. Entom. Research, London*, vii, no. 2, October 1916, pp. 145–159, 10 figs., 1 plate.

The following new species of African *Haematopota* are described:—*Haematopota pulchella*, *H. obsoleta* and *H. rabida*, from Nyasaland, *H. fasciatapex* from Nyasaland and N.E. Rhodesia, *H. pallidicornis* from S. Nigeria, *H. crassicrus* from British East Africa, *H. mordens* from the Gold Coast, *H. nefanda* from Uganda, *H. furians* from Sierra Leone, and *H. perturbans* from the Congo. The descriptions are supplemented by excellent photographs of the wings.

MACFIE (J. W. S.) & INGRAM (A.). **The Domestic Mosquitos of Accra.**—*Bull. Entom. Research, London*, vii, no. 2, October 1916, pp. 161–177, 5 tables, 1 chart, 2 maps.

The results of a careful examination of 417 samples of water containing mosquito larvae, collected during a complete year from December 1914 to November 1915 by the Sanitary Inspectors at Accra, are analysed in this paper. Ten different species of mosquitos were found in the 417 samples, viz:—*Stegomyia fasciata* in 88·44 per cent., *Culex fatigans* in 14·86 per cent., *Anopheles costalis* in 0·95 per cent., *Culex decens* and *Culiciomyia nebulosa* each in 0·71 per cent., *Stegomyia luteocephala* and *S. metallica* each in 0·47 per cent., and *Culex invidiosus*, *C. tigripes* var. *fuscus*, and *Stegomyia unilineata* each in 0·23 per cent. Only the first two species can therefore be said to be common domestic mosquitos in Accra. Six of the 417 samples were from the official residential area, all the rest being from native compounds. A comparison is made between these results and those which Graham obtained from 1,043 samples from the native compounds at Lagos. In both cases *S. fasciata* is by far the commonest species (92·5 per cent. at Lagos). *C. fatigans*, the only other species that was at all common at Accra, was not found at Lagos in a single sample. An editorial note states that Dr. J. M. Dalziel has recorded the capture at Lagos of two adult *C. fatigans* and five instances of the larvae having been found there. *Culiciomyia nebulosa*, which came second in Graham's list (21·6 per cent.), was found in only three samples from Accra, all from the residential quarter. The four species common to the two lists are *A. costalis*, *C. decens*, *C. tigripes* var. *fuscus* and *S. fasciata*. It is remarkable that the larvae obtained represent only ten out of the forty-one species of adult mosquitos recorded at Accra up to 1915, viz:—*Anopheles costalis*, *A. funestus*, *A. pharoensis*, *A. umbrosus*, *Culex decens*, *C. duttoni*, *C. fatigans*, *C. grahami*, *C. guiarti*, *C. insignis*, *C. invidiosus*, *C. ornatothoracis*, *C. quasigelidus*, *C. thalassius*, *C. tigripes*, *C. tigripes* var. *fuscus*, *Culiciomyia nebulosa*, *Cyathomyia* (*Protomelanoconion*) *fusca*, *Mansonioides africanus*, *M. uniformis*, *Micraedes inconspicuosus*, *Mucidus mucidus*, *Ochlerotatus albocephalus*, *O. irritans*, *O. domesticus*, *O. minutus*, *O. minutus* var. *biannulatus*, *O. minutus* var. *stenoscutus*, *O. minutus* var. *tarsalis*, *O. nigrocephalus*, *O. punctothoracis*, *Stegomyia fasciata*, *S. luteocephala*, *S. metallica*, *S. unilineata*, *Uranotaenia balfouri*, *U. connali*, *U. mashonaensis*, *U. mayeri*. Since 1915, additional species have been collected. At Lagos, Graham obtained six species of larvae, while forty-one species of adult mosquitos were recorded there up to 1913. In another table the mosquitos found at Accra as adults in a bungalow and as larvae in the samples sent by the Medical Officer of Health, from December 1914 to July 1915, are arranged according to frequency of occurrence, and a consideration of the two lists shows that an examination of the larvae found in compounds not only fails to give any adequate idea of the mosquito fauna of a town, but also fails to indicate the species of mosquitos to the attacks of which the inmates of the houses are liable. It also furnishes proof of the necessity for extending anti-mosquito measures so as to reach the species that breed far afield.

In one instance collections made in a native house in a part of Accra where *S. fasciata* abounds yielded 156 adults, including *A. costalis*, *C. fatigans* and *M. africanus*, but not a single specimen of *S. fasciata*. As the occurrence of this mosquito in houses in large numbers has repeatedly been recorded by others and one of the authors has often taken it in European bungalows in the Gold Coast, usually in the afternoon between 3 and 6 p.m., and not at night, a probable explanation is that *S. fasciata*, whilst entering houses to obtain a feed of blood, does not roost indoors.

Bodkin (G. E.) & Cleare (L. D.). **Notes on some Animal Parasites in British Guiana.** *Bull. Entom. Research, London*, vii, no. 2, October 1916, pp. 179–190, 3 figs., 1 map.

In British Guiana the presence of ticks is universally regarded with indifference, though very considerable financial loss is sometimes caused by them. The following species are recorded in this paper, with brief notes concerning them:—*Argas persicus*, Wald., common in fowl-houses, *Rhipicephalus sanguineus*, Latr., all stages of which are found on dogs, *Margaropus annulatus* var. *australis*, Fuller, on cattle, *Amblyomma cajennense*, F., a parasite of man, *A. humerale*, Koch, on turtles, and *A. dissimile*, Koch, a common parasite of toads, lizards, and many snakes. In the coastal region Tabanidae are of common occurrence, large numbers of only a few species being present. In the forest areas, these species seldom occur and their place is taken by numerous others, some of which are comparatively rare. No opportunity has yet occurred for collecting or making definite observations in the savannah lands near the Brazilian border, which are stated to be particularly rich in Tabanidae. The common species that attack live-stock on the coast-lands are *Tabanus trilineatus*, Latr., *T. senior*, Wlk., and *T. semisordidus*, Wlk.; of these the first-named is possibly the commonest and most widely distributed, occurring over both the coastal and forest areas. This species, which has not been observed attacking man, is frequently attracted to artificial light. *T. trifascia*, Wlk., is a closely allied species with very similar habits. A recent outbreak of *Trypanosoma equinum* (Mal de Caderas) among the sugar-plantation mules was in all probability propagated by biting flies, and most of the common species of Tabanidae and other biting flies, such as *Stomoxys calcitrans*, were observed on affected mules. *S. calcitrans* is common in the coastal area and in many of the inhabited areas of the inland regions. In the absence of other food supplies it readily attacks man. The principal enemies of the Tabanids are large Bembecine wasps, of which the species most frequently met with on the coast-lands are *Monedula signata*, Latr., *M. punctata*, Lep., and *M. surinamensis*, Dahlb., while in the forest area, *M. pantherina*, Handl., is common. *Bembidula discisa*, Tasch., and *B. variegata*, Oliv., also occur in this region. The Asilid fly, *Mallophora calidus*, F., is an occasional enemy of small Tabanids in the coastal area. *Dicranomyia cervus*, Wied., is not uncommon in some of the interior districts and readily attacks man. *Chrysops tristis*, F., is widely distributed throughout the coast region and occurs occasionally in the forest area. Both this species and *C. costata*, F., have a tendency to attack man. The latter is only met with in districts where the soil is of a sandy nature and in the proximity of large areas of fresh water. *C. fulviceps*, Wlk., apparently only occurs in the forest area. Single examples of *Bolbodimyia bicolor*, Big., and of *Lepidoselaga crassipes*, F., were taken while attacking man. At certain times of the year, *Diachlorus scutellatus*, Macq., *D. podagricus*, F., and *D. curvipes*, F., are extremely abundant and very obnoxious, owing to their persistent attacks on human beings; they occur in the forest areas, especially near the rivers in the North-West District. *Dichelacera damicornis*, F., and *D. testacea*, Macq., are found in the forest region and readily attack man. *Tabanus senior*, Wlk., and *T. semisordidus*, Walk., which are very similar in appearance and habits, attack stock of all kinds, but have not been observed attacking man. *T. impressus*, Wied., is a widely distributed species which is known to attack man. Only one specimen of *T. imponens*, Wlk., has been captured. The feeding habits of *T. desertus* have never been observed, though numbers of this fly have been collected and the larvae and pupae have also been obtained. *T. caiennensis*, F., is an occasional pest of stock on the coast-lands and is also common in some parts of the interior where it readily attacks man. *T. leucaspis*, Wied., which also attacks human beings, is of rare occurrence in the forest area. *T. ochroleucus*, Mg., is frequently taken in houses at light and has been known to attack man. One specimen of *T. oculus*, Wlk., was taken in the interior districts while attacking man. A number of Hippoboscid flies are known to infest birds, including *Lynchia maura*, Big., common on domestic pigeons. The burrowing flea, *Dermatophilus penetrans*, L., is widely distributed over the Colony, while *Ctenocephalus felis*, Bch. is probably the commonest flea on the coastlands on dogs and cats; it occasionally attacks man. The common bed-bug of British Guiana is *Cimex hemiptera*, F. (*rotundatus*, Sign.). *Pediculus capitis*, de G., infests negroes, East Indians, etc. *P. humanus*, L., has been found only on East Indians, while *Phthirius pubis*, L., infests all the different races inhabiting British Guiana. *Haematopinus eurysternus*, N., is the common cattle-louse, while *H. tuberculatus*, N., has been collected only on imported Indian buffaloes. *H. suis*, L., is very common on pigs.

NEWSTEAD (R.). **On the genus *Phlebotomus*—Part III.**—*Bull. Entom. Research, London*, vii, no. 2, October 1916, pp. 191–192, 1 fig.

A description is given of *Phlebotomus major* var. *chinensis*, var. n., from the Western Hills, Peking, with a note on another, possibly new species of this genus from the same locality [see this *Review*, Ser. B, iii, p. 113].

DYAR (H. G.). **New *Aedes* from the Mountains of California.**—*Insecutor Inscitiae Menstruus, Washington, D.C.*, iv, no. 7–9, July-September 1916, pp. 80–90. [Received 10th November 1916.]

The new species here described were collected in the region of the Sierra Nevada Mountains and are all spring forms, breeding in pools left by melting snows, and having one annual generation. At an altitude of 6,000 feet, pupae were found on 25th May and adults appeared by 1st June. The new species described include:—*Aedes tahoensis*, *A. hexodontus*, *A. ventrovittis*, *A. cataphylla*, *A. increpitus*, *A. palustris*. *A. tahoensis* was the commonest and earliest species, adults being abundant by the middle of June. Towards the end of June it was replaced to a considerable degree by *A. hexodontus*. The latter, together with *A. palustris*, occurred in the larval stage mainly in swampy ground. With the exception of *A. hexodontus* and *A. palustris*, the females were found to bite readily.

FROGGATT (W. W.). **A New Parasite on Sheep-Maggot Flies. Notes and Description of a Chalcid Parasite** (*Chalcis calliphorae*).—*Queensland Agric. Jl. Brisbane*, vol. vi, no. 3, September 1916, pp. 177–179, 1 plate. [Received 4th November 1916.]

The subject matter embodied in this paper has already been abstracted from another journal [see this *Review*, Ser. B, iv, p. 179].

FROGGATT (W. W. & T. L.). **Sheep-Maggot Flies, No. 2.**—*Dept. Agric. New South Wales, Sydney*, Farmer's Bulletin no. 110, August 1916, 30 pp., 8 figs. [Received 6th November 1916.]

This deals with further investigations subsequent to those previously recorded [see this *Review*, Ser. B, iii, pp. 13–17, 184]. The breeding and distribution of the Chalcid parasite, *Nasonia brevicornis*, was carried out on a large scale, and it was found that few flies are likely to emerge on carcases where these parasites are present. All flies captured near the station were examined as to species, sex and number of eggs in the female, and the results are tabulated as follows:—*Pollenia stygia* (*Calliphora villosa*), average about 260 eggs; *Anastellorhina augur* (*C. oceaniae*), average 48 eggs; *Pycnosoma* (*C.*) *rufifacies*, about 200; *P.* (*C.*) *varipes*, about 110; *Lucilia sericata*, about 200; *Ophyra nigra*, about 150. All the eggs in the ovaries of these flies appeared to have reached the same stage of development and are all deposited at the same time. Observations also tend to show that the same female, either with or without pairing again, can continue to oviposit. Attempts made to infect the flies with fungus and bacterial diseases were disappointing.

Lucilia sericata was noticed in fair numbers from November to January and was bred from blown wool in October and November 1914, and the first two months of the following year. *P. rufifacies*, which was a very serious pest in New England in 1913 and 1914, was very active from November to March and was also found in May, blowing carcases and offal. *Neocalliphora ochracea* has never been found breeding in carcases or live wool, and nothing is known of its life-history; it frequents shaded gullies and well timbered country. *Pollenia stygia* occurred in swarms in September, and for two months blankets had to be protected with mosquito nets. Wool was infested with the maggots of this fly in October and November, and again in the early months of 1915 and in August and September. *A. augur*, though less abundant than the larger species, occurred almost throughout the year, and was bred from blown live wool in October and November and again in April. *P. varipes* was observed from November to March and again in May, and seems to eat up the carcases it infests more than other flies. Sheep infested with these maggots suffer much more, and the area blown is much larger than in the case of attacks by other species, while the sheep so infested invariably appear to have been attacked at the same time by other species, or else have not been dressed after a previous attack. Hence this infestation seems to be a case of secondary fly-blow. *Ophyra nigra* was always found in putrid matter from October to the following March, and again about the end of August.

In order that the different species of flies blowing sheep could be identified from examination of the maggots found in the wool and offal, a great number of maggots have been prepared and sections of them mounted as microscopic specimens. The most distinctive structures are the spiracles, by means of which the maggots can easily be separated. A complete series is being prepared and mounted for reference.

Experiments to determine the depth of soil through which flies can emerge from the pupae when buried, showed that from a depth of 10 inches of light dusty soil rather more than one-third the number emerged; from 8 inches of stony soil, exactly one-third emerged, while from 8 inches of heavy gravelly soil, none emerged.

It is not thought that there is any infestation from sanitary depots where night-soil is deposited and covered with earth, but garbage depots where miscellaneous rubbish is thrown into the open and left to decay or blow away are ideal breeding-grounds. Tables are given showing the cost of crutching sheep for blow-fly, and also the estimated losses from blow-fly in the year 1914.

Dipping experiments lead to the conclusion that this method does not prevent attacks by the fly, but prevents the affected area from spreading. It is also certain that the wool of dipped sheep produces more in the open market than when undipped.

POTEL (R.). **Observations cliniques et étiologiques sur les Cas de Typhus soignés à l'Hôpital permanent de la Marine de Sidi-Abdallah. V. Remarques sur les Mesures de Prophylaxie et le Rôle des Ectoparasites.** [Clinical and etiological Observations on Cases of Typhus treated at the permanent Naval Hospital at Sidi-Abdullah. V. Remarks on Prophylactic Measures and the part played by Ectoparasites.]—*Arch. Inst. Past., Tunis*, ix, no. 4, September 1916, pp. 282–285. [Received 6th November 1916.]

The observations recorded in this article support the view that the propagation of typhus is due entirely to ectoparasites. On the hospital ships carrying patients from Corfu to Sidi-Abdallah no prophylactic measures were taken, with the result that, allowing for the necessary period of incubation, the crews forthwith developed the disease. In the supplementary hospitals, where, owing to the numbers in which the patients arrived, they could only be washed and their rags replaced by clean clothing and they were also allowed to retain possession of their small personal belongings, the hospital staffs fell victims to the disease after a period of 21 days. In the permanent hospitals, in which only Frenchmen were treated and where they only arrived a few at a time, the patients were thoroughly cleansed to ensure the removal of both adult lice and eggs and no personal possessions capable of harbouring the eggs were allowed to be retained; under these conditions no cases of typhus occurred among the staffs, though no precautions other than the extermination of vermin were taken.

BEACH (W. H.). **The Sheep Maggot-fly and how to control it.**—16 pp., 5 figs. Published by the Beach Chemical Co., Bridgnorth. [Received 24th November 1916.]

This pamphlet describes a portable trap for *Lucilia sericata* (sheep maggot fly) and its maggots. The apparatus consists of a round galvanised sheet-iron pan, with perforated sides—the perforations being covered with a wire gauze large enough to allow *L. sericata* to enter, but excluding the blue-bottles—and a close fitting weather-proof cover. The bottom of the pan is slightly dished, has a plug in the centre, and contains a bed of sand. Above this swings a flat saucer-shaped pan, in which the bait, consisting of raw meat, is placed. The flies, attracted by the odour, pass through the gauze, and, once inside, deposit their eggs and die. On hatching, the maggots crawl over the edge of the dish and fall into the sand where they bury themselves. When the pupal stage is reached the plug is removed and the sand is pushed out into a sieve in order to separate the pupae. To be successful, this apparatus must be baited with matter attractive to the fly and must be placed in a position where the odour of its contents will be carried by the air currents across the field occupied by the sheep. Where the space to be controlled is extensive, more than one decoy may be required. As the pupae may develop in 21 days from the date on which oviposition occurred, the sand must be sifted every 14 days to remove them, and they may be fed to poultry at once, or kept at a temperature under 50° F., or reserved for future use after steaming. Sheep that have been badly worried by maggots before the arrival of the decoy should not be left as a test for the apparatus, as they are too attractive. This decoy is said to be proof against rats, dogs, etc. To prevent damage to herbage, it is mounted on two legs and a wheel fork and it can be quickly moved, by one person, from one part of a field to another.

Cook (F. C.) & Hutchison (R. H.). **Experiments during 1915 in the Destruction of Fly Larvae in Horse Manure.**—*U.S. Dept. Agric., Washington, D.C.*, Bull. no. 408, 28th October 1916, 20 pp.

This is a record of further experiments on the same lines as those previously conducted [see this *Review*, Ser. B, iii, pp. 192–193], and is a summary of three years' work. The same methods and the same cages were used as before, but in the case of the open-pile experiments a pyramidal cage with a flytrap at the top was placed over the heap immediately after the last treatment, and all flies collected in the traps were chloroformed and counted. Experiments were made with infusions of poisonous plants, using 1 lb. to 10 U.S. gallons of water, two of the more effective being berberis and cinchona. Quassia was found effective only when used in large quantities. Black hellebore, larkspur, soapweed, and many others were tried without proving of great practical efficiency.

Tables are given showing the relative larvicidal value of various fertilising mixtures. Calcium cyanamide, kainit and acid phosphate, used in various proportions, proved an ideal fertiliser, but the larvicidal results were all low and irregular, varying from 10 to 81 per cent.

As a result of three seasons' work, it appears that borax is the best and cheapest larvicide, though excessive application has an injurious action on plant growth. Powdered hellebore is effective and has no action on plants; the cost is variable. Solutions of aniline and emulsions of nitrobenzene with fish-oil soap also proved effective larvicides and did not apparently injure the manure for agricultural purposes. It is indicated that calcium cyanamide, acid phosphate and kainit mixtures are effective larvicides, if one-half pound of calcium cyanamide is present in the mixture per bushel of the manure treated. The cost of such a mixture is about 1*d*. per bushel, this being materially lessened when the increased fertilising value of the treated manure is considered.

Potassium cyanide, Paris green, arsenic dip and pyridine cannot be recommended owing to their extremely toxic action.

A bibliography of seven works is given.

PHELPS (E. B.). **Studies on Sodium Salicylate, a new Muscicide, and on the Use of Formaldehyde.**—*U.S. Public. Health Repts., Washington, D.C.*, xxxi, no. 44, 3rd November 1916, pp. 3033–3035.

Among methods of fly destruction suitable for use in households, poisoning seems to possess the fewest disadvantages. In view of the dangerous nature of arsenic, an investigation was made with special reference to the selection of some other substance, which under ordinary conditions of use, and of accidental misuse, would not be so dangerous to children, while serving equally well, or better, for the destruction of flies. Only two have been found to possess the requisite properties, viz :—formaldehyde and sodium salicylate. The former, in solutions of various strengths, has been recommended from time to time for this purpose. In the present investigation the best results were obtained with a 1 per cent. solution, or $2\frac{1}{2}$ per cent. of the 40 per cent solution, the usual commercial form. This insecticide was found to possess a valuable property in that, whereas at summer temperature it is somewhat less efficient than commercial arsenical preparations, its loss of efficiency with decreasing temperature is much less and its relative value, therefore, correspondingly greater. During the cooler days of autumn, at which time the greatest difficulty is experienced in keeping the flies out of houses, this preparation compares most favourably with arsenic papers. Sodium salicylate has not, to the author's knowledge, been previously recommended for this purpose. In a 1 per cent. solution it is slightly less efficient than formaldehyde, but possesses certain marked advantages for household use. It is a less objectionable substance in a concentrated form, is a solid which does not lose its strength, and in the preparation of the solution the exact strength recommended need not be so carefully adhered to. Furthermore, it lends itself to the preparation of papers in much the same way as arsenic papers are now prepared. Like formaldehyde, it does not lose efficiency at lower temperatures nearly so rapidly as arsenic. For household use either of these solutions may be prepared by the addition of three teaspoonfuls of either the 40 per cent. solution of formaldehyde or the powdered sodium salicylate to a pint of water. A glass tumbler is nearly filled with the solution, a circular piece of blotting paper, somewhat larger in diameter than the tumbler, is placed over it, and over this an inverted saucer. The whole device is then turned upside down and a match is inserted under the edge of the tumbler to allow access of air. The blotting paper will remain in a moist condition until the entire contents of the tumbler have been used and the strength of the solution will remain uniform. The attractiveness of the bait may be increased by sprinkling a little sugar upon the paper, but this is not advisable where there are young children.

TRYON (H.). **The Spider or Tick Fly of the Horse** (*Hippobosca equina*, **Linné**).—*Queensland Agric. Jl., Brisbane*, vi, no. 4, October 1916, pp. 267–274.

Hippobosca equina, which has a very extended range, has recently been discovered in southern Queensland. It is a constant parasite of its host, and may infest a single animal in large numbers without the latter manifesting any indications of discomfiture, though horses unaccustomed to it evince extreme irritation when attacked. The life-history is described in detail. A single puparium only is produced at a time, and after its deposition, a month or more must elapse before it gives rise to the adult. This fly has not been proved to be a disseminator of disease.

ILLINGWORTH (J. F.). **Notes on the Hen Flea** (*Echidnophaga gallinacea*, **Westw.**).—*Proc. Hawaiian Entom. Soc., Honolulu*, iii, no. 3, September 1916, pp. 252–254. [Received 10th November 1916.]

The duration of the various stages of this flea was found to be the following:—Egg, 4 days; larva, 6 days; pupa, 12 days. Adult males lived from 2 to 6 days after emergence when in contact with the normal host, while females lived from 18 to 40 days. Eggs are deposited throughout the adult stage, but only after a meal of blood; under favourable conditions as many as 40 are produced during one night and only two or three during the day. Females were able to survive for a period up to 30 days if not brought into contact with a host from the time of their emergence from the pupa; those, however, which were removed from a host after a blood meal died in one or two days. Males were able to survive removal from the host for a somewhat longer period. A total number of 1,027 fleas emerged in three weeks from half a pint of soil from an infested henhouse.

STRICKLAND (C.). **Certain Observations on the Epidemiology of Malaria Fever in the Malay Peninsular.**—*Ind. Jl. Med. Research, Calcutta*, iv, no. 2, October 1916, pp. 256–262.

This paper has already been abstracted from another journal [see this *Review*, Ser. B, iv, p. 66].

STRICKLAND (C.). **A New Species of Protanopheline from Malaya**, *Myzorhynchus hunteri*.—*Ind. Jl. Med. Research, Calcutta*, iv, no. 2, October 1916, pp. 263–270.

A systematic description of the larva and of both sexes of the adult of *Anopheles* (*Myzorhynchus*) *hunteri*, sp. n., is given. The author considers that in Malaya, *A. sinensis*, *A. barbirostris*, *A. umbrosus*, *A. albotaeniatus* and *A. hunteri* will be found to form a compact group representing the *Myzorhynchus* section of *Protanopheles*, not only in general but also in genital characters.

STRICKLAND (C.). **An** *Umbrosus*-**like Anopheline from Malaya**—*Myzorhynchus novumbrosus*.—*Ind. Jl. Med. Research, Calcutta*, iv, no. 2, October 1916, pp. 271–273.

The full-grown larva of *Anopheles* (*Myzorhynchus*) *novumbrosus*, sp. n., here described, is distinguished from that of *A. umbrosus* by the presence of typical palmate hairs. The adult is separable from *A. umbrosus* by its smaller size, relatively shorter hind legs, and more slender palps. The genitalia of the two species are identical.

Nöller (W.). **Die Uebertragung des *Trypanosoma theileri*, Laveran, 1902.** [The Transmission of *Trypanosoma theileri*, Laveran, 1902.] —*Berliner Tierärztl. Wochenschr.*, *Berlin*, xxxii, no. 39, 28th September 1916, pp. 457–460.

The innocuous and easily bred *Trypanosoma theileri* probably occurs wherever domestic cattle are found and also among wild ruminants, such as antelopes. Its various forms have received different names. Knuth and Rauchbaar found flagellates in German Tabanidae (*Tabanus* sp. ? and *Haematopota pluvialis*, L.), but could not prove their connection with this trypanosome. In 1903 Theiler considered the transmission of *T. theileri* to have been effected in South Africa by the Hippoboscids, *Hippobosca rufipes*, Olf., and *H. maculata*, Leach, but this cannot be held to be conclusive, as the possibility of transmission by other carriers, such as Tabanids and *Stomoxys* was not excluded. The scarcity of Hippoboscids on German cattle show that these flies cannot play an important rôle. It is far more probable that Tabanids are involved, as they harbour many flagellates. From available data the following list of Tabanids in which flagellates have been recorded has been compiled :—*Tabanus tergestinus* and *T. glaucopis* in southern France ; *T. socius*, *T. par*, *T. ditaeniatus*, *T. fasciatus*, *T. africanus*, *T. gratus* and *T. virgatus* in Egypt ; *T. hilarius* and *Tabanus* sp. in India ; *T. secedens* and *T. thoracinus* in East Africa ; *T. testaceo-maculatus* in Chili ; *T. congolensis* and *T. taeniola* in the Island of Principe. To these the author adds *T. bovinus* in Poland, and *T. bromius* in Brandenburg. Other records include *Pangonia infusca* and *P. neavei* in the Congo ; *P. australis* in Chili ; *Haematopota italica* in southern France ; *H. pluvialis* in Germany ; *H. duttoni* and *H. vandenbrandeni* in the Congo. All those observers of Tabanid flagellates who have studied the site where the flagellates occur in the bodies of the flies state this to be the walls of the hind-gut, though Bruce occasionally observed them in the fore-gut. The author's observations only relate to flagellates attached to the hind-gut, and the dissected Tabanids showed none in their stomachs, indicating that the infections were not recent ones. All observations relate to flagellates from the blood-sucking females, which attack cattle and horses by preference. Only a small percentage of these females are infected, and in wet, cold years the infection is absent in localities where it had previously occurred. In cattle-breeding districts the flagellates are common in Tabanids during hot summers. These observations pointed to a connection between the Tabanid flagellates and *T. theileri*. Among the ways in which the exact experimental proof of such connection could be reached was the one provided by the size and the characteristic shape of the giant culture forms of *T. theileri*. A full account is given of the experiment, which proved that the flagellates from *Tabanus glaucopis*, Meig., are the developmental stage of *T. theileri*. It is thought probable that other Tabanid flagellates also represent the developmental stage of this trypanosome. This experiment further proves that the transmission is not a simple mechanical one. A bibliography of 14 works closes this paper.

Kleine (F. K.). **Die Uebertragung von Filarien durch** *Chrysops.* [The Transmission of *Filaria* by *Chrysops.*]—*Zeitschr. f. Hyg. u. Infekt.-Krankh., Leipzig,* lxxx, 1915, p. 345.

Owing to the War, the author was compelled to remain in the interior of Kamerun, where he devoted his time to searching for the carrier of *Filaria loa.* Six hundred female *Chrysops* were dissected and 32 (5·3 per cent.) were found to be infested with *Filaria* larvae. In 9 cases (1·5 per cent.) the process of maturation had reached completion. Twenty dissections are described in detail. On leaving the intestine in the abdomen the organisms migrate to the fatty tissue surrounding the fine branches of the tracheae. Here they remain motionless at first, becoming mobile only on attaining from $\frac{1}{3}$–$\frac{1}{2}$ of their final length. At first sluggish, their movements increase in rapidity. The salivary glands were not infested, though it is noted that Leiper has recorded *Filaria* in the salivary glands of *Chrysops.* Contrary to what happens in the case of trypanosomiasis infection of *Glossina,* a diminution of infection must take place in *Chrysops* each time feeding occurs, as there is no increase of the worms in the insect. It was not possible to prove definitely that the *Filaria* present were the larvae of *F. loa,* but the widespread distribution of the latter and the preference shown by *Chrysops* for human blood point to this being the case.

Van Saceghem (R.). **Contribution à l'Étude de la Transmission du** *Trypanosoma cazalboui.* [Contribution to the Study of the Transmission of *Trypanosoma cazalboui.*]—*Bull. Soc. Path. Exot., Paris,* ix, no. 8, 11th October 1916, pp. 569–573.

While trypanosomiasis is undoubtedly transmitted to animals by *Glossina,* some trypanosomes seem to be transmitted exclusively by these flies, for example, *T. brucei-pecaudi, T. congolense-dimorphon* and *T. rhodesiense,* while others become attached to the proboscis of various blood-suckers when attacking an infected animal and thus serve to inoculate others. Surra, caused by *T. evansi,* is transmitted by *Stomoxys nigra* in this way, according to Daruty de Grandpré, while among other investigators Leese has obtained positive results in the transmission of surra by *Tabanus, Haematopota* and *Stomoxys.* Mal de Caderas, caused by *T. equinum,* is believed to be transmitted by Tabanids and *Stomoxys calcitrans.* The experiments of Bouet and Roubaud have proved that trypanosomes in the Sahara are readily transmitted by *Stomoxys,* which may remain virulent for two or three days. Sergent records a case of transmission of *T. soudanense* var. *berbera* after 22 hours, by a species of *Tabanus. T. cazalboui* differs from any of the above-mentioned in that it can be transmitted equally well, even in its natural state, either by *Glossina* or by other blood-suckers. This species infects *Glossina* at the proboscis only, thus rendering transmission much easier than in the case of trypanosomes which require to undergo a cycle in the fly before being transmitted to another host. Experiments made by Bouffard at Bamako have proved the possibility of the actual transmission of *T. cazalboui* by *Stomoxys* to an ox kept behind wire-netting, and this has been confirmed by Bouet and Roubaud. Cases caused by *T. cazalboui* have been observed in Eritrea and in the province of Kassala in the Egyptian Soudan, where no

Glossina exist. The author has proved from observations made at Zambi, Lower Congo, that the trypanosome there present, to which he has given the name *T. cazalboui* var. *pigritia*, is transmitted by flies other than *Glossina*. He has observed cases of trypanosomiasis due to *T. cazalboui* var. *pigritia* in herds of cattle confined to high open land, far from a river, in districts where he is convinced that no *Glossina* exists. Among these the earliest cases always appeared towards November and no outbreak occurred after May. As the dangerous period coincided with the rainy season, it was thought possible that *Glossina* might be present temporarily during the rains, but minute search demonstrated the impossibility of this. Certain herds were observed to remain immune, whilst in others every animal was infected, and observations led to the conclusion that the infected herds were those which grazed near a papyrus swamp. The following conclusions were arrived at. The first cases of trypanosomiasis coincided with the appearance of a new species of *Haematopota*, *H. perturbans*, Edw. [see this *Review*, Ser. B, v, p. 2]. The spots where *H. perturbans* abounds, such as papyrus swamps, are dangerous to cattle and this fly does not occur where the cattle remain healthy. Examples of *H. perturbans*, captured on animals infected with *T. cazalboui* var. *pigritia*, were found to contain living trypanosomes in the gut. The chief reservoir of this trypanosome appears to be the infected cattle themselves, though certain wild animals may also be concerned in this. Examination of the blood of some antelopes, *Cobus ellipsiprymnus*, *Tragelaphus gratus*, *T. scriptus* and *Cervicapra arundinum* however proved negative, but further investigation of this point will be continued. The author does not claim that *H. perturbans* is solely concerned in transmitting this trypanosome; in his opinion, *Stomoxys*, *Lyperosia*, probably mosquitos and even certain ticks may also play this rôle.

Langeron (M.). **Les Phlébotomes dans la Région parisienne.** [*Phlebotomus* in the Neighbourhood of Paris.]—*Bull. Soc. Path. Exot., Paris,* ix, no. 8, 11th October 1916, pp. 573–576.

On two occasions, in 1914 and again in 1916, the author has captured female specimens of *Phlebotomus papatasii* in the district south of Paris, at Bourg-la-Reine. The hibernation of this species is an interesting problem and the greater part of the year must be spent in the larval or nymphal stage in this region.

Urbain (G.). **Un Cas de Gale Démodectique du Cheval. Contagion à l'Homme.** [A Case of *Demodex* Infestation of the Horse. Contagion to Man.]—*Bull. Soc. Path. Exot., Paris,* ix, no. 8, 11th October 1916, pp. 576–578.

A case is recorded from Brazil in which a man in charge of horses infested with *Demodex* himself became attacked in the face by this parasite. The question as to whether *D. folliculorum* occurring in the dog is contagious is considered as yet unproven.

Joyeux (Ch.). **Sur le cycle Évolutif de quelques Cestodes.** [On the Life-cycle of some Cestodes.]—*Bull. Soc. Path. Exot., Paris,* ix, no. 8, 11th October 1916, pp. 578–583.

The tape-worm, *Dipylidium caninum*, L., has for its intermediate hosts the louse, *Trichodectes canis*, Retz., and two fleas, *Ctenocephalus* *canis*, Curt., and *Pulex irritans*, L. It is admitted that the proboscis of these fleas is incapable of permitting the passage of the eggs of *D. caninum*, but the author has found that the flea larva can swallow the egg, which, on arrival in the intestine, at once hatches and the larva penetrates into the general body cavity.

Hymenolepis diminuta, Rud., a Cestode of the rat and of man, has for intermediate hosts, *Pyralis* (*Asopia*) *farinalis*, L., both the caterpillar and adult moth; the earwig, *Anisolabis annulipes*, Lucas: the Tenebrionid beetles, *Akis spinosa*, L., and *Scaurus striatus*, F.; and the fleas, *Ceratophyllus fasciatus*, Bosc, *Xenopsylla cheopis*, Roths., *C. canis* and *P. irritans*. These fleas also become infested in the larval stage. In the case of *Hymenolepis nana*, v. Siebold, the intermediate and final host are the same. Rats and mice are easily infested and the rat-fleas, *X. cheopis* and *C. fasciatus*, are said to be hosts, although the author was never able to infest these species.

JOJOT (Ch.). **Aperçu médical sur la Campagne du Cameroun de 1914-1916.** [Medical Observations on the Campaign in Kamerun, 1914–1916.]—*Bull. Soc. Path. Exot., Paris*, ix, no. 8, 11th October 1916, pp. 584–591.

During the course of this campaign no epidemic of any importance was imported into Kamerun, in spite of the constant relations with the ports of West Africa and Europe. Malaria is present throughout the country, but rarely attacked natives with any severity, though it was serious among the European troops. Black-water fever, which attacked Europeans only, caused many deaths. Trypanosomiasis was rare among either Europeans or natives, although *Glossina palpalis* abounds. The effects of the campaign on the development of the disease in the colony will not however become apparent until later. A few cases of infestation by *Filaria loa* were met with.

MANRIN (G.). **Contre les Mouches.** [Protection against Flies.]—*Jl. d'Agric. Pratique, Paris*, xxix, no. 22, 2nd November 1916, pp. 379–380.

This article refers to the work of MM. Galaine and Houlbert in connection with flies, which has already been abstracted [see this *Review*, Ser. B, iv, p. 156].

NEUMANN (L. G.). **Ixodides (Acariens); première série.** [IXODIDAE (Acarina); ser. i.]—*Arch. Zool. Expt., Paris*, lv, no. 12, October 1916, pp. 515–527, 1 plate.

This paper contains a complete record of the distribution of *Ixodes* (*Eschatocephalus*) *vespertilionis*, Koch, and of *Ixodes hexagonus*, Leach, together with notes on the biology of both species. Collections of *I. vespertilionis* show a considerably greater proportion of males than of females, nymphs, or larvae. Adult males have never been found as parasites on the bat, but always freely on the walls of caves. This fact indicates that in the males of this species parasitism is limited to the larval and nymphal stages, but occurs in the females in all stages. The larvae, which emerge either on the ground or on the walls of caves, pass through a period of free existence before attachment to the host. The nymphs are entirely parasitic, only leaving the host when mature, in order to transform into adults. Specimens of *I. hexagonus* have been obtained from the entrances of caves. This species is parasitic in the larval, nymphal and adult stages on various mammals, including the dog, fox, sheep, etc., as well as on man.

La Destruction des Mouches par l'Huile de Schiste. [Destruction of Flies by Shale Oil.]—*Bull. Soc. Etude Vulg. Zool. Agric., Bordeaux*, xiv, no. 11 & 12, November-December 1915, p. 95. [Received 24th November 1916.]

It is pointed out that heavy coal-tar oils, being heavier than water, are not convenient for use on a liquid surface. Shale oils, on the contrary, being lighter than water, remain on the surface, asphyxiate the larvae and by their odour keep the ovipositing flies away from the pipes or ventilators of cesspools. If used plentifully on manure-heaps, the heavy coal-oils, as well as cresyl, may affect the quality of the manure. This difficulty is obviated if the residuary coal-tar oils are used, as these have been deprived of their naphthaline constituents and dephenolised. With the addition of sodium resinate, a 2·5 per cent. strength in water gives a durable emulsion, which spreads over a large surface as a thin film and is an effective insecticide and insectifuge.

Agir. **Комары и туберкулезъ.** [Mosquitos and Tuberculosis.—**«Садоводъ.»** [*Horticulturist*], *Rostov-on-Don*, xv, no. 9, September 1916, pp. 513–515.

This is a short note referring to the work of Professor Wurtz on a specific form of rapid tuberculosis connected with malaria. His investigations were begun in Indo-China and continued in Madagascar and lately in France, where cases of this disease have occurred in soldiers on active service. It is said to be caused by a particular species of mosquito common in Asia and Africa, which has been imported into France in its larval stage with the baggage of the native soldiers. Professor D. K. Zabolotny, who has been approached on this subject by the author, admits the theoretical possibility of tubercle bacilli reaching the gut of mosquitos with the blood of patients, but was unable to offer a definite opinion on the discovery of Professor Wurtz, in the absence of further details.

Kulagin (Prof. N. M.). **Комнатная муха. Къ вопросу о борьбѣ съ нею.** [*Musca domestica*, L. On the question of its control.]—**«Любитель Природы.»** [*Friend of Nature*], *Petrograd*, xi, nos. 3–4 & 6–7, March-April & June-July 1916, pp. 93–100 & 189 & 194, 3 figs., 2 tables.

This lecture is one of a series on the control of epidemic diseases, organised by the Shaniavsky-University at Moscow. It contains a general review of the life-history of *Musca domestica* with particular reference to its part in spreading infection, various English, American, French, Italian and German authorities being cited in this connection.

DESCAZEAUX (J.). **Contribution à l'Etude de l' " Esponja " ou Plaies d'Eté des Equidés du Brésil.** [A Contribution to the Study of "Esponja" or Summer Sores in Brazilian Horses.]—*Rev. Gén. Méd. Vétérinaire, Toulouse*, xxv, no. 297, 15th September 1916, pp. 431–433. [Abstract from *Bull. Soc. Centrale Méd. Vét.*, 30th January—30th September 1915, p. 468.]

The cutaneous lesions on horses in Brazil which are known as summer sores only occur from October to April. They are not amenable to treatment, but heal spontaneously with the advent of winter. The parasites found in these sores are the larvae of *Habronema* sp., and infestation probably occurs by contact with manure containing the embryos. It is also possible that they are conveyed on the proboscis of flies. Prophylaxis includes the use of vermifuges, fly destruction, disinfection of manure and frequent change of litter.

RICHTER (C.). **Ein Beitrag zur Räudebekämpfung.** [A Contribution to the Control of Mange.]—*Deutsche Tierärtzl. Wochenschr., Hannover*, xxiv, no. 47, 18th November 1916, pp. 429–430.

The official remedy adopted by the German south army against horse mange consists in rubbing in a mixture of lime-water and petroleum, the animals having been previously shaved. The application must be renewed every three days until a complete cure is effected. To prepare the liquid, 2 lb. of burnt lime is gradually slaked with cold or hot water and 3 gals. of water is then added with continuous stirring. After allowing the lime to settle, the 3 gals. of liquid is drawn off and diluted with an equal quantity of water, 6 gals. of petroleum being then added. For animals with sensitive skins only half the quantity of petroleum, or even less, should be used. It is best to store the two liquids separately and mix according to the strength required in each case.

ENTOMOLOGICAL NOTICES.

Mr. C. F. C. Beeson (Temporary Captain R.A.M.C.), Forest Zoologist to the Government of India, has been on special duty in Mesopotamia since May 1916, in charge of anti-fly and vermin measures.

NOTICES.

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CLARE (H. L.). **Report of the Surgeon-General for the Nine Months ended the 31st December 1915.** *Trinidad and Tobago Council Paper no. 133 of 1916, Port of Spain* 1916, 162 pp. [Received 28th November 1916.]

Disinfection of premises for vermin was carried out by spraying the inner walls, floor and bedding with a mixture of cyllin, soft soap and kerosene. The total number of rats and mice caught during the nine months amounted to 7,661 rats and 3,660 mice. The former number shows a falling off during the past six years. Poisoned bait was laid in stores, but in residences the use of traps was preferred. An important anti-rat measure requires all refuse and waste food to be kept securely covered in proper receptacles on private premises and especially in hotels and restaurants. The landing of rats in packages of imported goods from lighters requires the adoption of preventive measures. With regard to mosquito prevention, filling, draining and oiling measures have been undertaken on low-lying lands in the vicinity of Port of Spain, and considerable improvement has taken place in the drainage of the few areas within the city limits referred to in the report for the previous year. The number of *Stegomyia* and *Culex* has been kept as low as possible by regular attention to the usual breeding places. Prosecutions for breach of the yellow fever regulations were laid against 102 householders, leading to 101 convictions.

HOFFMAN (F. L.). **The Sanitary Progress and Vital Statistics of Hawaii.**—*Prudential Press, Newark, N.Y., U.S.A.*, 1916, 82 pp., 1 diagram, 40 tables, 2 charts.

Bubonic plague appeared for the first time in Hawaii in December 1899. During the 14 years from 1902–15, 198 deaths occurred, but at the present time the disease has been practically eradicated, no death from this cause having been reported since August 1914. The rat campaign throughout the islands has been continued in an effective manner, the last plague-infected rat being caught in April 1910.

The local mosquitos are represented by *Culex pipiens*, *C. fatigans*, *Stegomyia fasciata*, and *S. scutellaris*. *S. fasciata* is said to be a recent introduction and is now quite abundant in some places. It has been supposed that *S. scutellaris* is connected with the periodical influenza which occurs in the islands, but this is considered very doubtful. The efforts which are being made throughout the islands to reduce the number of mosquitos to a minimum are apparently productive of good results.

A bibliography of 42 reports dealing with Hawaii is given.

SCHMIDT (M.). **Injury to Livestock by *Simulium columbaczense* in Hungary.**—*Internat. Rev. Science & Practice Agric., Mthly. Bull. Agric. Intell. & Pl. Dis., Rome*, vii, no. 7, July 1916, pp. 987–989. [Abstract from *Allatorvosi Lapok, Budapest*, xxxix, nos. 12 & 13, 18th & 25th March 1916, pp. 83–85, 89–91.] [Received 30th November 1916.]

The subject-matter of this paper, which deals with injury to live-stock by *Simulium columbaczense*, has already been abstracted from another journal [see this *Review*, Ser. B, iv, p. 158].

Knab (F.). **Egg-disposal in** *Dermatobia hominis.*—*Proc. Entom. Soc., Washington, D.C.*, xviii, no. 3, September 1916, pp. 179–183.

Two female examples of the mosquito, *Janthinosoma* (*Psorophora*) *lutzi*, bearing *Dermatobia* eggs, are described. These form a small package attached ventrally to the base of the mosquito's abdomen, in such a way that when the mosquito sucks blood, the free or hatching end is nearest the skin of the victim. Adhering to the side of the vial containing one of the specimens, which were preserved dry, was a newly hatched *Dermatobia* larva. A third specimen of doubtful identity, but undoubtedly a *Psorophora* bearing eggs, has also been obtained. The eggs are attached to the mosquito and to each other by a varnish insoluble in water and alcohol. Experiments made in breeding *Dermatobia* eggs are described. Dr. Pedro Zepeda observed the *Dermatobia* larva leaving the mosquito while this was sucking blood. He also found the eggs of *Dermatobia* attached to the femora, antennae and prothorax of the mosquito.

In the discussion following the reading of this paper, Dr. Townsend suggested that the female *Dermatobia* was probably led, through an olfactory tropism, to oviposit upon the body of the carrier. The eggs were incubated in the uterus and contained the fully formed maggot at the time of deposition and the maggot was stimulated by the rise of temperature to hatch at the time that the carrier imbibes a meal of warm blood. The maggot being unable to penetrate thick skin of itself, must enter the puncture made by the carrier and is perhaps guided there to by the odour of the serous exudation following the withdrawal of the carrier's proboscis. He stated that *Cuterebra* parasitises only thin-skinned hosts and has developed no carrier habit to extend its parasitism to such thick-skinned hosts as man, cattle, dogs, etc., as has evidently occurred in the case of *Dermatobia*, which was probably likewise confined originally to thin-skinned hosts. This has perhaps been due to a less acute sense of smell in *Cuterebra*, which has the third antennal joint atrophied, while *Dermatobia* has this organ very well developed.

A bibliography of eight volumes is appended.

Fayet (M.). **Du diagnostic de la Gale sarcophitique équine sur le Front.** [On diagnosing Sarcoptic Mange on Horses at the Front.]—*Rev. Gén. Méd. Vét., Toulouse*, xxv, no. 299, 15th November 1916, pp. 539–548.

It is stated that in the field lice are a source of great trouble to horses. Under war conditions, they may spread at an alarming rate. The irritation they cause, which exhausts the animal, can sometimes only be stopped by close clipping. This also enables the presence of mange to be detected.

McCulloch (Irene). **An Outline of the Morphology and Life-History of** *Crithidia leptocoridis*, **sp. nov.**—*Univ. California Publicat. Zool., Berkeley*, xvi, no. 1, 16th September 1916, pp. 1–22, 1 fig., 4 plates.

Large numbers of flagellates, *Crithidia leptocoridis*, sp. n., are recorded in the intestinal tract of *Leptocoris trivittatus* (box-elder bug), common about the buildings of the University of Kansas. The exact conditions under which the insects become infected are not yet definitely known.

SUDLEY (E. W.). **La fièvre récurrente malgache.** [Relapsing Fever in Madagascar.]—*Bull. Soc. Path. Exot., Paris,* **ix**, no. 9, 8th November 1916, pp. 688-693.

The transmitter of the spirochaete causing relapsing fever in Madagascar is *Ornithodorus moubata*, which has probably been introduced from East Africa. A company of Senegalese who travelled from Morudava to Majunga were everyone infected by the spirochaete, although the European officer commanding them, by taking precautions against the bites of *O. moubata*, was not attacked. This disease is particularly prevalent on the north-west coast and many cases have been observed among the Senegalese troops, as well as among the indigenous population.

JEANSELME (E.). **Cas de paludisme autochtone contracté en France au contact des troupes indigènes.** [A Case of locally acquired Malaria contracted in France through Contact with Native Troops.]—*Bull. Soc. Path. Exot., Paris,* **ix**, no. 9, 8th November 1916, pp. 693-694. [Received 1st December 1916.]

This paper describes the case of a soldier 24 years of age, born in and living in Paris until the time of his military service, when he was sent to Verdun. On the outbreak of war he served on the Meuse and the Somme. On 17th September he was sent to hospital at Beauvais, wounded in the head, and 10 or 12 days after admission developed all the symptoms of malaria, having been placed in a room containing natives of Martinique and Annam. During September mosquitos are common in France, and all the necessary conditions for transmission were therefore present, especially as the natives were not subjected to methodical treatment with quinine, nor isolated under mosquito-nets.

LANGERON (M.). **Remarques sur l'évolution larvaire de *Theobaldia annulata* (Schrank, 1776).** [Remarks on the Larval Stages of *Theobaldia annulata*.]—*Bull. Soc. Path. Exot., Paris,* **ix**, no. 9, 8th November 1916, pp. 704–708.

A description is given of the larva of *Theobaldia annulata*, which is common in France, and on these characters the author places it with its allied species, *T. incidens*, *T. absobrina* and *T. consobrina*, in a group apart, and quite distinct from the true *Culex*, with which it was placed by Christophers. He believes these mosquitos to be more closely allied to *Megarhinus* and *Stegomyia*.

DUKE (H. L.). **Trypanosomiasis in Northern Uganda.**—*Jl. of Hygiene, London,* **xv**, no. 3, September 1916, pp. 372–387, 1 map [Received 24th January 1917.]

A trypanosome showing marked morphological resemblance to the human parasite, the so-called *Trypanosoma rhodesiense*, was discovered in 1914 in the blood of a dog which had passed once through the belt of *Glossina morsitans* south of Masindi. The author therefore proceeded to the Northern Province of Uganda in order to test the hypothesis put forward by Miss Robertson in her report that this organism is a recent introduction into that district.

After quoting several portions of this report at some length, he criticises the views therein expressed. He doubts the possibility of a large area of sparsely populated bush country, thick with game and *G. morsitans*, being free from trypanosomes. He considers it probable that the pathogenic trypanosomes of cattle and domestic animals have been derived from those of wild game in which they are innocuous.

That disease or death in cattle in the area visited is invariably due to trypanosomes is inadmissible, as several other diseases are known to have occurred among them. The identity of these and the native names for them are discussed. The supposition that more or less speedy death follows infection with trypanosomes is not borne out by facts, as animals infected in June and July 1913 were still alive and in excellent condition early in 1914, nor is the conclusion justifiable that an animal has been recently infected because of the occurrence of *T. vivax* or *T. nanum* in the peripheral blood.

Some account is given from the evidence of natives of earlier outbreaks of trypanosomiasis in this part of Uganda and of the movements of cattle that have contributed to the present distribution of the disease. With regard to the movements of fly, experiments showed that, whereas a slow pedestrian will soon throw off "following fly," the pace of a cyclist seems to exert an irresistible attraction, and large numbers will follow for miles; the author therefore considers it possible that the introduction of bicycles among the natives of Busindi, dating from 1908, has had a definite influence on the recent epidemic.

A number of experiments in the belt of *G. morsitans* at Masindi are described. Wild flies caught at various places in the belt were fed upon suitable animals, such as monkeys, and gave rise to infections of *T. brucei*, *T. pecorum*, *T. nanum*, *T. vivax*, and *T. uniforme*. Two cases of natural infection by *T. brucei* and *T. pecorum* in dogs are recorded. Dissection of the flies used showed that infections of the proboscis only is ascribable to *T. vivax* or *T. uniforme*; those of the proboscis and gut to *T. nanum* or *T. pecorum*; those of the gut and salivary glands to trypanosomes of the *T. brucei* group; and those of the gut only to immature infection by *T. nanum*, *T. pecorum* or *T. brucei*. As evidence of the presence of *T. brucei* in *G. morsitans* in the Masindi belt before Miss Robertson's arrival, it is stated that the native dogs were dying in 1912–13 with symptoms of keratitis and that this symptom is almost always due to *T. brucei*, and rarely if ever to *T. pecorum*.

In another series of experiments, wherever a positive salivary gland was found, the animal fed upon developed *T. brucei*, and *T. nanum* appeared to be more common in the wild flies than *T. pecorum*. Of inoculations made from the blood of 30 head of game, 16·6 per cent. gave positive results, 6·6 per cent. being due to *T. brucei*. Similar experiments were performed in other tsetse districts of the Northern Province to determine the distribution of the *brucei*-like trypanosome. In the Ngussi River district, *G. pallidipes*, *G. palpalis* and *G. fusca* occurred. Of a total of 165 flies dissected, gut and salivary gland infection was found in 3 per cent. of *G. pallidipes* only, and *T. brucei* was obtained in feeding experiments. On the Sonya Peninsula and the shore of Lake Albert, *G. palpalis* only was found; among 407 flies dissected, no salivary gland infections were observed. Of 20 head of game examined, 9 per cent. were found infected with *T. nanum*, but none with *T. brucei*, nor was *T. brucei* obtained in feeding experiments. In the Chopi, Victoria Nile and Bugungu districts, *G. palpalis* and *G. morsitans* were found and *T. brucei* was obtained once in a feeding experiment with *G. morsitans*. Twenty head of game were examined and 19 per cent. were found to be infected with trypanosomes, but none were of the *T. brucei* type. The various strains of *T. brucei* obtained were compared and appear to belong to the same species.

The conclusion is arrived at that a trypanosome of the *T. brucei* group is widely distributed throughout the southern part of the Northern Province of Uganda, probably wherever *G. morsitans* and *G. pallidipes* occur. Where cattle are exposed to the bites of tsetse, especially of *G. morsitans* and *G. pallidipes*, they sooner or later sicken and die. The discovery in the Masindi fly-belt of a trypanosome showing a close affinity to that which is noxious to man in Southern Africa need not cause undue alarm. A similar or identical trypanosome will probably be found in every area infested with *G. morsitans* or *G. pallidipes*. As it may, for unknown reasons, develop the faculty of more or less permanent survival in man—a host usually immune—it must be viewed as a potential source of danger to human beings. The natives living in the fly-belt were however examined with negative results, and from an administrative point of view, the author does not consider this trypanosome a human parasite; and provided steps are taken against the introduction of too large a number of inhabitants into the now sparsely populated fly area, there is no reason to expect a serious situation to arise.

Macdonald (A.). **The Position of Malaria in Sanitary Administration.** —*Trans. Soc. Trop. Med. Hyg., London*, x, no. 1, November 1916, 21 pp., 12 figs.

The author urges the necessity for the control of malaria and general mosquito elimination being recognised as part of the routine work of the Health Department, wherever that exists, instead of being relegated to special commissions, and for the establishment of a Preventive Medicine Department with specialised and experienced heads, for the care of the health of tropical communities. The special measures of anti-malarial administration should include the systematic scrutiny of death returns; communication with general medical practitioners; routine returns from institutions of malaria and other mosquito-borne diseases; general sanitary measures; special anti-mosquito measures against *Stegomyia* in particular and Culicines and Anophelines in general. *Stegomyia*, being purely domestic, must be dealt with by householders and by sanitary inspection of towns, while Culicines may be exterminated by preventing the existence of any collection of stagnant water. With regard to Anophelines and malaria in general, the recognised control measures are reviewed.

The author is sceptical as to the value of quinine as a preventive, although he admits its usefulness in relief and cure. In any case, quinine has no position in sanitary administration, and the indiscriminate use of the drug has had, in his opinion, a disastrous effect in postponing sanitary administration in the tropics. The chief work of the medical officer of health should be to educate the people, much of the personal prevention of malarial infection being a matter of clean living.

McDonald (W. M.). **Suggestions for the Institution of Rural Anti-Mosquito Measures in Antigua.**—*Jl. Trop. Med. & Hygiene, London*, xix, no. 22, 15th November 1916, pp. 261–262.

The prevention of malarial and filarial diseases in Antigua and the Leeward Islands generally has not received much attention hitherto. In order to induce the co-operation of employers of labour throughout the island in a comprehensive scheme of mosquito destruction, the author proposes the establishment of an experimental area in which various anti-mosquito measures may be tried, a record being kept of their relative cost and efficiency and of the return of malaria in this area. The utilisation of natural enemies is a measure which has to be applied with a due regard to the many methods by which mosquitos may escape attack. It was observed in this connection that while small fish occurred in great numbers in the open water of certain ponds, mosquito larvae were also very numerous among the grass and vegetation round their edges. The latter must therefore be kept clear if the fish are to be of use. Oiling is likely to prove the most practical method of dealing with the majority of breeding places in the island, while draining is also to be tried.

Fantham (H. B.) & Porter (A.). **The Significance of Certain Natural Flagellates of Insects in the Evolution of Disease in Vertebrates.**—*Jl. of Parasitology, Urbana, Ill.*, ii, no. 4, June 1916, pp. 149–166.

This paper comprises a useful resumé of others previously published [see this *Review*, Ser. B, iii, pp. 68, 154]. A bibliography of 17 works is given.

Mosquitoes. An Unusual Breeding Place.—*Public Health Repts., Washington, D.C.*, xxxi, no. 46, 17th November 1916, p. 3159.

A case is recorded at the American consulate at La Guaira, Venezuela, where mosquitos were found breeding in a water-cooler of the type in which the water passes through a porcelain compartment surrounded by an ice chamber. The larvae were discovered in drawing off from the ice chamber some of the water resulting from the melting ice. The species breeding in this ice-cold water was not determined. Careful daily attention to the ice chamber was followed by the total disappearance of mosquitos from the offices.

Hall (H. C.). **Typhus Fever.**—*Military Surgeon, Washington, D.C.*, xxxix, no. 5, November 1916, pp. 474–490, 1 sketch-map.

In the latter portion of this paper a description is given of the Texas State quarantine measures for preventing the introduction of typhus by immigrants from Mexico, where the disease is endemic. It is stated that body lice [*Pediculus humanus*] when placed in a bottle with head lice [*P. capitis*], bed-bugs [*Cimex*] and raw meat, will first kill and devour the head-lice, then the bed-bugs, and after the raw meat has been consumed, will become cannibals. Body lice will not bite nor remain on a human body nor in garments moistened with perspiration, which may in a measure explain the supposition that typhus is a disease of cold climates.

Lefroy (H. M.). **The Control of Flies and Vermin in Mesopotamia.**—Separate, dated October 1916, from *Agric. Jl. of India*, xi, part 4, pp. 323–331. [Received 13th December 1916.]

The most abundant flies in Mesopotamia belong principally to the genera *Musca*, *Calliphora* and *Stomoxys*. Almost every disease in this country is carried by flies or by water. The fly-problem really falls into three sections, viz :—Flies in camps, trenches, etc.; flies in towns; and those accompanying moving bodies of troops. The chief breeding places in camps are the latrine trenches; stable manure is comparatively harmless, owing to its rapid desiccation and kitchen refuse is usually burnt or buried. Owing to the dry and barren character of the country, it is only where man is present that flies can find shelter, food or breeding places. In towns, it is more a question of extermination than prevention, as the native houses swarm with flies and camps are often very close to them. Bodies of men on the move carry hordes of flies with them, and often find millions to greet them on arriving at a camp which has been used before. In hospitals, supplies and staffs to carry out the obvious measures are badly needed.

A simple set of instructions was prepared and issued and the following measures recommended: Latrine trenches should be replaced by tins and incinerators, wherever possible. When this is not possible, ordinary burning oil has proved the most effective. This oil should be used even with tins, as it prevents flies settling. Kitchen refuse and offal must be burned or oiled and buried. Sodium arsenite proved an excellent fly poison, $\frac{1}{2}$ lb. of arsenite being used with $2\frac{1}{2}$ lb. of *gur* and $2\frac{1}{2}$ gals. water. Bags are dipped in this mixture and hung up; a shelter should be put over them and the bags kept moist. This solution is weak enough not to affect the flies until they have fed; if made too strong, they are affected before they acquire a fatal dose. An excellent plan is to arrange strips of material on the roller towel principle so that part of it dips in the tin; as the liquid dries and gets too concentrated, water is added. This bait seems to attract from a range of 200 yards and fly-poisoning stations should therefore be set up every quarter of a mile or so and, when possible, at a point between the latrines and the camp.

In the trenches flies collect in masses in sheltered spots at night and at mid-day and can be killed in bulk by spraying. For this purpose, a special grade of mineral oil with a small quantity of aromatic essential oil, such as citronella (known as "Flybane" in England), is used.

For hospital tents and buildings, formalin can be used, but the new fly-spray, Exol, known as "Miscible fly spray," gives the best results. It is mixed with water and sprayed in the air. This formula may have to be altered to suit the climate in Mesopotamia. Large quantities have been made for the War Office, who will not publish the formula for public use until the army has all it needs. For hospitals, an ample supply of netting, mosquito nets, etc., have been found essential.

In the author's opinion, it is better for bodies of men on the move who camp for not more than three days at a time, to have no trench latrines, but to mark off a space of clean, hard ground, where the heat and dryness are such that flies cannot breed in the material, which desiccates at once. This, however, is contrary to the sanitary expert's ideas.

Another entomological problem in Mesopotamia is the control of lice and sand-flies, the former conveying recurrent fever and typhus, and the latter sand-fly fever. A refined form of crude oil emulsion has been adopted to control these pests. Rubbed lightly on the hands and face it prevents the attacks of sand-flies or mosquitos, while for lice it is rubbed on the body and on the seams of the clothing; underclothes are washed in it and dried without rinsing so that they are lightly impregnated with it.

Symons (S. T. D.). **Tick-bite in Stock and its Treatment.**—*Agric. Gaz. N.S.W., Sydney*, xxvii, no. 11, November 1916, p. 767.

The scrub tick, *Ixodes holocyclus*, is troublesome to young stock in autumn and early spring in the coastal areas of Australia, and often proves fatal to them. The effects of infestation are commonly shown in a staggering gait and paralysis of the hind legs. The ticks shold not be forcibly removed at once, but a small quantity of turpentine or kerosene should be dropped on each, and they can be removed on the following day.

Wright (W.). **The Control of Rat Plague.**—*Jl. State Medicine, London*, xxiv, no. 12, December 1916, pp. 380–384.

The destruction of every rat on every vessel arriving from a plague-infected port is the ideal method of insuring absolute safety against ship-borne infection, but the author does not consider the immense outlay entailed to be necessary. It is difficult to believe that every rat can be killed in a fully laden vessel, even by the Clayton process, which is considered the best. From the bacteriological point of view, it is also necessary to destroy, not only every rat, but also every flea, as well as *Bacillus pestis*. An instance is given of a case of plague which occurred on a vessel in Glasgow in 1911, where few rats, if any, could have been on board. An explanation of this may be furnished by a suggestive statement by Dr. V. T. Verjbitski of Petrograd, to the effect that in the case of linen or other fabrics soiled by crushed fleas, bugs or their faeces, plague microbes can, under favourable conditions, remain alive and virulent during more than five months. No great fear of infection need be entertained in the case of vessels arriving from ports in areas where plague has been prevalent for years, as it is probable that the rats in such areas have acquired a considerable degree of immunity from long contact with infected animals. In conclusion, this paper describes the methods usually employed at ports to prevent rats from getting ashore. The fact, however, that stevedores' gangways are not always withdrawn for the night (as required by the regulations) and that, in tidal harbours, the vessel is often level with the dock, obviously permits rats to reach the shore despite all precautions.

Bacot (A.). **The Improvement of Fly-spraying Fluids and the Control of Experimental Trials.**—*British. Med. Jl., London*, no. 2919, 9th December 1916, p. 801.

Experiments with different fly-spraying fluids have shown, in accordance with general experience, that when used as directed they knock down, or stupefy, but do not kill all the flies, a varying percentage of which recover after an hour or two. In some cases, where the spray seemed fairly effective at room temperature (60–65° F.), it was only necessary to transfer the stupefied flies to a warm room (at 75° F.) for them to recover and speedily regain their full activity. An emulsion of kerosene oil and soft soap, diluted about 1 in 10, killed the flies within a period of 12 to 18 hours, although it did not stupefy them so quickly as most of the proprietary sprays. A combination of the latter with the oil emulsion fluid was tried and gave excellent results. The oil emulsion consisted of three parts of soft soap, completely melted by heat in 15 parts of water. A proportion up to 100 parts of kerosene is then added very gradually with thorough mixing. This emulsion can be kept indefinitely. For addition to the fly-sprays, allowance must be made for the extent to which they are diluted for use, the quantity of oil emulsion required being 1 in 10 to the water content of the fluid. A description is given of three experiments illustrating the advantages gained by combining the emulsion with a quick-action spray.

STORDY (R. J.). **Report of the Veterinary Department 1913-1914.**—*Ann. Rept. Dept. Agric. British East Africa, Nairobi,* 1915, pp. 126–147. [Received 27th December 1916.]

African coast fever was most prevalent during 1913 and 1914 in the Nairobi District, Kamasia Reserve and the Kedong Valley. No further outbreaks have occurred on the Uasin Gishu Plateau and the quarantine imposed has been removed.

An arsenical bath of standard strength every three days has proved a satisfactory and easy method of preventing this disease. Difficulty has been experienced in keeping many of the baths up to standard strength owing to the oxidation of the arsenite of soda, and its conversion into the arsenate, which is innocuous to the ticks. The Government has erected a model dipping plant at Nakuru and dipping demonstrations for the information of settlers have been carried out, showing the simplicity and safety of the operation. Where loss by poisoning has taken place, it has been shown to be due to carelessness, either in the preparation of the bath, or in allowing the cattle access to the tins of dipping fluid, or in not watering them properly before dipping. When the cattle are once accustomed to the tank as many as 326 head have been dipped in twenty-three minutes. Several cases of trypanosomiasis among horses have been recorded during the year.

STORDY (R. J.). **Report of the Veterinary Department for the Year ending 31st March 1915.**—*Ann. Rept. Dept. Agric., British East Africa, 1914–1915, Nairobi* [n. d.], pp. 115–124.

There were three outbreaks of African coast fever at Nakuru and six at Uasin Gishu during the year, these being in the so-called clean areas. There are now nearly 70 dipping tanks in working order throughout the country, and the efficacy of the three-day interval dips appears to be established over the five-day and seven-day dips.

JACK (R. W.). **Tsetse Fly Investigations, Sebungwe, August-September 1916.**—British South Africa Company Report received from Colonial Office, 27th November 1916, 3 pp.

As a result of investigations, it has been found that the tsetse-fly [*Glossina morsitans*] continues to spread rapidly in certain parts of the Sebungwe district, Southern Rhodesia. In the south-west corner of the big belt, the fly has advanced in a southerly direction from the Mzola to the Kana River, and in a westerly direction to the Shangani River. At the head-waters of the Mzola River, although no actual advance is recorded, the fly is certainly increasing rapidly. An advance of seven or eight miles has been made up the Sengwe River since 1914. It is reported to have also spread northward near the Sengwe and Sasame Rivers. At other points visited no advance is apparent since 1914. In some of the cases mentioned, the spread of the fly is believed to have been due to the movements of game.

With regard to an outbreak of trypanosomiasis on Meare's Farm, Sikombella River, the proof is considered practically established that trypanosomes of the *T. pecorum* type are capable of being transmitted under natural conditions from an infected to a healthy ox by some agency apart from a tsetse-fly. The facts are given in detail.

The author also discusses the possibility of isolating Sipani Vlei, in order to carry out experiments as to the result of excluding game from a fly area which is isolated during the latter half of the dry season, thus obtaining valuable information on the relation of big game to tsetse-fly.

SWELLENGREBEL (N. H.). **Quelques Notes sur la Distribution géographiques des Anophélines et du Paludisme, à Sumatra.** [Some Notes on the Geographical Distribution of Anophelines and Malaria in Sumatra.]—*Ann. Inst. Pasteur, Paris,* xxx. no. 11, November 1916, pp. 593–599.

On comparing the lists of Anophelines as found by the author and Schüffner in the plain of Deli and that given by Strickland for Malacca, they are found to be identical except that the latter includes *Anopheles* (*Neostethopheles*) *aitkeni*, *A.* (*Nyssorhynchus*) *fuliginosus*, and *A.* (*N.*) *karwari*, which are lacking in the first list, and *A.* (*N.*) *maculatus*, which has since been found on the plateau of Batak, Central Sumatra According to Watson, the most important carriers of malaria in Malacca, are *A.* (*Patagiamyia*) *umbrosus*, which is rarely found at Deli, and species of *Nyssorhynchus* which are not present there. It seems therefore probable that the small incidence of malaria at Deli is due to the rarity or absence of these mosquitos. Where malaria is present, especially on the coast, the Anophelines found are *A.* (*Nyssomyzomyia*) *rossi* and *A.* (*N.*) *ludlowi*, the latter being a proved transmitter of malaria, though less dangerous than *A. umbrosus*. In the interior of the Deli district, near the town of Medan, *A.* (*Myzorhynchus*) *sinensis* abounds, and although this is a transmitter of tertiary fever and despite the presence of breeding grounds of Anophelines, malaria is rare among Europeans in this town. There are outbreaks from time to time on the plantations, especially on one where *A.* (*Neomyzomyia*) *leucosphyrus* was abundant. This mosquito is of recent importation and was the only Anopheline found on this plantation.

On the west coast of Sumatra the health conditions are less favourable. At Siboga, which is on the coast near a salt marsh, where an attempt at drainage has only resulted in the formation of breeding grounds for Anophelines, malaria occurs in a severe form [see this *Review*, Ser. B, iv, p. 130]. Near the European quarter there are rice-fields, but it is useless to drain these alone as the only Anopheline present there is *A. sinensis*, the carrier of benign tertian malaria, while in the marsh *A. ludlowi*, the carrier of malignant tertian, is the only species. Since these observations were made, the quarter of the town nearest to the breeding grounds of the mosquitos has been destroyed by fire and the new town has been built further away from the marsh, with the result that there has been a considerable decrease both in the number of mosquitos and in the cases of fever.

The danger of only partly draining a marsh is emphasised, and instances of this with resultant increase of fever are cited.

Attention is called to the necessity for simplifying the nomenclature of the Anophelines and describing the salient characters of the principal species in order that colonial medical officers may be able to recognise them without difficulty.

A bibliography of 13 works concludes this article.

SCHÜFFNER (W.) & VAN DEN HEYDEN (H. N.). **De Anophelinen in Nederlandsch-Indië.** [Anophelines in the Dutch Indies.]—*Geneesk. Tijds. v. Ned.-Ind., Batavia,* lvi, no. 4, 1916, pp. 381-396, 1 plate.

This paper contains a key to the fifteen species of Anophelines recorded from the Dutch East Indies. In a supplementary note a brief description is given of *Anopheles gigas*, Giles, found on the Karo plateau at an altitude of over 4,500 feet. The species dealt with are:—*Anopheles* (*Myzorhynchus*) *umbrosus*, *A.* (*M.*) *barbirostris*, *A.* (*M.*) *albotaeniatus*, *A.* (*M.*) *sinensis*, *A.* (*M.*) *argyropus* ?, *A.* (*Cellia*) *kochi*, *A. punctulatus* (*Myzomyia tessellatus*), *A.* (*M.*) *leucosphyrus*, *A. aconitus* (*M. albirostris*), *A.* (*M.*) *rossi* var., *A.* (*M.*) *ludlowi*, *A.* (*Nyssorhynchus*) *karwari*, *A.* (*N.*) *maculatus*, *A.* (*N.*) *schüffneri*, and *A.* (*N.*) *fuliginosus*.

FAVERO (F.). **Larve di *Gastrophilus equi* ed *haemorrhoidalis* e tifo-anemia infettiva del cavallo.** [The Larvae of *Gastrophilus equi* and *G. haemorrhoidalis* and infectious Anaemia of the Horse.]—*Nuovo Ercolani, Turin,* xxi, nos. 1 & 2, 10th & 20th January 1916, pp. 4–7 & 17–21.

The author considers that his researches disprove the results obtained by K. R. and R. Seyderhelm, which tended to show the importance of Oestrid larvae in the etiology of pernicious anaemia of the horse (virus of Carré and Vallée). They attempted to demonstrate that the larva and its excreta, as well as the adult of *Gastrophilus equi*, and especially the larva of *G. haemorrhoidalis*, from both diseased and healthy horses contain a substance, by them called "estrina," specifically poisonous to the horse, and—in a lesser degree—to the donkey. A bibliography of 14 works is given.

Palazzolo (G.). **L'*Hipoderma bovis* e la Mosca *Dermatobius noxialis* o *cyaniventris* del Brasile.** [*Hypoderma bovis* and the fly *Dermatobia noxialis* or *cyaniventris* of Brazil.]—*Nuovo Ercolani, Turin*, xxi, no. 26–27, 20th–30th September 1916, pp. 433–437.

In Brazil *Hypoderma bovis* either does not occur at all, or only very rarely. *Dermatobia hominis*, Say (*noxialis*, Goud.) is very common and its larva causes great losses. It not only infests cattle, but also the horse, donkey, mule, monkey and even man. *D. hominis* less frequently met with on hot, sunny days; it is usually found near stock. Enormous numbers of calves perish through its attack, especially when another fly, which resembles *Sarcophaga carnaria* and is very numerous, deposits its eggs in the tumours due to *D. hominis*. The natives treat infested animals by removing the larva and pouring pure creolin into the wound, closing the orifice with dried horse-dung.

Bimbi (P.). **La Piroplasmosi Equina in Sardegna.** [Equine Piroplasmosis in Sardinia.]—*Moderno Zooiatro, Bologna*, Parte Scient., v, no. 9, 30th September 1916, pp. 225–233.

In Sardinia equine piroplasmosis was first observed in 1908. It occurs more especially in the province of Cagliari, of which a large portion is flat, marshy ground, where ticks abound. *Margaropus annulatus* is supposed to be the transmitter. All the observed cases occurred in imported animals, viz.: the Hungarian horses of the mounted police. A bibliography of eight works is given.

Ihering (R. von). **Aranhas e outros Arachnoides do Brazil que determinam Envenemento.** [Spiders and other Arachnoidea of Brazil with venemous Bites.]—*Annales Paulistas Med. e Cirurgia, S. Paulo*, vii, no. 1, July 1916, pp. 5–9, 1 plate. [Received 11th December 1916.]

The venomous spiders occurring in Brazil include:—*Homoeomma nigrum*, *Heteropoda venatoria*, *Lycosa raptoria*, *Latrodectus mactans*, and *Menemerus bivittatus*.

Schilling (V.). **Zur Biologie der Kleiderlaus. Uebertragung auf dem Luftwege.** [The Transportation of Lice by Wind.]—*Münchener Med. Wochenschr., Munich*, lxiii, no. 32, 8th August 1916, p. 1176.

The possibility of lice being transported by wind has been proved. While a labour battalion was being medically inspected in the Taurus region, engineers and officers standing behind the doctor to the leeward observed the presence of lice, gorged with blood, on their clothes. The men were passing one by one before the doctor and were stripped to the waist. There was no contact between them and the other members of the inspection committee. Wind transportation may therefore be a source of danger in the case of typhus and recurrent fever.

RIECK (—). **Ein transportabler Entlausungskasten.** [A portable Apparatus for Louse Disinfection.]—*Münchener Med. Wochenschr., Munich*, lxiii, no. 32, 8th August 1916, p. 1177.

The disinfection chamber described and illustrated here is made of wood and measures 5 ft. by 4 ft. 8 in. by 2 ft. 10 in. It has no bottom and one of the sides opens like a door. The structure is placed over a fire chamber excavated in the ground and furnished with a stove pipe. The excavation is covered with a sheet of metal with which the clothing is prevented from coming in contact by a wooden grid fastened within the open side of the box. A valve permits the temperature to be regulated. Fifteen uniforms can be dealt with at one time and the apparatus works well in the open air with the temperature at freezing point.

MASUR (—). **Influence of Colour in Horses on the Cure of Mange.**—*Internat. Rev. Science Pract. Agric., Mthly. Bull. Agric. Intell. and Pl. Dis., Rome*, vii, no. 8, August 1916, pp. 1128–1129. [Abstract from *Berliner Tierärztliche Wochenschrift, Berlin*, xxii, no. 25, 22nd June 1916, p. 294.] [Received 13th December 1916.]

In treating a number of horses for mange it was found that black horses recovered the quickest and were the easiest to treat, bay horses taking a longer time to cure. In chestnut horses the remedy has almost always to be repeated, and in the case of white horses even a second application is not sufficient to effect a cure. This was found to be the case with all the various drugs used.

It is suggested that Acarids penetrate more easily and more deeply into skin containing no pigment and thus render it more difficult for the curative agent to reach them.

MUTO (A.). **Nuovo metodo per la distruzione dei parassiti cutanei.** [A new Method for the Destruction of Skin Parasites.]—*Annali d'Igiene, Rome*, xxvi, no. 1, 31st January 1916, pp. 21–22. [Received 27th December 1916.]

This is a preliminary note on a method for destroying lice which was dealt with fully in a subsequent paper already abstracted [see this *Review*, Ser. B, iv, p. 177].

FERRIS (G. F.). **Some Ectoparasites of Bats (Dipt.).**—*Entom. News, Philadelphia*, xxvii; no. 10, December 1916, pp. 433–438, 2 plates.

This paper describes the Nycteribiids, *Penicillidia antrozoi*, Towns., found on *Antrozous pallidus*; *Penicillidia corynorhini*, sp. n., on *Corynorhinus townsendi*; and *Cyclopodia similis*, Speis., on an unknown bat in Samoa. The Streblid, *Nycterophilia coxata*, gen. et sp. n., on the bat *Macrotus californicus*, is also described from California.

DOVE (W. E.). **Some Notes concerning Overwintering of the House-fly, *Musca domestica*, at Dallas, Texas.**—*Jl. Econ. Entom., Concord, N.H.*, ix, no. 6, December 1916, pp. 528–538.

Further experiments on the lines of those previously carried out in Texas [see this *Review*, Ser. B, iii, pp. 92–94] prove that adult house-flies, when given sufficient food and not subjected to fatal temperatures, nor killed by *Empusa muscae*, or predators, show increased longevity in indirect proportion to decreases in temperature. Adults exhibit a tendency to seek temperatures above 60° F., thus reducing the length of life below 91 days, which was the duration obtained under the most favourable conditions. If prevented from reaching a warmer temperature than 45° F., and the humidity is normal, the adults become inactive. *M. domestica* does not oviposit at low temperatures, and it seems to be chiefly the sexually mature and fertilised flies which are thus prevented from ovipositing that develop the fungus, *Empusa muscae*. Pupae kept at a temperature above 43° F. produced adults in about 12 hours, but below this temperature no emergence was observed. Development was rapid in a cage supplied with fresh manure during November to January, and adult flies emerged continuously, but on discontinuing the supply of fresh manure the heat generated decreased and emergence ceased on 30th January. With the decrease of the flies, the predaceous *Scatophaga furcata* emerged in the cage in increasing numbers and undoubtedly preys upon the adult flies. The larvae were found to be capable of burrowing into sandy loam to a depth of 2 feet. Numbers of pupae near the surface of the soil receive sufficient heat to permit of emergence of the adults, but these usually succumb to cold before ovipositing. Larval migration as far as eight feet has been observed. Larvae and pupae which hibernated in a naturally accumulated and infested manure heap, exhibited the same results as in the cage experiments.

A bibliography of five works is given.

JACKSON (Major R.W.H.). **Administrative Control of Plague.**—*Jl. State Med., London,* xxiv, no. 9, September 1916, pp. 277–284.

This paper deals briefly with the etiology and prophylaxis of plague. To destroy fleas in human habitations the floors and walls should be thoroughly washed with a crude oil emulsion made according to the formula of Captain Burke, R.A.M.C., consisting of crude oil 80 per cent., with 20 per cent. whale-oil soap. It is a jelly mixing freely with water, and is commonly used in a 3 per cent. solution. At 10 per cent. strength it destroys fleas in any stage with certainty. The emulsion is cheap, can be applied with perfect safety, and can afterwards be washed out of the floor with water. With one gallon of the solution a room 12 ft. by 12 ft. can be thoroughly treated in five minutes.

BRAUN (—). **Le paludisme au Maroc en 1915 (Maroc occidental).** [Malaria in Morocco in 1915 (Western Morocco).]—*Arch. Méd. Pharm. Militaire, Paris,* lxvi, no. 5, November 1916, pp. 593–645, 5 figs., 2 sketch maps.

In this report on malaria in western Morocco in 1915 it is stated that representatives of the genus *Culex* constitute the majority of the mosquitos there, *Anopheles* and *Stegomyia* being present in smaller numbers. At Mazagan, *Stegomyia* was the only mosquito observed and there is no indigenous malaria in that harbour. At Cap Blanc, which is 9 miles away and in an extremely marshy region, practically only *Anopheles* occur.

MOON (R. O.). **The Chadwick Lectures on Typhus Fever in Serbia. Delivered at the Royal Society of Medicine on Oct. 20th and 29th, and Nov. 3rd 1915.**—*Lancet, London,* May, June, 1916, pp. 1069–1073; 1111–1114; 1157–1160.

HOWELL (B. W.). **The Typhus Fever Epidemic in Serbia 1915.**—*St. Barts. Hosp. Jl., London,* xxiii, no. 5, February 1916, pp. 52–54, 1 chart.

CHESNEY (Lilian Mary). **Typhus Work in Serbia.**—*Practitioner, London,* xcvi, no. 5 (no. 575), May 1916, pp. 542–550.

TULLIDGE (E. K.). **Fleck Typhus. The Scourge of the Eastern War Theatre.**—*New York Med. Jl., New York,* v. ciii, no. 25 (no. 1959), 17th June 1916, pp. 1167–1169, 2 figs.

These four papers deal with the typhus fever outbreak in the Eastern theatre of the war, especially in Serbia. Dr. Howell states that there is no doubt that lice transmit the disease, and that perhaps fleas and bugs also have a share. According to Dr. Chesney, though the louse is considered the chief transmitter, it is thought that other agents and means of infection must occur. Dr. Tullidge mentions that *Acarus scabiei* was a great pest amongst the men, almost as much so as the lice. The louse problem was dealt with vigorously, but in spite of all precautions, lice found their way into the wards, and doctors and nurses had to wear protective clothing.

TRASK (J. W.). **Malaria; a Public Health and Economic Problem in the United States.**—*U. S. Public Health Repts., Washington, D.C.,* xxxi, no. 51, 22nd December 1916, pp. 3445–3452.

The situation in respect of malaria in the United States is reviewed in this paper. It is stated that there is probably no State in the Union in which the disease is not present and in which it is not spread by the local mosquitos.

WOLBACH (S. B.). **The Etiology of Rocky Mountain Spotted Fever. Occurrence of the Parasite in the Tick (Second Preliminary Report).**—*Jl. Med. Res., Boston, Mass.,* xxxv, no. 1, September 1916, pp. 147–150.

In this paper the presence and distribution of the Rocky Mountain spotted fever parasite in experimentally infected ticks, *Dermacentor venustus*, Banks, is reported [see this *Review*, Ser. B, iv, p. 154].

ANDERSON (T. J.). **Report on the Entomological Laboratory for the Year ending 31st March 1914.**—*Ann. Rept. Dept. Agric. British East Africa, 1913–1914, Nairobi,* 1915, p. 82. [Received 27th December 1916.]

The following new mosquitos were collected during the year:—*Taeniorhynchus versicolor*, Edw., *Culex mirificus*, Edw., *C. trifilatus*, Edw., *C. andersoni*, Edw., *C. perfuscus*, Edw., and *C. aurantapex*, Edw.

GIOVANOLI (G.). *Leptus autumnalis*—**Herbstgrassmilbe bei der Ziege.** [The Autumn Grass-mite, *Leptus autumnalis*, on the Goat.]—*Schweizer Arch. f. Tierheilkunde, Zurich*, lviii, no. 2, February 1916, pp. 66–71.

The few notes that have been published on the infestation of domestic animals by *Leptus autumnalis* nearly all refer to the dog, so that it might be supposed that this is exceptional. The author has however observed that throughout the autumn nearly all the sheep and goats out at pasture in the Canton of Grisons are infested. Beyond causing great irritation no harm is done. A bibliography of six works is given.

KUHN (P.). **Die Geschichte der Schlafkrankheit in Kamerun und ihre Lehren.** [The History of Sleeping Sickness in Kamerun and its Teachings.]—*Arch. f. Schiffs- u. Trop.-Hyg., Leipsic*, xx, no. 11, June 1916, pp. 263–264. [Author's review of his paper in *Zeitschr. f. Hygiene u. Infektionskr., Leipsic*, lxxxi, 1916, p. 69.]

This paper is intended to provide officials engaged in combating sleeping sickness in Kamerun with accurate information as to the distribution of the disease. The coast became infected with sleeping sickness in the seventies and the disease penetrated to the Sanga region towards the end of the eighties or early in the nineties, it being considered improbable that an old focus of infection already existed there. Both Njong and Dume were infected in the nineties from Sanga and the author does not support the view that sleeping sickness has existed in Kamerun since early times. Its incidence is characterised by sudden outbreaks, with intervals of slow spread, which accounts for the difficulty in locating it and for the conflicting opinions current regarding its dangerous character. The accounts from Sanga and Njong especially show that after decades of comparative quiescence violent outbreaks take place. It is therefore incorrect to assume that the infection will die out of itself. The disease follows the march of European civilisation, being spread by trading factories and government posts. It first follows the rivers and then extends along the traffic routes. All the information obtained by the French as to the part played by *Glossina* in the Congo region is gathered together. The view that *Glossina palpalis* is not the cause of epidemics is considered premature. The striking contradiction between the remarkably small numbers of *Glossina* and the epidemic character of sleeping sickness may be ascribed to the fact that the *Glossina* in the north of the Sanga region chiefly depend on man as a source of food, while in the south they feed on big game.

HEYMANN (B.). **Beiträge zur Frage von der Beteiligung der Kopflaus an der Fleckfieber-Verbreitung.** [The part taken by the Head Louse in the Spread of Typhus.]—*Med. Klinik.*, xii, no. 18, 30th April 1916, pp. 480–488.

The distinctions between head and body lice [*Pediculus capitis* and *P. humanus*] are discussed, as well as the question of the transmission of typhus by the former, on which point no final conclusion appears to have been reached.

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Markoff (W. N.). **Piroplasmose und andere blutparasitäre Krankheiten der Haustiere am Balkan.** [Piroplasmosis and other Blood-parasite Diseases in the Balkans.]—*Arch. f. Schiffs- u. Trop.-Hyg., Leipsic*, xx, no. 14, July 1916, pp. 313–335.

Most of the author's observations were made during the first Balkan war in 1912–1913. Equine piroplasmosis occurs in the Balkan peninsula and on the European and Asiatic shores of the Black Sea. Transmission is believed to be due to *Dermacentor reticulatus*. The mortality varied between 5 and 12 per cent. In the Tschorlu region the disease begins before spring and lasts till June. In the case of horses which had not been recently infected, two or three injections of 10 cc. of a 1 per cent. solution of sublimate, at several days' interval, nearly always effected a complete cure.

Piroplasmosis of cattle occurs throughout Bulgaria and was also observed in Adrianople, Thrace and Macedonia. Besides *Ixodes ricinus*, other ticks are supposed to be transmitters. While *Babesia bovis* is the blood-parasite most frequently met with, there is another species present resembling *B. bigeminum*.

Spirochaetosis in fowls occurs in Bulgaria and Rumania, and probably also in Serbia and Turkey, *Argas persicus* being the tick concerned.

A bibliography of 54 works closes this paper.

Noeller (W.). **Beitrag zur Flecktyphus Überträgung durch Läuse.** [Transmission of Typhus by Lice.]—*Berlin. Klin. Woch., Berlin*, liii, no. 28, 10th July 1916, pp. 778–780.

Some work on the transmission of typhus by lice is described. The etiological significance of *Rickettsia prowazeki*, Rocha Lima, is considered no longer doubtful. In some experiments, human body-lice, horse-lice, and pig-lice were transferred to guinea-pigs in the laboratory. The first do not live long on laboratory animals, so that the life-cycle of *R. prowazeki* was difficult to follow. The horse-louse lives a little longer than the human louse, while the pig-louse will live on a guinea-pig from two to three days at 85° F., and for six days at 61° F. or lower temperatures. When pig-lice were transferred from infected guinea-pigs to pig blood, *Rickettsia* developed in them. Infected human body-lice were found capable of living and breeding on pigs, and *Rickettsia* developed in them normally. Eggs from three infected body-lice were hatched out and the larvae reared, but no *Rickettsia* were found in the seven larvae examined. Though the author has not yet found cases of hereditary infection, he thinks such cases are possible.

Haight (H. H.). **Endemic Typhus Fever in Toronto.**—*Canadian Pract. & Rev., Toronto*, xli, no. 5, May 1916, pp. 185–191.

The history of a case of what is now believed to have been typhus is given. Head lice [*Pediculus capitis*] were found on the patient, and the possibility of this parasite transmitting typhus fever is discussed.

Swellengrebel (N. H.). **Quelques Remarques sur la Façon de combattre le Pou des Vêtements.** [Some Remarks on the Control of Lice in Clothing.]—Separate, dated 1916, from *Achiv. Néerland. Sci. Exactes et Nat., Haarlem*, ser. iii B, vol. iii, pp. 1–31, 23 figs.

A number of investigations into the life-history of clothes lice (*Pediculus humanus*) are here described. The irritation produced by the bites of these parasites on the skin is usually slight, though if they are crushed while feeding the effects may be quite severe. In experimenting with lice as regards their power of wandering from one person to another, it was found that individuals placed on either smooth or rough surfaces at greater distances than from 15 to 18 inches from the skin wandered about aimlessly. It does not appear, therefore, to be necessary to take such precautions as standing the bed of a patient in pans of water, as would be done in controlling ants, though the rapidity with which a louse, when not actually feeding, will attach itself to any fragment of clothing is noted as being a very probable means of dissemination of typhus infection among doctors.

The methods of control employed should be as simple as possible, and the apparatus used should also be simple, so that each division of the army, and even each company, or at least each battalion, may possess it. Where districts are better provided with apparatus for disinfection the use of hot air (159° F.), or Rubner's method, is the simplest. This latter method consists in placing the clothing and bedding in the disinfection chamber, using formaldehyde 12 per cent., and water vapour at 140° F. *in vacuo.* The preliminary heating lasts 20 minutes, the temperature is then maintained at 140°-144° F. for three-quarters of an hour. Disinfection by this method is always complete in two hours. Other methods are described, and the experiments made with them are tabulated. Sulphurous anhydride is not recommended owing to the uncertainty of its action and the bleaching effect it has on equipment [see this *Review*, Ser. B, iii, p. 203]. For treating the body various substances are suggested, of which acetic acid, creolin and anisol are among those recommended.

PARKER (R. R.). **New Species of New England Sarcophagidae.**—*Canadian Entomologist, London, Ont.*, xlviii, nos. 10 & 11, October & November 1916, pp. 359–364 & 422–427.

Sarcophaga bullata, sp. n., and *S. scoparia nearctica*, subsp. n., which breed in carrion, manure and refuse, are here described.

DUNN (L. H.). **A Simple Method of Identifying the Anopheles Mosquitoes of the Canal Zone (Dip.)**—*Entom. News, Philadelphia*, xxviii, no. 1, January 1917, pp. 14–19.

A key is given to the common species of *Anopheles* found in the Panama Canal Zone. These include *A. pseudopunctipennis*, *A. eiseni*, *A. argyrotarsis*, *A. apicimacula*, *A. malefactor*, *A. albimanus*, and *A. tarsimaculatus.*

COCKLE (J. W.). **Notes on the Wood-Tick** (*Dermacentor venustus.*)—*Proc. B. C. Entom. Soc., Victoria*, 1916, Entom. Series, no. 9, August 1916, pp. 53–56. [Received 3rd January 1917.]

The paper describes various observations on this tick in British Columbia, but does not appear to contain any new information on the subject.

DELANOË (P.). **Existence de *Phlebotomus papatasii*, Scopoli, à Mazagan.** [The Existence of *Phlebotomus papatasii*, Scopoli, at Mazagan.]—*Bull. Soc. Path. Exot., Paris*, ix, no. 10, 1916, pp. 762–763.

During June and July, 1915, the author observed five examples of *Phlebotomus papatasii* at Mazagan, some of which were taken near the beds of patients in the field ambulances, after a meal of blood. This species was not observed during 1916, but the author's time was spent mainly in the field. It is possible that dengue, or three-day fever, may occur at Mazagan; one case, which lasted the typical three days, is described. This is apparently the first time that *Phlebotomus* has been recorded on the western coast of Morocco.

ROUBAUD (E.) & VAN SACEGHEM (R.). **Observations sur quelques Insectes et Acariens Parasites du Bétail au Congo Belge.** [Observations on some Insect and Acarine Parasites of Cattle in the Belgian Congo.]—*Bull. Soc. Path. Exot., Paris*, ix, no. 10, 1916, pp. 763–767.

Among larvae producing animal myiases in the Lower Congo, the gastric Oestrids found included *Cobboldia loxodontis* and *C. chrysidiformis* in elephants. From the stomachs of asses were taken larvae that produced adults closely allied to *Gastrophilus asininus*, which the authors consider to be a geographical race of *G. intestinalis*. Muscids included *Pycnosoma bezzianum*, Vill. The myiasis caused by this fly is common in cattle at Zambi. Rovere expressed the opinion that the eggs of this insect are deposited direct on to the skin, but in the case of the observations at Zambi there was always a pre-existing wound. The myiasis due to *Lucilia argyrocephala*, Mcq., was found not only in mammals, including man, but also in birds. In the nests of *Ploceus collaris*, pupae of *Passeromyia heterochaeta*, Vill., were found, as well as *L. argyrocephala*. The association of these two species is probably not accidental, as the wounds caused by the bites of the larvae of *Passeromyia* in young birds obviously provide the necessary opportunity for the parasite causing myiasis.

The principal biting insects collected at Zambi included: the Tabanids, *Haematopota perturbans*, Edw., the rôle of which in the probable transmission of *Trypanosoma cazalboui* has already been described [see this *Review*, Ser. B, v, p. 13]; *Tabanus canus*, Karsch; *T. ditaeniatus*, Mcq.; *T. pluto*, Wlk.; *T. par*, Wlk.; *T. biguttatus*, Wied.; *T. taeniola*, P. de B.; *Stomoxys calcitrans*, L.; and *Lyperosia pallidipes*, Roub. The flea, *Dermatophilus penetrans*, L., is a serious scourge among pigs, and *Echidnophaga gallinacea* on poultry. The lice, *Haematopinus suis*, L., on pigs, *H. eurysternus*, Nitzsch, on oxen, and *H. tuberculatus*, Grib., on a buffalo imported from Italy, are recorded. The mite, *Psoroptes communis* var. *caprae*, causes otacariasis in goats and sheep. *Dermanyssus gallinae* and *Cnemidocoptes mutans* are common on poultry, and *Chorioptes equi*, Her., on horses. Among ticks collected on animals at Zambi were *Rhipicephalus appendiculatus*, Neum., *R. simus*, Koch, *R. capensis*, Koch, *Amblyomma variegatum*, F., *A. splendidum*, Gieb., and *Margaropus annulatus*, Say. *Amblyomma tholloni*, Neum., was found on an elephant. The human tick, *Ornithodorus moubata*, has been found in large numbers in piggeries, though relapsing fever has not yet been recorded in the neighbourhood.

ROUBAUD (E.). **Les Porcins et la Conservation des Ectoparasites humains, dans les régions chaudes.** [Pigs and the Perpetuation of Human Ectoparasites in Hot Climates.]—*Bull. Soc. Path. Exot., Paris*, ix, no. 10, 1916, pp. 768–771.

In the account of his observations on *Auchmeromyia*, the author pointed out the curious relations that exist in regard to the Calliphorine blood-sucking larvae between man and certain hairless mammals of the burrowing type such as *Phacochaerus* and *Orycteropus* [see this *Review*, Ser. B, iii, p. 98]. A recent paper by Roubaud and Bouet has shown that species of *Choeromyia* are not confined in the adult stage to the burrows of their hosts, but that they may also frequent human habitations, presumably for the purpose of oviposition [see this *Review*, Ser. B, iv, p. 101]. In Rhodesia the tick, *Ornithodorus moubata*, which transmits relapsing fever to man, has been found in the burrows of the wart-hog, far from any native habitation [see this *Review*, Ser. B, iv, p. 44], and in the Belgian Lower Congo the same tick has been observed in piggeries (see above). *O. turicata*, Dugès, is known to attack both man and pigs in Mexico. The occurrence of *Dermatophilus penetrans*, L., on pigs as secondary hosts should also be noticed in this connection. The rôle of the pig as preferred secondary host of parasites liable to attack man can also be verified in the case of blood-sucking Diptera. In the island of Principe *Glossina palpalis* attacks wild pigs in large numbers and follows the herds about in their migrations.

It is, therefore, probable that many other normal or occasional parasites of man find in pigs, either domestic or wild, their preferred secondary hosts, and *vice versa*. While investigating the transmission of exanthematous typhus, Nöller discovered that the pig-louse can live for a long time on man, while lice from human clothing can maintain life for more than seven days on pigs. All these facts lead to the conclusion that pigs are of all animals the most closely related to man in regard to the possibilities of parasite nutrition. To this list must also be added the intestinal worms and blood parasites that the pig harbours, which may be transmitted to man. The latter fact has already been established in the case of certain pathogenic trypanosomes such as *T. dimorphon*, *T. pecaudi*, *T. rhodesiense*, etc. Further investigation of this subject would be valuable, and attention should certainly be given to the hairless mammals, the pig in particular, as liable to maintain, in common with man, a number of parasites which are probable carriers of tropical diseases.

SERGENT (E.) & ALARY (A.). **Petite Epidémie d'Acariose en Algérie.** [A slight Epidemic of Acariasis in Algeria.]—*Bull. Soc. Path. Exot., Paris*, ix, no. 10, 1916, pp. 771–773.

The irritation produced by *Pediculoides ventricosus*, an Acarid infesting barley, caused a slight epidemic in Algeria in the autumn of 1916, both Europeans and natives being attacked. The malady is extremely contagious, the characteristic eruption appearing a very short time after contact with an infected person, though the first cases were all traced to the handling of barley. In the barley suspected of causing the epidemic *P. ventricosus* was constantly found in the nymphal stage. The full course of the malady is about twelve days, but antiseptic lotions or the application of sulphur have been found to allay the irritation.

SARRAILHÉ (A.). **Dengue et Fièvre de Trois Jours.** [Dengue and Three Day Fever.]—*Bull. Soc. Path. Exot., Paris*, ix, no. 10, 1916, pp. 778–794.

The author's experience in Macedonia and the Dardanelles in 1915-1916 has led him to believe that dengue and *Phlebotomus* fever are one and the same malady. In this paper he discusses at length the symptoms of these diseases and the reasons that have led to this conclusion. Realising that identical symptoms might arise owing to the occurrence of two diseases concurrently, he traces each to its carrier, which, in the case of dengue is generally considered to be *Culex fatigans* or a species of *Stegomyia*, while in the case of three-day fever it is *Phlebotomus papatasii*. Here again there is matter for controversy. From May until October, 1915, at which latter date *Phlebotomus* disappeared in Gallipoli, the weather was exceptionally dry, and mosquitos were consequently very rare. During this period, *Phlebotomus* was abundant, its appearance coinciding with an epidemic of three-day fever, which abated with its disappearance. In 1916, in Macedonia an epidemic of dengue coincided exactly with the appearance of an unusual number of *Phlebotomus*, the question of *Culex* being solved here, as in Gallipoli, by the extreme dryness. If the virus of dengue and three-day fever are considered identical, there still remains the difference that *C. fatigans* is capable of transmitting dengue to a healthy subject immediately after attacking a diseased person, while *Phlebotomus* can only transmit three-day fever after a lapse of six days. The author would like to see this statement confirmed by further experiment, but this difference in the infectivity of the carrier does not modify his view as to the identity of the two Mediterranean maladies, which he combines under the name of Mediterranean dengue. The spread of this disease is ascribed to various carriers. *Culex fatigans* is the established carrier in India, the Philippines, the Mediterranean Coast, Egypt and Syria; *Stegomyia* is indicated in Tonkin; *Phlebotomus* has been identified with it in Dalmatia by Doerr, Franz and Taussig. It seems to be established that the epidemics among French troops at Cape Hellas and in Macedonia are due to *Phlebotomus*. In the Dardanelles the malady was strictly limited to native houses occupied by the troops, and it was only in houses that *Phlebotomus* was found in any quantity. This was also the case in Macedonia.

An important conclusion derived from these observations is that an army in the field should never be quartered in houses, as these are the chief places where *Phlebotomus* occurs. The small size of this fly allows it to penetrate the finest mosquito-net, and therefore tents or barracks protected by very fine mesh wire-gauze screens should be provided.

BOUET (G.). **Contribution à l'Etude des Zones à Glossines du Sénégal (Région du Chemin de Fer de Thiès à Kayes).** [Contribution to the Study of *Glossina* Zones in Senegal in the Neighbourhood of the Thiès to Kayes Railway.]—*Bull. Soc. Path. Exot., Paris*, ix, no. 10, 1916, pp. 802–813.

The railway which is to connect Senegal with the Soudan, from Thiès to Kayes, and which is now in course of construction, passes through a zone infested with *Glossina morsitans.* The country traversed does not seem to be either botanically or climatically incompatible with the existence of *G. morsitans,* yet this species is only found in certain areas which are identical with those occupied by big game, or are at least traversed by these animals at certain periods of the year. The *Glossina* of these zones, as well as those in the region of Upper Gambia, apparently only transmit *Trypanosoma dimorphon,* and are at present not infected with the other animal trypanosomes of Western Africa, such as *T. pecaudi* and *T. cazalboui.* It is to be feared that the passage of many herds, particularly of humped cattle destined for the factory at Lyndiana, which come from all the Soudanese regions, will introduce into the Thiès-Kayes district the other trypanosomes that *G. morsitans* is capable of transmitting. On the other hand, the Soudanese animals passing through this region will become contaminated with *T. dimorphon.* As the majority of these animals pass at once into the Lyndiana factory to be killed, there will be very slight loss from this cause, but the incidence of disease will certainly increase. If care be taken to convey the cattle in screened wagons, as is done on the Ivory Coast railway, this danger would be obviated. In time, the establishment of a population along the course of the railway, who settle there to cultivate ground-nuts, will drive away the big game and, consequently, *G. morsitans* also. Another feature of these regions infested with *Glossina* is the existence of a race of small cattle which are immune to tsetse-borne trypanosomiasis. The presence of tsetse-fly in Western Africa bars the extension of humped cattle to the south, and strictly limits the existence of cross-bred races.

FLETCHER (T. Bainbrigge). **Report of the Imperial Pathological Entomologist.**—*Rept. Agric. Research Inst. & Coll., Pusa*, 1915–16, Calcutta, 1916, pp. 78–84. [Received 8th January 1917.]

Observations have been continued on the life-histories of various TABANIDAE occurring at Pusa. Notes are given on the life-histories of *Tabanus nemocallosus,* the larvae of which are not, apparently, cannibals; *T. albimedius,* which is parasitised by a small Chalcidid, and has three broods annually; *T. striatus,* which also has three broods; *T. sanguineus*; *T. hilaris*; *Chrysops stimulans,* of which the larvae feed on dead earthworms and are probably also cannibals; the larvae of *Gastroxides ater* were found in hollows in tree-trunks.

An account is given of transmission experiments with biting flies in the zone where surra is prevalent. *Tabanus albimedius* and *T. striatus* were found capable of transmitting the surra organism, not only by an interrupted feeding, but also by complete feeding. *T. albimedius* was proved to transmit surra 24 hours after feeding on an infected animal, but it failed to transmit disease after a longer interval. *T. striatus*, however, was found capable of transmitting surra (in one experiment with two flies) as long as 72 hours after feeding on an infected host. Smaller species, such as a *Tabanus* near *virgo*, were tried, but were not found to transmit disease. *Ctenocephalus felis* and dog and cattle fleas were also found incapable of transmitting surra. *Philaematomyia insignis* is only capable of transmitting surra in the case of an immediate interrupted feeding, the maximum interval, between leaving an infected host and commencing to feed on a previously uninfected animal, for which positive results were obtained, being only seven minutes, although positive results were obtained by direct inoculation of abdominal contents of infected flies as long as 28 hours after feeding on a surra-infected animal.

Surra is not transmitted hereditarily to the progeny of infected females of *Tabanus striatus*, *T. albimedius*, or *Philaematomyia insignis*.

The mosquito campaign was continued at Pusa with considerable success; the species found breeding on the estate included *Anopheles fuliginosus*, *A. culicifacies*, *A. rossi*, *Culex fatigans*, *C. gelidus*, *C. sitiens*, Wied. (*micro-annulatus*, Theo.), *Taeniorhynchus tenax*, *Stegomyia scutellaris*, *S. sugens*, and *S. gubernatoris*. *Pseudograbhamia maculata*, not previously occurring at Pusa, was also found and reared. The results of a series of experiments on the rôle of blood in the development of eggs in mosquitos will shortly be published. *S. scutellaris* was found capable of oviposition without having fed on blood, and, while depositing as many as three batches of eggs after only one meal of blood, may deposit several batches after one fertilisation.

Many maggots causing myiasis in domestic animals have been received and the flies bred out from them.

Among the ticks received, *Ornithodoros savignyi* was under observation throughout the year. A species identical with, or near, *O. lahorensis* was received from Agra. Both were fed on goats.

Connal (A.) & Coghill (H. S.). **Annual Report of the Medical Research Institute of Nigeria for 1915,** *London*, 1916, 29 pp. [Received 11th January 1917.]

The following blood-sucking insects were reported during the year:—Muscidae: *Glossina palpalis*, *G. tachinoides*, *Stomoxys nigra*, and *S. omega*. Tabanidae: *Tabanus secedens*, *T. socialis*, *T. thoracinus*, *T. fasciatus*, *T. taeniola*, *T. par*, *T. kingsleyi* and *Hippocentrum versicolor*. Culicidae, some of which were bred from the larvæ, included: *Culiciomyia nebulosa*, *Ochlerotatus nigricephalus*, *O. irritans*, *Anopheles costalis*, *A. mauritianus*, *Mansonioides africanus*, *Culex duttoni*, *C. thalassius*, *C. consimilis*, *C. invidiosus*, *C. tigripes*, *C. grahami*, *C. decens*, *C. rima*, *C. fatigans*, *C. insignis*, *Stegomyia fasciata*, *S. luteocephala*, *S. africana*, *Banksinella lineatopennis* (*luteolateralis*) and *Uranotaenia annulata*.

Of 47 *Glossina palpalis* examined, trypanosomes were found in the proboscis of two, and in the stomach of two others. One specimen of *G. tachinoides* was examined with negative results. One *Stomoxys nigra* contained avian red blood corpuscles in the stomach. One

Tabanus secedens showed Herpetomonads in the intestinal tract. Of 112 *Culiciomyia nebulosa,* spirochaetes were found in the stomach of three, Herpetomonads in the stomach of three, and filaria in the thoracic muscles of one. Of 31 *Ochlerotatus nigricephalus,* Herpetomonads were found in the stomach of one. Of 27 *Anopheles costalis,* only one showed malarial infection, and one harboured filaria in the thoracic muscles. Of 23 *Mansonioides africanus* dissected, spirochaetes were found in the stomach of one, while of 22 *Ochlerotatus irritans,* one also was infected with spirochaetes. Only one *Tabanus secedens* out of five examined showed Herpetomonads. Examinations of *Culiciomyia nebulosa* disclosed the presence of avian blood in 27 cases and mammalian in only two.

Trypanosomiasis was found in 17 cases among natives in Lagos. Cattle and horses were found infested to the extent of 29·1 per cent., chiefly with *Trypanosoma vivax* and *T. pecaudi.* One goat out of 66 was infected with a parasite resembling *T. vivax,* one sheep out of 44 with *T. vivax,* three pigs out of 28 with trypanosomes resembling *T. pecorum,* two dogs out of 21 with *T. pecaudi,* and two out of four horses with *T. vivax.*

A table is given showing the distribution in time of various mosquitos throughout the year.

FREEBORN (S. B.). **Rice, Mosquitoes and Malaria.**—*Mthly. Bull. Cal. State Bd. Health, Sacramento,* xii, no. 5, November 1916, pp. 247–252, 2 figs. [Received 11th January 1917.]

The optimum conditions for the production of rice and for the breeding of Anopheline mosquitos are, unfortunately, identical. The rice-fields necessitate flooding with water, which remains practically stagnant from June to October, and the remarkable development of rice cultivation in California has increased the cases of malaria and the number of mosquitos in almost direct proportion to the growth of the industry. In some districts legislation is in force authorising the taxation of landowners for the purpose of mosquito control. The solution of the problem depends on the elimination of all breeding places outside the rice-fields both before, during and after flooding of the fields, with quinine prophylaxis and careful screening until the mosquitos are under control.

KENNEDY (C. H.). **A Possible Enemy of the Mosquito.**—*Mthly. Bull. Cal. State Bd. Health, Sacramento,* xii, no. 5, November 1916, pp. 256–259, 4 figs. [Reprint from *California Fish and Game,* October 1916.] [Received 11th January 1917.]

Cyprinodon macularius, a small minnow abundant in shallow pools and ditches in California, may prove useful in the control of mosquitos, its food being minute aquatic insects and Dipterous larvae, especially of Chironomids. At the time of the author's investigations, it was too late in the season for mosquitos to be present. Minnows of other species have been introduced with considerable success into Hawaii to combat mosquitos.

Tothill (J. D.). **A Study in the Variation in the North American Green-bottle Flies of the genus *Lucilia* with Systematic Notes on the Species involved.**—Separate, dated June 1913, from the *Ann. Entom. Soc. America, Columbus, Ohio*, vi, no. 2, pp. 241–256, 1 diagram. [Received 8th January 1917.]

Examination of the examples of the genus *Lucilia* in the United States National Museum has led to the following conclusions:—*L. morilli*, Town., =*Pseudopyrellia cornicina*, F.; *L. nigripalpis*, Town., =*L. sylvarum*, Meig.; *L. angustifrons*, Town., = an abnormal specimen of *L. caesar*, L.; *L. giraulti*, Town., and *L. barberi*, Town., both =*L. sericata*, Meig.; *L. unicolor*, Town., *L. purpurea*, Town., *L. australis*, Town., and *L. infuscata*, Town., all =*L. caesar*, L.; *L. infuscata*, Town. (1 cotype), =*Phormia regina*, Meig.; *L. oculata*, Town., ♂=*L. caesar*, L.; *L. oculata*, Town., ♀=*L. pilati*, Hough.

Cooley (R. A.) & Parker (R. R.). **Cattle Lice in Montana.**—*Rept. Montana Live Stock Sanitary Board and State Veter. Surgeon, Helena*, 1915–1916, pp. 19–21. [Received 17th January 1917.]

Against lice on cattle the methods of treatment recommended include:—dipping, which, when possible, is the most satisfactory, spraying and hand application. For the first two methods tobacco decoctions, kreso, and chloronaptholeum are suggested. The tobacco decoctions should be used as specifically directed for the brand employed; kerosene preparations should not be applied in bright sunshine. Kerosene and lard is used as a hand application in eastern Montana and is effective as a killing agent, but often results in the loss of hair from the parts treated. The various treatments should be repeated two or three times at one week or ten day intervals. Severely infested animals should be isolated.

Rothschild (Hon. N. C.). **Results of Dr. E. Mjöberg's Swedish Scientific Expeditions to Australia, 1910-1913. V. Siphonaptera.**—*Arkiv för Zoologi, Stockholm*, x, nos. 1–2, 1916, 9 pp. 5 figs. [Received 19th January 1917.]

The following fleas are recorded:—*Xenopsylla cheopis*, Roths., on *Perameles macrura*; *Pulex irritans*, L., on man; *Ctenocephalus felis*, Bch., on *Aepryprymnus rufescens*; *Pygiopsylla ochi*, Roths., on *Trichosurus* sp.; *P. pavida*, sp. n., on *Petaurus breviceps*, *Pseudochirus herbertensis* and other hosts; *P. solida*, sp. n., on *Epimys* sp.; *P. hilli*, Roths., on *Perameles macrura*; *Leptopsylla musculi*, Dugès, on *Epimys chionogaster*; *Stephanocircus dasyuri*, Skuse on *Perameles* sp.; *S. concinnus*, sp. n., on *Epimys* sp.; *S. pectinipes*, Roths., on *Epimys assimilis*; *S. jarvisi*, Roths., on *Phascologale swainsoni*; *S. simsoni*, Roths., on *Epimys velutinus*.

The American species originally placed in *Stephanocircus* are now placed in the genus *Craneopsylla*, Roths.

Galli-Valerio (B.). **Neue Beiträge zur Biologie und zur Bekämpfung der Läuse.** [New Contributions to the Biology and Control of Lice.]—*Centralbl. Bakt., Parasit. u. Infektionskr., Ite Abt. Orig., Jena,* lxxviii, no. 1, 9th May 1916, pp.37–43.

Observations on *Pediculus capitis* (*cervicalis*) show that these lice bite various animals as well as man. They resist hunger better at low temperatures than at high ones and can travel considerable distances, one individual covering 37 inches in 40 minutes. The view that lice may be transported on flies was confirmed by experiment. They are very resistant to pressure, water, frost and various chemicals, but are extremely sensitive to hot air, steam and boiling water. Hot air at 122°-126° F. killed them in 5-15 minutes, and at 131°-132° F. in five minutes. Steam (212° F.) killed them in 2-5 minutes, and boiling water in one minute.

Galli-Valerio (B.). **Beobachtungen über Culiciden.** [Observations on Culicidae.]—*Centralbl. f. Bakt., Parasit. u. Infektionskr. Ite Abt. Orig., Jena,* lxxviii, no. 2, 30th June 1916, pp. 90–96, 1 fig.

Some observations on Culicidae made during a complete year at Vidy (Lausanne), on the Lake of Geneva, are described. On 8th November 1914, very small larvae of *Culex* and of *Anopheles bifurcatus,* a large larva of *A. maculipennis* and a pupa of *Theobaldia annulata* were found. The fully developed larvae of *T. annulata* were numerous throughout the winter. In December the Culicine larvae left the edges of the pools for the deep water, where they passed the winter under a sheet of ice nearly three inches thick. On 8th May 1915, the first eggs of *C. pipiens,* a pupa of *A. bifurcatus* and a large larva of *A. maculipennis* were noticed. Larvae and pupae of *C. pipiens, T. annulata, A. bifurcatus* and *A. maculipennis* were abundant from June to the end of September. On 4th July a new emergence of *Culex* and *Anopheles* larvae was observed, emergences of *C. pipiens* occurring on 24th July and 9th September. On 16th September very small larvae of *A. bifurcatus* were found. It would, therefore, appear that in 1915 the Culicines oviposited four times, and the *Anophelines* three times, at Vidy. At Sondrio (Valtellina) larvae of *A. bifurcatus* were observed on 26th December 1914, and in spite of the very cold winter they lived until the spring. On 24th March 1915, larvae of this species were again noticed, and when they were brought indoors they pupated on 28th March, adults emerging on the 5th and 6th April.

At Vidy, the water weed, *Lemna palustris,* plays an important rôle in checking the development of Culicidae. The larvae of *C. ornata* and *A. nigripes,* taken from tree-holes, developed better in dark-yellow glass than in white glass containers. By night mosquitos seem to be attracted, not by the colour of light, but by its strength: in the author's experiments the adults of *C. pipiens* always gathered on those panes of glass which were most powerfully illuminated. By day, however, they were attracted to the dark panes, as recorded by other observers in the case of coloured cloth and paper. It therefore seems advisable to use dark lamp-shades in mosquito-infested districts. The author's experiments do not confirm the statements of Lima and Sen, that CULICIDAE beneath a film of kerosine or petroleum are killed by the anaesthetic action of the oil. Carbolic acid might sometimes be used in small, dirty pools, as in a one-per-thousand solution of liquid carbolic acid, Culicid larvae died in 20-25 minutes, and pupae in 85 minutes; a weaker solution (1 in 5,000) killed the larvae in two and a half hours, but did not prevent the development of the pupae. While the larvae of *Dytiscus marginalis* prey on those of *Culex* when confined with them, they can only be regarded as auxiliaries in control under natural conditions where other food occurs.

BAERTHLEIN (K.). **Der Vondransche Heissluftapparat und seine Wirkungsweise gegenüber Läussen, Nissen und bakteriellen Keimen.** [The Vondran Hot Air Apparatus and its Mode of Action on Lice, Nits and Bacterial Germs.]—*Centralbl. f. Bakt., Parasit. u. Infektionskr., Ite Abt. Orig., Jena,* lxxviii, no. 7, 18th November 1916, pp. 527–557, 17 figs.

In the Vondran hot-air apparatus intensive drying of the articles treated is the principle adopted for destroying lice and their eggs, as well as bacterial germs. An electric blower beneath the twin disinfecting chambers drives the heated air upwards through openings in their floors, so that garments hanging within are blown out and a uniform degree of heat is attained everywhere, a result peculiar to this machine and one very advantageous in practice. The air in the chambers is changed 43 times a minute. In one test it was found that with the air in the free space within a chamber at 186° F., the temperature in the centre of the mass of garments was 180°-187° F., the difference being thus very small. A uniform high temperature is quickly reached. In one test with a fully loaded chamber the air temperature was raised from 80° F. to 188° F. in six minutes, and to 198° F. in 11 minutes. To destroy lice, 45 minutes at 178° F. and 40 minutes at 186° F. suffice with this machine. Dealing with apparatus where the air is in a state of rest, Heymann stated that about two hours are required to raise the temperature to 178° F.-195° F., so that six hours would be needed to effect the destruction of lice. For practical work with the Vondran machine, temperatures of 178°-186° F. are the best. Only two minutes are needed to switch the hot-air blast from one chamber to the other, and while one is in use the other may be unloaded and reloaded. The articles to be disinfected are hung on a framework which is pushed into the chamber at one end, and after the operation is completed the frame is run out at the other end of the chamber and unloaded there, so that the risk of contact with infested garments is avoided. At a temperature of 186° F., 64 complete sets of military equipment can be dealt with per hour, or 1,536 in 24 hours, at a cost of about one farthing per set. There was no trace of damage to articles made of leather, fur, plush or velvet. The furnace is lighted two hours before the machine is required for work, the articles to be treated are arranged on the framework and pushed into the air chamber, the stream of heated air is admitted, and the thermometer is watched. The preliminary warming up takes 15 minutes, and disinfection 30 minutes. Overheating must be avoided. In the meantime, the other chamber is loaded, so that the articles in it may be somewhat warmed by the time the blast is switched on to it. Immediately this is done the first chamber is unloaded at its other end, its doors being quickly closed to conserve the heat. After unloading, the framework is taken through the chamber back to its loading place and prepared for the next operation. A bibliography of eight references is given.

HASE (A.). **Beiträge zu einer Biologie der Kleiderlaus** (*Pediculus corporis*, **de Geer** = *vestimenti*, **Nitzsch**). [Contributions to the Biology of the Clothes-louse.]—*Centralbl. f. Bakt. Parasit u. Infektionskr. Ite Abt. Referate, Jena,* lxiv, no. 17–18, 16th May 1916, pp. 528-530. [Abstract from *Flugschr. H. 1. der Deutschen Gesellschaft f. angewandte Entomologie; Brunswick,* Paul Parey, 1915, 95 pp., 47 figs. Price 3 M.]

This paper embodies the observations and experiments made in the camp for Russian prisoners at Hammerstein, West Prussia, in March and April, 1915. The author considers that morphologically and biologically *Pediculus capitis* (head-louse) and *Pediculus humanus* (clothes-louse) are distinct species. The life-history and habits are described in detail. Lice were found to make their way through both sand and earth 12 inches deep, if it is dry, and were able to live for four days beneath it. Temperature governs the length of time that a louse can live without food, and varies from one day at 98° F., to nine or ten days at 42° F. Dry cold is equally well borne by both eggs and adults; even 10° F. does not kill them. While damp and cold combined are easily resisted, damp and heat quickly kill all stages. Dry heat of about 122° F. causes death after one-half to three-quarters of an hour.

HASE (A.). **Ueber die Entwicklungsstadien der Eier und über die Larven der Kleiderlaus** (*Pediculus corporis*, **de Geer** = *vestimenti*, **Nitzsch**). [The developmental Stages of the Eggs and the Larvae of *Pediculus humanus*.]—*Centralbl. f. Bakt. Parasit. u. Infektionskr., Ite Abt. Referate, Jena,* lxiv, no. 17–18, 16th May 1916, p. 530. [Abstract from *Naturw. Wochenschr.*, xxxi, 1916, p. 1.]

The development of lice in the egg-stage is dealt with. In older text-books the incorrect statement is made that the eggs of *P. humanus* (*vestimenti*) hatch in three or four days, whereas the time required is six days, though a few individuals may exceptionally hatch on the fifth day. A knowledge of the developmental forms within the egg is important, as this will often permit of the day of infestation being ascertained and the moment of infection with typhus calculated.

RICHARDSON (C. H.). **The Attraction of Diptera to Ammonia.**—*Ann. Entom. Soc. America, Columbus, Ohio,* ix, no. 4, December 1916, pp. 408–413.

The facts dealt with in this article were obtained while carrying out experiments on the responses of the house-fly to certain chemical compounds, and relate to the other species of Diptera which entered the traps more or less regularly [see this *Review*, Ser. B, iv., p. 106].

The flies were captured in 23 screen wire traps 9¾ inches high and 6 inches in diameter at the base. Pieces of commercial ammonium carbonate were placed in glass dishes in the pan of the trap and a little water was usually added. The result was that 15 specimens of *Phorbia* sp., 11 of *Muscina stabulans*, one of *Ravinia communis*, one of *Fannia canicularis*, one of *Lucilia sericata*, two of *Ophyra leucostoma*, three of *Stomoxys calcitrans*, 106 of *Leptocera ferruginata* and two of *Sepsis minuta* were caught, while two specimens of *R. communis* and one of *L. sericata* were taken in the control traps. The number of *Leptocera ferruginata* caught only represents those that actually fell into the liquid, as they were small enough to pass through the meshes of the screen.

One trap experiment with valerianic acid gave no result with *Stomoxys calcitrans*, nor would this fly oviposit on cotton wool soaked in the acid, thus differing from the results obtained by Howlett.

A bibliography of 11 references is appended.

Corson (J. F.). **Entomological and other Specimens collected in the Northern Territories, chiefly in the Districts of Wa and Dorka.**—*—Rept. Accra Laboratory for the Year 1915, London* [n. d.], pp. 30–35. [Received 23rd January 1917.]

The following specimens collected were identified by Mr. H. F. Carter:—Culicidae: *Anopheles costalis*, Lw., *A. funestus*, Giles, *A. pharoensis*, Theo., *Culex decens*, Theo., *C. duttoni*, Theo., *C. invidiosus*, Theo., *C. tigripes*, Gr., *C. tigripes* var. *fuscus*, Theo., *C. univittatus*, Theo., *Culiciomyia nebulosa*, Theo., *Mansonioides uniformis*, Theo., *Ochlerotatus furcifer*, Edw., *O. hirsutus*, Theo., *O. ochraceus*, Theo., *Stegomyia apicoargentea*, Theo., *S. fasciata*, F., *S. sugens*, Wied. Tabanidae: *Chrysops distinctipennis*, Aust., *C. longicornis*, Macq., *Haematopota beringeri*, Aust., *H. corsoni*, Carter, *H. decora*, Walk., *H. gracilis*, Aust., *H. pinguicornis*, Carter, *Tabanus biguttatus* var. *croceus*, Surcf., *T. ditaeniatus*, Macq., *T. gratus*, Lw., *T. simpsoni*, Aust., *T. taeniola*, P. de B., *T. taeniola* var. *variatus*, Walk. Muscidae: *Glossina longipalpis*, Wied., *G. morsitans*, race *sub-morsitans*, Newst., *G. palpalis*, R.D., *G. tachnioides*, West., and *Stomoxys calcitrans*, L. A few of the cattle examined were found to be infected with *Trypanosoma vivax* and *T. congolense*. At Konkore, where *G. morsitans* was plentiful, the chief of the village stated that his cattle, which looked healthy, were free from sickness. The Oestrid, *Cephenomyia* sp., found in the nasal cavity of a hartebeeste, and the tick, *Aponomma laeve*, found on a snake, are recorded. The larva of a *Gastrophilus* is common in the horses in the district.

Ingram (A.). **Concerning Age, Sex and Race in the Incidence of Human Trypanosomiasis.**—*Rept. Accra Laboratory for the Year 1915, London* [n. d.], pp. 36–44, 5 tables. [Received 23rd January 1917.]

The conclusions arrived at by various authorities on this point are given and compared with those expressed by Todd and stated as follows:—The proportion of elderly individuals amongst natives of the Congo and Gambia is lower than amongst Europeans. The great majority of cases of trypanosomiasis are persons of middle age, almost none are elderly people. The percentage of individuals with a considerable degree of glandular enlargement, which is coincident with trypanosomiasis, is very much greater in younger adults and children, and it is possible that the low incidence of trypanosomiasis among elderly people may be due, in part at least, to an immunity acquired by them.

These conclusions are not strictly applicable to the disease as met with in the Eket District of Nigeria [see this *Review*, Ser. B, iii., p. 53]. It seems evident that human trypanosomiasis exists in the hinterland and that there is more likelihood of its assuming epidemic form there, in regions of localised fly, where a reservoir may exist other than man, than in the thick forest regions of Ashanti in which the fly is scattered and big game non-existent. It is probable that the native of Ashanti owes his escape to the character of the country he inhabits, and that, were he to travel and to adopt the same habits as the north country native, the incidence of the disease would show but little difference in the two races. In the more northerly parts of the Western Province, where *G. palpalis* is more abundant and where contact between the Ashanti and the northern trader is closer and there are more infective flies, the incidence of trypanosomiasis is greater. Todd's last conclusion is open to doubt, as both old men and women do little work in the fields, remain for the most part in the villages and are less exposed to the bites of tsetse-flies. In the Nyasaland disease old people appear to be infected according to the extent to which they are exposed to the attacks of *Glossina*. It is therefore concluded that age, sex and race incidence in human trypanosomiasis vary directly with the extent to which the individual is exposed to the bite of infective flies.

A bibliography of 19 references is given.

MACFIE (J. W. Scott). **The Results of Dissections of Tsetse Flies at Accra.**—*Rept. Accra Laboratory for the Year 1915, London* [n. d.], pp. 49–54, 4 figs., 2 tables. [Received 23rd January 1917.]

The specimens of flies examined were collected a few miles outside the town, as they do not breed in the immediate vicinity. The object of the examination was to determine, if possible, the species of parasites transmitted and what proportion of the flies was infected; 75 *G. palpalis* and 8 *G. longipalis* were dissected. Of the first named, 63 gave negative results; one showed spirochaetes in the gut; two had sporocysts in the abdomen, and one fungus infections; three showed trypanosome infection of gut and salivary glands, one of proboscis and gut, three of proboscis only and four of the gut only. Of the *G. longipalpis* dissected, seven showed no infection, one only showing trypanosome infection of the proboscis only. In five cases various animals were inoculated with the infected parts of the flies, but in no case was infection transmitted. Feeding experiments conducted with the same flies before dissection were also without positive results. Three flies showed flagellates of the *Trypanosoma grayi* type in the gut. In the absence of positive results from feeding and inoculation experiments it is difficult to decide what trypanosomes the flagellates represented. It is probable that all the infections of the proboscis were *T. vivax*, those of the gut and salivary glands were possibly *T. pecaudi* (*T. brucei* of Uganda), as were also, perhaps, those of the gut only, though, according to Roubaud, *T. pecaudi* develops in the gut and proboscis and not in the gut and salivary glands. None of the infections resembled stages of the development of *T. congolense*.

A bibliography of four references is given.

MACFIE (J. W. Scott). **Chlorine as a Larvicide.**—*Rept. Accra Laboratory for the Year 1915, London* [n. d.], p. 71. [Received 23rd January 1917.]

Experiments were carried out to test the effect of free chlorine dissolved in water as a larvicide. Fifty larvae of *Stegomyia fasciata* were introduced into samples of clear tap water and water containing mud, weed, etc., in which larvae were actually found breeding, 100 oz. being used in each case. Two drachms of chlorine solution (1 : 550) were added, giving a proportion of approximately 1 in 250,000. The larvae remained unaffected in both tap water and their natural medium when the chlorine was present in this proportion, as also when it was raised to 1 in 62,500, 1 in 50,000 and 1 in 25,000, but at 1 in 10,000 all the larvae in the tap water and a few of those in their natural medium were dead at the end of two hours, while all were dead within 24 hours. Some *Cyclops* present in their natural medium were also killed. Chlorine would not, therefore, appear to be of practical use as a larvicide, even if it were possible to remove the excess, after the larvae have been killed, by means of some suitable antichlor, such as sodium thiosulphate.

MACFIE (J. W. Scott). **Notes on the Insects collected at Accra during the Year.**—*Rept. Accra Laboratory for the Year 1915, London,* [n. d.], pp. 76–79. [Received 23rd January 1917.]

The number of mosquitos collected at Accra now totals 32 species. Besides those already recorded [see this *Review*, Ser. B, v., p. 3] the following are here mentioned :—*Culex ornatothoracis*, Theo., *C. quasigelidus*, Theo., *C. thalassius*, Theo., and *C. thalassius* var. *fuscus*, Theo. Many examples of *Mansonioides africanus* captured were infested with little red mites. The commonest Anopheline mosquito is *A. costalis*. Specimens of *Ochlerotatus irritans*, *Culex fatigans* and *C. decens* sent to the laboratory were found to be flourishing in media containing a high percentage of salt. The last-named was breeding in water actually more salt than sea-water. They had been captured in crab-holes near a lagoon, the water of which is brackish, and had, no doubt, become concentrated by evaporation. The average of 30 estimations of the chlorine in media in which this insect was found worked out at 4·3 parts per 100,000, and the highest proportion observed was 20·5 parts.

Other biting insects captured included :—*Phlebotomus minutus*, Rond., var. *africanus*, Newst., *P.* (?) *squamipleuris*, Newst. ; *Tabanus ditaeniatus*, Macq. ; *Glossina palpalis*, R.D., *G. longipalpis*, Wied., *Stomoxys calcitrans*, L., *Cordylobia anthropophaga*, Grünb., from a guineapig's foot ; the fleas, *Echidnophaga gallinacea*, Westw., on domestic fowls suffering from spirochaetosis, *Ctenocephalus canis*, Curt., on a dog, *C. felis*, Bch., on a rabbit, *Xenopsylla aequisetosa*, Enderl., on *Cricetomys gambianus* and brown rats, and *X. cheopis*, Roths., on brown rats; and the tick, *Rhipicephalus sanguineus*, Latr., on a dog.

MARLATT (C. L.). **The Bed Bug.**—*U. S. Dept. Agric., Washington, D.C.*, Farmers' Bull., no. 754, 14th October 1916, 12 pp., 4 figs. [Received 24th January 1917.]

The bed-bug, *Cimex lectularius*, L., may gain access to any house in spite of the adoption of all reasonable precautions. When its source of food supply ceases in any one place, it develops migratory habits, and escaping by windows, may pass along walls, water-pipes and gutters and thus gain entrance into adjoining houses. Its origin, varieties, general characteristics, habits and life-history are described. It usually obtains its food from human beings only, and no other natural feeding habit has been recorded, though it may be artificially induced to feed upon mice, rats, birds, etc., and possibly does so when the normal host is absent. When houses long uninhabited are found to be infested by this insect, their presence may be accounted for by such other sources of food, but may also be explained by its natural longevity, as it is able to survive for a year or possibly more without food. It is sensitive to temperature and is more prevalent in northern climates than in southern ones. A temperature of 96° to 100° F., with a fairly high degree of humidity, will cause the death of large numbers. The adult bugs will survive temperatures below freezing for a considerable period, but the eggs and larvae succumb if it be prolonged for 15 days or a month. It becomes quiescent and partly hibernates at temperatures below 60° F., while it is most active at temperatures between 60° and 98° F. In heated houses the insect may remain active throughout the winter. As a transmitter of disease it probably shares this responsibility with such insects as body-lice and fleas, the transmission apparently resulting from the accidental carriage of the virus in the mouth-parts. The fact that *C. lectularius* only feeds at intervals of a week to several weeks or months acts as a bar to its being a transmitter of certain insect-borne diseases. It is preyed upon by the house centipede (*Scutigera forceps*) and the little red house-ant (*Monomorium pharaonis*, L.). The most satisfactory remedy to apply against it is the fumigation of infested rooms with hydrocyanic-acid gas or sulphur. In cases of slight infestation simple measures of control are: the application of benzine, kerosene, the lighter petroleum oils, corrosive sublimate or oil of turpentine with small brushes, feathers or syringes, so as to reach all cracks and crevices, and the liberal use of hot water where it may be applied without damage to furniture.

CURLEWIS (A.). **A Sheep Dip.**—*Jl. Dept. Agric. Victoria, Melbourne*, xiv, no. 11, November 1916, pp. 694–698, 4 figs. [Received 26th January 1917.]

In continuation of the author's previous paper on sheep dips [see this *Review*, Ser. B, iv., p. 179], plans and details of a new dipping tank are given.

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PLACE (F. E.). **The Flies that defile.**—*The Register, Adelaide,* lxxxi, no. 21 & 39, 6th November 1916, p. 6.

Of the house-frequenting flies, *Musca domestica* is the predominating species; less prominent are *Fannia scalaris* and the various blow-flies. The habits of these flies and the manner in which they disseminate disease is dealt with. The diseases which may be fly-borne include dysentery, summer diarrhoea, cholera, tuberculosis, anthrax, diptheria, ophthalmia, infantile paralysis or poliomyelitis, smallpox, trypanosomiasis, yaws and myiasis. Unremitting efforts to eradicate these pests is insisted upon as the rational method of preventing the spread of these diseases.

PLACE (F. E.). **The Flies that bite.**—*The Evening Journal, Adelaide,* li, no. 14, 180, 25th November 1916, p. 18.

This article deals with the diseases borne by biting flies such as sandflies (*Phlebotomus* sp.), *Anopheles maculipennis, Culex pipiens, Stegomyia fasciata, C. fatigans,* horse-flies (*Tabanus*), the tsetse-fly (*Glossina*) and *Stomoxys calcitrans,* including malaria, yellow fever, dengue, filariasis, elephantiasis and infantile paralysis.

RODHAIN (J.) & BEQUAERT (J.). **Matériaux pour une Etude Monographique de Diptères parasites de l'Afrique. Deuxième partie. Révision des Oestrinae du Continent Africain.** [Material for a Monograph on the Parasitic Diptera of Africa. Second part. A Revision of the OESTRINAE of the African Continent.]—*Bull. Sci. France et Belgique, Paris,* l, nos. 1–2, 25th November 1916, pp. 53–165, 29 figs., 1 plate. [Received 3rd February 1916.]

This paper deals with the sub-family OESTRINAE, which, in the authors' opinion, does not correspond entirely with the intestinal OESTRIDAE of Brauer. They exclude the genus *Aulacephala,* Macq., of which the larval stages are unknown and which appears to be more closely allied to *Trixa,* B.B., as well as *Cephenomyia,* Latr., and *Pharyngomyia,* Schin., which they place, as does Girschner, in the CALLIPHORINAE. The chief characters of the larva at the third instar, the pupa and the imago of the OESTRINAE are given. On these characters this sub-family would include only the genera *Oestrus,* L., *Cephalopsis,* Towns., *Rhinoestrus,* Br., *Kirkioestrus,* R. and B., and *Gedoelstia,* R. and B. The authors consider a classification based on the characteristics of the larvae can be only a provisional one and is justified only where the adult insect is unknown. These genera form a homogeneous group and might reasonably be treated as sub-genera of a single genus *Oestrus,* L. The distribution of the spines in the larvae at the 3rd instar are not considered to have more than a minor value in classification, as they are probably very variable in different individuals at the same stage in any given species.

The larvae of the OESTRINAE are parasitic in the sinuses of the bones of the skull of various wild and domestic mammals and have been met with accidentally in man. In the latter case they never attain their full development and, when present, are usually localised in the eyes, in which they cause conjunctivitis. Since the cavities of the skull communicate with each other and also with the throat, these larvae may occur in the pharynx and larynx, and have even been found in sheep in the bifurcation of the trachea down to the large bronchial tubes. This often occurs after the death of the host, but probably never does so in the living animal. In antelopes several larvae of different species are usually found at the same time. The larvae of *Oestrus*, *Gedoelstia*, and *Kirkioestrus* are found only among the hollow-horned ruminants, those of *Rhinoestrus* among the equines, pigs and hippopotamus, while those of *Cephalopsis* are peculiar to the camels. Information as to the different species and their respective hosts is given in detail in a table.

The mode of nutrition of these larvae is not well known, but it is to be supposed that they feed on the mucus of the passages in which they are found. The importance of breeding them is emphasised, though hitherto all attempts to rear them to the adult stage in captivity have failed. The adult flies will not feed or pair in captivity.

An account is given of the organism, *Herpetomonas oestrorum*, which parasitises these larvae [see this *Review*, Ser. B, iii, p. 146]. Six larvae of *Rhinoestrus nivarleti*, R. and B., taken from the same individual of *Potamochoerus porcus*, L., were all parasitised by a flagellate closely resembling and perhaps identical with this.

A key to the genera of the Oestrinae is given and descriptions with discussions on synonomy, hosts, and geographical distribution of the following species:—*Cephalopsis titillator*, Clarke, *Oestrus ovis*, L., *O. aureoargentatus*, R. and B., *O. variolosus*, Lw., *O. macdonaldi*, Ged., *Rhinoestrus nivarleti*, R. and B., *R. hippopotami*, Grünb., *R. purpureus*, Brauer, *R. phacochoeri*, R. and B., *Gedoelstia cristata*, R. and B., *Kirkioestrus surcoufi*, Ged., *K. blanchardi*, and *K. minutus*, R. and B.

A bibliography of 46 works is given.

Bouet (G.) & Roubaud (E.). **Répartition des Glossines à la Côte d'Ivoire.** [Distribution of *Glossina* in the Ivory Coast.]—*Bull. Soc. Path. Exot., Paris*, x, no. 1, 10th January 1917, pp. 37–39.

Four principal zones, where various species of *Glossina* are prevalent, can be roughly defined from south to north in the Ivory Coast. In the most southern zone *G. palpalis* and *G. fusca* are predominant; the next zone is characterised by the presence of *G. pallicera*, while *G. medicorum* and *G. nigrofusca* also occur, although their boundaries are not so clearly defined as in the case of *G. pallicera*; in the third zone *G. longipalpis* predominates, and in the fourth, *G. tachinoides*. These zones only indicate the predominance of the given species and must not be considered as forming definite limits for the occurrence of any one of them.

Cadet (G.). **La Peste du Sud-Annam.** [Plague in South Annam.] —*Bull. Soc. Path. Exot., Paris*, x, no. 1, 10th January 1917, pp. 41–65.

In the dissemination of plague in South Annam (Indo-China), there are four species of rats which play an important rôle; these are the small domestic rat, which is probably a new species, the sewer rat (probably *Mus decumanus*), the rice-field rat, and the musk-rat, which is not a rodent, but an insectivore, probably *Crocidura murina*, L.; all of these, except the domestic species, are heavily parasitised by fleas. Experiments have shown that parasitisation reaches its height in the month of May, which is also the month in which the epidemic was at a maximum in 1916, when these investigations were made. This is the driest period of the year; with the coming of the rains, the number of flies decreases and plague gradually subsides. The importance of the rôle of *Xenopsylla* (*Pulex*) *cheopis* in the transmission of plague from rat to man has already been proved. The degree of parasitisation of the domestic rat was found to be low but remarkably constant; in the case of the sewer rat, parasitisation is highly developed, and, as this species is liable to plague infection, its presence constitutes a great danger. The musk-rat also is a carrier to be reckoned with [see this *Review*, Ser. B, iii, p. 97].

About 95 per cent. of the parasites taken from rats proved to be *X. cheopis*; *Pulex irritans* is not specially common, but *Ctenocephalus* (*P.*) *canis* is found sometimes in swarms in sandy places owing to the abundance of stray dogs. Cats have been observed covered with fleas of an undetermined species. In the case of *X. cheopis*, eggs do not hatch under 55° F., and at 90° F., 75 per cent. remain sterile; on the other hand, a dry atmosphere seems to have no influence on their fecundity. For the active larvae a certain amount of moisture and a still atmosphere are necessary; badly ventilated houses therefore favour their occurrence. During the pupal period the insect offers great resistance and can survive 12 hours of complete immersion. The adult can live 38 days without food and lives for preference on the body of its host rather than in its bed, which makes it a far more dangerous agent in plague transmission. The temperature of South Annam is very uniform and is never hot enough to offer a serious obstacle to hatching, while the conditions under which the natives live offer every encouragement to the increase of the pests. The two great reforms necessary are the extermination of rats from dwelling-places and other centres of attraction, and the amelioration of housing conditions, which, in the present state of squalor and ignorance among the populace, are not easy to accomplish. A code of remedial measures against plague epidemics has however been formulated in a decree issued by the Governor-General, acting on the advice of the medical inspector.

Piot (J B.). **Maladie des Tiques. Traitement préventif et curatif pour l'Egypte.** [Tick Disease. Preventive and Curative Treatment for Egypt.]—*Bull. Union Agriculteurs d'Egypte, Cairo,* xiv, no. 117, November-December 1916, pp. 85–88. [Received 17th February 1917.]

Cattle in Egypt, if left untended, frequently become entirely covered with ticks. It has been proved that infection in the tick is hereditary and that the piroplasm occurs in the salivary glands of the larvae, which can therefore directly inoculate the host. Piroplasmosis in cattle may be acute or chronic, the acute form being often responsible for a mortality as high as 80 per cent. The only curative treatment which the author has found to give complete satisfaction, other than quinine and trypanblue, is arrhénal; a hypodermic injection of one dose of one gramme is generally sufficient to allay the fever. This treatment to be effectual must be given as soon as the symptoms of the disease appear. Preventive measures should be directed against cattle sheds as well as against the cattle themselves. The earthen flooring should be frequently renewed and all cracks and crevices which could form a shelter for the female ticks during oviposition should be filled up. A coat of quicklime should be given occasionally to the wall supporting the manger. Each animal should be thoroughly curry-combed, which is a far more effective method of removing all kinds of parasites than the use of any drug. By these simple means, the Administration have succeeded in reducing the cases of disease among their cattle to a minimum.

JACK (R. W.). **Home-made Fly Papers.**—*Dept. Agric. Rhodesia, Salisbury,* Bull. no. 249, December 1916, 4 pp. [Received 20th February 1917.]

Many recipes for home-made mixtures of the nature of "Tanglefoot" have already been published, the main ingredients being resin and a non-drying oil. The principal preparations are reviewed in this paper, and new recipes are given, suitable for use in Rhodesia, where the European mixtures dry up too rapidly. The basis of all of these is ground-nut oil. The mixture which was found to give the greatest satisfaction was: resin, 12 parts (oz. by weight); ground-nut oil, 5 parts (fluid oz.); crude vaseline, 1 part (fluid oz.). The resin should be reduced to powder, and the ingredients heated together, without boiling, until all the resin is dissolved. Strips of paper, tape, string or wire dipped in this preparation may all be used with advantage. Kept in a closed tin, the mixture was found equally effective after eight months.

EDWARDS (F. W.). **Notes on Culicidae with Descriptions of New Species.**—*Bull. Entom. Research, London,* v, no. 3, February 1917, pp. 201–229.

The only Anopheline dealt with in this paper is *Anopheles* (*Coelodiazesis*) *plumbeus*, Hal., which was described by Christophers from larvae found in tree-holes in Simla [see this *Review*, Ser. B, iv, p. 74], and found by the author associated with *Ochlerotatus geniculatus* in holes in beech trees at Burnham Beeches, Bucks. These larvae were kept in the water in which they were found with some of the leafy debris which it contained, but made no growth, nor did those isolated in tubes without debris, but with small larvae of *O. geniculatus.* They were then given some crushed flies, on which they fed voraciously, some pupating shortly afterwards. These experiments confirm Christopher's conclusion that these larvae depend for their food on the insects that fall into the water and not on vegetable debris, as do the larvae of *O. geniculatus*, nor do they attack these latter larvae. The larvae of the North American *A.* (*Coelodiazesis*) *barberi* preys upon those of *Aëdes* (*Ochlerotatus*) *triseriatus*, which is the North American representative of *O. geniculatus*. *A. plumbeus* is a common blood-sucker in wooded districts in England, often biting in the daytime.

Owing to the diversity of structure among the species of the genus *Aëdes*, it is considered advisable to retain in it, as subgenera, some of the groups which have hitherto been regarded as genera. The genus *Aëdes* is therefore divided into the subgenera :—*Armigeres, Stegomyia,* *Ochlerotatus* (which is subdivided into the groups, *Finlaya, Diceromyia,* and *Ochlerotatus,* s. str.), *Aëdes* and *Skusea.* *Ochlerotatus,* s. str., consists of a heterogeneous number of species amongst which the subdivisions, *Ochlerotatus, Ecculex* and *Aëdimorphus* may be distinguished. The genus *Culex,* sens. lat., is divided into the subgenera *Culex, Lophoceratomyia,* and *Micraëdes.*

The new species described include:—*Armigeres durhami* and *A. maiae* from the Malay States, *Ochlerotatus* (*Finlaya*) *koreicus* from Korea, *O.* (*F.*) *fulgens* and *O.* (*Diceromyia*) *adersi* from Zanzibar, *Aëdes ceylonicus* and *A. yerburyi* from Ceylon, and *A. leicesteri* from the Malay States.

MacDonald (A.). **Notes on Blood-sucking Flies in Grenada.**—*Bull. Entom. Research, London,* vii, no. 3, January 1917, pp. 259–264, 2 plates.

Of the mosquitos in Grenada, the only Anopheline is *Anopheles argyrotarsis,* R. D., a recognised malaria-carrier, which has a permanent habitat in the shallow moist flats in the neighbourhood of lagoons and estuarine swamps round the island. Most of these are remote from human habitations and, as breeding places, should be abolished at little cost. The larvae of this mosquito prefer pools on which the sun will shine most of the day and may be found, tangled in algae, more frequently on the shaded side of a sun-heated pool. They are also found in temporary breeding places such as wayside gutters, hoof-marks, pig wallows, trenches and flats in grass land throughout the island in close proximity to human residences. *Stegomyia fasciata,* F., is common in and about the town of S. George's, but is not so numerous in the country districts. It was never found in empty cacao pods, the common breeding place of *Limatus durhami,* and only occasionally in rock-holes and once in a wild pine associated with *Wyeomyia pertinens.* The larvae are devoured by the larvae of *Megarhinus* in captivity, and therefore if *Stegomyia* eggs are laid in tree-holes and wild pines frequented by *Megarhinus,* the larvae will probably have little chance of reaching maturity. *Culex fatigans* is found in wayside pools and ditches, especially if they are foul. Filariasis in an acute form is unknown in Grenada. Several patients with morbid conditions diagnosed as filariasis may have acquired the infection elsewhere. *Limatus durhami,* probably the most ubiquitous mosquito in Grenada, occurs at elevations of 400 feet up to 2,300 feet. Its larvae are found in old cacao pods, in fallen palm leaf-petioles and in the flower spathes of palms. The adult in nature bites in the day-time. *Haemagogus splendens,* Will., is well distributed throughout the wooded parts of the island, except near the sea. One larva was obtained from a tree-hole. The avocado or alligator pear (*Persea gratissima*) most commonly provides holes in which mosquito larvae may be found. *Wyeomyia grenadenis,* Edw., comes into houses after dark, as does also *W. pertinens,* Will., which breeds in tree-holes and in wild pines. *Culex similis,* Theo., *Deinocerites cancer,* Theo., *Janthinosoma posticata,* Wied., and *Culex inflictus,* Theo., were found in roadside gutters. The last-named species may be caught in houses after dark and probably breeds in tree-holes and wild pines. *Janthinosoma neoapicalis,* Theo., was found associated with *Anopheles argyrotarsis,* as also was

Culex annulatus. *Stegomyia buscki*, Coq., was found in a collection of water in the petiole of a fallen palm leaf at an elevation of 2,600 feet and in a cacao pod at the upper limits of cultivation. Larvae and pupae of an unidentified *Aëdes*, probably a new species, were collected from a tree-hole and from a pine in a cacao plantation. The larvae of *Megarhinus haitiensis*, D. and K., were also found in wild pines and tree holes and fed readily on *Stegomyia* larvae in captivity. *Culex* (*Micraëdes*) *conservator*, D. and K., was found with *Corethrella appendiculata*, Grab., in similar breeding places and a *Culex* allied to *elevator*, D. and K., was bred from a wayside pool. The swamp mosquito of Grenada is *Ochlerotatus niger*, Giles; it remains in deep shade during bright sunshine and emerges about an hour before sunset, at which time it will bite as well as at night. *Deinocerites cancer*, Theo., also breeds in brackish water.

The sandfly of Grenada, which is a species of *Ceratopogon*, is practically ubiquitous and causes considerable annoyance, though no disease is known to be carried by it. Its control is difficult, as 16-mesh netting will not keep it out. Of the blood-sucking flies which attack domestic animals, *Stomoxys* is as common as in England, while TABANIDAE are uncommon, though a few unidentified specimens were captured, always in remote places.

TAYLOR (F. H.). *Sarcophaga froggatti*, **sp. n.,—A new Sheep-maggot Fly.**—*Bull. Entom. Research, London*, vii, no. 3, January 1917, p. 265.

Some fly-maggots taken from sheep in Queensland were bred out and found to be referable to two genera, *Pycnosoma* and *Sarcophaga*. One has been identified as *Pycnosoma rufifacies*, Macq., and the other is described as new under the name of *Sarcophaga froggatti*, sp. n.

STANTON (A. T.) & HACKER (H. P.). **The Anopheles of Malaya—III A new Variety of *A. albotaeniatus*, Theo.**—*Bull. Entom. Research, London*, vii, no. 3, January 1917, pp. 273–275.

A new variety of *A. albotaeniatus* is described under the name var. *montanus*. The larvae were found associated with those of *A. leucosphyrus*, Dön., and *A. aitkeni*, Theo., and occasionally with those of *A. umbrosus*, Theo., in shaded pools in a jungle stream at Selangor, at an elevation of 600 feet.

MACFIE (J. W. Scott). **The Limitations of Kerosene as a Larvicide, with some Observations on the Cutaneous Respiration of Mosquito Larvae.**—*Bull. Entom. Research, London*, vii, no. 3, January 1917, pp. 277–295, 1 fig., 1 table.

Exhaustive experiments on the action of kerosene on various species of mosquito larvae were undertaken, the results being described in this article. For some species this measure of control is most successful, but an exaggerated confidence exists as to its efficacy against all mosquito larvae. Experiments show that, in practice, the presence of weeds in ponds is liable to break the film of oil, thus allowing breathing spaces and, in the laboratory, that the presence of organic matter in the water diminishes the action of crude kerosene. To test the action of crude kerosene on larvae of *Stegomyia fasciata*, five larvae, in each case, were enclosed in test-tubes containing respectively, a natural medium, tap water, containing a fair amount organic matter, and distilled water. A layer of kerosene, equivalent to approximately 1 pint to 6 square yards, was applied to each. The results, giving the number of larvae alive at different periods of time after the commencement of the experiment, are shown in tabular form. Of the larvae in the first medium at the end of eight hours, only one was dead, while in the other media only one was alive. At the end of 12 hours, the larva still alive in the distilled water had died, while there was no change in the condition of the other larvae, either then or at the end of 57 hours, when the experiment was discontinued.

The oil may be supposed to act in one of several ways, e.g., by annulling the surface tension, by depriving the larvae of access to the air, or by a poisonous action. The first hypothesis is not borne out by facts, and the second is the theory which is most commonly held. The poisonous action might take place in different ways: either by the kerosene being dissolved in the water and acting on the larvae in solution; or by entering the tracheal tubes in the siphons when the larvae come to the surface to breathe, and either blocking them or spreading into the finer branches and acting directly on the tissues of the larvae; or again the vapour given off by the kerosene might act on the larvae when it enters the tracheae during respiration. Observations made on larvae of *S. fasciata* showed that these may live for several days under a film of kerosene, presumably obtaining the necessary oxygen from the air bubbles; and those of *Mansonioides africanus*, which do not require to come to the surface to breathe, were apparently unaffected after three days and then pupated. Experiments made to test the effect of kerosene vapour on larvae showed that, when applied to those of *S. fasciata* and *Culex fatigans* in a confined space, it causes them to become sluggish and will eventually kill them. In the open however the vapour must be very rapidly distributed by currents of air and probably is never sufficiently concentrated long enough for its action to have any importance. Larvae of *C. fatigans* in the fourth phase are almost invariably killed within half an hour by oiling, but if they are prevented from coming into actual contact with the film of oil, they survive longer. Where larvae were confined under layers of kerosene and paraffin respectively, but prevented from coming into actual contact with these by plugs of cotton-wool, very little difference in the length of time that the larvae survived in each case was observed, which shows that in this case the action of kerosene was not specific, but only deprived the larvae of access to air and so drowned them. Where a natural medium was used, the larvae of *C. fatigans* survived for only about a quarter as long as in distilled water, the organic matter present using up the available oxygen and thus reducing the amount on which the larvae could draw. In the case of *S. fasciata* larvae the action seemed to differ on some occasions and the oil did not appear to have any direct action on them. These larvae seem to be able to pierce the film of kerosene with the valves of the siphon closed and may thus avoid drawing the oil into the tracheae and so escape the direct action of the kerosene, though if the oil does enter the siphon, it acts as a direct poison as in the case of *C. fatigans*. In one experiment olive oil was used and the effects compared with those of kerosene and paraffin, with the result that it seemed to have the same action as paraffin, but acted differently from kerosene, which tends to prove that the action of this last is not due to a mechanical blocking of the siphon tracheae, for their effect in this respect should be similar.

Since the difference between the time of survival under kerosene and paraffin was so inconsiderable, it was suggested that the larvae had escaped the poisonous action and had succumbed mainly as the result of being prevented from breathing the external air. Observations were therefore made on the oxygen requirements of submerged mosquito larvae. Certain factors had to be considered when carrying out these observations. The species of mosquito is of primary importance, e.g., *S. fasciata* has apparently a higher power of resistance than either *C. fatigans* or *C. invidiosus*. It is pointed out that the relation of the basal diameter to the length of the siphon is in the case of *C. invidiosus* 1 : 8, in *C. fatigans* 1 : 4, and in *S. fasciata* 1 : 2, and that according to Sen the power of *S. fasciata* to withstand the want of oxygen better than *Culex* apparently has a natural connection with the respective lengths of their respiratory siphons. The age of the larvae is important, as young larvae were found to survive longer than fully developed ones. The temperature is another factor, for it was found that a lowering of temperature prolonged and a raising of it shortened the period of survival of submerged *S. fasciata* larvae. The presence of organic matter in the medium also profoundly modifies the power of survival of larvae submerged in it. This undoubtedly shortens the period during which mosquito larvae can survive when submerged in a fluid, since it absorbs and uses up the dissolved oxygen. Experiments also go to prove that the presence of organic matter is comparable to the effect produced on larvae submerged in water from which the oxygen has been expelled by boiling. In one experiment with *S. fasciata* larvae the presence of water weed in the medium appeared to prolong the life of the insect, a certain amount of oxygen being given off by it.

From the above experiments, it is deduced that the larvae died in consequence of the reduction from various circumstances of the dissolved oxygen to an amount that ceased to be of use for cutaneous respiration. Experiments were therefore made in order to determine the part played by cutaneous respiration, and the proportion of dissolved oxygen available for this process had to be considered. The experiments dealing with this point could not be satisfactorily carried out with the apparatus available and no definite data were therefore obtained, but young larvae were found to adapt themselves more easily than older ones, and though not surviving as long as they theoretically might have done, they nevertheless lived for many days, grew in size, moulted and developed fully. Experiments are described which deal with the survival of mosquito larvae submerged in slowly running water, being an attempt to reproduce more nearly the conditions present in a pool or stream in which the water is not held fast until its oxygen is exhausted, but is able to circulate more or less freely. These experiments confirm those carried out by A. da Costa Lima [see this *Review*, Ser. B, ii, p. 107] and show that the larvae of certain species of mosquitos, including *S. fasciata*, are undoubtedly capable of adapting themselves to a submerged life, and in this state continue to develop up to the point at which pupation would naturally take place. This is however usually delayed and, if it does occur, the mosquitos die, since the pupae are unable to survive without direct access to free air. Thus it is evident that in practice, oiling is less successful than it theoretically should be, because many species of larvae spend a considerable part of their time at the bottoms of ponds and some may remain submerged long enough to allow a most liberal application of kerosene to evaporate.

The particular effect of the application of crude kerosene to fluids containing various species of mosquito larvae is given. The larvae so treated included those of *Anopheles costalis, Culex fatigans, C. invidiosus, C. thalassius, Mansonioides africanus* and *S. fasciata*. The first three species are easily destroyed by oiling. *C. thalassius* is less readily killed, as, though the larvae are susceptible to the action of kerosene when they come in contact with it, they are capable of surviving for a long time without coming to the surface to breathe. The larvae of *Mansonioides africanus* usually obtain the oxygen they require by thrusting their siphon tubes into the roots of the water weed, *Pistia stratiotes*, but under laboratory conditions behaved in the same way with other plants when this species was not available. These larvae have been known to develop and pupate under a thick film of kerosene and it was not until the pupa was almost ready to hatch and became free from the weed that it was found dead in the oil on the surface. Two further experiments on larvae of *S. fasciata* are described which confirm the results of the experiment recorded at the beginning of the paper and show that unless the layer of kerosene be sufficiently thick, they may be able to survive long enough for the film to have evaporated.

MacFie (J. W. Scott). **Morphological Changes observed during the Development of the Larva of** *Stegomyia fasciata*.—*Bull. Entom. Research, London*, vii, no. 3, January 1917, pp. 297–307, 7 figs.

Descriptions are given of the structure of the various parts of the larva of *Stegomyia fasciata* at each of the four phases of the larval stage, which was found to average 13 days. For purposes of identification the phase of development to which the larvae have attained must be known, and for purposes of classification it is best to deal only with those of the last or fourth phase, when they are easy to recognise. Certain characters are constant throughout the larval period and other features seem to undergo a regular and progressive development as the larva matures. In addition, a few characters are peculiar to the earliest phases, some of these possibly indicating some earlier stage in the evolution of the species. A comparative study of the changes found in successive larval stages in other mosquitos might be of great assistance in formulating a natural system of classification.

Bodkin (G. E.). **Report of the Economic Biologist.**—*Rept. Dept. Sci. & Agric., British Guiana, for the Nine Months ended 31st December 1915* [*Georgetown*], 12th July 1916, pp. 8 & 9. [Received 27th February 1917.]

For the control of cockroaches the use of traps baited with molasses and stale beer and poisoned baits consisting of equal quantities of molasses and boracic acid are recommended. These insects seldom seriously infest houses which are kept thoroughly clean and especially those in which all food is kept in well-made safes completely excluding the possibility of cockroaches gaining access to it. For the protection of books, the covers may be painted with the following mixture:—1 pint of methylated spirits, $1\frac{1}{2}$ oz. carbolic acid crystals, and $\frac{1}{2}$ oz. corrosive sublimate. They should be repainted every year.

The earlier months of the year were devoted to the breeding and collection of mosquitos; one species, *Haemagogus capricorni*, Lutz, previously unknown in British Guiana, was taken.

HOWARD (L. O.). **Report of the Entomologist.**—*U.S. Dept. Agric., Bur. of Entom., Washington, D.C.*, 24th August 1916, pp. 8–11. [Received 27th February 1917.]

A portion of this report deals with insects affecting the health of man and domestic animals. Of the former, it is stated that the work on malaria mosquitos has been continued, considerable attention being paid to the conditions on plantations which give rise to infection. A demonstration of the transmission of malaria by a species of *Anopheles* hitherto considered a non-carrier has opened up new problems of control. Co-operative work with the Bureau of Fisheries with regard to mosquito control by top-minnows has been continued and extended. The control work against the Rocky Mountain spotted-fever tick (*Dermacentor venustus*) has been continued in Montana. The substitution of a method of control by starvation in one of the control districts for the previously recommended dipping and hand-picking of domestic animals in the tick-infested zones has given encouraging results. A campaign of destruction has been carried on against the Columbian ground squirrel (*Citellus columbianus*) and other rodent hosts of the immature ticks. The work on the house-fly has been continued along the same lines as in previous years. In the latitude of Dallas, Texas, *Musca domestica* passes the winter in the larval and pupal stages. In the latitude of Washington this is also believed to be the case, but final proof of this is lacking. Investigations of insects in relation to packing establishments operated under the meat inspection service of the Bureau of Animal Industry were continued throughout the year.

Of the insects affecting the health of animals the following have been the objects of investigation:—The screw-worm fly (*Chrysomyia macellaria*), horse-flies, especially in Nevada and California, the ox warble (*Hypoderma*), the nose fly (*Gastrophilus nasalis*), and poultry pests, especially the common red mite and various species of chicken lice. It has been found that sodium fluoride is effective against these lice. The chicken mite (*Dermanyssus gallinae*) depends exclusively upon the fowl for its food and will not feed upon filth or excrement. A few thorough applications of crude petroleum to the interior of fowl-houses will completely destroy the mites, and the painting of roosts and nests with a proprietory compound containing carbolic acid gave satisfactory results.

HABER (V. R.). **Cockroaches and their Control.**—*Ohio Agric. Expt. Sta., Wooster*, i, no. 8, August 1916, pp. 233–235, 1 fig. [Received 27th February 1917.]

This is a popular account of cockroaches and their habits in dwellings. Control measures recommended are spraying walls, floors and all crevices with a pitch or tar solution at intervals of two days for a period of ten days. Powdered borax, both as a solution and in powder form, is effective, or it may be burnt in a tightly closed room. Strong solutions of creosote, or creolin, or some commercial contact insecticides have proved successful. Carbon bisulphide fumigation may be used in the strength of 12 lb. per 1,000 cubic feet of space. Hydrocyanic gas is also effective, but more dangerous to use.

LASSALLE (C. F.). **Trinidad Malarial Report,** *Port of Spain 1916*, 126 pp. [Received 28th February 1917.]

The second section of this Report contains a survey of the *Anopheles* of Trinidad, and includes reports from various districts of the Island, detailing the breeding places discovered and the measures employed for control. All surface drains in villages should be properly graded to a suitable outfall and concreted as far as possible. Earth drains should be kept free of vegetation and oiled once a week. All low-lying and swampy lands, as well as useless shallow wells and ponds near villages, should be drained and filled in. If practicable, a pipe-borne constant water supply should be introduced in every village. This would render it possible to do away with shallow wells and water-holes, as well as cisterns and tanks. Where a pipe-borne supply is not possible, the efficient screening of all water receptacles should be secured. Borrow-pits should be filled in or, when very extensive, should be efficiently drained towards the nearest water-course. The current of streams should be accelerated by the regular removal of obstructions, such as vegetation, débris, etc., the courses being straightened wherever possible. In the vicinity of villages water collections which cannot be immediately dealt with should be oiled once a week, or fish, if they can live, should be put in them.

The oil which has proved best and cheapest is a mixture of crude petroleum and some lighter oil, such as kerosene or distillate oil, only a very small quantity of the latter being necessary to render the crude oil thinner and allow of its being used with a spray. This can be applied with an ordinary watering-can with a fine rose, or by means of pieces of rag dipped in the oil and scattered over the surface of the water, or a spraying machine may be used. In the case of large collections of water near villages, a barrel of oil may be so placed as to allow of the oil dropping constantly through small holes at the bottom.

For rice-fields one method advocated is a system of pisciculture, which has been very generally adopted in other parts of the world. Experiments would have to be carried out to ascertain the variety of fish best suited for the purpose in each locality. Another measure recommended is the periodic drying of rice-fields, which, if properly carried out, does not damage the crop.

The third section of this report deals with Trinidad mosquitos. A short classification, after Theobald, is given and a key to the various species now known to exist in the Island is added.

An appendix deals with the association of fish with Anopheline larvae, giving particulars as to the localities where they have been found together.

In an appended report by J. D. Leacock, particulars are given of mosquitos found during surveys of special districts.

The following list of species is given as occurring in the island :— *Anopheles apicimacula*, D. and K., *A. punctimacula*, D. and K., *A. bellator*, D. and K., *A. eiseni*, Coq., *A. pseudopunctipennis*, Theo., *A. albipes*, Theo., *A. argyrotarsis*, R. D., *A. maculipes*, Theo., *A. mediopunctatus*, Theo., *A. nimbus*, Theo., *Megarhinus superbus*, D. and K., *M. trinidadensis*, D. and K., *M. iris*, Knab, *Janthinosoma sayi*, *J. lutzii*, *J. posticata*, Wied., *J. discrucians*, *Psorophora saeva*, D. and K., *P. scintillans*, Walk., *Stegomyia fasciata*, F., *S. sexlineata*, *Taeniorhynchus palliatus*, *T. confinis*, Theo., *Leucomyia scapularis*, *Ochlerotatatus taeniorhynchus*, *Culex fatigans*, *C. imitator*, *C. neoapicalis*, *C. extricator*, D. and K., *C. simulator*, D. and K., *C. caudelli*, D. and K., *C. ocellatus*, Theo., *C. inimitabilis*, D. and K., *C. consolator*, D. and K., *C. coronator*, D. and K., *C. declarator*, D. and K., *C. carmodyae* subsp. *mollis*, D. and K., *C. barbarus*, D. and K., *C. inquisitor*, D. and K., *C. azymus*, D. and K., *C. divisor*, D. and K., *C. conservator*, D. and K., *C. corniger*, D. and K., *C. bastagarius*, D. and K., *C. pleuristriatus*, Theo., *C. scholasticus*, *C. flavipes*, Macq., *C. basilicus*, D. and K., *Protoculex serratus*, *Chrysoconops fulvus*, Wied., *Taeniorhynchus* (*Mansonia*) *titillans*, Walk., *T. fasciolatus*, Arrib., *Melanoconion spissipes*, Theo., *M. urichii*, *M. atratus*, Theo., *Bancroftia fascipes*, *Carrollia urichii*, Coq., *Aedes hortator*, D. and K., *A. oswaldi*, Lutz, *A. nubilus*, Theo., *A. fulvithorax*, Lutz, *A. idliota*, Knab, *Aedeomyia squamipennis*, Arrib., *Haemagogus capricorni*, Lutz, *H. splendens*, Will., *H. leucomelas*, Lutz, *H. regalis*, D. and K., *Cacomyia albomaculata*, Theo., *Verallina* (?) *insolita*, Coq., *V.* (?) *laternaria*, Coq., *Uranotaenia lowii*, Theo., *U. geometrica*, Theo., *U. typhlosomata*, D. and K., *Pseudo-uranotaenia rowlandi*, Theo., *Anisocheleomyia leucoptera*, Theo., *Trichoprosopon nivipes*, Theo., *Trichoprosopon lunata*, *Lesticocampa rapax*, D. and K., *Deinocerites cancer*, Theo., *D. troglodytus*, D. and K., *Limatus durhami*, Theo., *Wyeomyia melanocephala*, D. and K., *W. telestica*, D. and K., *W. bromeliarum*, D. and K., *W. pseudopecten*, D. and K., *W. autocratica*, D. and K., *W. drapetes*, D. and K., *W. abascanta*, D. and K., *W. cara*, D. and K., *W. ochrura*, D. and K., *Sabethes remipes*, Wied., *S. loculipes*, R. D., *Sabethinus purpureus*, Theo., *Phoniomyia longirostris*, Theo., *Sabethoides confusus*, Theo., *S. undosus*, Coq., and *Dendromyia luteoventralis*, Theo.

Die Larve des Speckkäfers (*Dermestes lardarius*, L.) ein Feind des schlüpfenden Geflügels. [The Larva of *Dermestes lardarius*, L., an Enemy of hatching Poultry.]—*Deutsche Landwirtschfl. Presse, Berlin*, xliv, no. 10, 3rd February 1917, pp. 83–84, 2 figs.

It is stated that the larvae of *Dermestes lardarius*, L., enter ducks' eggs when the shell is broken in the course of hatching, as many as 6–8 larvae being noticed in one egg. Hens' eggs are not attacked.

Mitzmain (M. B.). **A Digest of the Insect Transmission of Disease in the Orient with especial Reference to the Experimental Conveyance of *Trypanosoma evansi*.**—*New Orleans Med. & Surg. Jl., New Orleans*, lxix, no. 6, December 1916, pp. 416–424.

The transmission of surra in the Philippines appears to be mainly due to *Tabanus striatus*, and *Stomoxys calcitrans* cannot be considered a serious factor in the dissemination of the disease. *T. striatus* passes from one animal to another before completing its feed, giving rise to a condition favourable for transmission. Experiments have shown that, when these Tabanids bite several healthy horses after biting an infected animal, only the first of the healthy animals becomes infected and that this transmission takes place only when the interval of time between the two bites is less than twenty minutes. Various experiments were made with regard to the associated action of *Musca domestica* and *S. calcitrans*. That *M. domestica* can harbour infective organisms was determined by numerous dissections and injections of saline suspensions of the abdominal contents of flies fed on the abraded tail of a surra-infected monkey. Two guineapigs and one monkey inoculated with this material died, and blood preparations of these animals showed *Trypanosoma evansi* in large numbers. The possibility of surra infection being carried by the feet in the case of *M. domestica* was investigated, and it appeared that the wound made by the bite of the *Stomoxys* is not a suitable channel for the introduction of trypanosomes carried on the pulvilli of *M. domestica*. In attempts made to simulate the normal relationship of parasitism in *M. domestica* and *S. calcitrans* by placing many flies of the two species in a common bottle and permitting them to attack the enclosed tail of a surra-infected monkey, it was found that under these conditions *M. domestica* does not transmit infection. The practical significance of the conveyance of trypanosomes obtained by *M. domestica* from the bites of *S. calcitrans*, when wounds are present, was also investigated. Four of the five experiments attempted resulted in positive transmissions. These experimental results agree with epidemiological facts. The first of two epidemics observed in the Island of Luzon was most violent in the absence of *Tabanus striatus*, though this fly had been present when the first cases occurred, and, later on, swarms of *M. domestica* appeared as a result of the accumulation of sugar-cane débris near the stables where the affected horses were quartered. The second epidemic appeared to be due exclusively to *T. striatus*.

King (W. W.). **The Epidemic of Dengue in Porto Rico, 1915.**—*New Orleans Med. & Surg. Jl., New Orleans*, lxix, no. 8, February 1917, pp. 564–571.

The epidemic of dengue in Porto Rico in 1915 was a typical one in its onset, course and duration. *Culex* and *Aëdes* are the common mosquitos in San Juan and are constantly present in some numbers. They were especially numerous at the time of the epidemic. During December anti-mosquito measures were put into force and resulted in a diminution in the number of mosquitos. The only epidemiological factor of sufficient importance to explain the outbreak was the super-abundance of mosquitos, while the occurrence of secondary cases in the same house was also significant.

Corlette (C. E.). **Insecticidal Fumigation in Ships, with special Reference to the Use of Hydrocyanic Acid and to the Prevention of ship-borne Yellow Fever.**—*Med. Jl. Australia, Sydney*, ii (3rd year), nos. 19 & 20, 4th & 11th November 1916, pp. 384–387 & 405–409.

Hydrocyanic acid appears to be the most convenient, most effective, and also the cheapest eradicator of insects, other than weevils, on land

and, if it can be used as safely on ships, it is the one which should be adopted. For fumigating living quarters with hydrocyanic acid in conjunction with a blower system, an irritating substance, such as a volatile oil of mustard, may be introduced into the current as a preliminary to the poison. Carbon bisulphide should only be employed on board ship mixed with a fire-extinguishing gas. This would also permit of its use in grain elevators. In several of the American shipping ports the United States Government has adopted a system for the fumigation of ships which easily allows a poisonous vapour to be introduced (or, if required, first one fumigant and then another) to every part of a ship at practically any desired temperature, for an unlimited time and at the rate of 180,000 cubic feet per hour, and to keep it there at a slightly positive pressure. The fumigant is afterwards blown out with fresh air as quickly as it was introduced.

The primary object of this apparatus, invented by Dr. George Harker of Sydney University, is to prevent or extinguish fires in closed spaces by utilising the fact that, under ordinary conditions, an atmosphere containing less than 16 per cent. of oxygen is incapable of supporting a fire. By the time that air has passed through a furnace, its oxygen content has been reduced to 10 per cent. or less and it has become flue-gas, which with carbon monoxide and sooty matter forms the smoke. The soot is washed out of the smoke, which is cooled and then blown into the hold or bunker space, where it stops the flames as soon as the oxygen content of the space near the fire is reduced below 16 per cent. With a delivery of gas at the rate of 180,000 cubic feet per hour this only takes a few minutes. The carbon monoxide renders the gas poisonous to rats, but not to insects. The American authorities chiefly direct their attention to rat destruction, for which purpose this process is a complete success.

WERNER (H.). **Beobachtungen über Anophelenvorkommen in der Nähe menschlicher Fäkalien.** [Observations on the Occurrence of *Anopheles* near Human Excreta.]—*Arch. f. Schiffs- u. Tropen-Hyg., Leipzic,* xx, no. 19, October 1916, pp. 444–445.

During the spring and summer of 1916 observations made in the marshy districts of White Russia showed that *Anopheles* had a marked preference for latrines, this behaviour being quite different from that of the more numerous species of *Culex* present at the same time. It often occurred that in localities said to be free from *Anopheles* they were to be found in latrines.

RÈNE (C.). **Le Traitement de la Gale du Cheval.** [The Treatment of Mange in Horses.]—*Progrès Agricole, Amiens,* xxxi, no. 1522, 18th March 1917, pp. 125–126.

This paper supplements the author's previous remarks on the subject [see this *Review*, Ser. B, iv, p. 70]. It is easy to distinguish between psoroptic and sarcoptic mange, the latter being far the more dangerous, as it rapidly spreads over the entire body and is extremely contagious, being even transmissible to man. For farm conditions an ointment is recommended consisting of 9 oz. flowers of sulphur, 3 oz. carbonate of potassium and 36 ozs. lard. The carbonate of potassium is dissolved in its own weight of water and incorporated in the lard, which is made more fluid by heat, and the sulphur is then added while constantly stirring. Before using this paste, the horse's body must be clipped all over and the skin washed with warm water containing black soap, and dried with a piece of hot iron or a bunch of straw. Two or three treatments are given; in each case one side of the body is treated first and the other side two days later.

Another mixture consists of $1\frac{3}{4}$ lb. titrated extract of nicotine to 2 oz. soda crystals and $3\frac{1}{2}$ gals. water. The advantage of this treatment is that no preliminary clipping is required. One side of the body should be treated only at first and the other side on the following day. Four or five applications should be made at four or five days' interval.

Both of these measures should be followed by disinfection of stables, harness, implements, etc.

QUIROS (D.). **Biologia de la Nigua.** [Biology of the Chigger.]—*Anales Hospital de San José, San José, Costa Rica*, ii, no. 1, 1st November 1916, 17 pp. 4 figs.

This paper gives an account of the bionomics of the chigger, *Dermatophilus penetrans*, L., which chiefly infests domestic pigs in Costa Rica. When these are driven through the streets, they infest the soil in them, the chief human victims being the bare-footed boys who play there. The sores are stated to afford an entrance for the tetanus bacillus, and during the past four years 1,147 deaths from tetanus are said to have occurred in the Republic. Gas gangrene is also transmitted occasionally and the deaths of two Europeans are definitely stated to be due to this. Where the fleas are too numerous to be removed with a needle, the following ointment is advised: Salicylic acid, 2·50 grm., icthyol, 10 grms., yellow vaseline, 10 grms. Local baths of petroleum are also useful, but tincture of iodine is not recommended. The best prophylactic measure would be to prohibit infested pigs being brought through the streets, together with regulations for treating the animals in the piggeries.

DI PACE (I.). **A proposito della Malaria da Sterri. Problemi di Malariologia.** [Malaria due to Excavations and other Earth-works. Problems of Malariology.]—*La Malariologia, Naples*, Series i, 9th year (Series ii, 2nd year), nos. 1–6, January-December 1916, pp. 23–37, 57–63, 81–91, 103–115, 134–141, 171–180.

This paper deals with the connection between outbreaks of malaria and excavations of the soil and contains over 60 bibliographical references. A number of instances, ranging from engineering works in the time of the Pharaohs in Egypt to building operations in Messina in 1912, are enumerated. In cities it sometimes happens that small foci of malarial infection occur near minor excavations, and it was on this that Baccelli based one of his objections to the exclusively mosquito-malaria doctrine. The author records his own observations made during four years in Apulia. With regard to the decrease or disappearance of malaria in districts reclaimed for cultivation, he believes that this condition brings about changes in the malarial germ, in the food of Anophelines and in their resistance to infection owing to change of food. In Holland, Schoo observed that mosquitos fed on acid fruits were not infected, and in Italy Celli has recorded that malaria is rare in districts where tomatoes are grown. The author concludes that the problem of malaria is not yet entirely solved and that the generally accepted formula that a malarial epidemic arises from man infected with malaria in the presence of mosquitos needs to be modified for one in which proper value is given to the factor of environment.

VERCO (J. C.). **Romance in Medicine. II. Mosquito and Insect-borne Disease.**—*Med. Jl. Australia, Sydney*, ii. (3rd year), no. 26, 23rd December 1916, pp. 533–540.

The greater portion of this paper deals with the discoveries regarding malaria and its transmission made since Laveran observed the malarial parasite in 1880. Sleeping sickness, yellow fever and plague are also mentioned.

LAWRENCE (H.). **On a Skin Eruption associated with the Presence of great Numbers of** *Demodex folliculorum*.—*Med. Jl. Australia, Sydney*, ii, (3rd year), no. 27, 30th December 1916, pp. 555–556, 1 fig.

An increase in cases of an eruption having some resemblance to impetigo contagiosa is recorded. A feature common to all these cases is the presence of extraordinary numbers of *Demodex folliculorum.*

WEIDMAN (F. D.). *Cytoleichus penrosei*, **a new Arachnoid Parasite found in the diseased Lungs of a Prairie Dog**, *Cynomys ludovicianus*.—*Jl. of Parasitology, Urbana, Ill*, iii, no. 2, December 1916, pp. 82–89, 2 plates.

A new Arachnoid, *Cytoleichus penrosei*, is recorded from the lungs of a prairie dog, *Cynomys ludovicianus*, which died in the Philadelphia Zoological Gardens of acute broncho-pneumonia.

Typhus Fever. Measures for the Prevention of its Introduction at El Paso, Texas.—*U. S. Public Health Repts., Washington, D.C.*, xxxii, no. 5, 2nd February 1917, pp. 197–198.

The growing prevalence of typhus fever in Mexico has led to an increase of the disinfection measures at El Paso. All incoming travellers are inspected and those that appear to be infested with lice are treated in the disinfection building, their clothes and personal effects being sterilised by steam and their persons freed of vermin by the application of gasoline or a mixture of vinegar and kerosene.

VAN ZWALUWENBURG (R.H.). **Report of the Entomologist.**—*Rept. Porto Rico Agric. Expt. Sta., 1915, Washington, D.C.*, 23rd November 1916, p. 42. [Received 30th March 1917.]

The cattle tick (*Margaropus annulatus australis*) is being studied with a view to working out a method of extermination by pasture rotation applicable to Porto Rico. This tick is undoubtedly a most serious drain on the island's prosperity, but it is hoped that its ultimate extermination is possible.

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VOL. V. Ser. B. Part 5.—pp. 65-72. MAY, 1917.

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de CAMPOS (M.). **Sobre algumas affecções cutaneas do interior do Brasil.** [Some Skin Affections in the Interior of Brazil.]—*Arch. Brasileiros de Med., Rio de Janeiro,* v, no. 10, October 1915, pp. 358–363.

When travelling in the interior of Brazil in 1910–1911, the author noticed pustular affections due to the bites of two species of *Simulium* and of a species of *Ceratopogon*.

Вши на рогатомъ скотѣ. [Lice on cattle.]— **«Хозяйство на Дону.»** [*Husbandry on the Don*], *Novotcherkassk,* xi, no. 15. 25th August, 1916, pp. 711–712.

To destroy lice on cattle, smearing the affected spots with a mixture of equal parts of benzine and some vegetable oil, or with turpentine and oil in equal parts, or with tobacco extract is recommended. A stout thread smeared with grey mercury ointment may be placed round the horns.

CUGURRA (A.). **La *Pulex serraticeps* causa di moria nei giovani gatti.** [*Pulex serraticeps* causing the Death of Kittens.] — *Moderno Zooiatro, Bologna,* (5) v, no. 9, 30th September 1916, pp. 234–236.

A case is recorded of kittens being killed by anaemia due to the bites of fleas, *Ctenocephalus canis* (*Pulex serraticeps*).

ITURBE (J.) & GONZÁLEZ (E.). **A New Trypanosoma of the *Vampirops lineatus*.** — *Laboratory of Dr. Juan Iturbe, Caracas, Venezuela,* 1916, 8 pp., 9 figs.

This paper contains a description of *Trypanosoma lineatum*, sp. n., discovered while examining 65 bats (*Vampirops lineatus*) for possible infection by the plasmodia described by Dionisi, Kisskalt, Gonder and Yakimoff.

A bibliography of 11 references is given.

OTTEN (L.). **De Rol van de Veldrat in de Epidemiologie der Pest.** [The Rôle of the Field-rat in the Epidemiology of Plague.]—*Geneesk. Tijdschr. v. Nederlandsch-Indië, Batavia,* lvi, no. 6, 1916, pp. 789–862, 35 tables.

The fumigation of native dwellings undertaken in 1914 in the Malang district, as an anti-plague measure, killed numbers of rats, thus permitting a systematic investigation of the degree of infection in these rodents. It is concluded that they play only a minor part in the spread of plague in Java. The field-rat is at all times in contact with the house-rat in native dwellings, especially when the fields are flooded in the west monsoon and when they lie fallow during the east monsoon. Owing to this contact with the house-rat in native dwellings during the last months of the east monsoon, the field-rat carries *Xenopsylla cheopis* back to the fields. This house-flea, however, disappears when the rains set in, though this is not the case with *Pygiopsylla ahalae*, an out-door flea which is present in the fields throughout the year. While the occurrence of plague in the field-rat is proved, this rat is unimportant as regards the spread of plague from one native

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dwelling to another. The rôle played in such spread by house-rats, especially *Mus rattus griseiventer*, is also doubtful, as this rat is seldom met with in the field. The significance of human intercourse, in the widest sense, in the spread of plague is thus emphasised.

FLU (P. C.). **Verdere onderzoekingen over de vraag of muskieten als overbringers van pest kunnen optreden.** [Further Researches on the Question whether Mosquitos can act as Plague Carriers.]—*Geneesk. Tijdschr. v. Nederlandsch-Indië, Batavia,* lvi, no. 6, 1916, pp. 917–921.

An account is given of experiments with *Anopheles rossi* and *Stegomyia* which show that, whilst mosquitos may harbour virulent pest bacilli in the alimentary canal, their bite does not transmit plague from one guinea-pig to another. Fleas harbouring bacilli in this manner are not always able to transmit plague, and in these experiments with mosquitos, such inability seemed to be a constant phenomenon. The British India Plague Commission succeeded in infecting animals through the bite of *Culex fasciatus*, so that the possibility of transmission cannot be excluded, but the probability of this occurring under ordinary conditions is exceedingly remote. The results of these experiments agree with the fact that an epidemic of plague is entirely independent of the presence of mosquitos.

FLU (P. C.). **Vliegen en Amoebendysenterie.** [Flies and Amoebic Dysentery.]—*Geneesk. Tijdschr. v. Nederlandsch-Indië, Batavia,* lvi, no. 6, 1916, pp. 928–939.

This paper describes experiments which lead to the conclusion that under conditions obtaining in Java flies do not provide the most common and important mode of transmission of amoebic dysentery. Though the conditions prevailing in most of the native villages render the presence of flies a possible factor, the author is of opinion that contamination of drinking water is a far more important one.

WHITE (A.). **The Diptera-Brachycera of Tasmania. Part II.**—*Papers & Proc. Royal. Soc. Tasmania for the Year 1915, Hobart,* 24th February 1916, pp. 1–57, 13 figs.

In this paper the families TABANIDAE and THEREVIDAE are dealt with. A key to the former comprises the genera, *Tabanus, Chrysops, Pangonia* (sens. lat.), *Corizoneura, Diatomineura,* and *Pelicorhynchus.* Among the twenty-three species recorded the following are described as new :—*Tabanus tasmaniensis, T. hobartiensis, Diatomineura ianthina. Tabanus exulans,* Erichs., *T. fraterculus,* Macq., and *T. gregarius,* Erichs., which have been described from Tasmania, cannot be identified from the published descriptions and have therefore been omitted.

WHITE (A.). **The Diptera-Brachycera of Tasmania. Part III.**—*Papers & Proc. Roy. Soc., Tasmania for the Year 1916, Hobart,* 19th February 1917, pp. 148–266, 26 figs.

This paper deals with the ASILIDAE, BOMBYLIDAE, EMPIDAE, DOLICHOPODIDAE and PHORIDAE. Keys to the families and sub-families are given and ten new genera are erected, while of 105 species dealt with, 38 are described as new.

HARDY (G. H.). **Notes on Tasmania Diptera and Descriptions of New Species.**—*Papers & Proc. Roy. Soc. Tasmania for the Year 1916, Hobart,* 19th February 1917, pp. 267–272.

Tabanus wynyardensis, sp. n., is described in this paper.

TAYLOR (F. H.). **Contributions to a Knowledge of the Australian Culicidae, no. 3.**—*Proc. Linn. Soc. New South Wales for the Year 1916, Sydney,* xli, no. 163, part 3, pp. 564–574. [Received 8th March 1917.]

The following new species are described:—*Stegomyia daliensis*, sp. n., *Leucomyia vicina*, sp. n., and *Lophoceratomyia annulata*, sp. n., from the Northern Territory, and *Hulecoeteomyia milsoni*, sp. n., and *Culicada hybrida*, sp. n., from Milson Island.

Notes on the synonomy and additional records of previously known species are also given.

The male of *S. tasmaniensis*, Str., and the female of *Danielsia minuta*, Tayl., are described for the first time.

HILL (G. F.). **Report on Some Culicidae of the Northern Territory.**—*Bull. Northern Territory Australia, Melbourne,* no. 17, January 1917, 8 pp., 16 plates, 1 map.

This paper gives a list of 26 species of mosquitos collected by the author in the Northern Territory. This list corresponds with that given by F. H. Taylor [see this *Review*, Ser. B, iv, p. 11] with the exception of *Mucidus alternans*, Westw., previously recorded by Taylor [see this *Review*, Ser. B, i, p. 11] and *Lophoceratomyia annulata*, Tayl., of which little is known, *Leucomyia vicina*, Tayl., which does not appear to be a biting species, and *Stegomyia daliensis*, Tayl., of which at present a unique specimen only has been taken.

Of the mosquitos which bite equally by day or by night the following are the most important:—*Anopheles* (*Myzorhynchus*) *barbirostris* var. *bancrofti*, Giles, an exceedingly plentiful and very troublesome mosquito in certain localities. *A.* (*Nyssorhynchus*) *annulipes*, Walk., a widely distributed species, somewhat scarce near the littoral and fairly abundant in certain inland localities. Adults of this species are never numerous in Darwin, in spite of the fact that larvae are not uncommon, owing, it is believed, to the depredations of predaceous insects. This may account for the fact that malaria has seldom, if ever, arisen *de novo* amongst residents in Darwin. *Culex sitiens*, Wied., also an extremely plentiful and troublesome species, may be successfully repelled by the use of citronella oil. *Ochlerotatus* (*Culicelsa*) *vigilax*, Skuse, which is one of the most plentiful species near the sea-coast and on the adjacent islands, breeds chiefly in sea-water pools left by spring tides, but also in fresh water at the head of tidal streams and in hollows in mangrove trunks. It remains near its breeding place by day, but may travel a mile or more by night. The nature and extent of the breeding places precludes the effective use of larvicides as a control measure, and for the sole object of reducing mosquitos the cost of drainage or reclamation would be too great to be considered. A mixture of 5 parts citronella oil, 2 parts olive oil and 2 parts creosote is the best repellent, but is unsuitable for application on surfaces exposed to the sun, and loses much of its efficacy if smeared on the clothing only. *Pseudoskusea basilis*, Tayl., up to the wet season of 1916 has been somewhat rare, but was then even more numerous than *O. vigilax* and *C. sitiens*. This mosquito breeds in crab-holes containing salt water and putrifying mangrove leaves, but not in larger pools or hollow stumps. It is not known to enter dwellings.

Less numerous night-and-day-biting species include *Ochlerotatus* (*Scutomyia*) *notoscriptus*, Skuse, var., *Reedomyia pampangensis*, Ludl., and *Mansonioides* (*Taeniorhynchus*) *uniformis*, Theo.

Culex fatigans, Wied., is the only species recorded which bites only at night. Its presence denotes the existence of filthy water in the near vicinity. It may be found sheltering in dwellings and out-houses during the day. Citronella oil is efficient as a repellent smear.

The day-biting species are represented by: *Stegomyia hilli*, Taylor, which is rarely met with, and *S. fasciata*, F., which is well established at Darwin and the neighbourhood, but is not known on Bathurst or Melville Islands, nor on the Alligator, MacArthur, Roper, Daly and Victoria Rivers in the inhabited regions. Its spread appears to be along the railway line, and individuals have been frequently observed in the lavatories attached to passenger cars. It breeds in any receptacle sheltered from direct sunlight containing water, and prefers dark objects to rest upon. It is considered to have been responsible for the spread of the epidemic of dengue fever in Darwin during 1914. *S. scutellaris*, Walk., does not thrive in Darwin and neighbourhood, the only locality in Australia from which it is recorded. *Aëdimorphus australis*, var. *darwini*, Taylor, and *Macleaya tremula*, Theo., are both rare species, of which the latter has been observed biting goats. *Taeniorhynchus brevicellulus* (*Chrysoconops acer*, Walk.), is a somewhat uncommon species which is sometimes found in dwellings at night. Its bite is painful, causing a whitish swelling on delicate skins. It is believed to breed in wells.

Culex tigripes, Grp., is a beneficial rather than a noxious species. It is confined to the town area of Darwin and breeds in water-butts, disused horse-troughs and sometimes in stagnant pools and open irrigation wells. It does not molest man, but its larvae are voracious devourers of their own and other mosquito larvae.

At the Channel Island Quarantine Station, Port Darwin, a search for *Stegomyia fasciata* on two occasions was productive of no result. On the first occasion no mosquitos were observed and on the second a single specimen of *O. vigilax*, but no Anopheline mosquitos were found. The present condition of Channel Island as a quarantine station for prospective yellow fever cases is therefore very satisfactory. Owing to local conditions of moisture, it is considered highly improbable that any concentration of *Anopheles annulipes* will occur on the island.

WATERSTON (J.). **Notes on the Morphology of Chalcidoidea bred from** *Calliphora*.—*Parasitology*, *Cambridge*, **ix**, no. 2, 26th February 1917. pp. 190—198, 2 figs.

In this paper, *Melittobia acasta*, Wlk., is described, and its synonomy, about which there has been some controversy, is discussed. It is a markedly polyphagous species and never apparently a true hyper-parasite. It appears to attack everything within its limited range of action and has already been bred from a long list of hosts.

WATERSTON (J.). **A New African Louse** (*Polyplax calva*, **sp. n.) from** *Cricetomys.—Parasitology, Cambridge,* ix, no. 2, 26th February 1917, pp. 199–202, 2 figs.

A description is given of this new species from specimens taken on *Cricetomys gambianus* at Accra and in Zanzibar.

BACOT (A.). **A Contribution to the Bionomics of** *Pediculus humanus* (*vestimenti*) **and** *Pediculus capitis.—Parasitology, Cambridge* ix, no. 2, 26th February 1917, pp. 227–258, 4 figs.

This paper describes experiments carried out with a view to solving certain problems relating to sex and fertility of lice and incidentally to obtain further evidence on the laying and hatching of their eggs. It was originally intended to deal with *Pediculus humanus* only, but *P. capitis* was ultimately included in the experiments also. The method of conducting the experiments was similar to that adopted by Sikora [see this *Review*, Ser. B, iii, p. 226], the insects being kept under as natural conditions as possible.

P. humanus is a larger, more robust and less active species than *P. capitis*, the females having a relatively greater egg-carrying capacity. In the experiments described, the eggs were larger and the number laid was greater than in the case of the smaller species. Cross pairings were easily effected, the offspring being fertile *inter se*. Hybrid strains were produced until the F. 3 generation, and presumably could have been carried on indefinitely. The author considers that the marked disparity in the sexes of the F. 1 generation of some of the crosses suggests that *P. capitis* and *P. humanus* are specifically distinct, though no such obvious disparity occurred between the sexes of the F. 2 and F. 3 hybrid generation. The female of *P. humanus* was found to lay as many as 295 eggs, while the record for *P. capitis* was 141, these figures probably being exceeded under natural conditions. Experiments proved that fecundity is dependent on feeding, though the fertility of the eggs laid was not affected by increased food. The longevity of the male of *P. humanus* was about 32 days in these experiments, the longest female life being 46 days, with an average of 34 days. For *P. capitis* the figures were: male, 30 days, female, 38 days, with an average of 27 days. Whether the length of life would be extended by unrestricted feeding remains to be proved. Tests made with unfed *P. humanus* showed that at a temperature of 60° to 65° F., many individuals lived from 3 to 4 days, while at 75° F., all died within 5 days, and at 98° F. all died within 3 days. Newly-hatched larvae, unless fed, lived less than 24 hours at 98° F. Active specimens of *P. humanus* survived two days at a temperature of 27° to 30° F., but none survived a week. Under humid conditions, at 88° F., 3 per cent. of the eggs hatched on the 7th day, 56 per cent. on the 8th, 8 per cent. on the 10th, and ·2 per cent. on the 11th. No eggs hatched at 60° F. while at 77° there was considerable egg mortality. At 99° hatching was spread over 5 days and the mortality was not excessive. A single female may have 4,160 descendants during her life.

Hindle (E.). **Notes on the Biology of** *Pediculus humanus.—Parasitology, Cambridge,* ix, no. 2, February 1917, pp. 259–265.

These notes deal with the occurrence of male and female broods of *Pediculus humanus* and upon the inheritance of melanism in this louse. They have been published, though incomplete, as being of interest, in view of the results described in the preceding paper.

Nuttall (G. H. F.). **Studies on** *Pediculus.* **I. The Copulatory Apparatus and the Process of Copulation in** *Pediculus humanus.—Parasitology, Cambridge,* ix, no. 2, February 1917, pp. 293–324, 12 figs., 2 plates.

The subject matter of this lengthy paper is sufficiently indicated by its title. Though most authors recognise the head louse (*P. capitis,* de G.), and the clothes or body louse (*P. humanus,* L.) as two distinct species, the author states that, while the extreme forms appear markedly different, in a long series of specimens every intergrade can be found between them, so that no dividing line can be laid down, and they must therefore be treated as races of the same species, showing slight biological differences.

The publication of this preliminary paper has been deemed expedient owing to the active interest taken in this insect and its habits, especially in connection with the War.

A bibliography of 11 volumes is appended.

Richardson (Q. H.). **The Shatt-el-Arab River, with special Reference to Malaria.**—*Jl. Roy. Naval Med. Service, London,* iii, no. 1, January 1917, pp. 33–37.

Though tidal throughout its course, the Shatt-el-Arab contains fresh water from its point of origin—the junction of the Tigris and Euphrates, 120 miles from the Persian Gulf—to the village of Fao near its mouth. The country is extremely flat, and the date belt, the inhabited area proper, is in many places below high-water level, so that plantations are often converted into swamps, where weed growth is rapid, thus completing the necessary factors for an ideal breeding ground for mosquitos. During the malaria season, from April to December, on board the ship in which the author was serving, it was found that 30 gr. of quinine a week per man was the minimum effective preventive dose. Screening the ship was quite out of the question on account of the excessive temperatures, and mosquito nets were only partly useful. Mosquitos were however driven away or killed by the vapour from katol sticks obtained from India and burnt in the living spaces.

Grimshaw (P. H.). **A Guide to the Literature of British Diptera.**—Separate, dated 12th March 1917 from *Proc. Royal Phys. Soc. Edinburgh, Edinburgh,* xx, part 2, pp. 78–117.

This bibliography of British Diptera contains references to various species of economic importance, special notice being given to flies in their relation to man, to Culicidae (gnats or mosquitos), to Simuliidae (sand-flies), to Oestridae (bot-flies and warble-flies) and to Muscidae (house flies, blue-bottles, etc.).

Alessandrini (G.). **Le piroplasmosi ed i mezzi per prevenirle e combatterle.** [Piroplasmoses and the Means for their Prevention and Control.]—*Annali d'Igiene, Rome,* xxvii, no. 2, 28th February 1917, pp. 100–110.

This paper gives a brief résumé of present-day knowledge of piroplasmosis and babesiasis and their control. The ticks that are the transmitting agents of these diseases are discussed, the following summary being given :—*Piroplasma bovis* is transmitted by *Margaropus* (*Boophilus*) *annulatus*, Say, *M.* (*B.*) *decoloratus*, Koch, var. *calcaratus*, Neum., *Ixodes ricinus*, L., *I. hexagonus*, Leach, *Hyalomma aegyptium*, L., and *Haemaphysalis punctata*, C. and F.

Piroplasma parvum is transmitted by *Rhipicephalus evertsi*, Neum., *R. simus*, Koch, *R. appendiculatus*, Neum., *R. capensis*, Koch, and *R. nitens*, Neum.

Piroplasma mutans is transmitted by *R. simus*, *R. appendiculatus*, and *R. evertsi*.

Piroplasma ovis is transmitted by *R. bursa*, C. and F.

Piroplasma equi is transmitted by *R. evertsi* and *M. annulatus*.

Piroplasma canis is transmitted by *Rhipicephalus sanguineus*, Latr., *Ixodes hexagonus*, *I. ricinus*, *Haemaphysalis leachi*, Aud., and *Dermacentor reticulatus*, F.

Parker (R. R.). **The House-fly in Relation to Public Health in Montana. Article 1. Some Facts concerning its Habits.**—*State of Montana Bull. of Public Health, Helena,* ix, no. 9 & 10, January-February 1916, pp. 6–11.

This paper deals with the relation between the common house-fly (*Musca domestica*) and man. Figures are given to show the tremendous potential reproductive power of this insect, it having been estimated that a single female may have as many as 5,589,720,000 descendants between April 15th and September 10th of one year. The necessity for properly treating all decomposing animal or vegetable matter is emphasised, especially horse manure, it having been found that 1,000 lb. of this may contain 450,000 maggots.

Parker (R. R.). **The House-fly in Relation to Public Health in Montana. Article 2. The House-fly as a Disease Carrier.**—*State of Montana Bull. of Public Health, Helena,* ix, no. 11, March 1916, pp. 5–11.

It is stated that preventable diseases are responsible for 600,000 deaths annually in the United States. Diseases which are fly-borne in the State of Montana include typhoid fever, infantile diarrhoea and consumption.

The means by which flies carry disease is enlarged upon. The extent of this is indicated by the fact that flies captured in insanitary parts of cities have been found to carry from 800,000 to 500,000,000 bacteria, a large proportion being intestinal germs, while those from cleaner parts only carried from 21,000 to 100,000 germs. Of flies captured in dwelling houses, 75 per cent. have been shown to be infected with intestinal bacteria.

Lamson (G. H.). **Mercurial Ointment, an effective Control of Hen Lice.**—*Jl. Econ. Entom., Concord, N.H.*, x, no. 1, February 1917, pp. 71–74.

Powders and dust baths as a control for lice on fowls are considered ineffective. Continued applications have failed to control this pest, owing to the fact that the birds shake much of the powder out of their feathers immediately after application, while most powders lose their efficiency long before the next generation of lice is hatched. Mercurial ointment does not act as quickly as some powders, but within a few days the birds treated with it become free from lice and remain so for 8 to 16 weeks. Used in full strength, mercurial ointment has been found to cause some burning, but, when diluted with two parts vaseline, the lice are killed and no burning results. Mercurial ointment contains 50 per cent. metallic mercury with 50 per cent. petrolatum, and should not be confused with blue ointment, which contains 67 per cent. mercurial ointment and 33 per cent. vaseline. The method of application is to take an amount about the size of a pea and rub it into the base of the feathers on those parts of the body where the eggs of the lice are laid. Such applications to be effective should be made three times in the year in the northern States and perhaps six times a year in the south. For young chickens a little sweet oil is advised as a practical control measure owing to the tenderness of the skin.

Richardson (C. H.). **The Response of the House-fly to certain Foods and their Fermentation Products.**—*Jl. Econ. Entom., Concord, N.H.*, x, no. 1, February 1917, pp. 102–109.

This paper describes a series of experiments made with the object of obtaining a more intimate knowledge of the attractive constituents of the preferred foods of *Musca domestica*. Tables are given recording the results of the experiments, which led to the following conclusions: Glucose, fructose, maltose, lactose, starch and dextrin are not very attractive to house-flies. Lactose and dextrin caught the largest number of flies, starch the least. Sucrose was a poor bait, while 4 per cent. amylic alcohol gave better results than ethyl alcohol or acetic acid in 4 or 10 per cent. concentrations and better than 10 per cent. amylic alcohol; 4 per cent. ethyl alcohol was better than 10 per cent., and 10 per cent. acetic acid gave better results than 4 per cent. Succinic and lactic acids showed some attractive qualities.

Maltose, lactose, sucrose and dextrin in 4 per cent. solutions of amylic alcohol, ethyl alcohol and acetic acid were more attractive than the corresponding aqueous solutions. Maltose and dextrin solutions were more effective than lactose or sucrose. The order of response to the alcohols and acetic acid containing carbohydrate was the same as that for the aqueous solutions of these compounds. Crude glutin from wheat flour proved unattractive. The water soluble portion with or without starch in suspension was decidedly attractive. Several experiments with milk indicate that fat-free caseinogen is attractive, while butter-fat is not. Aqueous solutions of wheat flour and molasses to which sodium arsenite and amylic alcohol are added have considerable value as poison-baits for house-flies.

In the course of the discussion following this paper, it was stated that pig-blood had proved more attractive than any other substance tried by another investigator.

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Britton (W. E.). **Recent Anti-Mosquito Work in Connecticut.**—*Jl. Econ. Entom., Concord, N.H.*, x, no. 1, February 1917, pp. 109–111.

During the past few years anti-mosquito work in Connecticut has made considerable progress and results have been very satisfactory. More than 6,000 acres or about one-third of the existing salt marsh area in this State, has already been ditched and the breeding places of mosquitos thus eliminated. Legislation is now being sought providing for the extension of the ditching system to cover all salt marshes in the State within a period of, perhaps, six years, and for the supervision of maintenance work. Several projects are also in hand for dealing with inland breeding-places in a similar manner.

Cory (E. N.). **The Protection of Dairy Cattle from Flies.**—*Jl. Econ. Entom., Concord, N.H.*, x, no. 1, February 1917, pp. 111–113.

In 1914 it was found that while proprietory coal-tar products were unsuitable for spraying cattle as a protection against flies, owing to the fact that butter made on the premises became tainted with the coal-tar odour, a spray of 6 per cent. emulsion of pine-tar creosote was used with excellent results. In 1916 experiments were undertaken to ascertain the minimum effective strength of pine-tar creosote emulsion and the most successful methods of application. The emulsion used consisted of $\frac{2}{3}$ lb. caustic soda, 98 per cent. pure, dissolved in a known quantity of water for every gallon of pine-tar creosote to be emulsified, and the subsequent dilution with cold water to the desired strength. This emulsion is very stable and slightly alkaline, 3 per cent. emulsion being found to be the most effective minimum strength. Flies that were struck by this emulsion fell to the ground, all that were thoroughly wetted being killed. The mixture was found to be fully effective for one day only, though considerable protection was afforded for two or even three days. Cows sprayed between 3 and 4 a.m., prior to milking, remained practically free from flies throughout the day. These were preliminary experiments, and further tests are to be made, but it seems evident that such spraying will result in an increased average yield of milk. The principal flies treated in these experiments were *Lyperosia irritans* (*Haematobia serrata*) and *Stomoxys calcitrans*.

King (W. V.). **The Effect of Cold upon Malaria Parasites in the Mosquito Host.** — Separate, dated 2nd January 1917, from *Jl. Experimental Medicine, Baltimore, Md.*, xxv, no. 3, 1st March 1917, pp. 495–498, 2 plates.

It has been supposed hitherto 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 temperatures below this. In a series of experiments conducted in New Orleans from September to December 1916, it was found that *Plasmodium vivax* and *P. falciparum* in various stages of development in *Anopheles quadrimaculatus* are able to survive exposure to lower degrees of temperature than 60° F. Furthermore, the results with *P. vivax* have shown that it may survive freezing temperatures of several days duration, a condition which rarely occurs naturally at this latitude. The mosquitos used in these experiments were bred specimens. They were infected by a single blood-meal on suitable gamete carriers and were kept at room temperature except for the periods of exposure. Controls from each lot of mosquitos were kept under normal conditions for comparison with the experimental specimens. The results, which are summarised in a table, show that *P. vivax* in the mosquito host is able to survive exposure to a temperature of 30° F. for a period of two days, 31° F. for four days, and a mean temperature of 46° F. for 17 days. In each series of experiments the recovery of the parasites was demonstrated in later dissections by conclusive evidence of further development of the oocysts. In a smaller series of tests the sporonts of the aestivo-autumnal parasite have shown a resistance to temperature as low as 35° F. for 24 hours.

PARKER (J. B.). **A Revision of the Bembicine Wasps of America North of Mexico.**—Separate, dated 10th February 1917, from *Proc. U.S. Nat. Mus., Washington*, lii, pp. 1–155.

This systematic paper on the Bembicine wasps contains a chapter on their biology. The following list is given of flies found in three nests of *Bembex spinolae*:—*Winthemia 4-pustulata*, F.; *Pseudopyrellia cornicinia*, F.; *Musca domestica*, L.; *Sarcophaga* sp.; *Chrysops pudicus* O. S.; *C. niger*, Mcq.; *C. lugens*, Wied.; *Tabanus coffeatus*, Mcq.; *T. pumilus*, Mcq.: *T. lasiophthalmus*, Mcq., and *Odontomyia virgo*, Wied.

BACOT (A.). **The Effect of the Presence of Bacteria or Yeasts on the Hatching of the Eggs of *Stegomyia fasciata* (the Yellow Fever Mosquito).**—*Jl. Royal Microscop. Soc., London*, Part I, February 1917, pp. 173–174.

The eggs of *Stegomyia fasciata* are laid singly, either on the surface of water, or on the wet margin beside the water. Incubation lasts from 30 to 40 hours, the larva being then fully developed within the egg, moist conditions during the incubation period apparently being essential. Should the eggs remain dry during this period, they retain their vitality for several months and, upon immersion, hatching begins, but is often very slow. Certain stimuli, such as a fall in temperature or the addition of contaminated fluid, cause dormant eggs to respond by hatching. Experiments on sterilised eggs in connection with these phenomena show that the greatest stimulus to hatching is the introduction of living yeasts or bacteria; hatching followed the addition of a sterile autolised extract of brewer's yeast. The stimulus produced by killed cultures of bacteria and sterile watery extract of brewer's yeast was much more feeble, many of the resistant eggs failing to hatch, but these, when treated with living yeast cells or living cultures of bacteria such as *Bacillus coli*, never failed to hatch. Sterile filtrates of bacteria were less effective than killed cultures. The addition of dilute acid, sufficient to cause the same or a somewhat stronger colour reaction than that produced by a bacterial culture that induced hatching, was ineffective. The addition of alkaline solutions was either without effect, or caused only a small proportion of larvae to emerge, whereas the addition of a bacterial culture to the containers caused the eggs which had failed to respond to the alkaline solutions to hatch in large numbers within a few minutes. The most reasonable explanation of these phenomena would seem to be the stimulus by smell, or some closely analagous sensation of the larva, followed by active use of its egg-breaking appliance.

Salm (A. J.). **Description du** *Ceratopogon blanchardi*, **n. sp.** [A Description of *Ceratopogon blanchardi*, sp. n.]—*Bull. Soc. Zool. France, Paris*, xli, no. 8–10, 25th February 1917, pp. 106–108, 1 fig.

Ceratopogon blanchardi, sp. n., from Java, is described from specimens captured at light in 1914 and 1915.

Pointers on the Horn Fly.—*Jl. Jamaica Agric. Soc., Kingston*, xxi, no. 2, February 1917, pp. 46–48, 1 fig. [Received 11th April 1917.]

The horn-fly [*Lyperosia irritans*] has been introduced into the West Indies from Europe and, under tropical conditions, with no winter to check its increase, it becomes of great economic importance, attacking cattle in dense clouds. The eggs are laid on cow-dung, in which the larvae live, the pupal stage being passed in the ground. The adults are probably instrumental in the transmission of stock diseases. Control measures suggested are spraying the cattle with kerosene emulsion, which, however, is not lasting in its effects; netting the adult flies by hand nets; and spreading manure over the fields in the wet season to produce rapid drying.

Ritchie (A. H.). **Hog Lice.**—*Jl. Jamaica Agric. Soc., Kingston*, xxi, no. 3, March 1917, pp. 91–92.

The measures for the destruction of lice on pigs here suggested are:—Kerosene emulsion, 10 per cent.; Florida citrus spray, one part to five parts water; 1 lb. rancid grease, lard or butter, in which ½ pint of kerosene is mixed until a creamy mass is formed; tobacco decoctions; or emulsion of Jeyes' soap and hot water. This treatment should be repeated after about 10 days.

Another plan recommended is to drive posts into the ground in the sty and wrap them round with burlap saturated with a thick crude oil. The pigs will rub against these posts and smear the affected parts with the oil. Wherever it is possible to have the sty of concrete, this is far the best method of keeping the animals free from pests. No rough timber or posts with loose bark, seams or cracks, where lice can lodge, should be used, and the sty should be whitewashed, one pint of crude carbolic being added to each 4 gals. of wash.

Howard (L. O.) **Hydrocyanic-acid Gas against Household Insects.**—*U.S. Dept. Agric., Washington, D.C.*, Farmers' Bull. no. 699, 5th April 1916, 8 pp. [Received 12th April 1917.]

This bulletin gives popular instructions in the safe and effective use of hydrocyanic acid gas against household pests, such as bed-bugs, fleas, cockroaches, ants, clothes-moths and carpet-beetles.

As this gas is a deadly poison, the fumigation process must not be undertaken until it is thoroughly understood in every particular.

Single rooms should not be fumigated unless the whole building can be vacated during the operation.

To prepare hydrocyanic acid gas, 98–99 per cent. grade sodium cyanide should be combined with the other materials according to the following formula: Sodium cyanide 1 oz. avp., sulphuric acid $1\frac{1}{2}$ **U.S.** fluid oz., water 3 U.S. fluid oz. For loosely constructed frame-houses these amounts may be doubled for each 100 cubic feet. A tabular statement of the capacity of the various rooms and amount of chemicals required for each should be prepared. The opening of doors and windows from the outside at the conclusion of the fumigation must be arranged for, and all registers, fireplaces and other openings closed; food substances and metallic objects that are likely to be tarnished must be removed. The generating vessels should be placed in each room with a thick carpeting of old newspapers under each. The cyanide must be broken up out of doors and placed in thin paper bags containing charges suited to the amounts to be used in the different rooms. Into each of the generating jars the proper quantity of water should be measured and the requisite amount of acid slowly added. The cyanide should be taken in bags in a basket and the bags containing the proper amounts placed beside the generating jars in each room. Starting at the top of the house, the cyanide should be placed gently in each jar and the room quickly vacated. If two persons work together, they should deal with the same floor at the same time, taking different rooms. On the following day, the doors and windows should all be opened from the outside and the house allowed to ventilate for an hour before it is entered.

MONTGOMERY (E.). **On a Tick-borne Gastro-enteritis of Sheep and Goats occurring in British East Africa.**—*Jl. Comp. Path. Therapeut., London,* xxx, no. 1, March 1917, pp. 28–57.

The author gives the following summary of this paper:—Haemorrhagic gastro-enteritis occurs in British East Africa principally in the Kikuyu country, where it would appear to be enzootic, manifesting itself as an epizootic only when large mobs of susceptible animals are exposed to infection. Sheep and goats alone appear to be susceptible, especially the former. Grade and pure-bred sheep are far more resistant than the native sheep, in which the mortality is about 70 per cent. of those attacked. The disease is carried by the brown tick, *Rhipicephalus appendiculatus.* No other tick has yet been proved to transmit infection, but further investigation on this point is necessary. Adult ticks that have fed on infected animals in the nymphal stage can apparently carry the infection after moulting. It is possible that larvae born of a female feeding on a sick animal may also transmit the disease, but on this point the evidence is more scanty.

Preventive inoculation has been tried, but so far without success. The most favourable method seems to be by attenuating the virulence of the disease for sheep by passing the virus for several generations through the more resistant goat. Preventive measures should be directed towards the eradication of ticks capable of carrying the disease.

Rhipicephalus appendiculatus is also the carrier of African Coast fever in cattle and, for its eradication, cattle must be dipped every three days. There is no doubt that dipping cattle at a three-day interval would greatly clear the ground of ticks and, in their absence, gastro-enteritis of sheep cannot spread.

HENRY (—). **Otacariasis and the Prophylaxis of Psoroptic Mange.** —*Jl. Comp. Path. Therapeut., London*, xxx, no. 1, March 1917, pp. 84–87. (Abstract from *Bull. Soc. Cent. Méd. Vét.*, xcii, p. 41.)

Psoroptic otacariasis is common in rabbits and goats and has been observed in the gazelle and in the argali or wild sheep of America. The disease is also common in the horse, ass, mule and sheep. The infestation is invariably localised in the deepest part of the auditory meatus, where colonies of mites are always to be found in infected animals. The remedial treatment is to inject gently or run into the ears so that it reaches the bottom of the auditory meatus, a lukewarm watery 2 or 3 per cent. emulsion of cresyl. Under the microscope the mites were found to be killed almost instantaneously by this emulsion, when fresh. This treatment should be renewed two or three times at eight-day intervals, in order to destroy the parasites hatched from eggs that were not killed by the previous treatment. Examination of sheep leads to the conclusion that otacariasis is of common occurrence, though no scab may be visible on their bodies, and the author refers to the recent discovery by Roubaud and Van Saceghem of otacariasis in sheep in the Belgian Congo [see this *Review*, Ser. B, v, p. 35]. When psoroptic mange has become established on the bodies of horses and sheep, it can be transmitted from one animal to another by direct or indirect contact, so that it does not follow that mites can be found in the ears of all the animals affected with psoroptic mange. In the author's opinion, however, otacariasis remains the fundamental form and is the origin of new centres of the disease. This localisation in the ear will often explain relapses in the treatment of mange. In order to eliminate this factor in the spread of the parasite, no animal should be introduced into a flock of susceptible individuals without previous disinfection of the ears.

BERTON (—). **The Open-air Treatment of Mange.**—*Jl. Comp. Path. Therapeut., London*, xxx, no. 1, March 1917, pp. 91–93. (Abstract from *Rév. Gén. de Méd. Vét., Toulouse*, xxv, no. 291, pp. 531–539, 15th November 1916.)

The author's observations have led him to believe that horses affected with mange might be cured merely by keeping them in the open air, under hygienic conditions, with a plentiful supply of water and good food. An experiment was tried with 12 horses on which acari had been identified microscopically. The animals, which were in extremely poor condition, were turned out in a field traversed by a stream and fed on hay and oats. At the end of 2 months, 10 of them were cured and the other two, which were very old and exhausted when the experiment began, died. By these methods the author succeeded in curing in the space of 2 months 88 per cent. of cases, some of which were of long standing and had been repeatedly treated with drugs. A preliminary treatment consists of clipping and thorough cleansing, after which a parasiticide should be applied. Oily dressings should be avoided. A 2 to 2½ per cent. hot solution of potassium polysulphide has been found to give excellent results. This is used over the entire skin and rubbed in with the hands. This treatment should be repeated daily for three days and then the horse should be turned out to pasture as described.

Brown (W. G.). **The Maggot-Fly.**—*Queensland Agric. Jl., Brisbane,* vii, no. 2, February 1917, p. 85. [Received 11th April 1917.]

The author urges the necessity for destroying sheep-maggot flies instead of seeking palliatives for the infested sheep. As the grass in the paddocks, as well as shrubs and weeds, are frequently swarming with flies, it is suggested that a poison gas should be tried which is heavier than air and which would flow over the country and destroy the flies, the sheep having been previously removed to higher ground. This method is said to have been used with success to destroy prickly-pear.

Regulations of the Montana State Board of Entomology.—*2nd Biennial Rept. Montana State Bd. Entom. 1915–1916, Bozeman,* 15th December 1916, pp. 9–12. [Received 17th April 1917.]

These regulations are the same as those given in a former report [see this *Review*, Ser. B, iii, p. 60] with the exception of one section which prohibits domestic animals, including cows, horses, asses, mules, sheep, goats and pigs, from entering any tick-control district as designated by the Board for grazing or feeding purposes between 1st February and the 15th July of each year, unless accompanied by a permit issued by the Secretary of the State Board of Entomology or a duly authorised representative of the United States Bureau of Entomology or the United States Public Health Service.

King (W. V.). **Report on the Investigation and Control of the Rocky Mountain Spotted-fever Tick in Montana during 1915-1916.**—*2nd Bienn. Rept. Montana State Bd. Entom. 1915–1916, Helena,* 15th December 1916, pp. 13–23. [Received 17th April 1917.]

Experimental control operations against the spotted fever tick (*Dermacentor venustus*) were continued during the spring seasons of 1915–1916 on the same lines as those in the previous year [see this *Review*, Ser. B, iii, p. 60].

The number of dipping vats has been increased and the dipping solution now used is composed of sodium arsenite and a weak kerosene emulsion. These are prepared by dissolving a given amount of sodium arsenite in 50 U.S. gals. of water by boiling. The arsenite used should contain about 70 per cent. arsenic and the resultant solution from ·195 to ·200 per cent. arsenic in the arsenious form. This solution is added to a vat half full of water and 10 U.S. gals. of kerosene are then emulsified and mixed with it and the vat filled up with water.

The capacity of the vat is computed by the prismoidal formula (see U.S. Dept. Agric. Farmers, Bull. 498, p. 36). The kerosene emulsion is prepared by dissolving 12 lb. potassium soap in 2 U.S. gals. warm water and, when cool, kerosene is added in the proportion of 3 U.S. gals. to 2 quarts of soap solution. The emulsion is formed by being well sprayed back into itself in a hand-spray pump and, when of a thick creamy consistency, is diluted with water in a separate tank. No dipping is done until the chemical analysis shows that the correct strength of arsenic has been obtained: kerosene not completely emulsified is carefully removed by skimming. Frequent analyses are made so as to keep the solution in the tank always at the right strength.

For the destruction of the native rodent hosts of the tick, especially the Columbian ground squirrel (*Citellus columbianus*), the following poisoned grain formula gave the best results:— to 1 teaspoonful saccharine and 1 pint of salt dissolved in 2½ pints of warm water, one pint of starch is added and the mixture heated, but not cooked, and constantly stirred until quite thick; 2 oz. powdered strychnine alkaloid are then added to the starch solution and well mixed with it. This mixture is poured over 16 quarts of hulled oats in a tub and well mixed by rubbing through the hands. By means of this formula the grain is given a poisonous coating, the alkaloid of strychnine being insoluble in water.

It was estimated that at least half the squirrels in the treated area were killed in 1915 by this bait and that a further reduction of 50 per cent. was obtained in 1916.

FRICKS (L. D.). **Review of the Rocky Mountain Spotted Fever Eradicative Work conducted by the United States Public Health Service in the Bitter Root Valley, Montana, 1915-1916.**—*2nd Bienn. Report. Montana State Bd. Entom. 1915–1916. Helena,* 15th December 1916, pp. 24–27. [Received 17th April 1917.]

The work of eliminating Rocky Mountain spotted fever from the Bitter Root Valley was continued during 1915-1916 on the plan outlined by the representatives of the Public Health Service [see this *Review*, Ser. B, iii, p. 62]. Some of these measures have been amplified, more especially in connection with the destruction of small rodents and the substitution of sheep for horses and cattle on the west side of the valley. This area is suitable only for grazing purposes and good results were obtained in tick destruction in the districts under observation. Continued effort has been made towards decreasing by legislation, regulation and substitution, the number of horses and cattle allowed to graze on the west side of the valley.

FRICKS (L. D.). **Rocky Mountain Spotted Fever. A Report of Laboratory Investigations of the Virus.**—*2nd Bienn. Rept. Montana State Bd. Entom. 1915–1916, Helena,* 15th December 1916, pp. 28–34. [Received 17th April 1917.]

It has been found that man, rhesus monkeys and at least six varieties of small wild rodents found in the Rocky mountains are susceptible to the infection of Rocky Mountain fever, while the larger domestic animals are generally immune. Guinea-pigs and white rats (*Mus norvegicus albinus*) are highly susceptible, while white mice are apparently immune. The virus is transmitted by the bite of infective wood ticks (*Dermacentor venustus*), recovery being followed by complete immunity. No insect or other biting Arachnid has been found capable of transmitting the virus, but a female tick, once infected, remains so and transmits the virus to its progeny.

WOLBACH (T. B.). **The Etiology of Rocky Mountain Spotted Fever.**—*2nd Bienn. Rept. Montana State Bd. Entom. 1915-1916, Helena,* 15th December 1916, pp. 35–44, 3 plates. [Received 17th April 1917.]

This paper deals with the pathology and occurrence of the parasite of Rocky Mountain fever in guinea-pigs and monkeys and also in ticks.

Infected ticks were obtained by allowing them to feed once or more upon infected guinea-pigs, their infectivity being subsequently proved by allowing them to feed upon normal guinea-pigs. Ticks shown to be non-infective by feeding once or twice upon normal guinea-pigs were used for controls. It was found that a single feeding frequently failed to render a tick infective and occasionally two or even three feedings were required in order to do so. The distribution of the parasite in the infected ticks indicates transmission through the salivary gland secretions. Transmission by faecal contamination of the wound caused by the tick in feeding does not seem possible, as the faeces collect in the form of small pellets that soon become hard and dry and do not soil the skin of the host.

No new light has been obtained as to the exact nature of this organism.

PARKER (R. R.). **Some Facts of Importance concerning the Rocky Mountain Spotted Fever Tick** (*Dermacentor venustus*, **Banks) in Eastern Montana.**—*2nd Biennial Rept., Montana State Bd. Entom. 1915–1916, Bozeman,* 15th December 1916, pp. 45–56. [Received 17th April 1917.]

During the season of 1916 a field station was established in Eastern Montana for the purpose of studying the bionomics of *Dermacentor venustus* and the economic conditions, the control measures adopted in Western Montana being inapplicable to the Eastern side of the State. The species of ticks found included *D. venustus*, which is the only agent known to transmit Rocky Mountain spotted fever in nature, *Haemaphysalis leporis-palustris*, Pack. (rabbit tick), *Ornithodorus megnini*, Dug., and *Ixodes* spp. A table is given of 22 wild mammalian hosts, the most important being *Lepus townsendi campanius* (jack rabbit) and *Erethizon epixanthus* (porcupine). Domestic animals recorded as tick hosts are horses, cattle, sheep, dogs, cats and pigs. Only adult ticks are known to occur on these animals, while some of the wild hosts, notably the jack rabbit, are important hosts of the nymphs and perhaps the larvae.

Notes are given on the life-history of *D. venustus* under eastern Montana conditions. Oviposition begins in April, adults being most numerous from mid-April to the middle of June. The ticks evidently pass the winter as unfed nymphs and adults. In eastern Montana there are apparently no natural barriers against the spread of ticks, the limit of spread from any given locality being that of the ranging powers or habits of the host animals; cattle, horses and sheep are the most important agents of dispersal.

Ticks were common on human beings during the season of 1915 and, though less abundant during 1916, the majority of persons were troubled by their presence on the body or clothing at some time or other from March to August.

PARKER (R. R.). **The House Fly and the Control of Flies.**—*2nd Biennial Rept., Montana State Bd. Entom., 1915–1916, Bozeman*, 15th December 1916, pp. 57–66. [Received 17th April 1917.]

This article records investigations subsequent to those already described in the First Biennial Report [see this *Review*, Ser. B, iii, p. 61].

In the control of flies in cities the following objectives should be kept in view:—The prevention of egg-laying; the prevention of flies which are breeding in manure, garbage or refuse, from maturing within city limits by proper care pending removal and by removal at sufficiently frequent intervals; the disposal of waste matter in such a manner that flies cannot mature in it; the treatment of material naturally attractive to flies in order to render it as little attractive as possible.

Experiments to determine the radius of dispersion of the house-fly were conducted with 387,877 marked flies, released from four different stations. The greatest factor in stimulating dispersion is the odour from feeding areas, though wind, temperature, state of weather and other factors also influence it. The results showed that flies lead an extremely migratory existence and, while spreading from a given area within city limits to a radius of about five miles with almost uniform distribution in all directions, they may also leave the city and fly across open country to some distant point. Emphasis is laid on the necessity for general co-operation in control measures, and lectures have been given with this object. It is considered of vital importance to interest town-dwellers in general in this subject, since measures adopted for fly control are fundamentally those for good sanitation and for improving conditions detrimental to public health. The installation of incinerating plants for the disposal of garbage has been recommended when possible. A maggot trap and a manure box have been designed; the former, principally for use under country conditions, affords the best means yet devised for control of the house-fly with the minimum expenditure of time and care; the latter is adaptable to diverse conditions, its object being to keep manure from exposure out of doors. Further problems, such as the manner of hibernation of the house-fly in Montana, are still under investigation.

STRICKLAND. **A New Species of Anopheline, *Myzorhynchus similis*, from the Malay Peninsula.**—*Ind. Jl. Med. Research, Calcutta*, iv, no. 3, January 1917, p. 611. [Received 23rd April 1917.]

Anopheles (*Myzorhynchus*) *similis* is described as new from the larva, on the ground that it possesses clypeal, but is devoid of palmate hairs. The imago is apparently indistinguishable from *A. umbrosus*.

JÜRGENS (—). **Infective Periods in Typhus Fever.**—*Ind. Jl. Med. Research, Calcutta*, iv, no. 3, January 1917, p. 614. (Abstract from *Deutsche Med. Woch., Berlin*, no. 21, 25th May 1916.) [Received 23rd April 1917.]

In the course of the German Medical Congress held at Warsaw in May 1916, the author stated that an individual infected with typhus can infect only lice and not another man, and it is probable that the parasite of typhus can complete the cycle commenced in man only in the body of the louse. Lice can become infected only from a case of typhus fever and not in the incubation stage of the disease. The lice that have bitten a convalescent typhus patient will not be infective. All these observations indicate that the parasites in human blood produce at a definite period forms, the development of which can be completed only in the louse, where they mature into forms capable of re-infecting man. Lice become infective a few days after sucking infected blood and lose their infectivity a few days later. The eggs of an infected louse may be themselves infected. An epidemic never occurs in the absence of lice.

Dyar (H. G.) & Knab (F.). **Bromelicolous Anopheles.**—*Insecutor Inscitiae Menstruus, Washington, D.C.*, v, nos. 1–3, January-March 1917, pp. 38–40.

The larvae of closely related species of *Anopheles* have been found in the water held by the leaf-bases of Bromeliaceae. These are *A. hylephilus*, sp. n., occurring in Venezuela, Ecuador, and the Canal Zone in Panama; *A. boliviensis* in the moist forest zone of South America, extending to the slopes of the Bolivian and Peruvian Andes; *A. neivai* found in Panama, Costa Rica, and S. Mexico; and *A. bellator*, hitherto found only in Trinidad.

Townsend (C. H. T.). **A Synoptic Revision of the Cuterebridae, with Synonymic Notes and the Description of one New Species.**—*Insecutor Inscitiae Menstruus, Washington, D.C.*, v, nos. 1–3, January-March 1917, pp. 23-29.

This paper gives notes on several species, including *Cuterebra cuniculi*, Clk.; *Bogeria princeps*, Aust., which attacks both jack rabbit and cotton-tail in Arizona, California, Nevada and New Mexico; *B. emasculator*, Fitch, a parasite of squirrels and chipmunks; and *B. fasciata*, Swenk., from New Mexico, parasitic on a species of *Tamias*. The new species described is *B. scudderi*, two third-stage larvae of which were taken from the throat of a pig. These may have been ingested as ova from rabbit-burrows or by eating a rabbit containing third-stage larvae.

Cross (H. E.). **Annual Report of the Camel Specialist for the Year 1915–1916**, *Lahore*, 1916, 27 pp. [Received 30th April 1917.]

The most important disease of camels in the Punjab during the year under review was surra: the number of cases diagnosed was 1,593, though this figure was probably exceeded, as the disease appeared in various forms and was sometimes wrongly diagnosed. The large increase of surra is due to camel corps being sent to districts where biting flies are prevalent, and where the disease is therefore sure to spread. Many experiments in smearing or spraying camels with various anti-fly emulsions in localities where blood-sucking flies were abundant and surra was prevalent, are described. Creosol emulsion, consisting of creosol, 1 oz.; pix liquida, 2 oz.; soft soap, 8 oz.; water, 3 pints, was found to have some slight efficacy in warding off the attacks of Tabanids when animals were kept in the shade. As soon as this emulsion has dried on the skin, it loses its effect and in the case of animals kept in the sun the effect lasts only about half an hour. Jensen's emulsion (consisting of kerosene oil, 1 gal., powdered naphthaline, 4 oz., soap, 1 lb., water, 4 gals.) cannot be recommended for camels, as it causes severe blistering of the skin. It is said to protect cows against *Stomoxys calcitrans* and *Lyperosia irritans* for a week. On camels, it was efficacious against Tabanids for about 12 hours. Citronella oil prevents Tabanids and *Stomoxys* from attacking for a few hours, but has no repellent action after 17 hours. Cod-liver oil does not prevent flies of either genus from attacking camels. Aniseed oil was found to have no repellent action against Tabanids $2\frac{1}{2}$ hours after application. It has a slight repellent action against *Stomoxys*, but only for a very short time. The application of only one pint of aniseed oil was found to cause great restlessness in the camels. Castor oil had no effect against either *Stomoxys* or Tabanids, when only one pint per camel was used; 4 pints per camel prevents attack for three days and gives partial immunity for about two days longer. This oil is liable, when exposed to the air, to thicken and form a varnish-like film on the skin, but so far no harmful effect has been observed. This treatment is too expensive to be of practical use.

Camels actually suffering from surra were treated with arsenic alone or a combination of arsenic and soamin with excellent results. Ponies were found to be liable to surra infection from camels.

VILLENEUVE (J.). **Description of a new Species of *Stomoxys* (Diptera) from South Africa.**—*Annals S. African Museum, Cape Town*, xv, no. 6, 8th December 1916, pp. 453–454. [Received 24th April 1917.]

Stomoxys transvittata, sp. n., is described from Natal.

MAYNARD (G. D.) **The Trypanosomes of Sleeping Sickness; being a Study of the Grounds for the alleged Identity of *T. brucei* with those causing Disease in Man in Nyasaland.**—*S. African Inst. Med. Res., Johannesburg*, no. 6, 17th December, 1915, 39 pp. [Received 30th April 1917.]

This paper criticises the conclusions arrived at by the Sleeping Sickness Commission of the Royal Society, which, in the author's view, do not rest upon a sure foundation of fact. In analysing the morphology and measurements of the various strains of trypanosomes, of which a number of charts are given, the author finds that, while the dimorphic trypanosomes, *T. rhodesiense*, *T. brucei*, *T. gambiense* and the trypanosomes of Nyasaland sleeping sickness and of the Nyasaland wild game strain have certain features in common, at present no valid evidence as to the identity or otherwise of *T. brucei* and the trypanosome causing disease in man in Nyasaland can be drawn from length-measurement-distributions; at present the only valid argument in favour of the identity of these blood parasites is to be drawn from experiments in regard to their pathogenicity for animals. There is some evidence to suggest that there is less similarity between the Nyasaland human strain and *T. brucei* than between *T. rhodesiense* of Stephens and Fantham and *T. gambiense* as recorded by these authors. The author considers that the immunity experiments carried out by the Commission and others negative the suggestion of the identity of *T. brucei*, the Nyasaland human strain, the Nyasaland wild *G. morsitans* strain and *T. rhodesiense*. There is no evidence at present from the known geographical distribution of *T. brucei* to suggest that it is a cause of sleeping sickness in man ; and even if it were found to produce disease in man, this would of itself constitute no greater argument in favour of its identity with the Nyasaland strain than with *T. gambiense.* The author therefore concludes that there is very little scientific evidence to support the contention that *T. brucei* and the trypanosome causing sleeping sickness in Nyasaland are the same species, while there are some very valid reasons for regarding them as distinct. On the supposition that they are probably distinct species, several alternative hypotheses are put forward as to the derivation of the human strain.

In conclusion it is pointed out that, unless an unmodified game strain be the cause of human trypanosomiasis, the human carrier is of much greater importance than the wild animal, and consequently the recommendations of the Commission cannot, unless considerably modified, be considered as a satisfactory solution. The wholesale destruction of the big game of Africa cannot be accomplished without profoundly affecting the economic position on this Continent, nor, even if it could be satisfactorily carried out, can any positive guarantee be given at present that the situation in respect of sleeping sickness would be improved.

Отчеты Малярiйныхъ Экспедицiй 1904 и 1905 гг. [The Reports of the Malaria Expeditions in 1904 and 1905.]—**« Труды Коммиссiи по изученiю малярiи въ Россiи.»** [The Work of the Commission for the Study of Malaria in Russia], *Moscow*, 1915, pp. 17–218, 5 tables of figs. [Received 30th April 1917.]

The Institute of Experimental Medicine assigned in 1904 a grant of about £1,000 for an expedition to Gagri to study malaria on the Black Sea coast of Caucasia. This expedition was organised by the Malaria Commission of the Pirogov Society of Surgeons and took place in 1904, while another expedition was undertaken the next year to some localities adjoining Gagri ; both expeditions were under the leadership of the late Dr. N. M. Berestnev. For various reasons the publication of the full reports could not take place before, although notes dealing with the mosquitos observed by A. S. Skornikov appeared in 1906 in Nos. 3 and 4 of the Revue Russe d'Entomologie.

Two species of Anophelines, *Anopheles maculipennis* Meig., and *A. bifurcatus*, L., were present, though in small numbers. Species of *Culex* were more numerous. The mosquito larvae were found in stagnant or slow-moving waters, but, whereas larvae of *Culex* were found indiscriminately in all these, those of *A. bifurcatus* were present in more or less cool water, while those of *A. maculipennis* were only found in warmer water. Contrary to the usual statements, the Anophelines were found breeding in comparatively clean ditch-water, containing water-plants, and showed a marked preference for the water of reservoirs. The water in these reservoirs contained examples of the beetles, *Acilius sulcatus*, L., and *Eretes sticticalis*, L., which were found by experiment to devour the larvae of *Culex*, but not those of *Anopheles*. Though Gagri is a malarial locality, the number of mosquitos present is relatively small, owing to the limited breeding areas. The prevalence of malaria is due to the presence of a great number of infected individuals amongst the changing population.

Examination of the parasites found in the blood of birds showed about 50 per cent. of those examined in August to be infected. *Halteridium danilewski* was found in 12·4 per cent. of cases, *Leucocytozoon* in 3·4 per cent. and *Proteosoma* in 1·7 per cent.

The second expedition in 1905 was undertaken to Pilenkovo, Vesselaya and surrounding localities, which are regarded as important foci of malaria, the large majority of the population having been attacked. Owing to use of quinine in the first of these, the cases were less severe and the percentage of infested mosquitos was lower. Parasites were found in 81·6 per cent. of the primary cases and in 45 per cent. of the relapsing ones. Most of the patients suffered from the pernicious form of malaria, the tertian and quartan forms being less common. Mixed infections, the number of cases of which was 32, were *Plasmodium vivax* and *P. malariae*, 25; *P. vivax* and *P. praecox*, 3; *P. malariae* and *P. praecox*, 2; *P. vivax*, *P. malariae* and *P. praecox*, 2.

The predominant species of mosquito was *Anopheles maculipennis*, Meig., *A. bifurcatus* being only found occasionally.

Examinations of mosquitos as regards infection with parasites were carried out on a large scale. An average of 6·4 per cent. of mosquitos proved to be infected, the figure varying from 3 per cent. in Pilenkovo and 8·2 per cent. in Vesselaya to 25 per cent. in the environs of the first locality. The highest percentage of infected mosquitos was found in September, when there was also the greatest number of cases of malaria.

The Culicines were chiefly represented by *Culex pipiens*, though some other species were also present; about 3·8 per cent. of these were infected with non-malarial parasites, such as filaria and crithidia. A table showing the parasites found in the blood of various birds and other animals is given, followed by some discussion on their morphology.

Short résumés in French are appended to these reports.

Marzinovsky (E. I.). **Борьба съ малярiей и общественныя организацiи.** [Public Organisations and The Control of Malaria.]—Published by the Pirogov Malaria Commission, *Moscow*, 1916, 18 pp., 3 tables of figs.

This is a popular account of the causes and control of malaria and of the part which can be played in the campaign against mosquitos by various public organisations.

Robertson (M.). **Report upon the Present Condition of the Siroko Valley.**—*M.S. Colonial Office Report.* Dated 21st January 1914. [Received 19th May 1917.]

In the Siroko Valley, on the west side of Mount Elgon in Uganda, there are three narrow strips of forest infested with *Glossina palpalis*, which lie along parts of three rivers, and the fly is also found in two swampy forest patches in connection with the Siroko River. In the upper part of these rivers the fly does not occur, although the vegetation is apparently in many places well adapted to its existence. It seems as though the increased height and the close proximity to the mountain produces some condition, probably of temperature, unfavourable to their existence. The geographical position of the fly-area, which is shown on an accompanying map, practically isolates it, and experiments to determine the infectivity of *G. palpalis* in the valley led to the conclusion that there is no positive evidence pointing to the presence of pathogenic trypanosomiasis in the valley, while there is a very considerable amount of evidence indicating its absence. Though 1,004 flies from this area were fed upon healthy dogs and a goat and were examined daily for trypanosomes, the results were negative. Dissection of these flies, showed flagellates in the gut of 2·4 per cent., while only one specimen showed flagellates in the proboscis also. These flagellates in every case were characteristic of *Trypanosoma grayi* and were of a type that forms no part of the life-cycle of any of the pathogenic group of mammalian trypanosomes, such as *T. pecorum*, *T. vivax*, *T. uniforme* and *T. brucei*; they were most probably derived from the very numerous crocodiles which are to be found in all these rivers. Nine inoculations were made of the blood from buck, shot in the valley, into healthy dogs with negative results.

No case of sleeping sickness has ever been reported from the Siroko Valley, but while the district is a closed area in so far as the cultivation of the land and the building of permanent huts is concerned, the valley is open to native tribes who have a good deal of connection with the sleeping sickness areas in the vicinity and who come freely to the valley to hunt. There is, therefore, no guarantee as to the permanent safety of this area. The report recommends general measures for the protection of the land under consideration and for the repopulation of the valley. It is suggested that certain native tribes should be allowed to settle in the valley, conditionally upon a preliminary clearing of the land and closing of the valley to those tribes which have hitherto visited it from fly-infested areas. Domestic animals should be protected by perpetuation of the existing rinderpest regulations and, where necessary, movements of cattle, other than transport oxen, should be prohibited for a period of three years.

Belli (C. M.). **La Profilassi navale del Tifo esantematico, Febbre gialla, Peste, Colera, Tifo abdominale, Scorbuto e Beri-beri, alla Luce delle nuove Dottrine.** [Naval Prophylaxis of Exanthematous Typhus, Yellow Fever, Plague, Cholera, Enteric Fever, Scurvy and Beriberi, viewed by the Light of New Doctrines.]—*Ann. Med. Navale e Coloniale, Rome*, 32nd year, ii, no. 5–6, November-December 1916, pp. 522–567.

This paper deals with modern methods of prophylaxis against these diseases on board ship. The control of the insect vectors of exanthematous typhus, yellow fever and plague is recognised as providing a formidable weapon against these maladies and appropriate measures are briefly described.

Niclot (—). **Le Paludisme en Grèce, en Macédoine et à l'Armée d'Orient.** [Malaria in Greece, in Macedonia and the Army of the East.]—*Archives Méd. & Pharm. Militaires, Paris*, lxvi, no. 6, December 1916, pp. 753–774. [Received 29th March 1917.]

Malaria has been endemic in Greece since the most ancient times, and at the present day in Old Greece 800,000 persons are affected each year. Mosquitos abound, and in 1912 Cardamatis drew up the following table of proportionate occurrence of Anophelines, especially near Athens:—*Anopheles claviger*, 42·50 per cent.; *A. superpictus*, 50 per cent.; *A. bifurcatus*, 5·55 per cent.; *A. pseudopictus*, 1·85 per cent.

Up to the time of writing, the author has identified only *A. claviger* or *A. maculipennis* at Salonica or in Macedonia. In some places in the hinterland, *A.* (*Nyssorhynchus*) *pseudopictus* was also observed, as well as a species resembling *A.* (*N.*) *superpictus*. So far no examples of *A. bifurcatus* have been taken. *Stegomyia fasciata* (*calopus*) occurs at Salonica, where *Phlebotomus* also abounds. In addition to a carefully supervised quinine prophylaxis, there were served out to the Army of the East 112,300 mosquito nets for men standing up and 48,810 for men lying down. All standing water received attention, and, where oiling was required, a mixture of 9 parts "pétrole lampant" and 1 part spidoléine André was found satisfactory. No cases occurred in one regiment in which quinine prophylaxis and the use of mosquito nets were rigidly enforced.

P. S. **Къ борьбѣ съ куринными клещами.** [The Control of Ticks on Fowls.]—**« Туркестанское Сельское Хозяйство.»** [*Agriculture of Turkestan*], *Tashkent*, xi, no. 5, May 1916, pp. 463–464. [Received 10th April 1917.]

To protect fowls from ticks (*Argas persicus*), the adults of which hide during the day and attack the birds at night, it is suggested that the perches should be scorched at least once every three days with a torch of burning straw or wood-shavings. The use of perches isolated by cups containing oil or kerosene from the walls and floor of the houses is recommended, as well as frequent whitewashing of the houses, which should be constructed with a minimum of wood; the laying boxes must also be so made as to allow of proper disinfection.

Roubaud (E.). **Cas de Paludisme contracté dans l'Aisne.** [A Case of Malaria contracted in the Department of Aisne.]—*Bull. Soc. Path. Exot., Paris*, x, no. 3, 14th March 1917, p. 171.

A case is recorded of a French soldier having no previous colonial or malarial history, who developed this fever in August 1916, after having been in the same district since 17th February of that year. He had had no direct contact at any time with colonial troops, but at the time when the attack developed, Moroccan contingents were in the trenches to the left of his sector and mosquitos were abundant.

Weiss (A.). **Sur un Pulicide nouveau de l'Afrique mineure.** [On a new Flea from North Africa.]—*Bull. Soc. Hist. Nat., Algiers*, viii, no. 3, 15th March 1917, pp. 55–62, 3 figs.

Pulex raptoris, sp. n., obtained from Tunis, from a porcupine (*Hystrix cristata*), is here described.

Piettre (M.). **L'Onchocercose bovine dans l'Amerique du Sud.** [Bovine Onchocercosis in South America.]—*Recueil Méd. Vét., Paris*, xcii, no. 14, 30th July 1916. [Received 30th April 1917.]

Onchocercosis has been found to occur very frequently in South America. Among cattle destined for preserved meat factories as many as 70 or even 90 per cent. of the animals have been found to be infected.

Hendley (H.). **Report on Malaria in the Punjab during the Year 1915, together with an Account of the Work of the Punjab Malaria Bureau.** *Lahore*, 1916. [Received 30th April 1917.]

During the year 1915, the total fever mortality was 284,784, or a death-rate of 14·72 per thousand of the population, as compared with 345,471 (17·86 per thousand) in 1914 and 331,698 (17·15 per thousand) in 1913. No malaria occurred in an epidemic form in 1915 except in certain isolated areas. The localities that suffered most were those along river banks, visited by local inundations. The immediate effect of floods is to check the development of malaria by the destruction of breeding places of Anophelines; after the waters have subsided, however, stationary collections of water are left in ditches and on uneven land, where the natural enemies of mosquitos are rarely found, and it is in these temporary breeding places that Anopheline larvae develop, giving rise to epidemics.

Some investigations were made during the year by the Punjab Malaria Bureau in connection with the effect of certain aromatic plants on *Anopheles*, in the course of which it was discovered that the smoke of saponified cresol was a very deadly culicide. A weak solution was used in fire buckets and in small puddles and collections of water and was found to destroy Anopheline larvae speedily, though the pupae exhibited considerable resisting power and required 24 minutes' exposure before they were killed.

Tables and charts are given showing comparisons of spleen census records, fever mortality, endemic and epidemic areas and maps of the various Punjab districts under review.

ENTOMOLOGICAL NOTICES.

Mr. James Waterston, of the Imperial Bureau of Entomology, was gazetted Lieutenant R.A.M.C. on the 25th May 1917, and has been detailed for special entomological work with the British Expeditionary Force, Salonica.

Mr. Nigel K. Jardine has been appointed by the Ceylon Government to a temporary entomological post for the investigation of the Tea Tortrix in that Island.

NOTICES.

Secretaries of Societies and Editors of Journals willing to exchange their publications with those of the Bureau, are requested to communicate with the Assistant Director.

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MOTE (D. C.). **Observations on the Distribution of Warble Flies in Ohio.**—*Ohio Jl. Sci., Columbus,* xvii, no. 5, March 1917, pp. 169–176, 1 fig., 1 map., 3 tables.

The object of the investigations recorded in this paper was to determine (i) whether the warble flies, *Hypoderma bovis* and *H. lineata,* both occur in the State of Ohio, (ii) which species was sufficiently numerous to be markedly injurious to dairy cattle or to the beef industry, (iii) their local and regional distribution, and (iv) to study the conditions favouring their increase or decrease.

The distribution within the State is given in detail, *H. bovis* being much the more abundant and forming 83·5 per cent. of the total collected. *H. lineata,* the North American warble fly, probably occurs in every State in the Union, though it appears to be more numerous in the southern and central western States. *H. bovis,* the so-called European species, predominates both in distribution and abundance in the north-eastern States. In the western two-thirds of the United States, *H. bovis* appears to be found in rather restricted and well separated areas. Both species were found to be more abundant in the north-eastern section of Ohio, while the largest number of herds free from infection were noted in the north-western section. The earliest collections of *H. bovis* were received early in March from north-eastern Ohio, while the latest specimens came from south-western Ohio in June. One warble was observed in the Ohio Station herd in July. The first specimens of *H. lineata* came from south-western Ohio on 25th March, the last from the same district in the early part of May. Under normal conditions *H. lineata* is the earlier fly to appear. It is stated by Dr. Sheets of Van Wert county that, as a rule, native cattle are free from these insects, only imported cattle being infested. Some stockmen report that they never have had grubs in their cattle, while others state that their cattle have had grubs in the past, but are now free, owing to a systematic campaign of squeezing them out.

Investigation tends to show that young animals are more liable to infestation than old stock.

Sandflies and Mosquitoes.—*Public Health, London,* xxx, no. 7, April 1917, p. 170.

In this article a letter from F. M. Howlett to the *Times* is reproduced, recommending the following mixture as a protection against sandflies and mosquitos:—Oil of cassia, 1 part; brown oil of camphor, 2 parts; vaseline or salad oil, 4-5 parts, or lanoline. These ingredients must be well mixed and the mixture should be rubbed on the skin in small quantities. The formula was evolved from a considerable number of experiments made in India on the relative value of essential oils as deterrents for sandflies and mosquitos. Other correspondents suggest oil of citronella; essential oil of lavender and methylated spirits in equal parts; oil of pennyroyal; equal parts of oil of eucalyptus, oil of anise, and oil of turpentine.

PEACOCK (Lce.-Sgt. A. D.). **The Louse Problem at the Western Front.** *H.M. Stationery Office, London,* 1916, 29 pp., 9 figs., 2 tables.

The subject matter of this pamphlet has already been abstracted [see this *Review*, Ser. B, iv, p. 133].

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Bacot (A. W.). The Louse Problem.—Separate, dated 23rd February 1917, from *Proc. Roy. Soc. Medicine, London*, 1917, x, (Sect. of Epidemiology and State Medicine), pp. 61–94. [Received 19th May 1917.]

The experimental part of this paper has already been noticed [see this *Review*, Ser. B, v, p. 69]. Preventive measures for the protection of troops at the front naturally fall into two groups, the establishment of baths, wash-houses and laundries for the treatment of discarded clothing, and the issue of insecticides, including quick-acting remedies for use in emergencies and more stable slow-acting ones for continuous use. The question of economy of fuel and time should not be overlooked in the treatment of clothing; for example, dry heat at 130° F. applied for 30 minutes will destroy all lice and their eggs, as well as the active females of *Sarcoptes* causing itch, thus obviating the waste of time and additional fuel required to dry the garment after the application of hot water or steam. The ironing of the seams of tunics and breeches is effective and convenient, though economy of labour and greater efficiency could be obtained by hanging the garments in a hot room, or, better still, when speed and economy of fuel are important factors, by passing them through tubular ovens on travelling hangers. Similarly in the cleansing of undergarments and bedding, eggs are destroyed by the action of boiling water in half minute, the addition of chemicals being thus superfluous. On the other hand, if insects and eggs can be killed more conveniently or cheaply by chemicals, the process of boiling in addition is wasteful.

Insecticides may act either by contact or vapour, but for practical purposes in this connection contact remedies only are efficacious. The essential point in their use is a knowledge of the best method of application. Probably the worst and most wasteful is that of direct application to the skin. In the case of rapidly dissipated oils, they must be evenly distributed in minute quantities by means of a medium which retards their action and for this purpose the best substance is soap, which may be used as a paste or as a watery emulsion and aids in the final cleansing of the garment. The best remedy, which remains effective for nearly a week and is inexpensive, consists of crude carbolic acid emulsified with soft soap in the proportion of 45–50 per cent. soap to 55–50 per cent. of carbolic, sufficient heat being used to melt the soap thoroughly. The best strength for impregnating garments is from 5–10 per cent. according to climate or the time of year, as its action depends on the amount of perspiration. An average-sized shirt takes up 1,000 c.c. of fluid and retains 500–600 c.c. after wringing, and costs at pre-war rates $\frac{1}{2}$ to 1 penny according to the strength of the solution. The comparative slowness of its action is its only drawback. The most efficient, cheap, and quick-acting remedy is naphthaline, which is soluble to the extent of 40 per cent. in benzine, of 5–10 per cent. in methylated spirit and of 15 per cent. in paraffin. With the application of heat, it can be dissolved in oil or oily fluids, and subsequently made into a watery emulsion for the purpose of impregnating clothing.

The paper concludes with a summary of insecticides for the treatment of clothing and for the destruction of lice and their eggs.

Gunn (J. A.). **A Note on the Prevention of Pediculosis.**—*Brit. Med. Jl., London,* no. 2940, 5th May 1917, pp. 579–580.

The experiment of impregnating thin cotton undervests with a soluble insecticide was made in the spring of 1915. The insecticide used was a solution of 1½ oz. each of naphthaline and sulphur in 1 gal. of benzol or petrol, the cost at that time being about one farthing per garment. The result was perfectly satisfactory, the shirts proving excellent for scabies, causing no irritation, and actually killing the lice, though rather slowly, as they pass several days in a dormant state before dying. The vests have even been used under plaster jackets without causing irritation and form a complete protection against lice.

Furno (A.). **La Lotta contro la Pediculosi fra le Truppe in Guerra.** [The Control of Pediculosis among Troops in War.]—*Annali d'Igiene, Rome,* xxvii, no. 3, 31st March 1917, pp. 141–157.

In the trenches sachets worn between the outer and under garments provide the only practical means of keeping troops free from lice. The best formula was found to be:—Coarse naphthaline, 50 parts by weight, and either creosote, 1 part, or camphor, 5 parts. The camphor mixture is less strong and lasting. When the troops are out of the trenches, their clothing can be treated with steam under pressure at a temperature of 239°–248° F., but this method has the disadvantage of being a lengthy process and involving drying. Dry heat at 178°–195° F. is most efficacious and does not injure the grey-green cloth of the uniform. Most excellent results were attained by boiling in water to which 3 per cent. of potassium pentasulphide ($K_2 S_5$) had been added. In these experiments the samples were boiled for 15 minutes and then washed in ordinary cold water. The use of sulphur dioxide (SO^2) is not advised, as it has no effect on the eggs.

Cumming (J. D.). **Report of the Bureau of Communicable Diseases for February 1917. A Résumé of the Typhus Situation in California.**—*Mthly. Bull. Cal. State Bd. Health, Sacramento,* xii, no. 10, April 1917, pp. 213–217.

The appearance of typhus in California during the spring of 1916, among the Mexican immigrants employed on the railroads, and its subsequent increase led the State Board of Health to institute control measures in the autumn to prevent its becoming endemic in the cities. The regulations included the enforcement of louse-eradication measures in the section camps, the establishment of observation camps and the reporting to the Board of all new arrivals from Mexico. A weekly bath with kerosene and warm water followed by a complete change of clothing was made compulsory for all camp occupants. These regulations were printed in Spanish and posted in each section camp, with the result that louse-infestation was practically eliminated, and the number of typhus cases so much reduced, that the fear of its becoming endemic no longer existed in the spring of 1917.

HIRST (S.). **Species of Arachnida and Myriopoda Injurious to Man.**—*Brit. Mus. (Nat. Hist.), London*, Economic Ser. no. 6, 1917, 57 pp., 26 text-figs., 3 plates. [Received 16th May 1917.]

This pamphlet gives an account of the structure, distribution, life-history and habits of Arachnids and Myriopods which are in any way injurious to man. The Myriopods are comparatively unimportant in this respect; the Arachnids dealt with include mites, scorpions, spiders and ticks and harvest-bugs, many of which are concerned in the dissemination of disease.

BISHOPP (F. C.). **Some Problems in Insect Control about Abattoirs and Packing Houses.**—*Jl. Econ. Entom., Concord, N.H.*, x, no. 2, April 1917, pp. 269–277, 1 plate.

The question of dealing with animal products under sanitary conditions has given rise to so many problems in the United States that the meat inspection service has requested the coöperation of the Bureau of Entomology in the study of the relation of insects to the packing industry, and particularly in connection with fly repression. It is generally found that the packing houses under bad fly conditions produce the major part of the flies and other insects which constitute a danger, but even the best conducted factories are confronted with the problem of destroying the still numerous flies from neighbouring factories or surrounding breeding places. Most of the larger establishments are already under Government inspection, and very much has already been done towards eliminating insanitary conditions in both buildings and yards, but the condition of the smaller factories still constitutes a serious menace to public wellfare.

The insects that give trouble in packing houses include house-flies, blow-flies, cockroaches and ham and hide beetles. The flies are by far the most dangerous, the other insects usually giving most trouble among the inedible parts of the materials dealt with and where fresh blood is present, while the former not only occur under these conditions, but are most numerous where the finished food products are to be found. The most troublesome fly is *Phormia regina*, and this is later supplemented by *Lucilia caesar*, *L. sericata*, *Cynomyia cadaverina* and several species of *Calliphora*, including *C. erythrocephala*, *C. vomitoria*, *C. coloradensis* and *C. iridescens*. In the south, the screw-worm-fly, *Chrysomyia macellaria*, is often abundant in the summer season. The Anthomyid flies, *Ophyra aenescens* and *O. leucostoma*, are often numerous, but are rarely found in buildings. The skipper-fly, *Piophila casei*, causes considerable loss in small establishments where simple precautions are not taken against it. This is also the case with the ham and hide beetles [*Dermestes*], while cockroaches are chiefly troublesome in old and badly built establishments.

Almost all the known means of fly control have been resorted to in order to meet the various conditions. The installation of modern equipment with ample capacity for such processes as tankage drying, hair and bone drying, and adequate storage room; the concreting of horse stalls and manure pens; prompt removal of waste products and bi-products, and similar measures have done much to abolish breeding places. The most important improvement is the installation of incinerators with sufficient capacity to handle all refuse, and these installations should be considered as a primary measure by every municipality, as well as the packing houses. When all possible breeding places have been eliminated, there still exist some temporary breeding places which must be treated for the destruction of maggots and the prevention of egg-laying. Crude petroleum has been found very successful in this connection, but where the amount of material is large, the oil must be used very freely and frequently. Where incineration is not practised, the use of borax on breeding media has been found satisfactory. The prompt covering of breeding materials on dumps with fuller's earth, which has been discarded after use in lard refining, has been found to check fly breeding, but should be employed only as a supplemental or temporary measure. Since flies are attracted from considerable distances by the odours produced by packing establishments, the question of reducing these is important. Fresh meat should be kept covered as much as possible and carcases passed promptly into the coolers. Fly-traps are distinctly useful against flies attracted from a distance and, while the Hodge type window trap has been found useful, it is generally better to catch the flies by a bait outside the buildings. The mucous membranes from pigs' intestines (a by-product of sausage-skin manufacture), has proved the most attractive bait for blow-flies and also catches a large percentage of house-flies. Near edible matter, where the house-fly is the commonest, stale beer is a satisfactory bait.

In wholesale markets, etc., it is important that all flies should be excluded. Window-screening is useful in this connection, supplemented by blowing devices in passage-ways. In order to prevent the entrance of flies through the chutes with the live stock, the provision of a considerable darkened space before the cattle enter the pens has been found effective. Shipments of hams and bacon should be carefully wrapped up to avoid infestation by skipper-flies, and should be stored in clean, dry rooms screened with fine mesh wire. Cockroaches give little trouble where structures are built of brick and cement and cleaned with hot water or steam. In storage rooms, the use of sodium fluoride is an efficient control.

Over 62,000,000 animals were dealt with under Government inspection during the year, while over 40,000,000 are slaughtered without inspection. The first step towards mitigation of the fly trouble is to secure effective supervision and control over all such plants. Where incineration is not feasible, prompt burial under two feet of soil after the offal has been sprinkled with borax, thorough screening of buildings, and the installation of covered drains will accomplish much in reduction of the fly pest.

The Value of Economic Entomology in the War.—*Jl. Econ. Entom., Concord, N.H.*, x, no. 2, pp. 299–300.

The present crisis has accentuated the need for the conservation of development of all resources, many of which, such as life, health and food, have a close relation to applied entomology, and there are great opportunities for the economic entomologist to demonstrate the utility of his calling. The urgent necessity for better sanitation with regard to the insect problem warrants an entomological staff being attached to every large camp and hospital centre to handle, with the co-öperation of the medical or sanitary corps, the problems relating to flies and other disease-carriers, as well as those concerning body parasites and animal pests. The economic entomologist is also needed to advise and urge the adoption of measures which will minimize the effect of insect ravages, especially upon staple crops, and every effort should be made to forecast, and where possible forestall, insect depredations, rather than to adopt remedial measures after infestation is established, as the entomologist is frequently called upon to do.

Brown (W. G.). **The Blow-Fly Pest.**—*Queensland Agric. Jl., Brisbane,* vii, no. 3 March 1917, p. 119. [Received 7th May 1917.]

In regard to the treatment of sheep against blow-flies, a suggestion has been made that if sheep are thoroughly washed at the beginning of the summer, thus removing the dirt and grease from the wool, they would be safeguarded against attack. This is probable, because sheep with light, dry wool and cross-breds are not so liable to attack as merino sheep with dense and greasy wool. Further, experiments with poisonous and non-poisonous dips tend to show that the cleansing effect involved in the process bears more than a small share in the efficacy of the treatment.

Taylor (F. H.). **Malaria Mosquito Survey of Irrigation Areas in the Murray River District.**—*Commonwealth of Australia Quarantine Service, Melbourne,* Publication no. 12, 1917, 32 pp., 7 maps, 28 figs.

The purpose of this survey was the examination of the principal irrigation districts bordering on the Murray River, in order that the absence or prevalence of the malaria-carrying species of mosquito should be determined. This is considered a matter of fundamental importance in view of the fact that preparations are being made in many of these districts to establish there men returned from military service abroad, many of whom are infected with malaria. The survey was conducted immediately after a period of exceptional rains over the whole area, and abnormal flood conditions were existent, the prevalence of mosquitos being greater than usual. *Anopheles* (*Nyssorhynchus*) *annulipes* occurs throughout the irrigation area in considerable numbers, especially in the neighbourhood of human habitations. Detailed reports from the various irrigation districts are given, the conditions of each being described and the number of Anophelines and Culicines recorded. The latter included *Culicada* sp., *Grabhamia* sp., *Ochlerotatus* (*Scutomyia*) *notoscriptus*, Skuse, *Stegomyia* sp., *Culex fatigans* and *C. sitiens.* In one district near Lake Boga, mosquitos were remarkably scarce, probably owing to the presence of large numbers of dragonflies, especially *Xanthagrion erythroneurum*, Selys, and *Austrolestes annulosus*, Selys.

Leger (M.) & Mouzels (P.). *Plasmodium* **of** *Iguana nudicollis.*—*Bull. Soc. Path. Exot., Paris,* x, no. 2, 14th February 1917, pp. 95–98.

Iguana nudicollis, found in Guiana, is frequently infested with *Plasmodium carinii*, sp. n., which is considered to be distinct from other species found in lizards. This Haematozoan and its allies bear a close resemblance to *Plasmodium praecox.*

Yakimoff (W. L.) & Collaborators. **Microfilaires des Animaux au Turkestan russe.** [Microfilariae of Animals in Russian Turkestan.] *Bull. Soc. Path. Exot., Paris*, x, no. 2, 14th February 1917, pp. 102–105.

In examining the microfilariae of cattle, the authors have observed a minute parasite which resembles the sausage-like stage of *Filaria bancrofti* as found in the thoracic muscles of *Culex fatigans.* This parasite is believed to be identical with the embryo of *Filaria labiato-papillosa.*

Laveran (A.). **Au Sujet de l'Evolution des Infections experimentales des petits Rongeurs.** [Concerning the Development of experimental Infections of small Rodents.]—*Bull. Soc. Path. Exot., Paris*, x, no. 2, 14th February 1917, pp. 110–113.

It has previously been stated that small rodents, such as mice, when inoculated in the peritoneum with *Leishmania tropica* exhibit a general infection followed by tumours or similar symptoms of local infection. The experiments conducted by the author have, however, given entirely different results and in his experience the local infection has in every case preceded general infection, which was often entirely lacking in mice that were killed within a short time of the inoculation.

Greggio (G.). **Trypanose des Porcs ; Relations des Porcs avec la Trypanose humaine dans la Vallée de l'Inkissi (Moyen Congo Belge).** [Trypanosomiasis of Pigs; Relation between Pigs and Human Trypanosomiasis in the Inkissi Valley (Middle Belgian Congo).]—*Bull. Soc. Path. Exot., Paris*, x, no. 2, 14th February 1917, pp. 113–117.

Of 94 pigs brought to the Kisantu market that were examined for trypanosomes, 38·3 per cent. were found to harbour *Trypanosoma congolense.* The infection was found to be general throughout the Inkissi valley, the infected animals frequently showing no outward symptoms of disease. While there is no direct correlation between the existence of the human trypanosome and that of the pig, indirectly the keeping of pigs constitutes a serious danger to the inhabitants, the animals affording an abundant and favourite food-supply for *Glossina* and encouraging its increase. The pigs roam freely about the country in search of food, which is often to be found in the most fly-infested spots, and return to the villages bearing flies on their bodies. These include several species, *G. palpalis* being the most common. Though this slightly wooded region is climatically and topographically ideal from the point of view of resistance to sleeping sickness, 758 deaths from this disease occurred in the years 1910–1913. It is probable that a few natives became infected when travelling in the neighbouring districts and thus the wooded slopes beside the streams, where the pigs wander and *G. palpalis* are abundant, have become centres of infection.

Van Saceghem (R.). **Dermatose et Gale démodectique des Bovidés.** [Dermatosis and Demodectic Mange of Cattle.]—*Bull. Soc. Path. Exot., Paris,* x, no. 2, 14th February 1917, pp. 117–120.

The two diseases described in this paper are frequently confused although they differ both in their causation and clinically. Demodectic mange of cattle is caused by *Demodex folliculorum* and is characterised by the presence of comedones. The disease occurs with equal intensity in the dry or rainy season, and can be controlled by the regular use of arsenical dips.

Dermatosis is caused by a bacterium, *Dermatophilus congolensis,* and is easily recognisable by the scabs which it causes on the skin. Contagious dermatosis is a seasonal malady which rages in the rainy season in tropical countries ; in the dry season it dies out or becomes chronic. The control for this disease is the application of 5 to 10 per cent. carbolated vaseline to the skin. The two diseases may co-exist on the same animal, which is probably the cause of the confusion that has arisen.

Clapier (—). **Les Porteurs de Kystes filariens (*Onchocerca volvulus*) et de Nodosités juxta-articulaires en Pays Toma (Région militaire de la Guinée).** [Cases of Filarian Cysts (*Onchocerca volvulus*) and of juxta-articulary Nodules in the Toma country (Military region of Guinea).]—*Bull. Soc. Path. Exot., Paris,* x, no. 2, 14th February 1917, pp. 150–157.

The characteristics of these two diseases are compared and contrasted. The author has no new hypothesis to offer on the etiology of Jeanselme's juxta-articulary nodules, but he is convinced that they are quite distinct from the cysts produced by *O. volvulus,* which is apparently limited to the lymphatic system in its pathogenic action and plays a part, not yet determined, in the genesis of elephantiasis.

Van Saceghem (R.). **Cas suspects d'East Coast Fever au Congo.** [Suspected cases of East Coast Fever from the Congo.]—*Bull. Soc. Path. Exot., Paris,* x, no. 3, 14th March 1917, pp. 172–173.

The generally accepted view with regard to African coast fever is that it is due to *Theileria parva,* but recently certain writers have advanced the theory that the specific agent may be a filterable virus. The fact that *Theileria parva* has been found with certainty only in well-established cases of this disease does not support this view. Among cattle at Zambi, on the lower Congo, a disease has been noticed which has all the symptoms of African coast fever, but in which it has been impossible to demonstrate this parasite in any of the affected internal organs. A microscopic examination of the blood, however, showed the presence in the red corpuscles of small numbers of parasites apparently identical with *T. parva.* Lack of material prevented transmission experiments. The disease ravaged only an isolated herd, and all the animals attacked died, the mortality reaching 40 per cent. in a few months.

LEGER (M.) & MOUZELS (P.). **Piroplasme et Microfilaire d'un Edenté, le *Bradypus tridactylus*, Linné.** [Piroplasma and Microfilaria of an Edentate, *Bradypus tridactylus*, L.]—*Bull. Soc. Path. Exot., Paris*, x, no. 3, 14th March 1917, pp. 173–176.

Several haemotozoa have recently been described from the Edentates of French Guiana, including *Endotrypanum* and a trypanosome from *Choloepus didactylus*, the two-toed sloth, a trypanosome and microfilaria from *Tamandua tridactyla*, and a microfilaria from *Bradypus tridactylus*, the three-toed sloth. The last-named animal harbours in its blood an endoglobular parasite, *Theileria brimonti*, sp. n., and upon it has been found a tick, *Amblyomma varium*, Koch. *Microfilaria kerandeli*, Brim., has also been found in its blood and lungs.

GRALL (C.). **Paludisme "épidémié."** [Epidemic Malaria.]—*Bull. Soc. Path. Exot., Paris*, x, no. 3, 14th March 1917, pp. 184–208.

Malaria was practically the sole disease from which the Balkan army suffered in 1916 during the months of July, August, September and the first part of October. During the first period of the epidemic in April, May and June, quinine was found to cure the disease in its initial stage. In this paper charts are given showing the course of the slight form of fever due to direct Anopheline attacks. The more severe forms are due to the reproduction in the blood of the parasite introduced by the mosquito, the number and size of which are reduced, however, by strong doses of quinine.

The course of the various fevers, whether due to malaria alone, or to intestinal or hepatic amoebic attack, is illustrated by means of charts.

LAVERAN (A.). **Sur la Traitement du Paludisme.** [On the Treatment of Malaria.]—*Bull. Soc. Path. Exot., Paris*, x, no. 3, 14th March 1917, pp. 208–216.

The form of malaria from which the Balkan armies have suffered at Salonica has proved so virulent and difficult of control by the usual quinine treatment, that its identity with that of the usual type has even been questioned. Some doctors have even experimented with the use of arseno-benzol or similar arsenical compounds, alleging that quinine was not sufficiently efficacious. The author, however, considers that the fever at Salonica is of the usual type, aggravated by the intensity of the affection and the decreased resistance, due to over-fatigue, among the troops. In cases that do not yield to quinine there is probably an undiagnosed complication due to the presence of hepatic haematozoa.

VELU (H.). **La Trypanosomiase des Chevaux au Maroc.** [Trypanosomiasis of Horses in Morocco.]—*Bull. Soc. Path. Exot., Paris*, x, no. 3, 14th March 1917, pp. 253–260. [Received 11th April 1917.]

Experimental inoculations of the mule, dog, rabbit, rat, sheep and goat with *Trypanosoma marocanum*, Serg., are described; this organism causes a disease among horses in Morocco and has only been recently recognised. Of the experimental animals the rat was most virulently attacked, the rabbit was far less sensitive; while the dog, which died in about a fortnight, showed in its blood the almost constant presence of the trypanosome. Sheep and goats never showed any trypanosomes in the peripheral circulation, nor any symptoms other than attacks of fever and emaciation. Of the goats, one recovered at the end of thirteen months, the other at the end of twelve months.

LEGER (A.) **Spirochète de la Musaraigne (*Crocidura stampflii*, Jentink).** [Spirochaete of the Shrew (*Crocidura stampflii*, Jentink.)—*Bull. Soc. Path. Exot., Paris*, x, no. 4, 11th April 1917, pp. 280–281.

Spirochaeta crociduræ, sp. n., is recorded from French West Africa in the blood of the shrew (*Crocidura stampflii*), which was also infected with great numbers of *Anaplasma marginale* and a few *Grahamella*.

ARMAND-DELILLE (P.), PAISSEAU (G.) & LEMAIRE (H.). **Note sur les Constatations positives d'Hématozoaires au Laboratoire de Bactériologie de l'Armée d'Orient pendant l'Année 1916.** [Note on the positive Occurrence of Haematozoa in the Bacterial Laboratory of the Balkan Army during the Year 1916.]—*Bull. Soc. Path. Exot., Paris*, x, no. 4, 11th April 1917, pp. 284–287.

Two charts are given showing the seasonal incidence of *Plasmodium falciparum* and *P. vivax* in the Balkans. The high proportion of *P. vivax* in July is followed by its almost complete disappearance, when the tertian malignant form, *P. falciparum*, reaches its height in October. The parasite of quartan malaria was found only four times, and then exclusively in men from Algeria.

LAVERAN (A.). **Boutons d'Orient expérimentaux chez un *Cercopithecus mona* et chez un *Cercocebus fuliginosus*.** [Oriental Sore experimentally produced in *Cercopithecus mona* and in *Cercocebus fuliginosus*.]—*Bull. Soc. Path. Exot., Paris*, x, no. 4, 11th April 1917, pp. 291–293.

The author successfully inoculated two species of monkeys that have not previously been experimented with, *Cercopithecus mona* and *Cercocebus fuliginosus*, with *Leishmania tropica*. Each monkey received three inoculations and on the seventh day after inoculation exhibited the characteristic symptoms of Oriental sore or Biskra boil.

YAKIMOFF (W. L.). **Les Tiques des Animaux domestiques du Turkestan russe.** [Ticks found on domestic Animals in Russian Turkestan.] —*Bull. Soc. Path. Exot., Paris*, x, no. 4, 11th April 1917, pp. 298–301.

The ticks found in Turkestan include *Hyalomma aegyptium dromedarii* and *Rhipicephalus simus* on horses; *H. aegyptium aegyptium*, *Dermacentor reticulatus* and *Margaropus annulatus calcaratus*, on cattle; *H. aegyptium aegyptium*, *H. syriacum* and *M. annulatus calcaratus* on camels; and *Argas persicus* on fowls.

Lists are given showing the geographical distribution of the various ticks found throughout Russia, including: *Rhipicephalus sanguineus*, Latr., *R. simus*, Koch, *Dermacentor reticulatus*, F., *Haemaphysalis concinna*, Koch, *H. punctata*, C., *Argas reflexus*, F., *Ornithodorus canestrinii*, Bir., *O. tholozani*, Lab. & Megn., and *O. talajae*, Guér.

YAKIMOFF (W. L.) & COLLABORATORS. **Maladies animales du Turkestan russe à Parasites endoglobulaires.** [Animal Diseases in Russian Turkestan produced by Endoglobulous Parasites.]—*Bull. Soc. Path. Exot., Paris*, x, no. 4, 11th April 1917, pp. 302–311.

The diseases of animals caused by blood parasites in Russian Turkestan are as follows:—Piroplasmosis of cattle, which is very successfully treated with trypanblue; in horses the disease is caused by *Piroplasma caballi* and *Nuttallia equi*, against both of which trypanblue has given good results. Sheep are attacked less frequently by piroplasmosis than by *Theileria*; and while piroplasmosis is not found in dogs, it is common among wolves. Theileriasis in cattle, due to *Theileria parva*, occurs in two forms, acute and chronic, the first form lasting only a few days and passing into the second. Injections with neosalvarsan and trypanblue have produced no effect on this parasite. In sheep, *T. ovis* is found, and in camels, a form to which the name *T. camelensis*, sp. n., has been given provisionally. Foxes rarely harbour *Theileria*. Nuttalliosis occurs in horses, and in Turkestan is successfully treated with trypanblue, although in the Transvaal this method was tried unsuccessfully, perhaps owing to some difference in the strains. This disease is also found in donkeys. Anaplasmosis is produced in cattle by *Anaplasma marginale* and this parasite has been found in horses associated with *Nuttallia equi*; it is also occasionally found in dogs.

NICLOT (—), **L'Anophélisme Macédonien dans ses Rapports avec le Paludisme au Cours de 1916.** [Macedonian Anophelines and their Relation to Malaria during 1916.]—*Bull. Soc. Path. Exot., Paris*, x, no. 4, 11th April 1917, pp. 323–328.

Much of the matter contained in this paper has already appeared in a previous article [see this *Review*, Ser. B, v, p. 86]. In Macedonia, both in Salonica and the interior, *Anopheles maculipennis* is found to be the most important carrier, its distribution being identical with that of malaria. Whilst suspected pools have been oiled, the breeding places have not been dealt with except in a few sanitary areas. The Anophelines disappeared after the severe weather of November 1915, and only isolated female individuals of *A. maculipennis* were received up to early in May 1916, when a rapid increase began. The abundance of mosquitos reaches its maximum more than a month before malaria is at its height. In 1916, the mosquito season ended late and Anophelines were noticed in January 1917.

The abundance of Anophelines not only increases the amount of disease, but renders it more severe. The repeated inoculation and frequency of re-infection evidently explain why *Plasmodium praecox* is usually more severe at Karasouli than at Salonica.

Dubois (A.). *Onchocerca volvulus* **et l'Eléphantiasis dans le Haut-Ouellé (Congo Belge).** [*Onchocerca volvulus* and Elephantiasis in the Upper Welle Region (Belgian Congo).]—*Bull. Soc. Path. Exot., Paris*, x, no. 4, 11th April 1917, pp. 365–371.

The author's observations, extending over the Welle-Bomu basin, have shown that there is a vast region in Africa which suffers from a high degree of infestation with *Onchocerca volvulus*, accompanied by the frequent occurrence of elephantiasis. Of 105 cases of elephantiasis examined for *O. volvulus*, only three cases gave negative results. In Welle the riverside populations are especially attacked. The disease differs in many clinical particulars from the symptoms usually ascribed to *Filaria bancrofti*, and in two cases was apparently attributable to *F. loa*.

Gonzáles Rincones (R.). **Presentación de dos Anofelinos capturados en Aragua por el doctor Nuñez Tóvar.** [Two Anophelines taken in Aragua by Dr. Nuñez Tóvar.]—*Gaceta Med. de Caracas* (*Venezuela*), xxiii, no. 22, 30th November 1916, 171–172.

This paper reports the discovery in Venezuela of two malaria-carrying mosquitos hitherto unrecorded there. These are a new sub-species, which differs from *Anopheles* (*Cellia*) *argyrotarsis* and *A.* (*C.*) *albimanus*, the two species hitherto recorded in Venezuela, in that the posterior tarsi are ringed with pure white, and *Anopheles crucians*, Wied., which, though generally taken indoors, is not strictly a domestic species. It usually shelters by day in the webs of spiders, which do not appear to molest it.

da Rocha-Lima (H.). **Beobachtungen bei Flecktyphusläusen.** [Observations on Typhus-infected Lice.]—*Arch. f. Schiffs- u. Tropen-Hyg., Leipzig*, xx, no. 2, January 1916, pp. 17–21, 1 plate.

It is incorrect to suppose that most of the lice in prisoners' camps are infected with typhus; this is probably true only of those individuals from patients in an advanced stage of the disease. Inconclusive results were obtained in the experimental transmission of typhus to monkeys by the bites of lice, but 8 out of 10 attempts with guineapigs were successful. Though the average meal of a female louse is 0·000890 grammes, from 3 to 4 c.c. of blood from a typhus patient is required for the direct inoculation of guineapigs, indicating that transmission is not purely mechanical in the case of the louse. In nearly every infected louse there were present minute bacillus-like bodies which cannot be considered part of its normal intestinal flora, as they settle in huge numbers in the stomach-cells in which they cause visible changes. They also occur in the salivary glands. These bodies were not found in normal lice.

Carter (H. R.), Le Prince (J. A. A) & Griffitts (T. H. D.). **Impounded Water. Surveys in Alabama and South Carolina during 1915 to determine its Effect on Prevalence of Malaria.**—*U.S. Public Health Service, Washington, D.C.*, Public Health Bull. no. 79, September 1916, 34 pp. 3 maps.

This paper describes the results of much careful observation on considerable sheets of water retained by dams, in continuation of the investigation begun in the previous year [see this *Review*, Ser. B, iii, pp. 78, 79].

During the June survey on the Coosa River, Alabama, Anopheline larvae were abundant in the running water of small streams and in marshes and pools adjacent to them, but were practically absent in the main pool, except under conditions which suggested that they had been washed there from above. Of about 600 bred imagines, two only were *A. quadrimaculatus*, the others being *A. punctipennis*. In the latter part of May 1915 some female *A. quadrimaculatus* were taken in a house at the power plant. A careful search was made for their breeding places, but only *A. punctipennis* were bred from the larvae collected, and it is thought that possibly these individuals had hibernated from the previous year. In August and September, even more so than in June, the running water and side pools and marshes adjacent to it were swarming with *A. punctipennis*, though the pond water showed a preponderating proportion of *A. quadrimaculatus*. *A. crucians*, in addition to these species, was found in holes made by digging for angle-worms in one part of the bay at the mouth of a creek. The breeding in the pond at this time was decidedly irregular and apparently depended on factors affording protection to the larvae from wave action and fish. The reason why they were so rarely found in the backwaters of creeks is unknown. This zone, except the upper part, was usually barren, although *A. punctipennis* might be above in running water and *A. quadrimaculatus* below in the bay. It seemed desirable to see if *A. quadrimaculatus* again disappeared in advance of *A. punctipennis* in the autumn, and on 26th–30th October places which had earlier shown a preponderance of *A. quadrimaculatus* were examined, and 71 per cent. *A. punctipennis*, 19 per cent. *A. quadrimaculatus* and 10 per cent. *A. crucians* were found.

The occurrence of a considerable number of *A. quadrimaculatus* within range of habitations might be a decided factor in producing the malarial fevers prevalent near this pool in 1914. The first general recommendation made to the power company owning the pool was to keep the level of the pond as high as permissible during the season when it is not producing *A. quadrimaculatus*, i.e., from about 1st October to 15th or 30th June, and to lower it for the three summer months. This will kill the brush and land vegetation up to the high level and land the floatage and much of the drift on the bank above the low level, thus ensuring clean banks during the breeding season and rendering them open to both wave action and fish. It was also recommended to save the summer rises as much as possible so as to create the greatest variation during this season, as this would land the summer floatage and render the larvae more accessible to fish by compelling them to move from their shelters. In certain places the introduction was advised of mosquito-eating fish such as *Fundulus notatus* and *Gambusia affinis*, especially the former.

In the June and July survey of a pool on the Black Warrior River, Alabama, which was dammed in December 1914 for the improvement of navigation and has steep banks for the first 20 miles above the dam, there was but little accumulation of drift, though there was a great deal of leaf-floatage in which Anopheline larvae were found. Of the 100 larvae bred all were *A. punctipennis* except four individuals of *A. quadrimaculatus.* Schaudinn is quoted as stating that Anopheline larvae are not found in water over 1 metre deep, but here and elsewhere many were found in water over 6 feet deep. The influence of this pool on the considerable amount of malaria in its neighbourhood is not known. In the few residences examined in which cases of fever had occurred, 50 *A. quadrimaculatus* and 2 *A. punctipennis* were found.

As always, it was found in these surveys that, having regard to the production and proximity to sources of production, *A. quadrimaculatus* were found in residences in much greater numbers than *A. punctipennis*. while the difference was far less in sheds, unoccupied houses, etc. Whether *A. punctipennis* is present or not in residences by night, is a question which the authors hope to answer later.

The ponds examined in South Carolina had constant levels and in neither was wave action fully sufficient. The measures advised were only carried out at one of them, the brush being cut on the banks and the drift, etc., raked up from the water's edge and the side pools being ditched and rendered accessible to fish. One creek provided an instance of a particular aquatic growth being a serious problem, *Hydrochloa carolinensis* being the plant in question. It is not common, but is of rapid growth, and if it were to spread, the problem would be an insoluble one. Three species of mosquitos, including *A. quadrimaculatus*, *Uranotaenia sapphirinus* and *Culex* sp., were breeding profusely amongst it.

Full-grown Anopheline larvae do not merely drift about on floating objects, but possess considerable powers of selection as to where they travel in open water.

While *A. quadrimaculatus* was found in the pond, larvae of this species were not found near by in places where they might naturally have been expected, and both here and in the Coosa pool, the pond would appear to be a preferential breeding place for this species. The same facts were observed as to the greater frequency of *A. quadrimaculatus* in residences as compared with *A. punctipennis*, as in the Alabama Survey.

Headlee (T. H.). **Report on Mosquito Work for 1915.**—*Rept. Entom. Dept. New Jersey, Agric. Coll. Expt. Sta. for 1915, New Brunswick*, 1916, pp. 339–364. [Received 22nd May 1917.]

The salt-marsh mosquitos in the protected area were under better control than in the previous year, being entirely absent from many areas that were badly infested previously. As usual, *Ochlerotatus* (*Aedes*) *cantator*, Coq., appeared throughout the State as far north as Jersey City, being replaced after midsummer in this area by *O.* (*A.*) *sollicitans*, Wlk., which later in the summer became a terrible pest in the territory adjacent to the undrained marsh. All over the country the fresh-water species were very numerous, the most troublesome being *Culex pipiens*, L., and the fresh-water swamp mosquito, *O.* (*A.*) *sylvestris*, Theo.

A detailed account is given of the ditching and drainage operations carried out in 1915, together with tabular and financial statements.

CHIDESTER (F. E.). **The Influence of Salinity on the Development of certain Species of Mosquito Larvae and its Bearing on the Problem of the Distribution of Species.**—*New Jersey Agric. Expt. Sta., New Brunswick*, Bull. 299, 16 pp., 6 figs. [Received 22nd May 1917.]

The experimental work described in this bulletin is a continuation of that previously recorded [see this *Review*, Ser. B, iv, p. 123]. *Ochlerotatus* (*Aedes*) *sollicitans*, Wlk., and *O.* (*A.*) *cantator*, Coq., the two dominant species of salt-marsh mosquitos, were the principal subjects of experiment, though others were carried out on *O.* (*A.*) *sylvestris*, Theo., *Culex salinarius*, Coq., and *C. pipiens*, L. The effects of the pure salts found in sea water, viz., calcium chloride, magnesium sulphate, potassium chloride and sodium chloride, were studied, as well as the effects of sea water of various degrees of concentration. In the case of *Culex pipiens*, the larvae that hatched in salt water were unable to withstand the toxic action of salt, but in nature may become acclimatised to the gradually increasing salinity of the water, due to evaporation. *O. sollicitans* showed considerable mortality in solutions of low salinity, as well as in those above 21 per cent., but on the other hand, the development of the full-grown larvae was hastened by the hypertonic solution. *O. cantator*, Coq., is more susceptible to a high concentration of sea water than *O. sollicitans*, since it normally lives in water of 4–6 per cent. lower salinity. It was found that a 14 per cent. solution kills the majority, and a 24 per cent. solution kills all in one-third of the time taken by the larvae of *A. sollicitans* to succumb. All the larvae of *Culex pipiens* were killed by a 10 per cent. solution, while the second moult larvae of *C. salinarius*, a salt-marsh mosquito almost identical with *C. pipiens*, succumbed in water of 8 per cent. salinity. As regards the pupae of *O. sollicitans*, it was found that even a 40 per cent. solution of sea water was not strong enough to kill them or to prevent their normal emergence. Field observations show that in large shallow salt pools mosquito larvae may gradually become acclimatised as the salinity increases owing to evaporation.

As regards the toxicity of the individual salts, calcium chloride was found to be the most toxic, then magnesium chloride, potassium chloride, magnesium sulphate, and lastly sodium chloride.

Successful attempts, reported in 1911, were made in Virginia to destroy fresh-water larvae by connecting the lake in which they bred with a salt-marsh; and at New Orleans in 1905 by adding common salt to the open gutters. In the latter case however the final result was the attraction of *O. sollicitans*. The action of common salt on the larvae of *Stegomyia fasciata* has already been noticed [see this *Review*, Ser. B, ii, p. 84].

As a means of control ditching is of the utmost importance, since it quickly drains some areas, bringing the salt water to increase the salinity of permanent pools, and rendering them salt enough to retard or even to check the development of mosquitos. The author also thinks it more than possible that the rise and fall of the waves of the incoming tide may drown the larvae and prove to be a more important factor at high tide than either the presence of fish or the salinity of the water.

Chidester (F. E.). **A Biological Study of the more important of the Fish Enemies of the Salt-marsh Mosquitoes.**—*New Jersey Agric. Expt. Sta., New Brunswick*, Bull. 300, 16 pp., 1 plate, 2 figs. [Received 22nd May 1917.]

The following fishes are known enemies of mosquitos:—*Fundulus heteroclitus*, *F. majalis*, *F. diaphanus*, *Gambusia affinis*, *Cyprinodon variegatus*, *C. calaritanus*, *Heterandria* sp., *Abramis chrysoleucus*, *Carassius auratus*, *Eupomotois gibbosus*, *Mollinesia latipennis*, *Girardinus poeciloides*, *G. caudimaculatus* and *Haptochilus* sp.

Of these, by far the most important is *Fundulus heteroclitus*, known under various popular names, including killifish and salt-water minnow. It is the most voracious enemy of mosquitos in all stages and also eats the larva of the water-beetle, *Dytiscus*, and the water-bug, *Notonecta*, though the number of these mosquito enemies destroyed by it is relatively negligible. The importance of this species lies in the fact that it migrates from the ocean to the shallows, and even into almost fresh water, in vast hordes, and also that it may be artificially fertilised, the young embryos being remarkably vigorous and hardy, rendering the stocking of pools and streams with this species a simple matter.

Britton (W. E.) & Walden B. H.). **Anti-mosquito Work in Connecticut in 1916.**—*16th Rept. State Entomologist of Connecticut for the Year 1916, Conn. Agric. Expt. Sta., New Haven*, 1917, pp. 126–137, 1 plate. [Received 17th May 1917.]

This paper gives an account of the drainage of mosquito-breeding salt-marshes by the cutting of new ditches, the cleaning-out of old ones, and the building of tide gates. Though the work is not yet completed, good results are everywhere apparent, the number of mosquitos being greatly reduced.

Miscellaneous Insect Notes. *16th Rept. State Entomologist of Connecticut for the Year 1916, Conn. Agric. Expt. Sta., New Haven*, 1917, p. 142. [Received 17th May 1917.]

A beagle infested with the sucking dog louse, *Haematopinus piliferus*, Burm., was unsuccessfully treated with flea-powder, creolin, or whale-oil soap. Kerosene and water and a thorough combing proved only a temporary remedy, but thoroughly saturating the hair and skin with paraffin oil of about 28° gravity, followed in an hour with a wash of soap and water, proved perfectly successful.

Mackenna (J.). **Report on the Progress of Agriculture in India for 1915–1916,** *Calcutta*, pp. 56–57. [Received 20th May 1917.]

During the year, two species of *Tabanus* and one of *Philaematomyia* were found to be capable of transmitting surra [see this *Review*, Ser. B, v. p. 38]. Breeding places of mosquitos were dealt with by filling in hollows in trees, small puddles, etc., by the removal of tin-cans, pots, etc., holding rain water, by oiling large pools, and by the introduction of larvivorous fish into more or less permanent pools and wells.

NOTICES.

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THE REVIEW OF APPLIED ENTOMOLOGY.

SERIES B: MEDICAL AND VETERINARY.

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Hewitt (C. G.). **Report of the Dominion Entomologist for the Year ending March 31, 1916.**—*Dominion of Canada, Dept. Agric. Ottawa*, 1917, 70 pp., 9 figs. [Received 31st May 1917.]

In western Canada the red-tailed bot-fly, *Gastrophilus haemorrhoidalis*, and the nose-fly, *G. nasalis*, were reported to be on the increase. The warble-flies, *Hypoderma bovis* and *H. lineatum*, are also becoming more widely spread and extending into new areas, owing to the introduction of cattle from infested parts. In Manitoba blood-sucking flies were unusually scarce, and mosquitos were practically absent owing to lack of water for breeding-places, Tabanid flies being scarce for the same reason. The stable-fly, *Stomoxys calcitrans*, during 1914 was a constant source of annoyance to cattle, horses and dogs, but there was a great decrease in numbers in 1915 owing to the cold wet weather in June. In Alberta, blood-sucking flies, especially Simuliidae, were very abundant and troublesome, especially near running water, though their larvae were not found in the streams examined and it is not known to what extent they breed in the large rivers. Horses were attacked more than man and had to be protected by ear-coverings and cloths when in harness, and by protecting the pastures with smudges.

As regards household insects, an endeavour has been made to substitute the superheating method of eradication for bed-bugs for that of fumigation with hydrocyanic acid gas, as being both cheaper and safer.

Bevan (L. E. W.). **Immunity, in its Relation to the Stock Diseases of Southern Rhodesia.**—*Rhodesia Agric. Jl., Salisbury*, xiii, nos. 5 & 6, October & December 1916, pp. 640–651, 800–812, xiv, no. 2, April 1917, pp. 213–229.

In this series of articles the author reviews the principal diseases of domestic animals caused by micro-organisms in Rhodesia. Among diseases prevalent in Southern Rhodesia which are caused by Protozoan parasites are African coast fever, red-water, gall-sickness, trypanosomiasis, biliary fever in equines and malaria in man. The three methods by which parasites may bring about disease, *i.e.*, by mechanical effects, by robbing the host of nutritive material, and by the production of noxious substances, are discussed, and natural or inherited immunity is contrasted with acquired immunity, either active or passive. An important form of immunity occurs in Rhodesia in which certain micro-parasites and their host live together in apparent harmony, the host-animal being able to restrain the activity of the parasite and to neutralise its injurious effects, or the parasite exhibiting a period of non-infectivity. When the balance between host and parasite is disturbed, the resistance to it may break down. An instance of this is seen in the tolerance of game to trypanosomes, while cattle from the north which are hurried through belts of *Glossina* may remain apparently healthy for many months, but rapidly succumb when exposed to the first rains, which often follow a period of drought and scanty grazing.

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Just as yellow fever in the Panama zone has disappeared with the destruction of mosquitos and African Coast fever and redwater have been combated by the eradication of ticks, there is every reason to believe that the disappearance of trypanosomiasis from Southern Rhodesia will follow the discovery of a successful method of eradicating the tsetse-fly. When the principles upon which natural resistance depends are more thoroughly understood, there is every reason to believe that most of the diseases of this type in man and the lower animals will entirely disappear.

Hornby (H. E.). **Transmission of Cattle Trypanosomes by Flies other than Tsetse.**—*Rhodesia Agric. Jl., Salisbury,* xiv, no. 2, April 1917, pp. 168–176, 1 plate.

Of the 50 odd species of trypanosomes commonly occurring in mammalian blood throughout the world, less than a dozen are known to be transmitted by tsetse-flies, a large proportion of them being found in countries where no species of *Glossina* occur.

The trypanosomes causing disease in man and domestic animals in Central Africa have been classified by Bruce and his collaborators as follows :—Group A (*Trypanosoma brucei* group), including *T. brucei* and *T. gambiense* ; Group B (*T. pecorum* group), including *T. pecorum* and *T. simiae*; Group C (*T. vivax* group), including *T. vivax, T. caprae* and *T. uniforme.* The forms in group A develop in the intestine of the tsetse-fly, then pass into the salivary glands, where they develop into infective forms ; this is the only group in which the salivary glands are invaded. Those of group B, after developing in the intestinal tract of the fly, become infective in the salivary duct, but never invade the salivary glands. The *T. vivax* group develop first in the labial cavity of the proboscis and later in the salivary duct or hypopharynx ; no part of the development takes place in the intestinal tract or in the salivary glands. It is considered that this grouping may ultimately require some modification.

All three groups occur in Rhodesia, *T. brucei, T. pecorum* and *T. vivax* all having been isolated from cattle, *T. pecorum* being by far the most abundant. These are all true parasites of both mammals and tsetse-flies, but just as only a comparatively small number of mammals are true hosts of any one species of these trypanosomes, so only a small number of flies, and all of them of the genus *Glossina,* act as true hosts. In a district where *T. pecorum* and *Glossina morsitans* are both common, only comparatively few individuals of either mammals or flies would be found to harbour trypanosomes. Trypanosomes that have been imbibed by a blood-sucking fly suffer various fates, according to the nature of the fly and the nature of the trypanosome. For example, *T. brucei,* imbibed by *Glossina,* may be infective for some 18 hours and then degenerate and lose their infectivity and perhaps disappear altogether from the fly. They may, on the other hand, multiply in the alimentary canal of the fly, the new forms passing eventually into the salivary glands and regaining infectivity. When imbibed by non-susceptible flies, the trypanosomes degenerate after some hours, lose their infectivity and eventually disappear. A fly may act as a transmitter of trypanosomes in three ways. It may be a true host, as in the case of the tsetse, the hypopharynx of which swarms with trypanosomes, so that whenever it bites an animal it is bound to inoculate it. Other biting flies, which are not true hosts, may, after biting an infected animal, carry an infective trypanosome for some hours in its proboscis and in biting a healthy animal may mechanically infect it with the still dangerous trypanosome in its saliva ; in this case the chance of infectivity is in inverse proportion to the length of time that has elapsed between the two feeds. Non-biting flies may also transfer trypanosmes on their feet or proboscis from a sore on one beast to that on another. It is by mechanical infection that the trypanosomes of surra are transferred from one animal to another by *Tabanus*, *Haematopota* and *Stomoxys*, and in Central Africa this is frequently the method of transmission. Mechanical infection by *Glossina* is not strictly analogous with mechanical infection by flies other than tsetse, because in the one case the trypanosomes remain healthy, being in their true host, while in flies of other genera the trypanosomes are in an unhealthy environment and tend to die out rapidly. In the case of *Stomoxys*, the proboscis is said to be uninfective $1\frac{1}{2}$ minutes after the fly has fed on surra-infected blood.

In 1914, the author inoculated a dog with *T. brucei* vel *rhodesiense*. Living with it was another dog, both being much worried by *Stomoxys* and other Muscids biting their ears. After a time the second dog was found to be suffering from trypanosomes similar to those found in the other animal. In a Rhodesian farming district which is a fly-free area almost completely surrounded by fly-infested land, the author was impressed by the disproportion between the large number of animals infected and the small number or absence of tsetse in the neighbourhood of the outbreak. While the initial cause of the outbreak might well be a stray tsetse, it seemed probable that the disease was spread in the herd by some other agency. In another case a thousand village cattle were examined just as the rains were commencing and less than a dozen proved to be infected. Six months later, in the same village, 500 of the cattle previously examined were found to be either dead or very ill from trypanosomiasis. On neither occasion was a tsetse-fly seen in the vicinity, although occasional individuals were seen in neighbouring areas. The author considers this seasonal occurrence of the disease, which is coincident with that of other biting flies, to be significant, when it is considered that out of 300 cattle kept for one month in a thin fly belt, only 20 animals became infected. Finally, on estates where the danger from mechanical infection is realised and measures are taken to isolate all infected animals, no fresh cases occurred during the following rainy season, although severe outbreaks had previously been the rule. The conclusions are drawn that it is unwise to allow cattle infected with trypanosomes to run with healthy animals, particularly during the rainy season, but that the mere passage of infected animals in the vicinity of healthy cattle is not dangerous to the latter.

In a note appended to this paper, the chief veterinary surgeon remarks that while trypanosomiasis in domestic animals may in some areas be transmitted by flies other than tsetse, he believes this to be very rare in Southern Rhodesia.

Facer (A. W.). An Investigation of the Oxidation of Cattle Dips when Bottled.—*Rhodesia Agric. Jl., Salisbury,* xiv, no. 2, April 1917, pp. 202–205.

It is a well-known fact that sodium arsenite in cattle dip has a tendency in the tank to pass by oxidation into the much less effective sodium arsenate and it has been found that this conversion is sometimes much more rapid when the dip is enclosed in a corked bottle with only a limited supply of oxygen. A simple method of arresting this oxidation is the addition of sufficient sulphuric or hydrochloric acid to render the dip faintly acid in reaction. Experiments have been undertaken to determine the period that elapses before oxidation takes place in the absence of a preservative acid. For this purpose bottles of the dip were taken from various tanks and analysed from time to time. Considerable variations were found in the reaction of the dips, some oxidising much more rapidly than others, this being possibly due to lack of uniformity in the solutions. The average taken from six samples gave an increase in oxidation after three days of 4·7 per cent.; after seven days, 11·2 per cent.; after 49 days, 50·9 per cent. After oxidation takes place, the sodium arsenate has a tick-killing power of about one-half of that of the arsenite from which it is formed. Hence the deterioration in tick-killing power is 2·3 per cent. after three days, 5·6 per cent. after seven days, and 25·4 per cent. after 49 days. As the deterioration in one week is only 5·6 per cent., it does not seem necessary to add a preservative unless the dip is to be prepared more than one week before use. When the preservative is required, 2 c.c. of sulphuric acid added to each bottle completely arrests oxidation in all cases. As these experiments were only conducted with six samples, they are not put forward as being conclusive, but as a practical guide to farmers in remote districts.

Della Rogna del Cavallo. [Horse Mange.]—*Clinica Veterinaria, Milan,* xxxx, no. 8, 30th April 1917, pp. 232–237.

The following pomade was successfully used by Carpartier in curing mange on French army horses:—Sodium bicarbonate, 30 grammes; petroleum, 300; olio di cade, 20; ground-nut oil, 100; bichloride of mercury, 1; water, 1,000. The following mixtures may be used with a sprayer, especially the second:—Potassium pentasulphide, 25 grammes; cresyl, 20; sodium arsenate, 2; water, 1,000; or potassium pentasulphide, 41 grammes; nicotine, 1; sodium arsenate, 2; water, 1,000. After being sprayed abundantly and carefully the the coat must be dusted with sulphur. In the English army, horses are dipped in tanks such as are used for cattle and sheep, a lime-sulphur dip being employed. In the German army, which appears to have suffered more than others from mange infection, a tar pomade is used after the horses have been shorn and washed with soap. Epidemics of equine mange have broken out among German soldiers, especially on the Russian front. Good results were obtained with a pomade containing 17 per cent. of sulphur and 8 per cent. of potassium carbonate, the body (except the face and head) being anointed, one-third at a time, on consecutive occasions. The last application is followed, at 12–24 hours' interval, by a hot bath. This treatment is followed by one aiming at stopping the itching, a paste containing menthol being used. Men told off to attend to infected horses should be provided with overalls with an elastic collar and wristlets.

Отчетъ о дѣятельности 6-го Съѣзда Россійскихъ Терапевтовъ. [Report on the Work of the 6th Congress of Russian Therapeutists.] — **« Медицинское Обозрѣніе.»** [*Medical Review*], *Moscow,* lxxxvii, no. 1–2, 1917, pp. 97–103.

Several papers dealing with the rôle of insects as carriers of infectious diseases were read at the Congress. Dr. Marzinovsky pointed out the great importance which this question has acquired during the War and as a consequence of the medical officers generally not having been properly equipped to deal with it. He advocated the institution of special courses on tropical diseases and of a separate course on insect carriers of disease, and the establishment of tropical institutes in Caucasia and Turkestan. For the time being special courses on these subjects should be instituted for medical officers working with the armies.

Marzinovsky (Dr. E. I.). *O Grahamella* [About *Grahamella.*] — **« Медицинское Обозрѣніе.»** [*Medical Review*], *Moscow,* lxxxvii, no. 1–2, 1917, pp. 84–86, 3 figs.

While studying piroplasmosis in cattle, the author found *Grahamella* bodies in the blood of a bull, which exhibited marked anaemia, but was not infected with piroplasmosis. Investigation of examples of the tick, *Margaropus* (*Boophilus*) *calcaratus,* taken from this animal, demonstrated the presence of *Grahamella* in their intestines. *Grahamella* would therefore appear to be a Protozoan parasite of which ticks are the intermediate hosts.

Tarassevitch (Prof. L. A.) & Marzinovsky (Dr. E. I.). **Современныя данныя по эпидеміологіи и профилактикѣ сыпного тифа.** [Recent Data on the Epidemiology and Prophylaxis of Exanthematous Typhus.] — **« Медицинское Обозрѣніе.»** [*Medical Review*], *Moscow,* lxxxvii, no. 1–2, pp. 212–213.

This is a short review of the papers read by the authors at a meeting of the Section of Bacteriology of the Society of Friends of Natural History, Anthropology and Ethnography. The first author, on the strength of his experience in the War, stated that typhus infections usually occur only through the agency of lice and that measures of disinfection provide adequate means for the control of the disease. This was also the view taken by Dr. Marzinovsky, who thought that cases of infection not caused by lice are very exceptional. He gave an account of the spread of the epidemic on the front in Caucasia and Armenia; during the second year of the War, as a result of energetic measures, the death-rate has been lowered from 70 per cent. to from 13 to 25 per cent.

Picollo (L.). **Peste de Cadeiras.** [Mal de Caderas.]—*Chacaras e Quintaes, Rio de Janeiro,* xv, no. 4, 15th April 1917, p. 315.

In answer to an enquiry for a remedy against mal de caderas, which is causing great loss among horses and mules in the State of Paraná, the specific called Protosan, discovered by Dr. A. Machado of the Oswaldo Cruz Institute and obtainable through the Ministry of Agriculture, Rio de Janeiro, is recommended.

McArthur (C. L.). **Farm Sanitation.**—*Univ. Arkansas Agric. Expt. Sta., Fayetteville,* Bull. no. 127, March 1916, 24 pp., 9 figs.

This bulletin deals with general methods of farm sanitation, including special reference to house-flies and mosquitos, with the usual recommendations for their control and the elimination of breeding-places.

Cleland (J. B.). **Further Investigations into the Etiology of Worm-nests in Cattle, due to *Onchocerca gibsoni*. No. 2.**—*Published by Direction of the Minister of Trade and Customs, Commonwealth of Australia,* 41 pp.

This paper records further experiments carried out on calves in fly-proof pens and in the open, with the object of discovering the vector of the embryos of *Onchocerca gibsoni*, the cause of worm-nests in cattle [see this *Review*, Ser. B, iii, p. 207]. The results practically exclude the probability of *Stomoxys calcitrans* being the carrier, and suggest that transmission is due to Tabanids rather than mosquitos, a view strengthened by the fact that the geographical distribution of Tabanids coincides with that of worm-nests in cattle.

da Rocha-Lima (H.). **Untersuchungen über Fleckfieber.** [Researches on Typhus.]—*Münchener Med. Wochenschr., München,* lxiii, no. 39, 26th September 1916, pp. 1381–4, 3 figs.

Only once in 13 experiments was typhus infection found to be hereditary in lice. In this case larvae from eggs of lice fed on typhus patients were ground up in salt solution and injected into a guinea-pig, which became infected ; an injection of its blood also gave a positive reaction in a second guinea-pig. In spite of numerous attempts it was never possible to infect lice by feeding on typhus convalescents, so that healthy persons are evidently unable to carry the virus. During and after the fall of the temperature the virus is so scanty in the blood that lice are usually unable to contract the infection. During the febrile stage of the disease, one feed upon the patient suffices to infect the louse. A feed upon a patient on the fourth day of the disease causes infection by *Rickettsia* in the louse, but it was not possible to ascertain if this is also the case for the first three days. On the fourth day after the first feed, the presence of *Rickettsia* in the louse was ascertained both by experiments on animals and by microscopical examination.

TÖPFER (H.). **Zur Ursache und Uebertragung des Wolhynischen Fiebers.** [The Cause and Transmission of Volhynian Fever.]—*Münchener Med. Wochenschr., Münich*, lxiii, no. 42, 17th October 1916, pp. 1495–1496, 1 fig.

The author considers lice to be the carriers of Volhynian fever, a disease which usually terminates favourably even in the absence of treatment, but which incapacitates soldiers for considerable periods. The causal agent is a parasite very similar to that of typhus.

SEITZ (—). **Zur Läusevertilgungsfrage.** [Louse Destruction.]—*Münchener Med. Wochenschr., Münich*, lxiii, no. 43, 24th October 1916, pp. 1538–1539, 1 fig.

The results of experiments with a number of liquids and powders recommended against lice are recorded. Many of them proved unsatisfactory, cresol-soap solution, 5 per cent., being the most effective.

TÖPFER (H.). **Die Uebertragung der Rekurrens durch Läuse.** [The Transmission of Recurrent Fever by Lice.]—*Münchener Med. Wochenschr., Münich*, lxiii, no. 44, 31st October 1916, pp. 1571–1572, 1 fig.

The author's summary of this paper is as follows:—The spirochaetes are able to multiply to a considerable extent in lice fed on the blood of an infected patient. In the louse the spirochaetes retain their form, motility, virulence and staining properties. Certain developmental forms of the spirochaete are not found in the louse. Transmission of recurrent fever from the louse to man does not appear to result from its bite, but the infection of man is thought to be due to the crushing of the louse and the entry of the spirochaetes through abrasions of the skin or mucous surfaces.

STEMPELL (W.). **Ueber einen als Erreger des Fleckfiebers verdächtigen Parasiten der Kleiderlaus.** [On a Parasite of the Clothes Louse suspected of being the Excitant of Typhus Fever.]—*Deutsche Med. Wochenschr., Berlin*, xlii, no. 15, 13th April 1916, pp. 439–442, 3 figs.

This paper records the presence in the intestine of the clothes louse [*Pediculus humanus*] of a hitherto unknown parasite. It is sometimes very abundant and is perhaps allied to *Babesia* or *Leishmania*. This parasite, *Strickeria jürgensi*, gen. et sp. n., apparently occurs during part of its development in the louse and seems to be sometimes transmitted to man in large numbers. Further research is required to determine whether it is the cause of disease.

v. BENCZÚR (J.). **Zur Frage des** ***Icterus epidemicus*****.** [A Note on *Icterus epidemicus*.]—*Deutsche Med. Wochenschr., Berlin*, xlii, no. 16, 20th April 1916, pp. 482–483.

During the summer and autumn of 1915, the author, in studying a widespread epidemic of *Icterus epidemicus*, observed that a decrease in the number of cases coincided with a reduction in the number of house-flies, which may perhaps be carriers of this disease.

Müller (L. R.). **Ueber den *Icterus infectiosus*.** [*Icterus infectiosus.*] —*Deutsche Med. Wochenshr., Berlin*, xlii, no. 17, 27th April 1917, pp. 505–509.

It is suggested that mosquitos may be responsible for the transmission of *Icterus infectiosus*, cases of which were numerous in November 1915, while some occurred in January 1916. The winter was a mild one and during it many mosquitos were noticed indoors.

Töpfer (H.) & Schüssler (H.). **Zur Aetiologie des Fleckfiebers.** [The Aetiology of Typhus.]—*Deutsche Med. Wochenschr., Berlin*, xlii, no. 38, 21st September 1916, pp. 1157–1158, 3 figs.

Bacteria-like organisms of characteristic form, appearance and abundance, are constantly present in clothes lice from patients in the advanced stage of the disease or from convalescents. These organisms occur in lice after they have been fed on typhus patients, but not in control lice. A patient who infected lice during the febrile stage failed to infect lice after his temperature had fallen. The typhus virus chiefly occurs in blood at the exanthematous stage. The virus does not appear to be transmitted by infected lice to their eggs and progeny. The contents of the gut of an infected louse give rise in the guinea-pig to the same febrile conditions as does the blood from a typhus patient, but the incubation period is shorter. Up to the present the virus has only been propagated in the intestine of the clothes louse.

Töpfer (H.). **Der Fleckfiebererreger in der Laus.** [The Causative Agent of Typhus Fever in the Louse.]—*Deutsche Med. Wochenschr., Berlin*, xlii, no. 41, 12th October 1916, pp. 1251–1254.

The conclusion is arrived at that the organism mentioned in the previous paper is the cause of typhus fever. It multiplies very rapidly in both head and clothes lice [*Pediculus capitis* and *P. humanus*]. It is not known whether it develops elsewhere than in the intestinal cells. Transmission to man is probably effected by the bites of the louse, but the excreta of infected lice and the crushing of their bodies provide other possible means of transmission through abrasions of the skin. Patients free from lice are not a source of danger and convalescents are also harmless, even though they may become infested with lice immediately after leaving the hospital.

Frickhinger (H. W.). **Ueber das Geruchsvermögen der Kleiderlaus.** [The Sense of Smell in the Clothes Louse.]—*Deutsche Med. Wochenschr., Berlin*, xlii, no. 41, 12th October 1916, pp. 1254–1256.

This paper describes experiments showing that the clothes louse [*Pediculus humanus*] is able to detect the vicinity of certain individuals through its sense of smell. This accords with the well-known fact that some persons escape for many weeks under conditions in which others immediately become infested.

Reiter (H.). **Beiträge zur Aetiologie der Weilschen Krankheit.** [Contributions to the Aetiology of Weil's Disease.]—*Deutsche Med. Wochenschr., Berlin,* xlii, no. 42, 19th October 1916, pp. 1282–1284.

Observations have shown that the true Weil's disease may occur in May and June, but is chiefly prevalent in July, August and September. Well-watered areas seem to be the most affected. As the disease does not occur in an epidemic form, neither lice, fleas nor ticks can be the carriers. Winged carriers are indicated and, as this disease is not more common in malarial districts, mosquitos also may be disregarded. It is more probable that the transmitters are biting flies, such as *Haematopota pluvialis, Chrysops coecutiens* and other Tabanids, *H. pluvialis* being the most likely. Transmission would appear to be purely mechanical.

Kraus (R.). **Ueber die Feststellung der Dengue in Argentinien.** [A Record of Dengue in Argentina.]—*Deutsche Med. Wochenschr., Berlin,* xlii, no. 43, 26th October 1916, pp. 1314–15, 2 figs.

The occurrence of dengue is recorded from Concordia, Argentina, and Salto, Uruguay, two towns which lie close to each other. Mosquitos were unusually abundant in the towns affected and practically every house in Concordia was a breeding place for *Culex fatigans* and *Stegomyia fasciata.* In the absence of other species of mosquitos, these are believed to be the carriers, as Graham, Ashburn, Craig and others have already stated.

Schilling (V.) & Schiff (F.). **Ueber Papatacifieber.** [Phlebotomus Fever.]—*Deutsche Med. Wochenschr., Berlin,* xlii, no. 45, 9th November 1916, pp. 1378–1380.

In recording the conditions at " A." [? in Turkey], it is stated the *Phlebotomus papatasii,* Scop., was present. While some houses were badly infested, others quite close by were so free from this midge that a net was unnecessary. A net of muslin-like texture is needed, as the meshes of ordinary mosquito netting are too large. The female *Phlebotomus* bites by day in well-lit rooms, as well as by night in dark places. Newstead's recommendation for spraying the walls with a 1 per cent. solution of formalin several times a week proved an effective prophylactic measure.

Blanc (G.). **Sur un Cas de Toxoplasmose canine observé en Tunisie.** [A Case of Canine Toxoplasmosis observed in Tunis.]—*Bull. Soc. Path. Exot., Paris,* x, no. 5, 9th May 1917, pp. 377–378.

Canine toxoplasmosis is recorded from Tunis for the first time, the conditions of infection being very obscure. Two dogs, *B* and *C*, were inoculated with the product of crushing ticks in the nymphal stage procured from a dog, *A*, suffering from experimental kala-azar (canine virus). The animal, *B*, became ill within a month, exhibiting double conjunctivitis and opacity of both corneas, but the post-mortem examination revealed no parasites either of leishmaniasis or of toxoplasmosis. The animal, *C*, died shortly afterwards, without any illness, the autopsy revealing the presence of toxoplasma in the organs. The destruction and examination of the dog, *A*, revealed many leishmania but no toxoplasma. Three hypotheses are possible: The dog, *C*, may have been naturally infected with toxoplasmosis before the inoculation. The inoculation from the dog, *A*, may have caused the infection, although neither of the inoculated animals showed toxoplasma at the autopsy. Toxoplasmosis may have been transmitted to the dog, *C*, by larvae from the gundi [*Ctenodactylus gundi*], some of which were kept in the same building, these animals becoming naturally infected with toxoplasmosis during the autumn and winter, during which time the inoculations were carried out.

A similar case was observed at Frankfort-on-Main, the subject being a dog inoculated with the organs of a dog infected with canine leishmaniasis, which had been sent from the Pasteur Institute at Tunis, and which had lived in the same conditions as the dog referred to above.

GREGGIO (G.). **Note sur la Lutte contre la Trypanose à Kisantu (Congo Belge). Résultats et Espérances.** [Note on the Control of Trypanosomiasis at Kisantu (Belgian Congo). Results and Expectations.] —*Bull. Soc, Path. Exot.*, *Paris*, x, no. 5, 9th May 1917, pp. 398–406. [Received 1st June 1917.]

Sleeping sickness, which first appeared in the region of Kisantu in 1900, in less than 10 years carried off two-thirds of the inhabitants and in some localities as many as nine-tenths. The difficulties of combating it were increased by the indifference of the natives. A great improvement has, however, been effected, a percentage of 4·7 among those examined in 1912 having fallen to ·7 per cent. in 1915. In fact, recourse has perforce been had lately to infected animals for a supply of the virus for experimental purposes owing to the difficulty of finding human carriers. The natives also eagerly seek for treatment, even offering to pay for it, the result in the first place of teaching in the schools, for the use of which a series of articles on noxious insects in the local dialects has been prepared.

HOWARD (C. W.). **What the House-fly costs?**—*Minnesota Insect Life*, *St. Paul*, iv, no. 2, 1st May 1917, 8 pp. [Received 2nd June 1917.]

The house-fly [*Musca domestica*] has come to be considered one of the most dangerous enemies of man. Owing to the number of diseases that it carries, at least one-fifth of the cases of typhoid fever, one-twentieth of those of tuberculosis, and one-tenth of the cases of other intestinal diseases are due to food contamination by this insect. On the supposition that a human life has a value of £360 to £600, and taking into consideration the cost of illness, nursing, and medical treatment, it has been calculated that the annual loss in the United States due to the house-fly as a disease-carrier, is approximately £31,560,000. In addition to this there is annually spent in the States £2,000,000 in screening, and £400,000 in fly papers and fly poisons. The first and most important control measure is the abolition of all breeding places; in towns, by the use of fly-proof bins for stable manure and by an organised system of garbage disposal, and in the country by the daily distribution of farm manure on the fields where it quickly dries and becomes distasteful to flies, at the same time having its fertilising value increased. The use of the maggot trap has also proved very successful on farms. This consists of a wooden platform, with quarter-inch spaces left between the planks, built about a foot above a cement tank containing water with a little kerosene on the surface. The manure is piled on the platform and the surface is kept moist; the maggots to avoid the wet manure attempt to escape and are drowned in the tank. The screening of dairies, where the dairy utensils should be kept in fly-proof enclosures, and above all, the careful screening of hospitals and houses in which there is any infectious disease, are control measures of the utmost importance.

Moore (A. E.). **Sheep Scab.**—*Agric. Gaz. Canada, Ottawa*, iv, no. 4, April 1917, pp. 262–265. [Received 6th June 1917.]

Sheep scab or scabies in sheep is an extremely contagious disease caused by a parasitic mite, *Psoroptes communis*, which lives on the surface of the skin, causing the formation of scabs, followed by loss of wool, general loss of health and finally death. The remedy consists in the outward application of a suitable insecticide, the one officially adopted consisting of 10 lb. of unslaked lime and 24 lb. flowers of sulphur. It is prepared by first slaking the lime in enough water to make a paste, to which the sulphur is then added and thoroughly mixed to the consistency of mortar. This is then put into 30 gals. of boiling water and boiled for three hours, water being added to maintain the same proportion while it is stirred till all the sulphur is dissolved. The dark chocolate-coloured fluid is then poured off and measured, and warm water added to make 100 gals. The sheep may be dipped in this, either by swimming them through vats, or by holding them in small tanks, care being taken that the dip does not enter the nostrils, and that they remain in it for, at least, two minutes. The animals should have been previously clipped, and the dip should be warm, from 100° to 105° F., it being safest to do the work on a warm sunny day. Two dippings are necessary and, as a rule, sufficient, an interval of 10 to 14 days being allowed to elapse between them, to permit the eggs, which are not affected, to hatch out. Thorough cleaning and disinfection of all fences, pens and yards, and the destruction of all tags of wool, straw and litter, are absolutely necessary to prevent re-infection.

Sergent (E.). **Service antipaludique.** [Antimalarial Organisation.] —*Rapport Inst. Pasteur d'Algérie en 1916, Algiers*, 1917, pp. 8–10. [Received 6th June 1917.]

The annual appearance of endemic malaria is inseparably connected with meteorological phenomena and is especially influenced by the spring rainfall. In 1916 in Algeria abnormally heavy rains occurred at the beginning of summer, causing widespread floods that enormously increased the area of mosquito breeding places, and the flood area coincided with that of a serious outbreak of malaria. The disease was worst among Europeans, and the mortality was high among the natives, the inhabitants of districts that had been immune within the memory of man being severely attacked. The disease was held in check in places where quinine had been distributed daily from the beginning of summer, even when these were among the most malarial in Algeria; but where, through lack of funds, quinine could be distributed only every three or four days, this was not the case, thus showing the inefficacy of bi-weekly doses. Other measures of control were the anti-larval treatment of pools, canals, and the borders of marshes twice a month; the curative and preventive administration of quinine to the natives by special agents; and the mechanical protection of dwellings by means of window and door nettings.

Gussow (H. T.). *Empusa muscae* **versus** *Musca domestica*, **L.**—*Ann. App. Biol., London*, iii, no. 4, April 1917, pp. 150–158, 1 plate. [Received 9th June 1917.]

The dying-off of house-flies in autumn cannot be ascribed to the fungus disease caused by *Empusa muscae*, only about one death in 1,000 being directly due to it. Attempts to cultivate the fungus artificially from spores for the purpose of spreading the disease as a natural fly control have not proved successful, chiefly owing to a lack of knowledge concerning a suitable nutrient culture solution.

Rène (C.). **Gale du Mouton.** [Sheep Mange.]—*Progrès Agricole, Amiens*, xxxi, no. 1528, 29th April 1917, p. 200.

To cure mange in sheep, they must be shorn and well soaped and the crusts softened with a suitable fatty substance. They must then be dipped in the following solution:—Arsenious acid 2 lb., zinc sulphate 10 lb., aloes 1 lb., and water 20 gals. This quantity is sufficient for 100 sheep. The sheep should remain in this bath for from 1 to 5 minutes and be scrubbed at the same time.

Chapin (R. M.). **The Chemical Composition of Lime-Sulphur Animal Dips.** — *U.S. Dept. Agric., Washington, D.C.*, Bull. 451, 14th December 1916, 16 pp., 2 tables. [Received 9th June 1917.]

A working formula for the preparation of lime-sulphur solutions for use as sheep and cattle dips is given in this bulletin. The title suggested is the "8–10–18" formula, that is, 8 lb. high grade commercial quicklime, 18 lb. fine sulphur (either flowers or flour) with rather more than 10 U.S. gals. water, to be boiled for an hour to a final volume of 10 U.S. gals. This is suitable for dipping sheep, where an excess of lime must be avoided. If commercial hydrated (not air-slaked) lime is used, the amount should be 10·5 lb. For dipping cattle the formula may be used on the basis of available calcium oxide if the analysis of the lime is known; if it is not, 8·5–9 lb. of lime may be taken. The finished solution, drawn off from the sediment, should be diluted in the proportion of 1 volume to 9 or 10 volumes of water for dipping sheep, and at the rate of 1 volume to 7 or 8 volumes of water for cattle. In use, the baths should be kept up to strength as previously described [see this *Review*, Ser. B, iii, p. 76]. The advantages of this formula are that it closely approaches the theoretical ratio deduced from experiments, it is as concentrated a product as can be prepared without conversion of thiosulphate to sulphite, and the figures are easily remembered and converted for the preparation of large or small quantities.

WENYON (C. M.) & O'CONNOR (F. W.). **The Carriage of Cysts of *Entamoeba histolytica* and other Intestinal Protozoa and Eggs of Parasitic Worms by House-flies with some Notes on the Resistance of Cysts to Disinfectants and other Agents.**—*Jl. R. A. M. C., London,* xxviii, no. 5, May 1917, pp. 522–527. [Received 11th June 1917.]

Amoebic dysentery is caused by *Entamoeba histolytica,* which lives in the large intestine, invading the wall of the bowel and producing dysenteric ulceration. The fact of the house-fly being the means of distributing the infective agent has been previously suspected, but it is now established beyond doubt, as the result of experiments conducted by the authors. In the acute stage of dysentery, only free motile amoebae are found in the faeces, but as the acute symptoms abate, smaller amoebae occur and many of these become encysted in transparent capsules, and, as such, are passed in the faeces in very large numbers. Owing to the presence of the capsule they are relatively hardy structures, and can survive for considerable periods if they remain moist. These cysts are often passed in very large numbers by "carriers," i.e., cases that have partially, or apparently wholly, recovered from amoebic dysentery. Experiments with the house-flies, *Musca* and *Fannia,* and with the blue-bottle, *Calliphora,* and the green-bottle, *Lucilia,* have proved that these flies ingest cysts of *Entamoeba histolytica* when fed on infected faeces, as well as the larger cysts of the non-pathogenic human *E. coli,* and the cysts of the flagellate, *Lamblia intestinalis.* This was demonstrated by killing and dissecting the flies immediately after feeding, when the cysts were found in their intestines, where they remained so long as any faeces was present in the gut, in one case as long as twenty-four hours. The cysts seem to escape from the fly only by passing in the faeces and not by regurgitation through the proboscis. With continuous access to human faeces, a fly will feed every few minutes, and as often evacuates its intestinal contents in droplets that contain typical, living, unaltered cysts. Owing to the habit of the fly of cleaning its legs before leaving its food, there seems to be little chance of the cysts being distributed by contact, any that might remain attached being killed by drying, especially under a tropical sun. The most effective disinfectant seems to be cresol of a strength of 1 in 40 or 50, which must be intimately mixed with matter to be dealt with. Much in the way of control can also be done by the careful use of fly-proof latrines and covered receptacles.

FERMI (C.). **La Profilassi antimalarica in due Città sarde.** [Antimalarial Prophylaxis in two Sardinian Towns.]—*Annali d'Igiene, Rome,* xxvii, no. 4, 30th April 1917, pp. 228–236. [Received 14th June 1917.]

This paper describes the antimalarial measures adopted in the

Sardinian towns of Alghero and Terranova Pausania. After a careful survey of the breeding places of Anopheline mosquitos, complete anti-larval work was carried out, supplemented by drainage restricted to those waters which had proved to be a source of danger. The work began in September 1915, and cost only £140, whereas over £80,000 had previously been spent at Terranova alone. Of 400 children born between 1st November 1915 and 31st October 1916, only three became infected with malaria, and these had been removed from the protected region.

Petroleum should be applied twice a month at the rate of 20 c.c. per square metre of water surface. It causes but little inconvenience as the heat evaporates it within 3–5 days. The roots of vegetables will not be injured by irrigation with water from oiled places, as the water is drawn off under the surface and the minute quantity of petroleum which may reach the plants will evaporate before reaching the roots. The alga, *Lemna palustris*, provides an easy means of covering a surface of water where petroleum cannot be used. To sow this is a simple matter, a complete covering being ensured in 3–4 weeks by throwing in a handful for every 10 square metres. Wells may be protected by using a little over 2 lb. of cork granules of no. 3–4 size per square metre of surface. When drawing water, it is only necessary to strike the surface two or three times with the bottom of the bucket in order temporarily to displace the covering.

Arkell (T. R.). **Get rid of the Ticks.**—*Agric. Jl. Dept. Agric., Victoria, B.C.*, ii, no. 3, May 1917, pp. 47 and 51, 1 fig. [Received 15th June 1917.]

The mite [*Psoroptes communis*] causes sheep-scab, a contagious disease, governed by the "Animal (Contagious Diseases) Act," under which failure to report an outbreak involves a fine of £40. Clipping the wool from the affected part and dipping twice at an interval of 10 days effects an almost certain cure. The sheep louse [*Trichodectes sphaerocephalus*] and the sheep tick [*Melophagus ovinus*] also cause disease, and it is against the attacks of the latter Hippoboscid fly that dipping operations are chiefly directed. The mistake is frequently made of dipping only once, *i.e.*, in the spring after shearing, when the insects are visible, though in reality it is, if anything, less necessary then, when many would naturally die from sudden exposure to the cold, than in autumn when the fleece is heavy. Further, if sheep are heavily infested during the winter, when both food and weather conditions lower their vitality, they lose flesh and become debilitated. Dips containing carbolic acid, arsenic or tobacco, and most proprietary dips, give good results if the directions are carefully followed. For autumn dipping it is advisable to construct a draining-pen, or better still, two in connection, close to the dipping tank to prevent the waste of a large quantity of dip soaked up by the long wool. The operation should be performed on a bright sunny day, and the dip should be warmed to about 100°, as the sheep should be kept in it for not less than two minutes.

CAMERON (A. E.), TREHERNE (R. C.) & HADWEN (S.). **Doing Away with the Mosquito Pest.**—*Agric. Jl. Dept. Agric., Victoria, B.C.*, ii, no. 3, May 1917, p. 56. [Received 15th June 1917.]

The problem of controlling mosquitos in any given area involves a thorough preliminary investigation by an entomologist of the different species of mosquitos breeding there. At the same time it should be discussed from an engineering standpoint with a view to removing all breeding areas, such as marshes and shallow pools, and the swampy areas subject to overflow at high tides, which should be drained so that the water can easily recede as the tide falls. Deep ponds, exposed to the wind, and running water do not harbour mosquitos. Pending the attainment of this permanent control, the temporarily efficacious method of oiling should be adopted, the treatment requiring to be renewed every 10 to 18 days, throughout the breeding season.

REICHENOW (E.). **Parásitos de la Sangre y del Intestino de los Monos Antropomorfos Africanos.** [Parasites of the Blood and Intestine of African Anthropoid Apes.]—*Bol. Real Soc. Espanola de Hist. Nat., Madrid*, xvii, no. 5, May 1917, pp. 312–332.

Microfilaria previously observed in the blood of chimpanzees were considered to be embryos of *Acanthocheilonema perstans*; Ziemann also found a trypanosome which he identified some years later as *Trypanosoma gambiense.* Malarial parasites that occurred in the chimpanzee he considered identical with *Plasmodium kochi*, also found in other monkeys.

The present investigations were undertaken for the purpose of determining whether the anthropoid apes are to be reckoned with as hosts of *T. gambiense* in Kamerun. Of 8 gorillas and 8 chimpanzees examined, none showed the presence of *T. gambiense*; in no case, however, were these apes found in the regions where sleeping sickness is endemic. They are however frequently in contact with the natives in populated regions, entering their plantations and passing the night in the immediate vicinity of the villages. In nearly all the individuals examined of both species *Microfilaria perstans* was found in the same form as in man, only the very young animals giving negative results. While *M. perstans* is frequently found in the blood of natives accompanied by *M. diurna*, the latter is absent in monkeys. The explanation is that *M. diurna* is carried by the Tabanids, *Chrysops dimidiatus* and *C. silacea*, which are found only on open ground and bite only in the sun, where monkeys are seldom found. Bearing this explanation in mind, it is considered probable that the animal transmitter of *M. perstans* is a shade-loving insect and in all probability a mosquito.

A trypanosome was found in the blood of all the adult apes with the exception of two gorillas, the development of which is completely identical with that of *T. lewisi*, while the morphology is very similar. The author considers this a new sub-species, *Trypanosoma lewisi primatum.* All other known trypanosomes of monkeys are morphologically distinct from this species.

An infusorian belonging to the genus *Troglodytella*, found in the intestine of chimpanzees, is described. Each individual examined was found to harbour a distinct species.

MATTHIESEN, PEETS & DAHLGRÜN. **Viehverluste in den Niederungen der Leine und Aller durch die Stiche der Kriebelmücke,** *Simulium reptans*, **L.** [Cattle Losses in the Lowlands of the Leine and Aller through the Bites of *Simulium reptans*, L.]—*Berliner Tierärztl. Wochenschrift, Berlin*, xxxiii, no. 17, 26th April 1917, pp. 193-197. [Received 19th June 1917.]

In 1916 numerous deaths among cattle in the Leine lowlands [see this *Review*, Ser. B, iv, p. 126] again occurred at the end of April and early in May, and confirmation was obtained of previous observations that the *Simulium* pupae attached to water-plants must be above the water-level before the adults can emerge on the advent of warm, damp weather. The flies that emerge later than the first swarms come from pupae deeper under water. The egg, larval, pupal and adult stages occur throughout the summer up to late in the autumn, there being apparently several generations. The larvae from eggs laid in autumn attain full growth only in the following spring, when they pupate and, on warm, damp weather coinciding with a fall in the level of the water, produce those adults the bites of which are so fatal to cattle. Large numbers of newly-emerged adults were caged, so as to prevent the females from sucking blood, and in no case was pairing or oviposition noticed. The females were never seen to suck fruit juices or sugar syrup and appeared to require blood, the absence of which apparently prevented pairing and oviposition. Inspection of the Leine and Aller rivers showed that large colonies of *Simulium* larvae occurred only near pastures. Oviposition throughout the summer and autumn therefore proves that cattle are bitten in those seasons and the fact that no deaths occur then points to the gradual production in the animals of an anti-toxin which neutralises the poison. Further investigation on this point is required. A few isolated bites are harmless, but general attacks are fatal. These have been facilitated in recent years by the smaller areas of pasture and by their enclosure with wire fencing, which prevents the animals from escaping into bush-covered ground when attacked. As these conditions cannot be altered, the cattle may either be rendered immune by being put out to graze before the main swarms appear or they must be kept indoors until these swarms have disappeared. The latter is the only practical measure, the first being too risky to be recommended. The cost of clearing away the water-plants would be excessive and would not be efficacious, since the survival of a very few females, each capable of laying 10,000 eggs, would nullify the measure.

La Gale du Cheval, Maladie contagieuse. [Horse Mange, an infectious Disease.]—*La Vie Agric. et Rur., Paris*, vii, no. 30, 28th July 1917, p. 118.

A decree of the 22nd June, appearing in the *Journal officiel* of the 11th July, adds mange in horses to the list of contagious animal diseases which are dealt with under the law of 21st June 1898.

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Du Toit (P. J.). **Ueber das Sammeln und die Zucht unserer heimischen Zecke,** *Ixodes ricinus*, **L.** [The Collection and Breeding of our native Tick, *Ixodes ricinus*, L.]—*Berliner Tierärztl. Wochenschr., Berlin*, xxxiii, no. 11, 15th March 1917, pp. 124–127. [Received 19th June 1917.]

Microscopic examination of five males of *Ixodes ricinus*, L., that had been on cattle for 8 to 11 days, showed digested and undigested blood in the intestines of three of them, thus proving that the males are blood-suckers. Contrary to Nuttall's statement that hungry ticks are to be seen pairing only in captivity, the author has often taken them when pairing in pastures. Guinea-pigs enclosed with *I. ricinus* were quickly covered with very large numbers of young larvae, but although sexually mature ticks that had been unfed for several months were present, not one female attached itself to these animals, thus confirming the fact that the mature individuals prefer the larger animals. Not one single larva attached itself to the author, whereas both nymphs and females often attach themselves to man. The symptoms noticed in the guinea-pigs were similar to those of tick paralysis.

Mornard (—). **La Lutte contre les Mouches.** [Fly Control.]—*Progrès Agricole, Amiens*, xxxi, no. 1533, 3rd June 1917, p. 264.

To prevent flies from penetrating into habitations, the use of wire screens or "Japanese" blinds in doors and windows is advocated. For the total and immediate destruction of all flies in a building, fumigation with sulphur or cresyl is advised. Of the former, 1 oz. to every 37 cub. ft. of space, placed in earthenware saucers, is used; each lump of sulphur is hollowed out into a cup-shaped depression into which alcohol is poured and lighted to ensure the combustion of the sulphur. The fumigation should last 24 hours, the building being hermetically sealed throughout the operation and thoroughly ventilated before being entered.

Cresyl vapour is less dangerous to use than sulphur; 3 drams to each 42 cub. ft. of space are placed over a fire in a large receptacle and brought to boiling-point. The vapour given off is at first white, then grey and bluish. When the room is filled with blue fumes, which are very toxic to the flies, but harmless to man, it can be entered and the fire extinguished. It should then be closed again, allowing the fumes to act for at least six hours before ventilating. As the flies are more often stupefied by the fumes than killed, they must be collected and burnt.

Formalin vapour is very toxic to flies and may be used in the following formula: Commercial formalin 2 parts, slightly sugared water 100 parts, placed in saucers in a sheltered place. Another formula is: Commercial formalin 25 parts, milk 25 parts, sugared water 60 parts. This is used in the same way; a few pieces of bread may be added to the contents of the saucers. Adhesive baits recommended are: Colophonium 72 parts, castor-oil 30 parts, heated and mixed together, 12 parts of honey, glucose or molasses being then added. This mixture is smeared on wands stripped of their bark and placed in receptacles full of sand. Castor-oil, 5 parts, and resin, 8 parts, can be mixed by boiling and spread on strips of paper. Co-operation in fly control, which has succeeded in almost completely eliminating flies from some localities, is strongly advocated.

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Rène (C.). **Les Poux chez les Moutons.** [Sheep Ticks.]—*Progrès Agricole, Amiens*, xxxi, no. 1534, 10th June 1917, pp. 275–276.

Against parasites of sheep such as the Hippoboscid, *Melophagus*, and the louse, *Trichodectes*, the author deprecates the use of insecticide powders and ointments and recommends dipping. Titrated extract of nicotine of State manufacture, $\frac{1}{2}$ gal., and water, 100 gals., can be used as a bath, the sheep being dipped twice at eight days' interval, care being taken that none of the liquid is swallowed by the animals. The most efficacious bath is composed of carbolic acid $2\frac{1}{2}$ gals., black soap 10 lb., water 200 gals. The black soap and phenic acid are separately dissolved in a little warm water, the two solutions are then mixed and the rest of the water added. The bath should be kept warm by occasional additions of hot quantities of the solution. The animals should be kept in it for some minutes in order to soak the fleece, shearing being unnecessary. To prevent re-infestation, the folds should be thoroughly cleaned and washed down with milk of lime. For *Ixodes* the usual methods of control are removal of the ticks by hand or covering them with a drop of oil, benzine and petrol mixture, or baths, using either the carbolic formula given above or an arsenical dip composed of arsenic anhydride 4 lb., carbonate of soda 10 lb., Norwegian tar $3\frac{3}{8}$ gals., water 180 gals. The usual precautions in using this poisonous solution must be taken.

Die Bekämpung der Gastruslarve. [The Control of *Gastrophilus* Larvae.] —*Deutsche Landwirtschftl. Presse, Berlin*, xliv, no. 39, 16th May 1917, p. 325.

According to P. Larisch, the abundance of *Gastrophilus* larvae in the stomach and duodenum of German army horses on the east front is due to the animals being kept in the open from June to October, when they are constantly exposed to bot-fly attack. The Russian horses suffer to a still greater extent for the same reason. Insufficient and unsuitable fodder appears to favour the presence of the larvae, which occur in both old and young animals. In 60 per cent. of all cases *G. equi* was present, and the disease was severe where *G. pecorum* and *G. nasalis* occurred. The horses rapidly lost weight, from 500 to 750 larvae being present in the stomach. In about 20 cases from 250 to 350 larvae were found at the beginning of the duodenum, of which about two-thirds were those of *G. equi.* Colic was sometimes noticed and the beginning of perforations of the stomach and the walls of the small intestines. Of 80 horses dissected between mid-February to mid-May, 1916, 55 had succumbed to infestation by these larvae.

Carbon bisulphide was used for 725 horses, 1,800 pills being administered. The usual doses were found to be too strong. For heavy German horses three 10-gramme pills should be given at hourly intervals; for light German horses, two 10-gramme and one 8-gramme pills; for very small Russian horses, two 8-gramme pills. Should colic supervene, treatment must be discontinued and begun afresh some days later. Treatment causes a lack of appetite for a couple of days. This method saved a large proportion of the animals and no larvae were found in treated animals that subsequently died. Prophylactic treatment lies chiefly in the care of the coat, which should be well cleaned daily in the late afternoon from June to October.

To control the Ox-Warble.—*Mthly. Bull. Ohio Agric. Expt. Sta., Wooster*, ii, no. 2, February 1917, p. 67. [Received 19th June 1917.]

The ox-warble fly [*Hypoderma*] may be largely controlled by squeezing the grubs out of infested animals during the early spring months, thus reducing the egg-laying females for the next summer. The eggs are laid during the summer months mainly upon the hair on the legs of cattle. The young maggots are found in the gullet from September to February, after which they appear under the hide on the back. It is doubtful whether they enter the body by the animal's licking the eggs off the hair, recent investigations having indicated that they may burrow directly through the hide [see this *Review*, Ser. B, iii, pp. 19, 22].

SCOTT (J. W.). **Report of the Parasitologist.**—*26th Ann. Rept. Univ. Wyoming Agric. Expt. Sta., 1915–1916, Laramie*, pp. 88–91. [Received 19th June 1917.]

Further experiments in the transmission of swamp fever in horses [see this *Review*, Ser. B, iv, p. 14] have confirmed the view that it is transmitted by *Stomoxys calcitrans* (stable fly), and probably not by mosquitos, nor by means of a secretion from bot-fly larvae, as suggested recently by German writers.

REINHARDT (R.). **Mitteilungen aus dem Pferdelazarett Brüssel.** [Communications from the Veterinary Hospital at Brussels.]—*Berliner Tierärztl. Wochenschr., Berlin*, xxxiii, nos. 21–22, 24th–31st May 1917, pp. 241–245, 251–252, 2 figs.

A liniment containing crude oil and lime-water proved very effective against horse mange and was, generally speaking, harmless. It diminishes the appetite and may cause slight temporary oedema and a more or less considerable loss of hair, but no lasting ill-effects were observed. The dipping arrangements at the hospital are described. The tank is similar to those used in South Africa and elsewhere for freeing cattle from ticks. The dipping fluid is a 2 per cent. aqueous solution of creolin at a temperature of 100°–110° F. This is non-poisonous, cheap, harmless and highly effective. Very severe cases were usually cured by treatment twice weekly for five or six weeks, medium cases in four weeks and slight ones in three weeks. Each treatment consisted of three separate dippings with a good rub-down after each. After treatment, the horses were placed in warm stalls. Their stalls, harness, etc., were disinfected once a week with a solution of lime-water and lysol. It is possible to treat 40 horses per hour and only 12 men are required for the actual dipping and rubbing down of this number.

STRICKLAND (C.). **A curious Adaptation of Habit to its Environment of a Malayan Mosquito.**—Separate from *Jour. Straits Branch R. A. Soc.*, [*sine loco*], no. 75, 1917, 1 p., 1 plate. [Received 26th June 1917.]

An example of the mosquito, *Chaetomyia* (*Leicesteria*) *flava*, Leic., has been captured having attached to its hind leg a mass, which on examination proved to be a collection of ova with the head of a young larva protruding from each. The mosquito, on being placed in a bottle containing some water, immediately flew down to the water and methodically dipped its hind leg into it, whereupon the larvae all emerged and swam away. It is supposed this act of oviposition on its own leg is a device by which the mosquito is enabled to lay its eggs in water which is ordinarily inaccessible to it, or it may be a means of saving the eggs from some danger which they might incur if laid directly on water.

CORNWALL (J. W.) & MENON (T. K.). **A Contribution to the Study of Kala-azar (III).**—*Indian Jl. Med. Research, Calcutta*, iv, no. 4, April 1917, pp. 672–687. [Received 26th June 1917.]

Two classes of flagellates occur in nature, one that flourishes in the presence of bacteria, and another that rapidly dies in their presence. There are also two classes of insects, those whose alimentary canal contains numerous bacteria obtained from a diet of non-sterile substances either throughout life or only in the larval stage, as is the case in the cockroach or house-fly and mosquito respectively, and insects whose alimentary canal is sterile owing to their having lived on sterile food, such as blood obtained through a long, puncturing proboscis. Hence, assuming that the flagellate stage of *Leishmania donovani* and *L. tropica* cannot occur in the stomach of an insect in which bacteria abound, the number of hosts is limited. The multiplication of flagellates of *Leishmania* in the stomach of bed-bugs (*Cimex*) is seldom very profuse and sometimes scarcely occurs at all; on rare occasions only, living flagellates of *L. donovani* have been found in the intestine and rectum of artificially infected bugs. There is a very considerable weight of evidence against the transmission of both typhus and spirochaetes by bugs in the act of feeding and a less amount against the transmission of plague. They may however occasionally infect healthy animals either by regurgitation or by washing out with their saliva infective material which has remained in the lumen of their sucking tubes, though attempts to induce regurgitation of flagellates of *L. donovani* by infected bugs have had negative results. The flagellates of both *L. donovani* and *L. tropica* grow well in a medium prepared from the blood of the monkey, *Macacus sinicus*, and the former have been cultivated from the peripheral blood in cases of kala-azar even during apyrexial periods.

SEN (S. K.). **A preliminary Note on the Rôle of Blood in Ovulation in Culicidae.**—*Indian Jl. Med. Research, Calcutta*, iv, no. 4, April 1917, pp. 729–753. [Received 26th June 1917.]

The view that mosquitos require meals of blood to propagate their species has been so widely held, without experimental proof, that attention has recently been drawn to the facts that mosquitos occur in uninhabited regions in Greenland; that they occur in large numbers in tracts in which there is no epidemic malaria; that large numbers of mosquitos live with very few chances of getting blood; that substances, other than blood, have been found in the alimentary tract of females that have laid eggs in captivity; and that they have been observed sucking juices from fruit and flowers, etc. An extensive series of experiments was undertaken by the author with a view to determining, if possible, what property of blood is responsible for ovulation and whether or no such property is present in some of the ordinary substances in nature. For this purpose mosquitos were fed with milk and sugar, peptone and sugar, and sugar only, with the result that eggs were deposited from which adults in some cases were reared, thus proving that deposition of eggs is possible without any meal of blood. No results were however obtained as regards the nature of the organic compound required, as legumin and sugar, albumin and sugar, urea and sugar, and glucose only, gave negative results. Incidentally it was also proved that an initial meal of blood may sometimes suffice for as many as three batches of eggs, while a single fertilisation suffices for several batches.

PARKER (R. R.). **Seasonable Abundance of Flies in Montana.**—*Entom. News, Philadelphia*, xxviii, no. 6, June 1917, pp. 278–282.

Experiments conducted during July and August showed that the house-fly reached its greatest abundance during the first three weeks in August and showed an abrupt decrease during the fourth week; this decrease continued during September owing to the increasing cold. For the same reason house-flies and other species were more abundant in houses during September than in July and August. The total number captured out of doors in beer-baited traps was made up of the following species:—*Musca domestica*, 91·8 per cent.; *Muscina stabulans*, 3·61 per cent.; *Fannia scalaris*, F., *F. canicularis*, L., and an undetermined species, together, 2·38 per cent.; *Lucilia sericata*, Mg., 1·51 per cent.; and less than 1 per cent., in all, of the following, *Muscina assimilis*, Fall., *Lucilia caesar*, L., *L. sylvarum*, Mg., *Phormia terrae-novae*, Desv., *P. regina*, Mg., *Calliphora erythrocephala*, Mg., *C. coloradensis*, Hough, *C. latifrons*, Hough, *Ophyra leucostoma*, Wied., undetermined ANTHOMYIDAE, *Ravinia communis*, Parker, *R. peniculata*, Parker, *Sarcophaga haemorrhoidalis*, Fall., *S. cooleyi*, Parker, *Boettcheria cimbicis*, Towns., *Anacampta latiuscula*, and *Culex tarsalis*, Coq. The comparative abundance of the house-fly may be expected to be even greater in towns, but that of *Fannia scalaris* and blow-flies would be less owing to systematic disposal of garbage. Blow-flies were most abundant during the spring, especially *Phormia terraenovae* and a species of *Cynomyia*, probably *C. elongata*, Hough, and these were followed by *Calliphora* spp. A knowledge of the seasonal occurrence of the blow-fly would be of value in connection with the blowing of wool at lambing time, the species responsible for this trouble being at present unknown.

South Carolina Agric. Expt. Sta., Clemson College, S.C., Press Bulls. nos. 93, 144, 147, 151. [n. d.]. [Received 29th June 1917.]

The success of any method to control rats, whether by bait or traps, depends on its simultaneous use in all parts of infested premises. The best poisons are barytes, plaster of Paris and phosphorus. Each is used by making a stiff dough with 1 part of the poison and 6 parts of maizemeal or oatmeal. Rats may be driven from grain cribs or killed, by fumigation with carbon bisulphide.

Lice on cattle can be destroyed by washing with a solution of 1 lb. tar-soap in 7 U.S. gals. of water, or with various proprietary preparations. This should be done in the evening after milking in the case of milch cows.

The house-fly [*Musca domestica*, L.] is best controlled by attention to manure heaps, which should be stored in dark places and spread out once a week and treated with borax or hellebore. Powdered borax should be used at the rate of $\frac{3}{5}$ lb. to 8 bushels of manure and 2 or 3 U.S. gals. of water then poured over the heap. Hellebore should be applied as a solution made by mixing $\frac{1}{2}$ lb. hellebore with 10 U.S. gals. water.

Chicken lice and mites may be controlled by keeping fowl-houses clean by spraying all cracks and crevices with lime-sulphur wash, kerosene, whitewash or crude carbolic acid, and by painting all nests and roosts annually with some wood preservative. Sitting hens may be dusted two or three times a week with insect powder, and the heads of young chicks treated with lard or sweet oil, or with 1 part blue ointment mixed with 5 parts of vaseline or lard.

Nicoll (W.). **Flies and Bacillary Enteritis.**—*Brit. Med. Jl., London*, no. 2948, 30th June 1917, pp. 870–872.

In no case has the house-fly [*Musca domestica*, L.] been proved to be exclusively the specific carrier of any particular disease, though it is generally the most effective. Neither is it known to be the intermediate host of any disease-causing organism occurring in man, though it is the true intermediate host of *Habronema muscae* infesting horses. Observations on flies from houses in which cases of dysentery or diarrhoea were present have shown that under experimental conditions flies can readily carry and disseminate certain pathogenic organisms, which they also do under natural conditions, especially during outbreaks of infectious diseases. Organisms producing bacillary enteritis may often be met with in flies under natural conditions.

Dienst der Pestbestrijding. Verslag over het vierde kwartaal 1915 tevens jaarverslag. [Plague Control Service. Report for the 4th Quarter of 1915 and Annual Report.]—*Batavia*, 1916, 98 pp. [Received 15th June 1917.]

Supplement XIX in this report illustrates and describes various systems of construction applicable to native dwellings in Java whereby the opportunities for contact between human beings and rats are lessened.

Sadi de Buen (—). **Los Mosquitos del genera** "*Phlebotomus*." **Su interés médico.** [The Flies of the Genus *Phlebotomus*. Their Medical Importance.]—*Siglo Med.*, lxiii, no. 3281, 28th Oct. 1916, pp. 695–696, 1 text-fig. [Abstract in *Trop. Dis. Bull., London*, ix, no. 7, 30th April 1917, pp. 368–369.]

A short note, with an illustration of the insect, drawing the attention of Spanish practitioners to the importance of *Phlebotomus* as a propagator of three day or pappataci fever. Doerr, Taussig and Franz have shown that the insect is not merely a mechanical transmitter of the virus, but that an incubation period of a week within the body of the insect is necessary. Townsend has expressed the opinion that a species of *Phlebotomus* is the transmissor of verruga in Peru. Sergent and others, again, have suggested that the leishmaniasis of Oriental sore is transmitted by a *Phlebotomus*, the reservoir being the gecko (*Platydactylus mauritanicus*). Medical practitioners in Spain should therefore note that Oriental sore is common on the African coast of the Mediterranean, that flies of the genus *Phlebotomus* have been recognised in Grenada, Malaga and Palma de Mallorca, in Spain, and that the gecko, vulgarly termed " drago " in Catalonia and the Balearic Islands, is found practically all over Spain. *Phlebotomus* has also been taken by Pittaluga in Spanish Guinea.

CRAIG (Major C. F., U. S. Army). **The Occurrence of Endamebic Dysentery in the Troops serving in the El Paso District from July 1916 to December 1916.**—*Military Surgeon, Washington, D.C.*, xl, nos. 3–4, March-April 1917, pp. 286–302, 423–434.

The occurrence of 156 cases of endamoebic dysentery among the troops in the El Paso district led to an enquiry as to epidemiology of the outbreak of which the causal agent was *Endamoeba histolytica*, and with regard to its transmission the conclusion reached was that it was carried by flies. From 1st December 1916 until 8th January 1917 (the date of writing) not a single new case occurred, and during that period flies were practically absent or in such small numbers as to be below an infectious minimum.

HINE (J. S.). **Description of North American Tabanidae.**—*Ohio Jl. Sci., Columbus*, xvii, no. 7, May 1917, pp. 269–271. [Received 11th July 1917.]

Five new North American species of *Tabanus* are described, namely, *T. annularis*, sp. n., from Mississippi ; *T. daeckei*, sp. n., from New Jersey ; *T. petiolatus*, sp. n., taken from a horse in Louisiana ; *T. uniformis*, sp. n., from Kansas, Mississippi, Louisiana and Alabama ; and *T. nantuckensis*, sp. n., from Nantucket Island only.

KISLIUK (M.). **Some Winter Observations of Muscid Flies.**—*Ohio Jl. Sci., Columbus*, xvii, no. 8, June 1917, pp. 285–294.

A double series of experiments conducted by the author, during winter, on flies in an unheated stable and in the insectary, led to a confirmation of Dr. Bischoff's previous conclusion, that flies which are not kept cold enough to become inactive will either oviposit if the temperature is sufficiently high, or die comparatively soon. In the stable the greatest longevity of an adult was 44 days, at a mean temperature of 45° F., and in the insectary 30 days at a mean temperature of 30° F. Eggs were deposited in the stable on 6th May, and in the insectary on 20th April. It was shown that all stages may be obtained throughout the winter under rare conditions of artificial heat and breeding media ; that under natural conditions neither eggs nor maggots are to be found alive in the normally preferred situations, though maggots may probably be found in early winter; that the small number of puparia taken from their preferred environment in mid-winter (26th February) and their successful emergence on 10th–12th March, under artificially heated conditions—in spite of the large proportion (91 per cent.) affected by autumn parasites—apparently indicates that under natural conditions *Musca domestica* hibernates as a pupa. From breeding experiments it was concluded that *Lucilia sericata*, Mg. (common green-bottle) hibernates in the larval or pupal condition, and that *L. caesar*, L., *L. sylvarum*, Mg., *Phormia regina*, Mg., *Calliphora erythrocephala*, Mg. (large blue-bottle), *C. vomitoria*, L. (blue-bottle), and *Cynomyia cadaverina*, R.D., hibernate in the immature stages, while *Pollenia rudis*, F., also hibernates as an adult. Hence it is not sufficient to kill the adults in early spring as a control measure, but manure piles and rubbish heaps, in which the larvae and pupae successfully hibernate, should receive attention in autumn and winter, so that the latter may be killed by exposure to fatal winter temperatures.

HIRST (S.). **On the occurrence of a Pseudoparasitic Mite** (*Cheletiella parasitivorax*, **Mégnin) on the Domestic Cat.**—*Ann. Mag. Nat. Hist., London*, xx, no. 115, July 1917, pp. 132–133, 1 fig.

The mite, *Cheletiella parasitivorax*, formerly found only on rabbits and hares, was discovered on the hairs of the body of a freshly-killed cat which had suffered from mange on the ears and face. Probably it fed on the acarus (*Notoedrus cati*) which was the cause of the mange. Other species of *Cheletiella* have been found on birds, or in their nests.

DOUVILLE (—). **Quelques Réflexions sur la Gale du Cheval et son Traitement.** [Some Reflections on the Subject of Mange in Horses and its Treatment.]—*Rev. Gen. Méd. Vét., Toulouse*, xxvi, no. 306, 15th June 1917, pp. 225–237.

During a period of 18 months, when the author was in charge of a large depôt for sick and especially for mangy horses on the French front, he was struck by the extreme seriousness and the extensiveness of this disease among the army horses. He agrees with Fayet [see this *Review*, Ser. B, v, p. 18] that a careful watch should be kept for the first symptoms of the disease and even suspected cases promply placed under treatment, in order to avoid its spread. The effectiveness of various medicaments is discussed, but the author deprecates in general the use of anti-psoroptic pastes. Of those mentioned, he gives the preference to an alkaline petroleum emulsion composed of 1 oz. soda crystals and $10\frac{1}{2}$ oz. petroleum to $1\frac{3}{4}$ pints of water. The emulsion must be perfect at the moment of use, and is applied as a shampoo every six days, six or seven applications being sufficient. Owing to the amount of hand-labour required for these treatments and the necessity for supervising the thoroughness of the applications, a good deal of inconvenience is attached to their use, and a dipping bath, such as that advocated by Descazeaux [see this *Review*, Ser. B, iv, p. 165], is strongly recommended in preference.

The author is not in agreement with Berton regarding the effectiveness of the open-air treatment of mange [see this *Review*, Ser. B, v, p. 77]. In his opinion the parasites during this treatment enter on a period of inertia, during which their reproduction and development is certainly retarded, and their presence difficult of detection owing to their having sought cover in the more sheltered parts of the horses' body, such as the base of the ears, inside the thighs, etc. Thus the horse returning from a period of cure in the open air may exhibit an apparently healthy condition, while close examination reveals the presence of the parasites, which are only awaiting more favourable conditions to recommence their activity. The risk of turning horses out in cold winter weather should also be taken into consideration, and the author queries whether the resistance of the host to such conditions may not be less than that of the parasite. Mange has been known to spread among horses which had hitherto been immune owing to the introduction among them of a few individuals that had been passed as completely cured. In the depôt referred to, the only safe method was found to be one stable for convalescent animals and another for those available for service. In the first the animals were kept for some 15 or 20 days, subject to frequent inspection, which often revealed the beginning of a fresh outbreak, which was thus checked at its commencement; in the second, frequent inspections were made up to the date of departure, while the greatest prophylactic precautions were taken with regard to harness and utensils.

PHALEN (Major J. M., U.S. Army). **U.S. Army Methods of Disposal of Camp Refuse.**—*Amer. Jl. Public Health, Concord, N.H.*, vii, no. 5, May 1917, pp. 481–484.

The destruction of kitchen refuse by burning is the only practical method for a camp of anything but the shortest duration. An incinerator may be built by excavating a quadrangle or oval about 6 feet by 3 feet and preferably about 4 feet deep. This is filled loosely with large stones, broken bricks or other heat-conserving material. The earth from the pit is banked along the sides about a foot high and this sloping bank is lined with stones, the ends being left without banking in order to increase draught. Upon this incinerator a wood fire is kept burning and all the kitchen and camp area refuse is dumped on the hot stones. If poured slowly, most of the liquid will rapidly evaporate, the remainder being absorbed into the ground. A refuse dump is required for the ultimate disposal of the incinerator refuse and if it is kept levelled an average of thirty waggon-loads a day for twenty months can be dumped on an area of one acre.

Manure should be daily removed from the picket lines and either disposed of to farmers or burnt, for the use of chemicals is impracticable for large quantities. In a camp containing about 4,500 animals, furnishing about 100 waggon loads of manure daily, the following method was successful:—On a dump, 1,000 yards long by 80 yards wide, winrows of manure running widthwise were made by dumping from the tail of the waggon as it was gradually moved across the area. They were about $1\frac{1}{2}$ feet high and of the width between the waggon wheels. The manure was dumped early in the forenoon and allowed to get surface dry. Then six labourers sprinkled the windward side of the winrows with crude oil, set them alight and kept turning the manure over to ensure combustion. From three to five barrels of oil a day were required, depending on the amount of wind blowing. This method was satisfactory except in wet weather when burning was impossible. Such periods were followed by a plague of flies. Near the manure dump a hole about 15 feet long by 10 wide and 4 deep was dug for cremating dead animals. Half a cord of wood was piled around and over the carcase and a couple of buckets of crude oil was poured over it. About a score of carcases may be burnt before it becomes necessary to remove the ashes.

In dealing with human excreta the deep pit latrine has the widest general application to camp conditions. The pit is usually about 8 feet deep, $1\frac{1}{2}$ to 2 feet wide, and 18–20 feet long for a company latrine, with eight holes. The box must be light enough to be turned back by two men and must be built of seasoned wood to prevent cracks permitting flies, or even light, to enter. The covers must close the holes tightly and a rail must be fitted to prevent them from remaining open when the hole is unoccupied. In front of each hole should be nailed to the upper angle a piece of tin, 8 by 12 inches, shaped into a gutter and so placed that it will divert the urine back so as to clear the anterior wall of the box. Besides walls the latrine should have a good roof to protect the users and the pit. The roof should project sufficiently beyond the walls to deliver storm water into a ditch at a distance of about a foot from the walls. The daily burning out of the latrine is important. The box is turned back, a layer of hay or straw is thrown into the pit, which is sprinkled with crude oil and set afire. One U.S. gallon of oil and 14 lb. of hay a day is sufficient. After the fire has burnt out the box is restored to its place, its base being banked up with a little earth. The charred layer over the excreta renders them unattractive to flies. This purpose is also attained, and perhaps to an even greater degree by spraying the interior of the pit daily with a suspension of lamp black in coal oil. For this the box need not be moved. Night urine is collected in galvanised iron cans, whitewashed and placed near a lantern in the company street and emptied each morning into the latrine pit, after which they are burnt out and whitewashed afresh.

TEICHMANN (E.). **Entlausung durch Zyanwasserstoff.** [Louse Destruction by Hydrocyanic Acid Gas.]—*Deutsche Med. Wochenschr., Berlin,* xliii, no. 10, 8th March 1917, pp. 303–304.

In these experiments lice and their eggs were placed in glass dishes (either open, or closed and wrapped in cotton wool) and subjected to fumigation with H C N in a well-closed room. Adults, larvae and eggs were killed by 1 per cent. of hydrocyanic acid acting for 2 hours. It will be seen that the percentage value (1) multiplied by the number of hours (2) produces the figure 2; if other percentages are used the time must be varied so as to obtain this product 2. For instance, with 2 per cent. strength one hour is required. The gas has great penetrative power and lice in one of the closed dishes were not protected in the least by being placed in a bed beneath two pillows and a blanket. A room of 2,120 cubic feet space may be entered fifteen minutes after airing has been begun subsequent to a fumigation lasting two hours. Clothes, beds, etc., in it may be used without much delay. The only disadvantage is the poisonous nature of the gas, but if proper care is exercised this need not be a deterrent to its use.

Jungmann (P.) & Kuczynski (M. H.). **Zur Klinik und Aetiologie der Febris wolhynica (His-Wernersche Krankheit).** [The Clinical Symptoms and Aetiology of Volhynian Fever (His-Werner's Disease).]—*Deutsche Med. Wochenschr., Berlin,* xliii, no. 12, 22nd March 1917, pp. 359–362, 6 diagrams.

Töpfer has stated that lice are the carriers of Volhynian fever [see this *Review*, Ser. B, v, p. 111] and the authors' observations confirm this. In many cases which were at first clinically obscure an early diagnosis of Volhynian fever was possible by examination of lice taken from the patients.

Ritchie (A. H.). **Report of the Government Entomologist for Year 1916–1917.**—*Supplement Jamaica Gazette, Kingston,* xl, no. 4, 5th July 1917, pp. 97–98.

Stock pests of the year included a somewhat serious outbreak of *Lyperosia irritans*, L. (horn-fly), in St. Ann, the mixed pastures affording ideal breeding grounds during continuously damp weather, such as had persisted during the close of 1916 just before the outbreak, when it was impossible to secure rapid drying-out of the cow-manure in the long, damp grass. The application of external repellents is not recommended in grazing pens, although in a dairy herd such a method may be resorted to during milking time. Netting the flies from the stock when passed between double fencing was suggested, and the scattering of manure in the fields by forks or bush harrows will accelerate the drying out. The drying out and deep burial of manure in the fields is greatly aided by dung-infesting beetles, such as *Phanaeus sulcatus*. It is suggested that an exchange of such species might be effected with other entomological stations. Tabanids recorded during the year included: *Lepidoselaga lepidota*, Wied., *Tabanus trilineatus*, Latr., and *Chrysops costatus*, F. *Stomoxys calcitrans* is general and increases rapidly after rains. Tick control is being undertaken seriously; four vats are now in use in the colony and others are being constructed. The use of spraying machines is increasing and hand-spraying is general. Methods for controlling hog-lice have already been dealt with [see this *Review*, Ser. B, v, p. 75]. Sanitary conditions are the best safeguard against lice on pigs, and the adoption of concrete wallows with crude oil on the surface of the contained water is strongly recommended.

Moore (W.). **Toxicity of Various Benzene Derivatives to Insects.**—*Jl. Agric. Research, Washington, D.C.,* ix, no. 11, 11th June 1917, pp. 371–381, 4 figs.

Fumigation with nitrobenzene having been found effective in destroying external parasites of animals, it was felt that this was too dangerous a poison for general use by inexperienced persons. A study of a series of benzene derivatives was therefore undertaken with a view to determining their toxicity to insects, and it was hoped to arrive at some compound which would be quite toxic to insects but non-toxic to higher animals or plants. The vapour of 28 benzene derivatives has been studied and the toxicity of each determined. This knowledge is of value, not only as regards the possibilities of fumigation, but also as an index of their worth as contact sprays, since these have been shown to kill by the action of their vapour rather than by the plugging of the spiracles. The experiments are described and their results shown in graphs and tables. The house-fly (*Musca domestica*) was selected for the experiments as being typical and easy to breed in large numbers. The toxicity of the benzene derivatives was found to be similar for other insects. A comparison of the green-bottle fly (*Lucilia sericata*, Mg.) with *Musca domestica* shows that house-flies die more quickly from compounds with a low boiling point than green-bottle flies, while the reverse is the case with compounds with a high boiling point. Similarly, the cockroach, *Phyllodromia germanica*, L., succumbs less readily than the potato beetle (*Leptinotarsa decemlineata*, Say) to low boiling compounds and more readily to high boiling compounds. This may be due to morphological differences in the insects. All the benzene derivatives tested proved to be more toxic to insects, molecule for molecule, than carbon bisulphide. A graph shows the quantity of various benzene derivatives necessary to saturate 1,000 cub. ft. of space at 70° F., and the time required by such quantity to kill house-flies. Carbon bisulphide at the standard rate is given for comparison. As a low-boiling compound will penetrate grain better than a high-boiling compound, the possibilities of xylene, chlorbenzene, and brombenzene are at once apparent, though no actual tests have been made.

For the fumigation of animals, a compound with a high boiling point is needed, so that relatively little of the material shall be in the air to be taken in by the animal, and in this respect salicylic aldehyde is probably the best. As the higher animals readily oxidise this substance into salicylic acid, it is suggested that it might be used for internal fumigation to destroy bots. Further tests are, however, necessary before selecting the most practicable substances. Up to 250° C. the higher the boiling point the more toxic the compound to insects. Beyond 250° C. the compound is usually so slightly volatile that not enough of the chemical will evaporate to be effective. Lipoids are very soluble in compounds with low boiling points and but slightly soluble in compounds with high boiling points. Even though compounds with low boiling points are less toxic than those with high boiling points, better results may be obtained with the former, as more of such compounds may be evaporated before saturation is reached.

Pierce (C. C.). **Combating Typhus Fever on the Mexican Border.**—*U.S. Public Health Repts., Washington, D.C.*, xxxii, no. 12, 23rd March 1917, pp. 426–429, 4 figs.

During the past five years migration in Mexico due to the disturbed political conditions there has resulted in spreading typhus fever from the plateau regions, where it has been endemic for many years, to all parts of the country. The disease is, however, mostly limited to the extremely poor and vermin-infested portion of the population. During December 1915, the occurrence of three cases of typhus at Laredo, Texas, caused the U.S. Public Health Service to institute measures to prevent the disease from spreading to the United States and abandoned disinfecting plants along the frontier were put into operation, so that the clothing of louse-infested persons might be sterilised with steam, and their bodies bathed with soap and water before they were allowed to enter the States. A description of the plant at El Paso, Texas, is given.

If lice are present, the hair of men or boys is clipped and burnt. Women have a mixture of equal parts of kerosene and vinegar applied to the hair for half an hour with a towel covering the head. The dilute acetic acid loosens the eggs from the hair and the kerosene kills or stupefies the adult lice, which are removed by washing with warm water and soap. After being passed by the attendant, liquid soap is sprayed upon the body from an elevated reservoir and the person then proceeds to the baths. The soap is made by boiling one part of soap chips in four parts of water and then adding two parts of kerosene oil. This jellies when cold, and one part of this soap-jelly is added to four parts of warm water, making a good liquid soap at very small cost.

Clothing is disinfected by being placed in bundles in the steam chamber in which a vacuum of 10 to 15 inches is created and live steam is then introduced until the gauge shows 20 pounds, which gives a temperature of 259° F. This is maintained for 10 minutes to insure penetration. The creation of a second vacuum of 10 inches and holding it for 10 minutes will dry the clothes completely, though at El Paso this is unnecessary.

MITZMAIN (M. B.). **Anopheline Mosquitoes. Their Distribution and Infection under Field Conditions.**—*U. S. Public Health Repts., Washington, D.C.*, xxxii, no. 15, 13th April 1917, pp. 536–540.

Under experimental conditions *Anopheles punctipennis* may serve as a vector of malaria. In order to determine whether conditions exist in nature in the presence of which this insect may be of epidemiological significance, a total of 1,377 specimens of *Anopheles quadrimaculatus* and *A. punctipennis* were collected from 18th September to 15th November 1916, at Talladega Springs, Alabama, a region of which the maximum parasite index had previously been ascertained to be 18·6 per cent. among 200 persons. At least 85 per cent. of the specimens reached the laboratory at New Orleans in an uninjured condition suitable for dissection. This collection showed that in the three sources of direct human influence, namely, inside dwellings, under dwellings, and in privies, the last produced the greatest numbers of *A. punctipennis*. This species comprised 30 per cent. of the catch in houses, and 62 per cent. under dwellings. The majority of individuals of *A. punctipennis* infesting houses are usually found in an engorged state resting under the flooring of dwellings. Officers conducting malarial surveys have noticed that although *A. punctipennis* rarely bites while inside a building, it is found to attack persons seated on the porch or gallery of the house, after which it seeks rest, presumably under the house in preference to the interior. This is not an unusual habit of an Anopheline mosquito and has been recorded by Ross in the case of *Anopheles* (*Pyretophorus*) *costalis*. The presence of blood-engorged specimens of *A. punctipennis* in houses and privies justifies the assumption that the source of the blood was probably human, and suggests an active agency in malaria dissemination.

Dissection showed infected specimens early in the investigation, namely, an example of *A. quadrimaculatus* on 21st September (collected 18th September) and another of *A. punctipennis* on 29th September (collected 26th September).

An effort was made in the region of Alabama to determine the season when malaria ceased to exist in a transmissible form. One infection was noted in an *A. quadrimaculatus* examined on 15th November in the shape of a single oocyst apparently of stunted development and similar in character to those seen in mosquitos kept in the laboratory at low temperatures for two months or longer, and which were not observed to develop to maturity during this period.

LE PRINCE (J. A. A.) & GRIFFITTS (T. H. D.). **Flight of Mosquitoes. Studies on the Distance of Flight of *Anopheles quadrimaculatus*.**—*U.S. Public Health Repts., Washington,* **xxxii**, no. 18, 4th May 1917, pp. 656–659, 3 figs.

In the Southern United States *Anopheles quadrimaculatus* is probably the principal carrier of malaria and these studies of flight-distance, made in 1916 in S. Carolina, have been devoted to this species, *A. punctipennis* and *A. crucians* not having been studied from this point of view as yet. The experiments were planned on the same lines as those carried out with the flight of a Panama species, *A. tarsimaculatus,* at Gatun. At Stevens Creek large numbers of *A. quadrimaculatus* were captured, either at their breeding places or in heavily infested houses. They were stained by spraying with a 1 per cent. aqueous solution of eosin from an atomizer and liberated from a point in the breeding area selected as a liberation station. On the first day only a few were set free, but on the second day a large number were liberated, all at one point. For ten days following the liberation of the first batch daily catches, totalling 1,542, were made in inhabited houses, barns and stables within 1½ miles from the point of liberation. The first stained specimen was recovered on the third day at a distance of 5,565 feet. On the following day a second specimen was caught at 2,800 feet. Two others were captured on the sixth day at 3,245 feet. All these stained specimens were engorged, and were taken during the daytime, apparently near where they fed. At Fort Lawn it was desired to determine if *A. quadrimaculatus* would cross the river there. The liberation station was on the east bank of the Catawba where there were only one or two houses within one mile. On the west shore houses were more numerous and there were cattle in the fields—a plentiful blood supply. About 270 *A. quadrimaculatus* and 30 *A. punctipennis* were captured in houses and barns within one-half mile of the Catawba on the west side. After staining they were liberated from the east side. Within 72 hours two of the marked *A. quadrimaculatus* were found in a negro shack on the west side. On the following day a third *A. quadrimaculatus* was taken at the same place. It is worthy of note that a large proportion of the Anophelines originally captured for the experiment came from this cabin. The flight distance was 3,090 feet from the point of liberation (providing the flight was in a direct line), 800 feet being over the waters of the Catawba River. An examination of many houses from three-quarters of a mile to a mile distant from the river proved negative.

CARTER (H. R.). **Spontaneous Disappearance of Yellow Fever from Failure of the Human Host.**—*Trans. Soc. Trop. Med. Hyg., London*, x, no. 7, June 1917, pp. 119–139.

The author assumes as a basis of his reasoning that one attack of yellow fever gives permanent immunity from the disease. This however, as he indicates, is a disputed point, and has been discussed by him in a previous paper [see this *Review*, Ser. B, iv, p. 109]. The conditions necessary for the continued existence of yellow fever in a community are the parasites of the fever, active *Stegomyia fasciata* (*calopus*), and susceptible men. The parasites live in the mosquito only during the life of the host: therefore, for yellow fever to be transmitted, a sick man must be bitten by a mosquito which in its turn must feed on another man susceptible to yellow fever, before the death of either parasite or mosquito. If in a community there be no susceptible persons, the disease will disappear. Where a community exists which is an endemic focus of yellow fever, that is, where the three necessary conditions for the transmission of the disease exist, if it be true that one attack of yellow fever produces in general a permanent immunity, there will be in time no individuals susceptible to the disease left in that community, and yellow fever would disappear as soon as the infected mosquitos died off and the parasites with them. This community moreover would remain free unless the same three factors for conveyance were again brought together. Naturally, a younger generation would grow up susceptible to the fever and susceptible immigrants might arrive, but unless the parasite be again introduced there would be no yellow fever. The new generation, being protected for some years at least by its immune environment, is of much less importance in maintaining yellow fever than adult immigrants.

Turning from theoretical deductions to facts, the author gives many instances of yellow fever having disappeared from tropical towns in which no sanitary work has been done and in which *Stegomyia* is still abundant; in fact this disappearance seems to be the rule in the case of isolated communities of small or moderate size. The explanation that the fever disappears owing to "the failure of the human host" is believed to be true because it is logical and accords with the known facts and because none other is apparent.

It is obvious that this explanation depends absolutely on the doctrine that an attack of yellow fever confers immunity against another attack. A commission of the Pasteur Institute, working at Rio de Janeiro, has definitely stated that "yellow fever is kept up in endemic centres by recurrent attacks among the indigenes" and this view is accepted by many modern writers. If this be so, the recurrences might well make their appearance indefinitely, independently of immigration or new births.

The possibility of disappearance by the process described above is therefore not dependent upon the permanence of the immunity given by one attack, but the chance of its occurring in any place at any definite time is directly dependent on it, and reaches its maximum if one attack gives permanent immunity. The frequent disappearance of the fever, when immigration is absent, is evidence against the recurrence of attacks.

A number of towns, between which there is intercommunication, may represent a permanent focus of yellow fever, though perhaps no single one could continue as such by itself. In such an area, the rapidity of spread of the fever, and hence the exhaustion of the susceptible material, would be much slower than in a single town. The effect of such a permanent focus is not to prevent other communities from freeing themselves from yellow fever by the process outlined above, but to re-infect them as soon as a sufficient number of susceptible individuals has accumulated. It is this recurrence of fever which has given rise to the belief in "larval" fever held by many authorities. Yellow fever undoubtedly does sometimes exist unrecognised among the native children of a community, being noticed only when it attacks a stranger. In this way there is true recrudescence whenever an influx of strangers occurs, this being quite different from the re-infections that occur by reason of adult immigration. In order, therefore, that a town which has freed itself from yellow fever by the failure of the human host may remain permanently free from fever, isolation from infected places is necessary. When yellow fever has been eliminated by the control of the insect host, this isolation is not necessary as long as this control continues to be efficient, because, in the absence of the mosquito, yellow fever is not communicable, and such parasites as might be brought in by infected persons or infected mosquitos would, at the most, establish a very temporary focus of infection. If the control were complete, men infected by mosquitos would transmit no parasites to other mosquitos, and there would be no secondary human cases, the possibility of conveyance of the disease ending with the death of the mosquitos introduced. Naturally, the method for the elimination of yellow fever by control of the insect host would be that chosen by the sanitarian, while in nature the method is by failure of the human host.

These deductions can be applied to explain the great diminution of yellow fever in the Americas. In this way the great permanent foci of Havana, Vera Cruz, Panama and Rio were extinguished and with them a number of smaller places were freed by control of the insect host. Steam vessels built of iron very rarely carry *Stegomyia*, as the old sailing vessels frequently did, and hence are much less efficient in the transport of parasites. The European war has restricted foreign immigration and greatly lessened the movement of people between different towns. Thus places which have cleared themselves of infection are far less likely to be re-infected; so long as the parasite is absent, even an influx of susceptible people has brought no recrudesence of fever.

These facts indicate that a well-organised effort against yellow fever will result in its complete elimination from the earth, so that it will never return. The opportunity for making such an effort has never been so favourable as at the present time. It is upon these facts that the recommendations of the Yellow Fever Commission of the International Health Commission have been based, their purpose being the permanent elimination of yellow fever from the globe. This will be the first time in history that an attempt is made to eliminate completely a micro-organism pathogenic to man; its accomplishment will mark an epoch in sanitation.

A long and interesting discussion, which followed the reading of this paper, is given verbatim.

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Greening (W. R.). **Mosquito Control at Messina [Transvaal].**—*S. African Med. Record, Cape Town,* **xv**, no. 7, 14th April 1917, pp. 105–107.

Prior to the anti-malarial measures adopted at Messina, a mining camp in the northern Transvaal with a population of about 500 whites and 2,500 natives, an annual outbreak of malaria of more or less severity occurred, especially in 1914 and 1915. Hollows abound in the country around the town and in a series of shallow water-holes, one and a half miles to the south, Anophelines found a breeding place throughout the year. The sanitary conditions in the camp were imperfect and favoured mosquito breeding, which was also promoted in the mine itself. All hollows that admitted of being filled up were dealt with in that manner, whilst in others the pools were oiled. Some trees were found to be a source of danger, as they harbour water for a long period after rain. The maroola tree is one instance of this, the baobab being another. No further complaints were received from a police station after a maroola tree near by was removed. This tree contained a couple of gallons of water teeming with larvae. It was noticed that cattle, more especially those of a dark colour, brought mosquitos into camp on their coats, and for this reason water-holes at a considerable distance were brought under control. Anophelines were also detected on the dark helmets of police coming into camp from patrol duty. As a result of the measures taken not a single locally-acquired case of fever has occurred during the past and present season.

Kaupp (B. F.). **Diseases of Poultry.**—*North Carolina Agric. Expt. Sta., Raleigh, N.C.,* Bull. no. 233, September 1915, 27 pp., 9 figs. [Received 6th July 1917.]

This is a practical paper compiled for the information of poultry keepers. The common external and internal parasites of fowls are discussed and advice as to control and proper sanitation is given.

Haseman (L.). **The House-Fly and its Control.**—*Missouri Agric. Exten. Service, Columbia,* Circ. no. 16, April 1917, 11 pp., 4 figs.

This is a popular bulletin on the life-history and habits of the house-fly and its danger to man as a carrier of disease. In Missouri there are probably 9 or 10 generations in a year. Methods of control and, more particularly, means of preventing infection by the house-fly are discussed. The importance of farm sanitation and the need for co-operation in towns, which is essential in control of the fly pest, are emphasised. All the methods of control advocated have previously been dealt with in this *Review*.

Fullaway (D. T.). **Description of a New Species of *Spalangia*.**—*Proc. Hawaiian Entom. Soc., Honolulu,* iii, no. 4, May 1917, pp. 292–294, 1 fig.

Spalangia philippinensis, sp. n., is described. It was bred from house-fly and other Muscid puparia and introduced from the Philippines in 1914 and distributed throughout the Hawaiian islands in the hopes of controlling the horn-fly, *Lyperosia irritans*.

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Illingworth (J. F.). *Clerada apicicornis* **sucking Blood (Hemip.)**——*Proc. Hawaiian Entom. Soc., Honolulu*, iii, no. 4, May 1917. p. 274.

This predaceous bug, which is commonly found about buildings, has previously been suspected of feeding on *Lepisma* and small Blattids. The author records having taken two specimens in beds and on one occasion took an adult, full of blood, on a sleeping child, who bore marks of the bite of the insect.

The Vizor Anti-Mosquito and Fly-proof Headgear.—*Trans. Soc. Trop. Med. Hyg., London*, x, no. 7, June 1917, p. 140, 1 plate.

The helmet here described, which has been introduced by Professor W. J. Simpson, differs from others in that it is designed to be worn either over or beneath the hat and is suitable for day or night wear. It is provided with a vizor-like framework which holds the net away from the face and back of the neck. When not required, it can be folded up very small and is very light and perfectly ventilated.

Legroux (R.). **Présentation du Matériel de Prophylaxie anti-paludique destiné à l'Armée d'Orient.** [Presentation of Equipment for Anti-malarial Prophylaxis for the Balkan Army.]—*Bull. Soc. Path. Exot., Paris*, x, no. 6, 13th June 1917, pp. 421–427, 1 plate, 3 figs.

As a result of the investigations that were made by delegates from the Institut Pasteur d'Algérie into conditions in Macedonia in 1916, the French Government has sent out to the Balkan Army for the campaign of 1917, a permanent mission for anti-malarial prophylaxis. That part of the country occupied by French troops has been divided into districts, at the head of which the members of the mission have been placed, their work being to establish the local endemic spleen index, to direct the anti-malarial measures in the immediate vicinity of the troops, and to superintend and control the preventive quinine measures for natives and soldiers. Anti-Anopheline prophylaxis is established by a campaign against mosquito larvae, not by any drainage system on a large scale, but by treating with paraffin or filling up the small pools in the vicinity of camps and by the alteration of slow-running streams. Adult mosquitos are prevented from biting by the use of mosquito nets. The nets used during the day-time as a head-covering are provided with a framework to keep them from touching the face. The model introduced by Professor Simpson is recommended for this purpose [see preceding paper]. For protection during sleep a light folding waterproof tent has been devised by the Institut Pasteur, the openings at both ends being protected by mosquito netting. A temporary protection from bites is afforded by the application of ointments containing essential oils. In barracks, hospitals, etc., windows and doors are screened. In Panama hand-collection was found a useful auxiliary method. The mission, enlarging on this idea, advise several methods for the capture and destruction of mosquitos in buildings. A simple apparatus to evaporate cresyl consists of an ordinary mess-tin fitted with two small measures attached to the handle by a chain. The mess-tin is placed on a cylinder of sheet-iron finely perforated in order to prevent inflammation of the vapours produced by a spirit lamp, without a wick. Mosquito traps might also be placed in dark corners of rooms. Quinine is administered daily by means of tablets of chlorhydrate of quinine, two or three of which should be taken daily according to circumstances. By means of notices, posters, etc., the importance of these anti-malarial measures is brought to the notice of the men.

LAVERAN (A.). **La Prophylaxie du Paludisme dans l'Armée d'Orient.** [Prophylaxis of Malaria in the Balkan Army.]—*Bull. Soc. Path. Exot., Paris,* x, no. 6, 13th June 1917, pp. 450–455.

In this paper, malarial conditions in the environs of Salonika are discussed and methods of control against mosquitos and preventive quinine prophylaxis described.

MOUCHET (R.). **Contribution à l'étude des Myiases.** [Contribution to the Study of Myiases.]—*Bull. Soc. Path. Exot., Paris,* x, no. 6, 13th June 1917, pp. 467–472.

Throughout almost the whole Katanga region of the Belgian Congo cutaneous myiasis has been observed in man and various animals. Dogs in particular are frequently attacked, but the favourite host of the larva causing the myiasis is the rat or mouse found in dwellings. Field rats are never infested. The life-cycle of the larvae was completed in the laboratory and they were found to give rise to two species of flies, *Cordylobia anthropophaga*, Bl., and *Sarcophaga haemorrhoidalis*, Meig. (*nurus*, Rdi.). Eggs are normally laid in the lair of the host and not directly on the skin; hence Europeans, sleeping in beds, are more frequently attacked than natives. While in rats the myiasis produced may cause death, in man the disorder lasts about 10 days.

In the Belgian Congo other Muscid larvae are known to infest both man and animals, but only occasionally. These include *Chrysomyia chloropyga*, *C. putoria*, *C. megacephala* and *Lucilia sericata*.

ROUBAUD (E.). **A Propos de la Communication de M. Mouchet "Contribution à l'Etude des Myiases."** [Respecting the Communication of M. Mouchet "Contribution to the Study of Myiases.]—*Bull. Soc. Path. Exot., Paris,* x, no. 6, 13th June 1917, pp. 472–474.

The history of the African furuncular myiasis described in the preceding paper is given and the author points out that the infestation of man, when it occurs, is merely accidental. The larvae of *Cordylobia anthropophaga*, after hatching, may stay in the dust on the floor for about a fortnight awaiting a favourable host. In this way they may become attached to clothing or bed-clothes and thus reach the skin. In no case are eggs laid on the skin of the host. The other fly referred to, *Sarcophaga haemorrhoidalis*, Meig., is not a specific agent of myiasis. It is a common sarcophagous Muscid of world-wide distribution, the larvae of which live in excrement, on decomposing meat, or in wounds. In the case mentioned there was certainly a secondary infection of necrosis tumours caused by *Cordylobia*. This was fortuitous and is no proof of an association between the two parasites.

ZETEK (J.). **The Ecology of Bubonic Plague.**—*Ann. Entom. Soc. America, Columbus, Ohio*, x. no. 2, June 1917, pp. 198–206.

The excellent results obtained by the sanitary officers of the Isthmian Canal Commission with regard to the control of malaria in the Canal Zone, where it was found that maximum malaria and maximum numbers of transmitters of malaria coincided with conditions of maximum humidity, suggested to the author the desirability of learning if similar ecological relations could be traced in the case of any of the other diseases directly transmitted by Arthropods, especially bubonic plague. The study of reports on plague investigations in India lead to the conclusion that, while temperature has a certain bearing on the incidence of plague, the most important factor is humidity. When plague mortality and humidity are placed on the same chart, it becomes at once evident that there is a direct relation between the two.

Nearly all reports on plague show that its maximum coincides with the period of maximum numbers of fleas. Fleas are abundant if rats are abundant and humidity is the critical factor determining at what time of the year fleas are most numerous. Investigation has shown that a temperature above 80° F. affects the conditions to which the bacillus is subjected in the flea's stomach, the bacillus disappearing from the stomach more quickly than at lower temperatures, during which fleas remain infective for longer periods. High temperatures retard both oviposition and development, and low temperatures prolong the life-cycle. High temperatures in India are always associated with high humidity. Humidity is therefore inimical to the flea.

Rat breeding was found to be at its minimum when humidity was lowest, and, at its maximum when humidity was highest. Plague is highest when humidity is lowest, and large numbers of rats are killed off, leaving only a few immune individuals to produce the next generation. As the plague incidence decreases, rat-breeding becomes more vigorous under conditions of high humidity, and a new colony of non-immune rats results. The rat epizootic began in January and declined in April; during this period fleas reached their maximum. A chart shows the corresponding prevalence of fleas on rats and of plague in both rats and man. Fleas on all species of rats were at a maximum in March and April. Plague mortality in rats reached its culmination in March. The fleas which left their dead hosts caused a marked increase of plague in man. From May onwards, plague decreases, this being the period of rains.

The black rat, *Mus rattus*, was found to harbour more fleas than the brown rat, *M. norvegicus*, and is thus of greater importance with respect to the transmission of human plague. The reason is that the brown rat burrows wherever it can, preferably in moist situations, whereas *Mus rattus* builds its nest above ground, in a drier habitat, such as the walls of buildings. Moisture is inimical to fleas, and therefore the greater number are found on the black rat, which is the common Canal Zone rat, while *Xenopsylla cheopis* is the common flea, its natural host being the black rat.

In India, then, the severity of an epidemic of bubonic plague bears a direct ratio to flea abundance and to humidity, and this probably holds true for other places where bubonic plague is endemic. The same conditions may not be duplicated elsewhere, but the ecological relations will in the main correspond to those of India.

Headlee (T. J.) & Beckwith (C. S.). **Some recent Advances in Mosquito Work.**—*Ann. Entom. Soc. America, Columbus, Ohio*, x, no. 2, June 1917, pp. 211–218.

The ditching and draining operations for mosquito control in New Jersey during the year 1916 are recorded, and some striking changes that have been made in response to the practical needs of mosquito control work are described. It was originally thought that only the marsh where breeding was discovered required draining, in such a way that water would flow in and out with the tide, while the killifish should be afforded ingress at all times to all parts of the salt marsh known to harbour mosquitos. In 1913 it became clear that there were two fallacies in this theory: first, the assumption that the salt marsh has certain breeding areas which may be determined in the course of one or two inspections and which, if drained, will free the marsh from breeding; and second, the assumption that all salt marshes respond to drainage systems of the above kind. Investigation showed that every undrained area of salt marsh covered with grass or reeds is potentially dangerous, unless frequently covered by the tide, and that even such tide-swept areas may in certain seasons be covered at such infrequent intervals as to permit breeding. New drainage was therefore planned to open all parts of the marsh that were seldom swept by the tide, while areas on which the narrow trenching failed to afford protection have been provided with dyke, sluice and tide gates. In 1913 the practice was begun of tracing broods of salt marsh mosquitos by following their flight in motor cars and this method proved very successful. Attempts were made to trace in the same manner the haunts of house mosquitos breeding in a sewage-charged salt marsh. This necessitated evening collections, which proved so successful that it was considered possible by this process to determine the density of the mosquito fauna throughout the protected area, and thereby check the efficiency of the control work. During 1916, various investigations revealed *Ochlerotatus* (*Aedes*) *sylvestris*, Theo., as the dominant species in many localities and consideration was given to the problem of its elimination. In Atlantic County, *O.* (*A.*) *sollicitans*, Wlk., was found to take flight on winds of low velocity, high relative humidity and high temperature. Under other conditions migration is very slow and covers only short distances. The question of the influence of salinity on the development of mosquito larvae and on the distribution of species was investigated [see this *Review*, Ser. B, v, p. 103].

Many problems of mosquito work still remain to be solved. Machinery adapted to the work of cleaning and repairing the many ditching systems on the salt marsh should be devised. The fresh water swamp mosquito (*O. sylvestris*) has been acquiring predominance over a large part of the protected area, indicating that a further study of its life economy must be undertaken. The oils used as larvicides need to be standardised and a practical larvicide soluble in water or miscible with it should be found. Some practicable method of reducing those mosquitos that have survived the application of the present methods should be devised in order to check the rapid increase which follows any failure of the present system during a period of trying weather.

FREEBORN (S. B.). **The Rice Fields as a Factor in the Control of Malaria.**—*Jl. Econ. Entom., Concord, N.H.*, x, no. 3, June 1917, pp. 354–359.

In a previous paper the author has drawn attention to the influence which the introduction of rice culture into California may have upon the increase and control of malaria [see this *Review*, Ser. B, v, p. 40]. While, theoretically, the conditions of rice-growing should be ideal for the breeding of mosquitos, it must be borne in mind that the majority of species of *Anopheles* are limited to very definite areas. For example, *A. malefactor*, a tropical species, breeds almost exclusively in hollow tree-trunks, while *A. ludlowi* is limited to brackish or tidal waters. It has been shown that the rice areas of the Philippines are remarkably free from malaria, because the typical rice-field mosquito, *A. rossi*, is only a slight carrier of malaria, while *A. minimus* (*febrifer*), which is the intensive carrier, is a stream-breeder whose breeding-places are destroyed with the introduction of rice cultivation. It is therefore considered possible that the development of rice culture in the Philippines may result in the diminution of malaria. In the Federated Malay States rice culture has actually been suggested as an anti-malarial measure. Each district, then, requires separate investigation, and in order to determine the importance of the rice-field mosquitos as a factor in the control of malaria, it is necessary to ascertain what species of Anophelines breed in and around the rice-fields, their susceptibility as malaria-carriers and their relative abundance.

In the Californian rice-fields the two most prevalent species are *A. occidentalis*, D. & K., and *A. pseudopunctipennis*, Theo. While *A. occidentalis* has never been tested experimentally with regard to its susceptibility as a malaria-carrier, it is one of only two Anophelines that are found in highly malarial districts, and the other, *A. pseudopunctipennis*, is known to be only slightly susceptible. Its close connection and possible identity with *A. quadrimaculatus*, a known malaria-carrier in many parts of the United States, also indicates the probability of *A. occidentalis* being the chief carrier. *A. quadrimaculatus* has been stated to be a carrier of tertian and quartan types of malaria and also of aestivo-autumnal fever. It seems highly probable then that *A. occidentalis* is the important carrier in California, while a few infections may be due to *A. pseudopunctipennis*.

It is known that a heavy and uniform growth of rice produces relatively few mosquitos, while a sparse stand with irregular growth generally breeds Anophelines in large numbers. Far more dangerous than the fields, however, are the overflow pools of surplus water; and these are entirely unnecessary. The control of breeding places outside the rice fields before, after and during the rice season, combined with sound methods of rice cultivation, would do much towards the control of mosquitos. Unfortunately, a large percentage of the rice is cultivated by tenant farmers whose only object is to reap speedy and lucrative returns, with the result that irrigation is badly organised and the agricultural methods are poor, while the labourers, whose shelters are often mere shacks, lacking any attempt to exclude mosquitos, often spread infection. Adult dragonflies exert some check upon the increase of mosquitos, but are not an efficient control. Organised quinine prophylaxis and treatment, together with anti-mosquito precautions, would materially decrease the incidence of malaria.

HERMS (W. B.). **A State-wide Malaria-Mosquito Survey of California.** —*Jl. Econ. Entom., Concord, N.H.*, x, no. 3, June 1917, pp. 359–370.

The author reviews the history of the anti-mosquito campaign in California from its beginning and records the passing of the "Mosquito Abatement District Act" in 1915. The fourteen species of mosquitos in California listed by Quayle in 1906 are enumerated. In May 1916, a systematic mosquito survey was undertaken by the author, assisted by S. B. Freeborn, acting under the State Board of Health, and between that date and 14th August, 6,446 miles had been covered, Anopheline breeding places being located throughout the journey, while information and demonstrations were given to the inhabitants of the infested localities. In many cases the author had the satisfaction of seeing his methods of mosquito control carried out before he left a district. As a result of his observations he is convinced that Anophelines do not wander far from their larval habitat, and therefore the discovery of an individual generally results in the locating of its breeding place in the near vicinity. The chief source of Anophelines was usually the green, scum-covered edge of a small receding stream, or a grassy, weed-grown pool of clear water. It is evident that Anophelines prefer clear, cool water rather than stagnant pools. While the distribution of *Anopheles* is wider than was supposed, the author is convinced that the malaria menace can be brought under control. This is considered a matter of detail, intensive rather than extensive, and calls for the assistance of specially trained men. In the author's opinion, far too little attention is paid to the irrigation methods in North California, the malaria menace not being within the scope of work of the engineer who is entrusted with the irrigation and drainage. It is hoped that as a result of this survey many newly-organised mosquito-abatement districts will be formed under the act mentioned above, but the greatest good arising from such a survey is the educational value of the information disseminated among the inhabitants of the malaria-infested districts.

Cooperation to Banish Mosquitos.—*Mthly. Bull. Cal. State Bd. Health, Sacramento*, xii, no. 12, June 1917, pp. 309–311.

In the district of Los Molinos, where mosquito conditions are bad, and where funds are insufficient for the organisation of paid workers, volunteers have come forward in large numbers, giving their services for one day and often bringing teams with them. These voluntary workers drained sloughs, filled depressions, oiled pools of standing water, and helped to clear vegetation so that standing water would drain into creeks or rivers to a point where it can be collected and oiled. It is hoped, by the organisation of further days of voluntary labour, to complete the necessary work and thus greatly ameliorate the existing malarial conditions.

Corsini (A.). **I corredini antipediculari.** [Anti-Louse Sachets.]—*Annali d'Igiene, Rome*, xxvii, no. 6, 30th June 1917, pp. 364–372, 3 figs.

This article supplements a previous one by Furno [see this *Review*, Ser. B, v, p. 91] by describing the three principal kinds of anti-louse sachets used in Italy. The Pellizzari type comprises a double scapulary (front and back) for the neck, a waist-belt, two "anklets" fastened a couple of inches above the ankles, and two small bags which the wearer may pin wherever he wishes. This outfit contains $4\frac{1}{3}$ oz. of crude naphthaline to which 2 per cent. of creosote has been added. It must not be worn next to the skin. The Pasini type includes two long bands—hanging down from the shoulders and joined by two horizontal bands crossing the chest and the back, two wristlets and two anklets. The equipment contains $5\frac{1}{3}$ oz. of a mixture of 1 part camphor and 9 parts of either refined or commercial naphthaline. The Daccò type includes six sachets, two worn on the front and back of the thorax, two placed just beneath the waist and hanging by tapes from those above, and two others which the wearer may place where he wishes. This outfit contains $2\frac{1}{3}$ oz. of the same mixture as used by Prof. Pasini. It seems to be the least efficient of the three, that of Pellizzari appearing to be the best, though the odour of the creosote is rather trying at first. Examination of a battalion, thus equipped, showed only 5–6 per thousand of the men to be infested and these had either lost their outfit or had refused to wear it.

Fonyó (J.). **Zur Epidemiologie und Prophylaxe des Fleckfiebers.** [The Epidemiology and Prophylaxis of Typhus.]—*Wiener klinische Wochenschr., Vienna*, xxix, nos. 42–43, 19th–26th October 1916, pp. 1321–1328, 1369–1372, 14 figs.

The bulk of this paper is a review of published work on lice and their destruction. It is pointed out that typhus is a winter disease, as lice perish at a temperature of 85°–95° F. The advent of summer cannot, however, completely check an epidemic unless louse-destruction measures are carried out.

Eugling (M.). **Ueber Malaria und ihre Verhütung.** [Malaria and its Prevention.]—*Wiener klinische Wochenschr., Vienna*, xxx, no. 3, 18th January 1917, pp. 65–68.

The presence of Anophelines in Bosnia, Istria, Dalmatia and in the Save, Theiss and Danube regions is proved by the yearly occurrence of malaria there. These mosquitos probably occur in other parts of Austria-Hungary, but have not claimed attention owing to malaria being rare. For instance, some years ago Anophelines were observed in the flat areas near the Danube in the neighbourhood of Vienna. Austrian soldiers have come in contact with malaria on the Isonzo, in Volhynia and Albania, especially in the last-named field of operations, and may introduce tropical malaria into regions where the tertian form only has been known. *A. maculipennis* is the only species found in Albania up to the present. Oiling is recommended as the most practical anti-mosquito measure, and in this connection it is remarked that the effect of oiling is to suffocate the larvae, olive oil having given the same result, experimentally, as petroleum.

ARZT (L.). **Ueber eine Epidemie von *Ikterus infektiosus* in Süd-Mazedonien und Albanien.** [An Epidemic of *Icterus infectiosus* in South Macedonia and Albania.]—***Wiener klinische Wochenschr.**, Vienna,* **xxx**, no. 6, 8th February 1917, pp. 189–191.

Though unable to connect the epidemic of jaundice in Albania and Macedonia with any definite species of mosquito, the author records the great abundance of both Anophelines and *Phlebotomus papatasii.*

SKINNER (H.). **Insects and War.**—*Entom. News, Philadelphia,* xxviii, no. 7, July 1917, pp. 330–331.

The necessity for adequate sanitary measures and the control of insect carriers of disease in the present war is emphasised. Some striking figures are given showing the proportion of deaths among soldiers from wounds and from disease in some of the recent campaigns, *e.g.*, in the Spanish-American war, only 454 Americans were killed, while 5,277 died from disease, mostly from typhoid fever carried by house-flies. Other diseases liable to be contracted by soldiers on service through the agency of insect carriers are typhus fever, malaria, yellow fever, tuberculosis, and many minor ailments. Hitherto, the American Government has done very little to prevent a recurrence of this enormous sacrifice of life. It has been suggested that a medical entomologist should be stationed at each concentration camp.

In a footnote to this paper it is stated that the Council of National Defence is considering plans for utilising entomologists in the war: the present plan of the Council provides for a corps of entomologists to be co-ordinated with the corps of sanitarians.

RICHARDSON (C. H.). **The Domestic Flies of New Jersey.**—*New Jersey Agric. Expt. Sta., New Brunswick,* Bull. no. 307, 7th February 1917, 28 pp., 18 figs. [Received 25th July 1917.]

The species of flies frequenting human habitations in New Jersey are dealt with in this bulletin. They are:—*Musca domestica* (house-fly), Sarcophagids or flesh-flies, including *Ravinia communis*, Parker, *R. latisetosa*, Parker, *Sarcophaga helicis*, Towns., and many other species. Blow-flies and allied species include *Calliphora erythrocephala*, Meig., *C. vomitoria*, L., *Cynomyia cadaverina*, Desv., *Lucilia sericata*, Meig., *L. caesar*, L., *Phormia regina*, Meig., *Stomoxys calcitrans*, L., *Muscina stabulans*, Fall., *Fannia canicularis*, L., *Pollenia rudis*, F., *Ophyra leucostoma*, Wied., *Sepsis violacea*, L., and *S. minuta*, Wied. *Scenopinus fenestralis*, L., is predaceous on other insects and therefore is beneficial rather than harmful. *Drosophila ampelophila*, Lw., and many others are occasionally found in houses. The feeding habits and the breeding places of these species are described and the usual recommendations for eradication are given. The paper includes a key to the domestic flies of New Jersey.

IMES (M.). **The Sheep Tick and Its Eradication by Dipping.**—*U. S., Dept. Agric., Washington, D.C.*, Farmer's Bull. no. 798, May 1917, 31 pp., 15 figs.

This is a popular bulletin written for the information of sheep owners. The life-history and habits of the sheep tick, *Melophagus ovinus*, are given fully. Detailed instructions for dipping sheep for the control of this Hippoboscid are given, and the most useful apparatus is described. The various dipping mixtures include coal-tar-creosote, cresol, nicotine, and lime-sulphur-arsenic dip; the choice of the dip to be used should depend upon the conditions under which it is to be employed. The first three mentioned are all sold under various trade names. The lime-sulphur-arsenic dip is the only home-made mixture that has proved efficacious; it is made by mixing standard strength lime-sulphur with one-half standard strength arsenical dip; full directions are given for the preparation of the mixture. The construction of the best kinds of dipping vats is described, with diagrams and illustrations.

Jackson (A. C.) & Lefroy (H. M.). **Some Fly Poisons for Outdoor and Hospital Use.**—*Bull. Entom. Research, London*, vii, no. 4, May 1917, pp. 327–334.

Solutions of sodium arsenite and sugar have frequently been employed as outdoor fly poisons, and were used with good results in Mesopotamia in 1916. The disadvantage of using these solutions is that they are poisonous in themselves and remain poisonous when thrown away or dried on sand or soil. Formaldehyde, which is the only other generally known poison, is exceedingly variable in its action and is too volatile for outdoor use in a hot climate. The authors therefore undertook a series of experiments with other substances used as fly poisons, usually at a strength of 2 per cent. by weight with a 20 per cent. sugar solution. A complete list of the substances tested is given, these being divided into three classes: (1) those that kill quickly, (2) those that killed on the second day and (3) those that failed at 2 per cent. strength. While these experiments are not conclusive, it is evident from the results that there are substances other than arsenic that will kill flies and, while these may not be effective in areas where flies have abundant shelter and food as in France and England, they may be very effective as outdoor poisons in Mesopotamia and Egypt. It seems probable that some of the fluorides, iodates and salicylates of sodium, potassium and ammonium, iron perchloride and some other substances may replace sodium arsenite in these circumstances, which would be a great advantage owing to their being less poisonous and their residues forming non-poisonous compounds. These chemicals might be tested in areas where flies are important and might be used in distant places where sodium arsenite cannot be obtained. It seems evident that many common drugs and substances, not known to be fly poisons, may be so under conditions where flies are really abundant, and where they will probably take the substances offered with avidity, as sodium arsenite is taken in Mesopotamia, and it is suggested that, if the known poisons should not be available, the medical officer in such localities should try anything else that is obtainable. In hospitals particularly there will probably be a use for these poisons, where any of the above-named substances, used at 1 per cent. in sugar solution, are neither dangerous nor offensive.

ADERS (W. M.). **Insects Injurious to Man and Stock in Zanzibar.**—*Bull. Entom. Research, London*, vii, no. 4, May 1917, pp. 391–401.

During the spring and autumn rains in Zanzibar, Anophelines enter the town by way of a line of small collections of water formed by the rains; these temporary breeding places soon dry, with the result that most of the adult Anophelines in the town die. There are however permanent breeding grounds outside the town, which constitute the real home of these mosquitos. These larger swamps have in many cases been drained to control the mosquito larvae, while the smaller pools are oiled. Various traps have been used for collecting larvae. The Anopheline trap consists of a flat tub filled with rain-water and algae, with a small layer of earth sprinkled on the bottom. The Culicine trap is a half-barrel filled with water rich in decaying vegetation or organic material; the trap for *Stegomyia* is similar, but is filled with clean rain-water. Fish imported from Seychelles have been of some use in wells and tanks; in the larger swamps their efficacy is still uncertain. The great problem in mosquito destruction in the towns is the control of *Culex fatigans*, which is the most prevalent species and is found in the larval stage in practically all cesspools. *Stegomyia fasciata* is also found throughout the town area, particularly in native huts.

The following natural enemies of mosquitos have been recorded: larvae of dragonflies, waterbugs (many species), and larvae of various aquatic Coleoptera. Nightjars, bats and various Attid spiders prey upon the adults. A comprehensive list is given of the mosquitos found in Zanzibar and Pemba Islands, with a detailed description of their favourite breeding places. *Anopheles costalis* is the only Anopheline taken in the town area and is the common vector of malaria in Zanzibar. *Stegomyia fasciata* is found breeding under the most varied conditions. Adults fed on a patient showing numerous *Filaria bancrofti* in his blood exhibited microfilariae in the thoracic muscles nine days later. Several captured specimens of this species have shown a natural thoracic infection with microfilariae. *Culex fatigans* has also been found to be infested with *Filaria bancrofti*, showing both thoracic and proboscis infections.

A complete list of the blood-sucking Arthropods known from Zanzibar is given.

LYON, Junr. (M. W.). **Filariasis. Report on Two Cases in the District of Columbia and Analysis of the Cases reported for eastern North America.**—*Jl. Amer. Med. Assoc., Chicago, Ill.*, lxviii, no. 2, 13th January 1917, pp. 118–119.

In reporting upon two cases of infection with *Filaria bancrofti* in the District of Columbia it is pointed out that *Culex fatigans* (*quinquefasciatus*), the mosquito serving as the intermediate host of *F. bancrofti*, ranges as far north as Washington and St. Louis.

KEILIN (D.). **Recherches sur les Anthomyides à Larves carnivores.** [Research on Anthomyids with Carnivorous Larvae.]—*Parasitology, London*, ix, no. 3, May 1917, 125 pp., 11 plates, 41 figs.

This paper has been abstracted in this *Review*, Ser. A, v, p. 427.

Léger (L.) & Mouriquand (G.). Sur la Répartition des Stations d'Anophèles dans le Secteur médical Grenoble-Gap-Briançon et Indications prophylactiques qui en découlent. [The Distribution of Anophelines in the Medical Division of Grenoble-Gap-Briançon and the Prophylactic Indications resulting therefrom.]—*Bulletins & Mémoires Soc. Méd. Hôpitaux de Paris,* xxxiii, no. 1–2, 18th January 1917, pp. 16–22.

Attention is drawn to the danger resulting from the arrival in France of malaria patients. In the region in question all the conditions required for the development of malarial foci exist, *i.e.*, the presence of Anophelines, the existence of parasites—chiefly in the gamete stage—in the blood of individuals that have returned to France, and a temperature suitable for the evolution of the parasite in the body of the mosquito. A careful investigation has shown the presence of Anopheline larvae in numerous localities, chiefly in water of a temperature over 57° F., though they were occasionally found in water at 46° F. Unlike the larvae of *Culex*, they prefer the quiet parts of streams and those parts of swamps which have clear, gently running water. *Anopheles maculipennis* and *A. bifurcatus* were the species found, together with larvae of *Culex* and *Dixa*. In this connection it is pointed out that at nightfall it is difficult to distinguish *Dixa* from *Anopheles*, but Léger has found that if the dry finger is placed on a *Dixa* larva when it comes to the surface, it will adhere to the finger, which the Anopheline never does. Cases of locally-acquired malaria have been recorded in France since the War began and a rational prophylaxis is needed. This should aim at protecting malaria patients from the bites of mosquitos by screening buildings in which they live and by establishing hospitals for them at a distance from localities harbouring Anophelines.

Stallybrass (C. O.). The Control of Rat Plague.—*Jl. State Medicine, London,* xxv, no. 4, April 1917, pp. 116–121.

Rat extermination on board ships at Liverpool seems to show that all forms of apparatus depending on the use of sulphur dioxide (SO_2) are ineffectual owing to the high absorbability of this gas; the destruction of rats can be successfully effected only when the holds are empty and for this purpose stout pots or buckets are amply sufficient and are capable of indefinite multiplication at small expense: sufficient time must be allowed for the sulphur to burn out, $2\frac{1}{2}$ to 3 per cent. of SO_2 being finally attained; all spaces, especially store-rooms, require to be fumigated simultaneously and the process should be repeated at intervals of not more than six months.

The Nocht and Giemsa apparatus is much too dangerous for routine use, as it evolves a high percentage of carbon monoxide. The Harker apparatus, depending on the lack of oxygen, uses the washed flue gases from any coal-burning furnace, produces only 3 per cent. of carbon monoxide and is cheap in use [see this *Review*, Ser. B, v, p. 62].

At Liverpool two officers search all vessels from districts infected or suspected to be infected with plague, in order to discover dead rats. On several occasions unusual mortality amongst rats has been discovered at an early date after arrival. The author regards it as particularly suspicious when the rats have been dying throughout a week or longer and not simultaneously, as shown by the different degrees of decomposition of the bodies. In the latter case the mortality might be due to poison, fumigation abroad, etc.; but the former conditions would certainly be due to an epizootic, which in the author's experience has proved to be plague in 50 per cent. of the cases.

The routine application of rat-guards to ropes, etc., seems to be of little value in preventing rats from getting to land. For the campaign ashore, buildings must be constructed so as to leave no nesting places, and in warehouses rat-catchers must be employed in addition. During 1916 some 10,000 rats were destroyed by the public rat-catchers at Liverpool. Poison had no great success, and, when successful, it usually led to grave complaints. The same applies to the use of virus, of which however little experience was had. The only virus successful over any considerable period was one prepared by a bacteriologist and constantly kept up in strength by repeated passage through rats. The replacement of ashpits by sanitary bins very generally throughout the city has largely driven rats from the residential parts.

COPEMAN (Lieut.-Col. S.M.). **The Prevention and Arrest of certain Epidemic Diseases in War Time.**—*Jl. State Medicine, London,* xxv, nos. 4–5, April-May 1917, pp. 103–115, 129–143, 4 charts.

The contents of this review are indicated by its title. The control of lice is briefly dealt with in connection with the prevention of typhus.

NICOLL (W.). **Flies and Typhoid.**—*Jl. of Hygiene, Cambridge,* xv, no. 4, February 1917, pp. 505–526.

The experimental work detailed in this paper was carried out from 1909 to 1912. The results are incomplete and are published in the absence of any opportunity of amplifying them.

The author's summary and conclusions are as follows: (1) The chain of evidence incriminating the house-fly as a disseminator of typhoid fever is at present fairly complete, but many of the links are weak and not thoroughly strengthened by experimentation. (2) The bulk of experimental work has hitherto been done under highly unnatural and artificial circumstances, and the results so obtained cannot be accepted unreservedly as giving a correct view of conditions in nature. (3) The experiments described in the present paper show that flies can ingest typhoid bacilli from natural matter, *i.e.*, human faeces and urine, and carry them for a certain period of time. (4) There is no evidence to show that the typhoid bacilli multiply in the house-fly. On the contrary the evidence goes to show that they are not adapted for prolonged life on or in the fly. (5) It thus follows that the house-fly is a purely mechanical carrier of the typhoid bacillus and is not a natural "host" in the strict sense of the term. (6) Many bacilli closely resembling *Bacillus typhosus* in cultural characteristics appear to be natural or, at least, common inhabitants of the intestine of the house-fly. These are extremely likely to be mistaken for *B. typhosus* unless the most stringent tests are employed. (7) As might be expected, there is evidence to show that a process of bacterial selection occurs in the fly's intestine. Some bacteria appear to flourish, but others are rapidly eliminated. Among the latter must be numbered *B. typhosus*.

PHILIP (W. M.) & HIRST (L. F.). **A Report on the Outbreak of the Plague in Colombo, 1914-1916.**—*Jl. of Hygiene, Cambridge*, xv, no. 4, February 1917, pp. 527–564, 5 maps, 1 chart.

The advent of plague in Ceylon occurred in January 1914 under circumstances pointing to its introduction into Colombo by an infected rat concealed in a bag of rice from South India. The deaths totalled 383 in 1914, and 128 in 1915. Nearly all the cases came from the very poorest class of the population, living in the most insanitary parts of the town. The rat has less difficulty in obtaining food in the poorer quarters where waste food-stuffs are usually thrown into the yard. The custom of sleeping on the earthern floor within easy reach of the infected fleas from the numerous rat-holes also favours the spread of plague. At Singapore, where there has been very little plague compared with Colombo, rat-holes in houses are comparatively rare. Thirty specimens of the Insectivore, *Crocidura coerulea*, the common shrew of Colombo, were received in 1914, and 163 in 1915. The plague infection among these was nil and subsequently the capture of *C. coerulea* was forbidden and all that entered the traps were liberated. Of *Mus (Epimys) rufescens*, the local representative of *Mus rattus*, the total number examined in 1914 and 1915 for plague was 11,183 and 13,757 respectively, the gross percentage incidence being 1·13% and 0·23%. The corresponding figures for *M. (E.) norvegicus* were 3,891 and 5,129, with 2·72% and 0.58%. Of the infected *M. rufescens*, 45·08% and 60·6% of the infection was of the septicaemic type, the corresponding figures for *M. norvegicus* being 20·75% and 30%. The most remarkable feature of the Colombo epizootic is this high proportion of plague-infected *M. rufescens* showing the septicaemic type. This feature is less marked in the case of *M. norvegicus*, but is still very notable. As regards the relation between human and rat plague it was observed that the discovery of the latter preceded that of the former in 15 streets of the town, thus enabling precautions to be taken in advance. The rat plague when it appeared in new areas was almost always of the septicaemic type.

The following species of parasites have been identified from Colombo rats: The fleas, *Xenopsylla astia*, Rothsch., and *X. cheopis*, Rothsch., the mites, *Dermanyssus muris*, Hirst, *Laelaps echidninus*, Berl., and *L. nuttalli*, Hirst, and the louse, *Haematopinus spinulosus*. In view of the exceptionally high degree of septicaemia in many of the Colombo cases of human plague, the question of the possibility of transmission from man to man by human parasites such as *Pulex irritans (hominis)*, *Cimex hemiptera (rotundatus)* or *Pediculus humanus (corporis)* becomes of practical importance.

As regards seasonal incidence, there seems to be a more distinct relation between the curve of humidity and the flea index than between that of flea index and temperature. The curves showed a very close correspondence between the periodicity of rat and human plague. A sharp rise in the flea index in June 1915 was followed by a rise in the curve of plague incidence among *M. norvegicus*.

Brooks (R. St. J.). **The Influence of Saturation Deficiency and of Temperature on the Course of Epidemic Plague.**—*Jl. of Hygiene. Cambridge*, Plague Supplement v, issued 19th May 1917, pp. 881–899, 18 charts.

The conclusion arrived at is that, while the combined effects of temperature and saturation deficiency have in the majority of cases an influence on the incidence and course of plague epidemics, yet under certain conditions such epidemics come to an end at a time when the climatic conditions are presumably favourable for a continuance of the disease. In these cases other factors come into play, and attention is directed to the work of the Advisory Commission in connection with the seasonal breeding of rats, the decrease in the numbers of rats during epidemic periods, and the accompanying increase in the proportion of immune to susceptible rats. The adverse influence of high temperature and saturation deficiency may be explained by their effect on the duration of life of the rat flea, *Xenopsylla cheopis*, when separated from its host.

The author's summary is as follows: Plague does not maintain itself in epidemic form when the temperature rises above 80° F. accompanied by a saturation deficiency of over ·30 of an inch. Plague epidemics are rapidly brought to an end in the presence of a high saturation deficiency, even when the mean temperature throughout and after the termination of the epidemic has been considerably below 80° F. Plague epidemics may commence and increase in intensity when the mean temperature is well above 80° F., provided that the saturation deficiency is below ·30 of an inch. In some districts in India and in certain tropical islands (*e.g.*, Java, Mauritius), where the climatic conditions are favourable at all times of the year to the incidence and spread of plague, the disease may occur at any season.

Wenyon (C. M.) & O'Connor (F. W.). **An Inquiry into Some Problems affecting the Spread and Incidence of Intestinal Protozoal Infections of British Troops and Natives in Egypt, with special Reference to the Carrier Question, Diagnosis and Treatment of Amoebic Dysentery, and an Account of Three new Human Intestinal Protozoa. Part iv. Experimental Work with the Human Intestinal Protozoa, their Carriage by House-flies and the Resistance of their Cysts to Disinfectant and other Agents.**—*Jl. R.A.M.C., London*, xxviii, no. 6, June 1917, pp. 686–698.

This paper records much experimental work with the house-fly as a carrier of human intestinal protozoa. Flies feeding on faeces were found readily to take encysted and other forms of protozoa into their intestines; these may remain as long as 42 hours in the intestine if the flies are prevented from feeding, or may be passed from the gut as early as five minutes or as late as 20 hours after feeding [see this *Review*, Ser. B, v, p. 117]. Flies infected in this way will deposit the material on any kind of food, and it seems that the wide distribution of human protozoal infections in warm countries can best be explained in this way. Wild flies captured in Alexandria often deposit cysts of protozoa and eggs of worms which they have evidently taken up from human dejecta on which they have fed. Cysts of *Entamoeba histolytica* will survive in water, but are killed instantaneously by drying or by cresol solution, 1 in 20. These observations all emphasise the importance of sanitary measures against the house-fly, its destruction by traps and other means, the removal of its breeding places, the protection of food, kitchens, dining-rooms and latrines, and the removal of the dwellings of natives as far as possible from those of Europeans.

OLLÉ (—) & DAVIZÉ (G.). **Etuve à Sulfuration démontable et transportable.** [A detachable and portable Chamber for Sulphur Fumigation.]—*Arch. Méd. & Pharm. Militaires, Paris*, lxvii, no. 4, April 1917.

The fumigation cupboard described in this paper is substantially the same in construction as one already noticed [see this *Review*, Ser. B, iv, p. 177]. The equipment to be disinfected is hung up inside it. Bedding is placed on a shelf of wire netting or similar material preventing contact with the generator beneath. The latter is simply a mess-tin placed on the floor of the cupboard. A container filled with water is put on a tripod stand over the mess-tin and the burning sulphur evaporates the water so that the sulphurous anhydride vapours are produced in a damp atmosphere. The operation is complete in three hours. Six complete sets of equipment can be dealt with simultaneously, or ten lots of bedding.

PIZZINI (L.). **I Pidocchi nella Epidemiologia della Meningite cerebrospinale epidemica.** [Lice in the Epidemiology of Epidemic Cerebrospinal Meningitis.]—*Il Policlinico, Rome*, xxiv, Sez. Med., no. 5, 1st May 1917, pp. 212–228.

This paper records observations on two outbreaks of cerebro-spinal meningitis at Bergamo, from 1st February to 8th May 1915 and from 6th January to 19th May 1916, the total number of cases studied being seventy-seven. Individuals infested with lice, or soldiers, who from the nature of their duties have to occupy dirty premises, are the most frequent sufferers. Some patients were found to have in their underclothing lice vectors of the meningococcus of Weichselbaum, or to have handled garments infested with such lice. The months during which the disease is prevalent are those during which lice are definitely parasitic.

COLEMAN (L. V.). **Insect-borne Diseases.**—*Syllabus Guide to Public Health Exhibits in the Amer. Mus. of Nat. History, New York City*, Guide Leaflet Series no. 45, May 1917, 14 pp. [Received 11th August 1917.]

This leaflet contains useful information in a popular form on the principal insect-borne diseases and their mode of transmission. The diseases dealt with include bubonic plague, malaria, yellow fever, typhus, sleeping sickness and tick fever. Simple methods of control of rats, mosquitos and the house-fly are given.

MANSON (Sir P.). **Tropical Medicine and Hygiene.**—*Brit. Med. Jl., London*, no. 2952, 28th July 1917, pp. 103–109.

This paper gives a résumé of the principal tropical diseases caused by protozoal organisms and helminths. Among those which are known to be insect-borne are malaria, carried by Anopheline mosquitos; trypanosomiasis, conveyed by *Glossina morsitans* and *G. palpalis*; tick fever, carried by *Ornithodorus moubata*; yellow fever and dengue, transmitted by *Stegomyia fasciata* (*calopus*), and perhaps by *Culex fatigans* also in the case of the latter; pappataci fever, carried by *Phlebotomus papatasii*; and filariasis, conveyed by *Culex fatigans* and *Stegomyia pseudoscutellaris*.

Clark (G. H.) & Raper (H. S.). **Chlorine Gas and Scabies.**—*Brit. Med. Jl., London*, no. 2952, 28th July 1917, pp. 113–114.

It was remarked at the time of the German chlorine gas attacks that gas cleared the camp of scabies, and it was thought probable that the chlorine was fatal to the mites. Experiments in treating cases of scabies with chlorine gas resulted in 25 per cent. being cured, while many more showed marked improvement. It is pointed out however that this treatment is difficult in private life, while other and more simple remedies are considered efficient.

Bacot (A.). **A simple Means of ascertaining if a sterilizing Hut is hot enough to destroy Lice and Nits in Clothing or Blankets.**—*Brit. Med. Jl., London*, no. 2953, 4th August 1917, p. 151.

Unless a uniform temperature throughout a sterilising chamber is obtained by circulating the air, a stratified condition results, in which the heat is too low to kill at the lower levels and needlessly high at the top. By the use of porcelain pots or dishes of a definite surface area, containing a given quantity of stearin or paraffin wax of a suitable melting point, a sufficiently stable relationship between the heat and the period required to kill lice and their eggs can be established. The eggs, when protected by a single thickness of khaki cloth as used for army breeches, are killed in 15 minutes at 126° F. In order to allow an adequate margin for contingencies the necessary temperature and period were assumed to be 140° F. and 30 minutes. Using stearin, melting at 140° F. according to trade tests, in pots such as are used in the trade for samples and measuring $2\frac{1}{2}$ inches wide by $2\frac{1}{2}$ inches deep, it was found that 7 grams will melt in 30 minutes, while 10 grams require between 40 and 50 minutes, only a narrow ring being melted within 30 minutes. If two pots, one containing 7 and the other 10 grams, are placed or hung slightly below the level of the lowest garment in the sterilising room, it is certain that, if all the stearin in the 7-gram pot is melted before the removal of the garments, the exposure has been sufficient both as regards period and temperature to kill the eggs of *Pediculus humanus*. If all the stearin in the 10-gram pot is melted, it indicates greater heat or longer exposure than is necessary.

The question of the possibilities of an altered relation between the melting of the stearin and the killing of the eggs with a short-period exposure to a higher temperature was tried. Eggs and stearin were exposed together and the stearin proved more resistant than the eggs. When the temperature was rapidly raised from 70° F. to 177° F. within 20 minutes, the eggs were killed while the 7 grams of stearin were not quite melted. A rise to 180° F. in 15 minutes was just sufficient to melt all the stearin, the eggs being killed. Again, a rise in 12 minutes to 179° F. killed all the eggs, but left a central disc of stearin unmelted

THOMSON (D.). **The Diagnosis and Treatment of Malarial Fever.**—*Jl. R.A.M.C., London*, xxix, no. 1, July 1917, pp. 1–37.

Quinine prophylaxis, or the administration of small doses of the drug to uninfected subjects in a malarial community in order to safeguard them against infection from mosquitos, was formerly considered to be the best means of preventing or reducing the incidence of malaria. Anti-mosquito measures have, however, proved to be vastly superior, since mosquitos are in themselves a pest and are capable of carrying diseases other than malaria. It has been shown that the gametes or sexual forms of the malarial parasite alone have the power of rendering the mosquito infective to human beings. When the Anopheline sucks the blood of a human patient containing these, fertilisation occurs in the stomach of the mosquito, which becomes infective to human beings about twelve days later. If, however, the mosquito sucks the blood of a human patient containing only the asexual or fever forms of the parasite, and no gametes, it will not become infected. Gametes are not always found in the blood of every malaria patient; in early acute cases they are comparatively rare. They do not cause any fever symptoms and a patient may feel quite well and yet have large numbers in his blood, since they are usually associated with small numbers of the asexual forms insufficient to cause any fever. It appears that when the asexual form of the parasite begins to find life difficult owing to occasional doses of quinine or to the development of natural resistance, it transforms into the sexual type and remains passive awaiting transference to another host, *i.e.*, the mosquito. Hence the danger of administering small doses of quinine to prevent infection, for, though it may have this effect in certain cases, in others the disease may be rendered latent and " gamete carriers " produced. The most reasonable and scientific course is to carry out anti-mosquito measures as far as possible and to treat early and thoroughly every malarial patient by a continuous course of quinine of 30 grains every day for three weeks, by which means the gametes are destroyed and another link in the perpetuation of the disease is broken.

McDONNELL (R. P.) & EASTWOOD (T.). **A Note on the Mode of Existence of Flies during Winter.**—*Jl. R.A.M.C., London*, xxix, no. 1, July 1917, pp. 98–100.

Investigations undertaken with a view to determining how the generation of flies is linked up from season to season are described. The fact that the search for hibernating flies has not resulted in their discovery seems to discount the generally accepted view that they survive throughout the winter in this stage. A heap of old manure, covered with grass and weeds, that had been lying untouched since the previous October, was investigated in March, and living larvae were found at a depth of three feet. In the same month they were found at a depth of two feet in a mixture of dry earth and human excreta covered with six inches of earth which had been made the previous September. Pupae that had evidently migrated in the larval state from these heaps were found at a distance of two feet, lying about an inch below the ground surface. The larvae, when removed from the heaps and placed in a warm room, pupated within

24 hours and emerged during the first week of April, some being *Fannia canicularis* and others *Musca domestica*. Some larvae were found hibernating at a depth of two feet.

From these observations it appears that the fly either passes the winter in the pupal stage, or that the larvae may have the power of hibernating with intervals for feeding during the spells of warmer weather. Ova deposited on manure heaps late in autumn and covered over, may, owing to the warmth generated in the manure, give rise to larvae that feed and eventually pupate. The pupae may remain dormant till spring, or be hatched by a brief spell of warm weather, which may account for the presence of adult flies in winter. Hence it follows that if the spread of flies is to be prevented, manure should either be burnt or spread out in thin layers, since covering the heaps with earth, or even sowing the surface with grass or other seeds, appears to be of doubtful value once the eggs have been deposited in the manure.

The Warble Fly.—*Jl. Dept. Agric. Tech. Instruct. Ireland, Dublin,* xvii, no. 4, July 1917, pp. 657–658.

In Ireland there are two varieties of warble fly [*Hypoderma*] that cause loss to farmers by injuring the flesh of cattle, reducing the milk-producing power of cows and rendering the hides worthless for tanning. During the fly season, which may last from the middle of May till the end of August, the female lays eggs on the hairs of the sides, legs and feet of cattle, rarely on the back. The eggs are hatched in four or five days and the young maggots bore into the skin, wander through the body for several months, and from December onwards appear beneath the skin of the back forming round tumours or warbles. Later the skin is pierced, and from February to June or July the maggots emerge, fall to the ground and eventually develop into the flies of next summer.

The best method of control is by destroying the maggots by squeezing them out. This can be done more easily in wet than in dry weather and the skin can be made more pliable by washing with salt solution—$\frac{1}{2}$ lb. salt to 3 gallons of water. The skin heals quickly, but, where several maggots have been removed from a small area, an antiseptic dressing is advisable. The practice of smearing the backs of cattle with a sticky substance mixed with a poison has also been advocated, but no mixture can be recommended with confidence as being deadly to the maggots and harmless to the cattle. Squeezing-out should be thoroughly done three or four times in the season, and, if systematically carried out for a few years throughout the country, should greatly reduce the number of these flies and finally exterminate them.

ATKIN (E. E.) & BACOT (A.). **The Relation between the Hatching of the Eggs and the Development of the Larvae of** *Stegomyia fasciata* **(*Aëdes calopus*), and the Presence of Bacteria and Yeasts.**—*Parasitology, London,* ix, no. 4, 27th July 1917, pp. 482–536.

An elaborate series of experiments was conducted with the object of testing the old and popular belief held in all mosquito-ridden districts, that mosquito larvae exert a clearing action in turbid water and cannot live in clear water.

The eggs of *Stegomyia fasciata* are deposited singly on the water surface or on the wet margins of surrounding objects. Incubation is complete in 30–50 hours (according to temperature) provided that the surface of the egg be kept moist, following which, the eggs containing living larvae may be dried, and remain so for months without losing their vitality. Upon subsequent immersion they may hatch within a few minutes, or remain dormant for months, eventually yielding healthy larvae, a fall in the temperature of the water acting as a stimulus to hatching. The experiments on eggs yielded the decisive results that the presence of bacteria, yeasts, and, less definitely, moulds, does exert a stimulus causing eggs to hatch that would otherwise have remained dormant for a longer period, this stimulus, however, being less powerful, or altogether ineffective if killed cultures or sterile extracts of bacteria or yeasts are used. In the case of the larvae it was proved that they greedily consume and thrive on bacteria and yeasts in the absence of any other food, but entirely fail to develop under sterile conditions, from which it may be concluded that the presence of bacteria or yeasts is a practical necessity for the maintaining of the species. This knowledge should enable the methods now so largely available for the purification of water from bacteria to be utilised for the destruction of this species of mosquito.

MITZMAIN (M. B.). *Anopheles punctipennis.* **A Note on its Ability to serve as a Host for** *Plasmodium falciparum.*—*Public Health Repts., Washington, D.C.*, xxxii, no. 27, 6th July 1917, p. 1081.

In a series of experiments recently conducted at New Orleans, the susceptibility of *Anopheles punctipennis* to infection with the parasites of subtertian malaria has been established, it having been proved easily infectible with *Plasmodium falciparum*, Welch. Of one series of 16 mosquitos, given a single feeding, one became infected; in a second group of 36, given a variable number of feedings, 13 infections resulted; in the two groups, 27 per cent. of infections were observed. Of 8 examples of *A. quadrimaculatus* used as controls, 4 developed infections [see also this *Review*, Ser. B. v. p. 133].

PARROT (L.). **Sur un nouveau Phlébotome algérien,** ***Phlebotomus sergenti*, sp. n.** [A new Algerian *Phlebotomus*, *P. sergenti*, sp. n.]—*Bull. Soc. Path. Exot., Paris*, x, no. 7, 11th July 1917, pp. 564–567, 11 figs.

Three species of *Phlebotomus* have hitherto been recorded from Algeria, namely, *P. papatasii*, Scop., *P. minutus* var. *africanus*, Newst., and *P. perniciosus*, Newst. The new species, *P. sergenti*, here recorded, is described from several male individuals captured at Constantine.

DELANOË (P.). **Contribution à l'Etude du Paludisme au Maroc Occidental. i. L'Epidémie palustre des Oulad Hassoun.** [Contribution to the Study of Malaria in Western Morocco. i. The Malarial Epidemic among the Ulad Hassun.]—*Bull. Soc. Path. Exot., Paris*, x, no. 7, 11th July 1917, pp. 586–611.

A malarial epidemic occurred in western Morocco in 1915, commencing in June and reaching its height in July and August. It is explained by the presence, in the centre of the infection, of numerous *Anopheles maculipennis* and a few chronic malaria cases. Great impetus was given to the epidemic in the month of August owing to the precocious production of gametes observed in the blood of recently-infected persons. This is an important symptom, indicating the necessity of dealing promptly with any cases of primary malaria in Moroccan towns, particularly in those districts where it is possible to contract malaria. The quotidian type predominated, though the intermittent type also occurred. Quinine was found to have an excellent effect on any of the parasites concerned. *Plasmodium vivax* occurs in the proportion of 43 per cent.; *P. falciparum*, 33·1 per cent.; and the two associated in the proportion 18·8 per cent.

Roubaud (E.). **Histoire d'un élevage de *Glossina morsitans* à l'Institut Pasteur de Paris.** [History of the Rearing of *Glossina morsitans* at the Pasteur Institute in Paris.]—*Bull. Soc. Path. Exot., Paris*, x, no. 7, 11th July 1917, pp. 629–640, 2 figs.

The breeding of *Glossina morsitans* and *G. palpalis* from pupae brought by the author from Senegal and reared in muslin cages at the Pasteur Institute in Paris, was begun in 1914 and has previously been described [see this *Review*, Ser. B, iii, p. 77]. The examples of *G. palpalis* unfortunately died out almost at once, but the rearing of *G. morsitans* has continued satisfactorily for three years, the strain ultimately dying out naturally owing to an unusual preponderance of males and absence of females. Details of the construction of the breeding cages, feeding experiments, etc., are given, and records made of longevity, reproduction, etc. An unsuccessful attempt was made to infect some of the *Glossina* with strains of *Trypanosoma rhodesiense* and *T. brucei* from Uganda. Experiments in parasitisation of the pupae of *G. morsitans* by the Chalcidid, *Nasonia brevicornis*, are described in the next paper.

This attempt has proved that *Glossina* can be reared in Europe and biological experiments attempted under the same conditions as in tropical countries. It is hoped by this means to elucidate many hitherto obscure details of the life and pathogenic rôle of these insects, which it is not always possible to do in tropical laboratories.

Roubaud (E.). **Observations Biologiques sur *Nasonia brevicornis*, Ashm., Chalcidide Parasite des Pupes de Muscides. Déterminisme physiologique de l'Instinct de Ponte; Adaptation à la Lutte contre les Glossines.** [Biological Observations on *Nasonia brevicornis*, Ashm., a Chalcidid Parasite of the Pupae of Muscids. Physiological Determination of the Instinct of Oviposition; Adaptation to the Control of *Glossina*.]—*Bull. Scient. France et Belgique, Paris*, l, no. 4, 8th June 1917, pp. 425–439, 1 fig. [Received 14th August 1917.]

Nasonia brevicornis, Ashm., is known to parasitise the pupae of various Muscids throughout the world. It has been observed that in attacking the pupa of its host the parasite makes a number of punctures and sucks up the liquid which issues from the wounds.

Experiments show that the punctures of the Chalcidid are primarily for the purpose of nourishment, and that this nourishment at the expense of the pupa is a specific food indispensable to oviposition. It is only after at least one such meal that the fly is able to oviposit in the successive pupae that it attacks, while of the pupae injured only that one which has been used as a food supply is capable of developing into an adult fly. All pupae pierced after the first feed are parasitised.

The author has found *N. brevicornis* naturally parasitic upon *Calliphora erythrocephala* and *Phormia sordida,* and has obtained experimentally oviposition in *Gastrophilus equi* (*intestinalis*) and in *Glossina morsitans* from Senegal. The parasite, in fact, attacks any pupa that it can pierce with ease in order to obtain the juices necessary for its nourishment. In the case of *Gastrophilus* and *Glossina morsitans* the pupal cases were found to be too tough for the adult parasite to emerge. One Chalcidid has been observed to be capable of destroying four Muscids, especially when the pupae are young; when supplied with only old pupae, the parasites die from lack of nutrition, being unable to pierce the pupal cases. The destructive powers of *N. brevicornis* in connection with the pupae of various flies and its perseverance in reaching and puncturing its victims, even when the latter are concealed under a light layer of earth, indicate the possibility of its being used in the campaign against *Glossina,* the pupae of which are hidden under bark, in holes in trees, under light sand, etc. Various specific parasites of these flies have been described during the last few years, but their biology is too little understood to allow of their being utilised to any great extent. This cannot be said of *N. brevicornis,* which can be obtained in large quantities from the pupae of common Sarcophagid flies. The mode of action of the parasite towards the pupae of *G. morsitans* has been identical with that towards the Muscids of France. Young pupae were searched for eagerly, the old ones avoided. The development of the pupa of *Glossina* being slower (one month) than that of *Calliphora,* the possible limit of infestation of *Glossina* is naturally more extended. The impossibility of emergence limits the extent of parasitism, although it does not reduce the immediate destructiveness of the parasite.

The question naturally arises of the possibility of acclimatisation of the insect. *N. brevicornis* seems experimentally capable of enduring the usual temperature in which the tsetse-fly lives; at 77° to 82° F., which is the average temperature of *Glossina* haunts, its life is apparently normal, the activity of the adults being increased and the life-cycle appreciably shortened. A female reared at this temperature produced 105 individuals in 12 days. A greater difficulty is the maintenance of parasitism in the tsetse breeding grounds if the continuity of parasitism at the expense of *Glossina* is not possible. It is probable however that the Chalcidid will find some species of flies other than *Glossina* in which successive generations can breed. Experiments in this connection would be interesting. The method of dissemination of the parasite among the *Glossina* haunts would be simple. Having obtained a quantity of parasitised pupae of various blow-flies, such as *Calliphora, Lucilia, Sarcophaga, Chrysomyia, Pycnosoma,* etc., these would be distributed a few days before emergence of the parasites, being either scattered by hand in the

Glossina haunts or placed in small masses lightly covered with humus to protect them from predators. This method, applied to permanent breeding-grounds of limited extent, would undoubtedly offer an appreciable check to the increase of *Glossina*.

MESNIL (F.) & ROUBAUD (E.). **Sur la Sensibilité du Chimpanzé au Paludisme humain.** [On the Susceptibility of the Chimpanzee to Human Malaria.]—*C. R. Hebdom. Séances Acad. Sciences Paris*, clxv, no. 1, 2nd July 1917, pp. 39–41.

While malaria is easily communicable from man to man by inoculation of parasitised blood, human malaria has never before, to the authors' knowledge, been communicated to animals, although the endoglobular parasites in various monkeys greatly resemble human haematozoa. The experiment was therefore tried of inoculating a chimpanzee with human malaria. A first inoculation of the tertian benign form (*Plasmodium vivax*) gave negative results. A second inoculation from another source after 12 days, which is the average period of inoculation from man to man, showed the presence of the parasite *P. vivax* in the blood. In another 10 days the strain had died out and examinations gave negative results. It is hoped to repeat and continue these investigations.

ARMAND-DELILLE (P.). **Remarques sur les Aspects parasitologiques du Paludisme contracté en Macedoine.** [Remarks on the Parasitology of Malaria contracted in Macedonia.]—*C. R. Hebdom. Séances Acad. Sciences, Paris*, clxv, no. 5, 30th July 1917, pp. 202–203.

The almost exclusive predominance of the tertian malignant form of malaria (*Plasmodium falciparum*) among the Balkan army in Macedonia in the summer of 1916 has already been recorded [see this *Review*, Ser. B, v, p. 98]. This parasite first appeared in July, increased steadily until October, then gradually decreased until March and finally disappeared in April. It is this complete disappearance of this parasite and its substitution by *P. vivax* that is surprising. Similar reports come from a hospital in Paris dealing with malarial subjects from Macedonia, where, after December 1916, *P. vivax* completely replaced *P. falciparum*. The author, working at the malaria hospital at Vichy, found only *P. vivax* after the end of June 1917. The great majority of the patients studied during the spring must, however, have contracted the disease during the period July–November 1916, and a great proportion of them must therefore have been infected by *P. falciparum*. Records taken daily for eight months show that patients badly infected during the summer by *P. falciparum* and treated with quinine have nevertheless shown during the following winter an access of secondary malaria. After February 1917, only *P. vivax* was found in their blood. The author doubts whether this is to be considered a case of transformation of the parasite. The question arises as to how the form which offers the greatest resistance to quinine disappears first, while *P. vivax*, which is more sensitive to this drug, persists in the blood so long. The author suggests as a possible explanation that *P. falciparum* is simply retained in the more deeply seated organs.

These facts seem to confirm the "unicist" doctrine of Laveran and the possible duality of the parasites of tertian benign and tertian malignant forms hinted at by Billet. The subject offers a vast field for further investigation.

BERLESE (A.). **Insetti delle Case e dell' Uomo e Malattie che diffondono.** [The Insects infesting Houses and Man, and the Diseases they spread.]—*Milan*, Ulrico Hoepli, 1917, xii + 293 pp., 100 figs. [Price *Lire* 4·50.]

In this manual the insects infesting man and his dwellings are divided into parasites, including mosquitos, bugs, fleas and other blood-suckers; commensals, including house-flies; guests, including cockroaches, termites, grain pests, etc.; and auxiliaries, the last-named being spiders, etc., predaceous on the noxious species. The text is clear and concise and is illustrated with one hundred figures. Besides an index to the insects in order of pagination there is another which groups them according to the surroundings in which they live. These features, together with the practical nature of the control measures advised, render this manual one of the best of those designed for general use.

MIYASHIMA (K.) & OKUMURA (T.). *Trombidium akamushi* **and allied Forms, a comparative Study of the various Mites found in Japan.** —*Saikin Gaku Zasshi* [Jl. of Bacteriology], no. 254, 20th November 1916, pp. 5–38, 5 plates. [Abstract in *China Med. Jl., Shanghai*, xxxi, no. 4, July 1917, pp. 338–345.]

The first portion of this article is a review of the history of the study of these mites in Japan, with a general description of the morphology of the group. A description of the various species that have been collected in the infested districts is given, with some account of the different stages of their life-history; eleven different species are recorded, of which six were successfully carried through the larval, nymph and adult stages. So far as known, none of these are the transmitters of any disease to man.

HERMS (W. B.). **Malaria and Mosquito Control.**—*Cal. State Bd. Health, Sacramento*, Special Bull. no. 9, 15th December 1916, 20 pp., 6 figs. [Received 28th August 1917.]

This bulletin describes the history of the malaria parasites in the blood and of their transmission by mosquitos. The distinguishing features of Culicine and Anopheline mosquitos are described, with photographs. The breeding habits and life-history of mosquitos are dealt with and the essentials for the control of the Anophelines are given. The difficulties of rice cultivation under malarial conditions are discussed [see this *Review*, Ser. B, v, p. 142]. A copy of the Mosquito Abatement Districts Act is given and the establishment of several Abatement Districts recorded [see this *Review*, Ser. B, v, p. 143].

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SERGENT (Edmond) & SERGENT (Etienne). **Etudes Epidémiologiques et Prophylactiques du Paludisme : Treizième et quatorzième Campagnes en Algérie en 1914 et 1915.** [Studies in the Epidemiology and Prophylaxis of Malaria: 13th and 14th Campaigns in Algeria in 1914 and 1915.]—*Ann. Inst. Pasteur, Paris,* xxxi, no. 6, June 1917, pp. 253-268, 6 figs. [Received 13th August 1917.]

The two years 1914 and 1915 have been particularly interesting from the point of view of malaria : in 1914 there was a recrudescence of fever in several localities, followed in 1915 by a general epidemic attaining at times extreme severity [see this *Review*, Ser. B, iv, p. 190]. During this epidemic *Anopheles algeriensis*, which is found only in the spring, was recorded, for the first time, at an altitude of about 3,000 feet. The study of malaria prophylaxis extended over a period of 14 years has led to the conclusion that a distinct amelioration of malarial conditions is possible by the regular administration of quinine amongst the natives by a European agent. Anti-larval measures play a very important part in control of malaria, and frequently suffice to hold Anophelines in check. A striking instance of this is shown in the case of Montebello, Algeria, where anti-larval measures have been carried out unremittingly each year from April to December, ever since the severe epidemic of 1904. The result has been that in spite of extremely favourable conditions for the development of mosquito larvae, Anophelines were held in check and no case of malaria occurred in Montebello during the epidemics of 1914–1915. The recent outbreaks are largely attributed to the interruption of anti-larval measures owing to the war.

Mechanical means of defence against mosquitos (screens, mosquito-nets, etc.) are efficacious and indispensable for complete protection, and deserve to be more widely employed, as they protect not only from mosquitos, but also from flies. A mosquito-proof tent formed of a folding metal stand draped with mosquito-netting is described and illustrated.

HOWARD (C. W.). **The Common Mosquitos of Minnesota.**—*Sixteenth Rept. Minnesota State Entomologist for 1915 and 1916, St. Anthony Park,* 1st December 1916, pp. 73–92, 7 figs.

This paper contains a popular account of the mosquitos found in Minnesota, which include some twenty species. The domestic mosquitos, *i.e.*, those which breed in artificial collections of water in the vicinity of human dwellings, include *Culex pipiens* and *C. restuans* ; the other species are those which breed in natural collections of either permanent or temporary water, open or in woodlands. These include *Ochlerotatus* (*Aëdes*) *sylvestris*, Theo., *O.* (*A.*) *canadensis*, Theo., *O.* (*A.*) *fuscus*, O.S., *O.* (*A.*) *abfitchi*, Felt & Young, *O.* (*A.*) *trivittatus*, Coq., *O.* (*A.*) *auroides*, Felt, *Taeniorhynchus* (*Mansonia*) *perturbans*, Walk., *Culex tarsalis*, Coq., *Anopheles punctipennis*, Say, and *A. quadrimaculatus*, Say. Less common in Minnesota are *Culex dyari*, *Ochlerotatus* (*Aëdes*) *impiger*, *O.* (*A.*) *triseriatus*, *O.* (*A.*) *nemorosus*, *O.* (*A.*) *curriei*, and *Wyeomyia smithi*.

A key is given for the determination of adult mosquitos and mosquito larvae and the usual controls are recommended.

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Herms (W. B.). **Flies: their Habits and Control.**—*Cal. State Bd. Health, Sacramento,* Special Bull. no. 20, 15th December 1916, 19 pp., 6 figs. [Received 28th August 1917.]

This bulletin gives a popular description of the house-fly, its life-history, breeding habits, range of flight and its significance as a carrier of disease. The economic importance of eradicating this pest is pointed out; the elaborate precautions which are carried out against its incursions (screens, poisons, etc.) being unnecessary where efficient control is maintained. The essentials of such control are discussed, particularly with regard to stable construction, disposal of manure in sanitary bins, etc., various types of which are described, with diagrams. All the usual preventive measures are advocated.

Cox (F. E.). **A Review of Recent Literature on Typhus Fever and Acute Anterior Poliomyelitis.**—*Commonwealth of Australia Quarantine Service, Melbourne,* Publication no. 13, 1917, 79 pp., 2 plates, 1 map.

This review gives a detailed account of the history of typhus fever, its geographical occurrence and its epidemiology, leading to the conclusion that the body-louse, *Pediculus humanus* (*vestimenti*), may be regarded as the chief, if not the sole, agent of transmission, while *P. capitis* does not play any important rôle in its spread; *Phthirius pubis* may perhaps act as a carrier, though this is not the case with the bed-bug [*Cimex*].

Other sections deal with the causative virus of the disease; the habits of *Pediculus humanus*; the prevention of typhus fever; a list of reagents for destroying lice; immune carriers of infected lice, etc.

In dealing with the recent literature of acute anterior poliomyelitis it is stated that the virus has been demonstrated in the dust of the rooms of patients, and on the bodies and in the intestines of flies that have fed on infected spinal cords. On the bodies of the flies its presence was demonstrated for at least 24 to 48 hours, and in the intestines for six hours longer. *Stomoxys calcitrans* was at one time supposed to play some part in the spread of this disease, since of 12 monkeys experimentally exposed to the bites of flies previously infected, six developed the disease and three died. Subsequent experiments, having yielded negative results, it is now considered probable that the infection is spread by direct or indirect contact and not by the bites of flies. Owing to the fact that the disease is more severe and common in country districts than in large cities, it has been suggested that some insect found more commonly in the country may be the transmitting agent; but this difference in its incidence is more probably due to the greater susceptibility of country children to the disease, those living in cities having acquired some immunity to it.

Roubaud (E.). **Auto-inoculation et Developpement primaire dans les Muqueuses buccales, de la Larve du Gastrophile equin (Œstre du Cheval).** [The Entrance and primary Development of the Larva of *Gastrophilus equi* in the Buccal Mucosa.]—*C. R. Hebdom. Séances Acad. Sciences, Paris,* clxiv, no. 11, 12th March 1917, pp. 453–456.

The method by which the larva of *Gastrophilus equi*, L. (*intestinalis*, De G.) reaches the digestive tract of its host and the facts of its early development are unknown. Some authors think that the young larvae after hatching, reach the mouth and nostrils themselves, while others believe that they are introduced into the mouth by licking and then swallowed. Owing to the discovery in man of larvae of this type in the areas of the skin affected by creeping myiasis, the hypothesis has been evolved that the newly-hatched larvae penetrate the skin of the horse and cause itching, which induces the animal to scratch with its teeth and so ingest the larvae.

Most recent research has shown that the eggs of this fly do not hatch spontaneously, and that the larvae can remain waiting in them for several weeks until they are liberated from the egg by mechanical contact; the young larvae, liberated by contact with the mucous membrane of the lips or gums, immediately perforate the epithelium; they are unable to penetrate the skin, though they can develop in the mucous membranes of the mouth. Infestation occurs when the horse scratches with its teeth or rubs its legs with its nose and lips, and chances of infestation can be greatly reduced by lightly rubbing those parts where the eggs are laid, so as to cause their automatic hatching. The development of *Gyrostigma* (*Spathicera*) infesting the rhinoceros probably resembles that of *Gastrophilus* owing to the similarity of the eggs and young larvae. The point of entry of the larvae occurring in creeping myiasis must be the external mucous membrane of the eyelids or of the lips or some lesion of the skin, as they cannot perforate the epidermis directly.

Flies.—*Agric. News, Barbados*, xvi, no. 399, 11th August 1917, pp. 241–243.

This editorial deals with the annoyance caused by flies in West Indian houses, as well as the danger of disease arising from their presence. An account is given of the life-history and usual methods of control, and it is pointed out that the future development of the West Indies depends largely upon increase in their population, while disease, especially among infants, is an important factor in retarding this, the most active disseminators of disease being flies.

Carpenter (G. H.). **Injurious Insects and other Animals observed in Ireland during the Years 1914 and 1915.**—*Econ. Proc. R. Dublin Soc.*, ii, no. 12, September 1916, pp. 233–237. [Received 10th September 1917.]

The cattle louse, *Trichodectes scalaris*, N., occurred plentifully on cattle in Co. Dublin in the autumn of 1914, biting into the skin sufficiently to cause bleeding. As in the case of *T. sphaerocephalus*, the closely related species found on sheep, it is most important that infested animals should receive two dippings or washings at an interval of about ten days, as the eggs that are attached to the hairs of the host are not killed by a poison that kills the lice themselves.

Froggatt (W. W. & J. L.). **Sheep-Maggot Flies, No. 3.**—*Dept. Agric. N.S.W., Sydney*, Farmers' Bull. no. 113, June 1917, 37 pp., 12 figs. [Received 11th September 1917.]

This report contains an account of the work carried out at the Government Sheep-fly Experiment Station from the end of 1915 to

March 1917. The destruction of all carrion, offal, and animal matter which serves as the primary breeding grounds of the sheep-fly, to which reference has already been made [see this *Review*, Ser. B, iii, pp. 13–17, 184], has come to be regarded as of such primary importance that many sheep owners are in favour of compulsory legislation on the subject.

The best method of destroying dead sheep, namely by burning, is often impossible owing to shortage of labour, to the danger of fire in summer time, and to the lack of fire-wood on the plains. Under these circumstances they can be utilised as poison-baits to kill large numbers of the active blow-flies always hovering round a carcase. The dead animal should be half skinned, disembowelled, the paunch slit and the contents scattered about, the exposed flesh slashed with a knife and the whole sprayed or covered with arsenic water. This remains attractive until the second day, by which time the arsenic will have rendered the flesh dry and hard. If the carcase be then turned over and the operation repeated, many more flies will be destroyed and the remains will then simply dry up.

To make the arsenic water for spraying, 1 lb. white arsenic (or arsenious oxide) should be mixed with $1\frac{1}{2}$ lb. washing soda and the whole dissolved by boiling in 5 gals. water. Before use this must be diluted with another 5 gals. water. The solution may be more easily made by using sodium arsenite, which is readily soluble, $1\frac{1}{2}$ lb. being used in place of 1 lb. white arsenic. A dead horse or bullock in a sheep paddock cannot be dealt with by burning or burying, as it would entail too much fuel, time and labour, but can be treated by driving four stakes into the ground round the carcase and connecting them with a strand of fencing wire 2 or 3 ft. above the ground. A Hessian cover is then thrown over the wire and the lower edges are pegged to the ground, a bank of earth being then thrown over them. The maggots in the carcase hatch out in about a fortnight, and the flies, being unable to escape, die in large numbers. All butcher's offal should be burned, an incinerator being easily made with a few mud bricks and half a dozen fire-bars raised a foot or two off the ground to create a draught. Freshly-flayed skins should be treated with arsenic water to kill flies and protect them from beetles.

Statements have frequently been made that blow-flies breed in decaying vegetable matter along river banks and the margins of lagoons, but up to the present no specimens of blow-fly maggots have been taken in vegetable matter. The maggots found were probably those of the black bush-fly, *Musca autumnalis* (*corvina*), the common house-fly, *Musca domestica*, or of a small white-barred fly which swarms along the edges of swamps.

Experiments carried on with a view to finding attractive substances combining both fermentative and putrefactive processes, the resultant products of which would form a mixture resembling putrefying offal in odour, have resulted in the production of two such mixtures. At comparatively small cost these can be easily distributed in suitable vessels which can be frequently emptied and refilled. The most important point is that both sexes of all the different species of blow-flies should be attracted, which is not the case with baits of essential oils, each of which attracts the males of one species only. The two new mixtures are, caseinogen, prepared from fresh or skimmed milk, preferably the latter, and yeast mixture, a preparation of brewers' yeast, which can be made very cheaply on a large scale. Caseinogen has an odour like tainted meat, is small in bulk, can be easily distributed, requires no admixture of poison and lasts a long time.

Experimental tests with dips and dressings have in many cases yielded negative results; some have proved excellent for blown wool or for cracks and sores on the skin caused by blow-flies, but no absolute preventive against flies blowing live wool has been found. The fact that carbolic dips act satisfactorily at one time and are almost valueless at another is due to the want of standardisation of coal tar products, the amount of phenol present varying from 4·1 per cent. to 71·86 per cent. The so-called non-poisonous carbolic dips and dressings may easily become poisonous if they are not diluted sufficiently, a 10 per cent. solution of carbolic acid in cotton seed oil used as a spray having given rise to carbolic acid poisoning. The use of the liquids, tetrachlorethane and pentachlorethane, the vapours of which are extremely poisonous, gave very unsatisfactory results when mixed with caseinogen, as they stopped putrefaction, and their odour seemed obnoxious to the flies.

The value of dipping and spraying as a protection against blow-fly attack is a much debated question, and its success depends largely on the care and thoroughness with which it is carried out, and also on the type of sheep, those with wrinkled, close wool being much more difficult to treat. In spraying under pressure, so as to penetrate the wool and reach the skin, great care must be exercised in using arsenical or carbolic preparations, as they are apt to set up blood-poisoning, if used too strong. Thus a spray of $1\frac{1}{2}$ lb. arsenite of soda to 16 gals. water can safely be used as a surface-application to destroy young maggots and eggs, but, if it is to come in contact with the skin, not more than $1\frac{1}{2}$ lb. should be used to 50 gals. water. Though unhealthy sheep are readily attacked by blow-flies, the same thing applies to healthy individuals if their wool gets into a wet and soiled condition when the fly season is at its height.

As regards the control of blow-flies by birds, it has been stated that the poisoning of rabbits has caused the plague of blow-flies owing to the destruction of insectivorous birds by the poisoned bait. As a matter of fact, the carnivorous birds controlled the flies by devouring the carrion long before it was sufficiently decayed to breed maggots and these birds, though wisely protected in the Southern United States and Mexico, had practically been exterminated long before rabbit poisoning was undertaken. The decrease in the number of insectivorous birds is due to the cleaning of scrub and forest land for agricultural purposes, to the numbers of wild cats in the bush and of homeless ones swarming in the cities, and to the wholesale poisoning of water to kill rabbits. The birds that have been noticed destroying blow-flies or their maggots are the soldier bird, *Myzantha garrula*, the white-eared honey-eater, *Ptilotis penicillata*, and the wagtail, *Rhipidura tricolor*.

Weather conditions have a marked influence on the appearance and activities of the flies and the blowing of the sheep. The smaller yellow house blow-fly, *Anastellorhina augur*, has been found in carrion, and bred out of blown wool, both in winter and summer; the golden-haired blow-fly, *Pollenia stygia* (*villosa*), cannot stand very hot weather and does not blow sheep in the summer months; the green and blue sheep-maggot fly, *Pycnosoma (Calliphora) rufifacies,* is a typical hot-weather fly and has been found blowing live wool and carrion throughout the year except during the cold weather of July and August. The English sheep-fly [*Lucilia sericata*] does not like extremes of either heat or cold; its maggots are found in blown wool all through the early summer. The shining black fly [*Ophyra nigra*] is not a blow-fly in the strict sense of the term, being usually found all the year round under the carrion on the damp soil, but it has adapted itself to blow live wool; the small green blow-fly, *Pycnosoma (Calliphora) varipes,* has been bred from blown wool taken directly from the sheep's back and has been found throughout the year except in July and August.

Observations on sheep-maggot parasites have shown that in cases where *Nasonia brevicornis* directly infests fly pupae in the paddocks, the pupae attacked are always those of the two common green flies, *Pycnosoma rufifacies* and *P. varipes,* while in laboratory experiments it lays its eggs indiscriminately in fly pupae of any species without exhibiting any preference. The discovery of another Chalcid parasite of blow-fly maggots, *Chalcis calliphorae,* has already been recorded [see this *Review*, Ser. B, iv, p. 179]. Although only a single individual emerges from each fly pupa and the increase is therefore not so rapid as in the more prolific *N. brevicornis,* the fact that the maggots are parasitised before they seek cover or pupate may be a great advantage. A new primary Hymenopterous parasite, which, however, is not of much economic importance, has been obtained from the maggots of *Ophyra nigra.*

JACK (R. W.). **Natural Transmission of Trypanosomiasis (*T. pecorum* Group) in the Absence of Tsetse-fly.**—*Bull. Entom. Research, London*, viii, no. 1, August 1917, pp. 35–41, 2 maps.

In this paper the author supplements the information conveyed in a previous report [see this *Review*, Ser. B, v, p. 26] by detailed accounts of outbreaks of trypanosomiasis, three being among cattle, and two among pigs on isolated farms, some miles removed from a belt of *Glossina morsitans.* From these he concludes that, given the necessary conditions, transmission of this disease may take place and has occurred more often than has generally been recognised, in the absence of tsetse-fly.

It appears probable that the transmitting agents are abundant in spring and summer, and decrease or disappear in the winter; the disease is not readily transmissible under S. Rhodesian conditions by these agents from chronic cases that live over until the rains, or recover; such carriers are not capable of transmitting the disease indefinitely, or only so under exceptional circumstances; the method of transmission is of a mechanical and not of a cyclical nature; the segregation of infected animals (on showing temperature) would, in the absence of tsetse, effectively check the spread of the disease.

The most probable transmitting agents are *Tabanus fuscipes, T. taeniola, Haematopota pertinens* and other species of this genus, *Stomoxys calcitrans, Lyperosia* and mosquitos. Of these, it must be admitted that *S. calcitrans* and mosquitos are the only agents that are everywhere abundant throughout the season over which infection extends, but it is by no means necessary to infer that the power of mechanical transmission is confined to one species or family.

These agents have not however resulted in the establishment of trypanosomiasis in areas away from the fly-belts and in no instance as yet recorded in Southern Rhodesia can *Glossina* be definitely disassociated from the inception of an outbreak. The whole question is one that calls for careful experiment and investigation.

Ingram (A.) & Scott Macfie (J. W.). **Notes on some Distinctive Points in the Pupae of West African Mosquitos.**—*Bull. Entom. Research, London,* viii, no. 1, August 1917, pp. 73–91, 16 figs.

This paper deals with a scheme of classification of mosquitos based upon the characters of the pupal paddles and their appendages. Keys to the pupal characters of certain species of *Stegomyia, Ochlerotatus, Aëdomyia, Culex, Cyathomyia, Eumelanomyia, Mimomyia* and *Chaoborus* are given; the pupa of *Anopheles marshalli* is described for the first time, further details being given of those of *A. pharoensis* and *A. mauritianus,* which are compared with the pupae of *A. costalis* and *A. funestus.*

Garman (H.). **A Few Notes from Kentucky.**—*Jl. Econ. Entom., Concord, N.H.,* x, no. 4, August 1917, pp. 413–415.

Simulium pecuarum (buffalo gnat) was abundant for a day or two in one county in Western Kentucky, some mules being actually killed by it. Examination showed that the locality where it appeared was entirely unsuited to the breeding of the insect; the streams were small and were said to dry up completely in the summer. Some farmers were of opinion that the insects came from a distance on a cold west wind. Pupae were, however, collected at the time in a willow on the edge of a creek which were apparently those of a species allied to *S. venustum.* There is evidently much to be learnt about the life-history and habits of this fly.

Herms (W. B.). **Contribution to the Life-history and Habits of the Spinose Ear Tick,** *Ornithodorus megnini.*—*Jl. Econ. Entom., Concord, N.H.,* x, no. 4, August 1917, pp. 407–411.

Ornithodorus megnini is a serious pest of cattle in California, where almost all warm-blooded animals are liable to attack, calves suffering the most severely and frequently dying from the effects. The experience is recorded of a man whose ear was entered by a tick while sleeping on the ground in the vicinity of cattle during the month of September. The tick lived in the ear until 9th December, causing much inconvenience, and was finally expelled by a strong dose of peroxide applied with a syringe. This individual in all probability entered the ear as a larva; when it emerged nine weeks later, it was a full-grown female. It remained alive for nearly a year without food. Experiments showed that oviposition and emergence of larvae may take place during the winter months under laboratory conditions. Under field conditions this occurs during the summer and autumn months. Tables are given recording the various stages in the life-history; the average length of the larval period was 44 days.

Howard (C. W.). **A Fly Control Exhibit.**—*Jl. Econ. Entom., Concord, N.H.*, x, no. 4, August 1917, pp. 411–412, 1 plate.

This paper describes an exhibit labelled "The Flyless Farm." The model has been constructed to show how the various farm buildings, stables, out-houses, etc., can be made absolutely fly-proof. The exhibit has proved exceedingly popular and it is considered that more practical information is disseminated among the public in this way than by any number of leaflets. It is hoped to exhibit this model at a number of State Fairs.

Lamson, Junr. (G. H.). **The Life-histories of the Cattle Lice.**—*Jl. Econ. Entom., Concord, N.H.*, x, no. 4, August 1917, pp. 446–447.

Haematopinus eurysternus (short-nosed cattle louse) was found to hatch in 7 to 8 days from eggs placed on the shoulder of a young calf, the complete life-cycle occupying 22 to 24 days. *Linognathus* (*H.*) *vituli*, L. (long-nosed cattle louse) has a similar life-history, eggs hatching in 8 to 9 days, and the whole cycle occupying 25 to 27 days. *Trichodectes scalaris*, Nitzsch (little red biting louse) is less easy to study owing to the difficulty of keeping it confined. Apparently the eggs hatch in 5 or 6 days and the lice mature in two weeks, indicating that a treatment might successfully be made 10 days or 2 weeks after the first, but further investigations are necessary.

Dios (R.). **Sistemática y Biología de los Ixodídeos Argentinos: Contribución á su Estudio.** [Biology and Systematic Description of Argentine Ixodidae: Contribution to their Study.]—*Anales Soc. Rural Argentina, Buenos Aires*, li, no. 3, May 1917, pp. 249–251, 2 figs. [Received 12th September 1917.]

This paper contains a description of both sexes of a new tick, *Amblyomma altiplanum*, sp. n., which has been found upon llamas inhabiting the Argentine-Bolivian arid plateaux at from 4,500 to 12,000 feet. These examples were taken in April and were never found on any other host, while attempts to rear them on goats, sheep and other animals were unsuccessful. Though females were kept alive in the laboratory for more than three months, no case of oviposition was observed.

Mendoza (P. de la C.). **La Garrapata en el Paraguay.** [The Tick in Paraguay.]—*Anales Soc. Rural Argentina, Buenos Aires*, li, no. 3, May 1917, pp. 251–253. [Received 12th September 1917.]

Ticks are a serious pest of cattle in certain regions of Paraguay. The most important species found in Argentina and Brazil is *Margaropus annulatus*, var. *microplus*, Can. The species concerned in Paraguay is probably the same and a study of this tick as a transmitter of disease is greatly needed in order to determine whether the methods of control employed in other countries would be efficacious in Paraguay. The part played by the tick in the transmission of *Piroplasma bigeminum* in Paraguay has long been a matter of dispute among stock-breeders. It was previously believed that the tick was not associated with disease owing to many animals being heavily infested without showing any symptom of illness. It was not understood that immunity has attained such a degree among Paraguayan cattle that it forms a permanent barrier to any fatal invasion of the disease, which in the country under review takes the form of a slight enzootic, only occasionally appearing as a severe epizootic. It is a matter of common experience in Paraguay that cattle reared on tick-free farms and brought into the country almost invariably contract piroplasmosis. On tick-infested farms young cattle that have a certain degree of inherited resistance are observed to suffer from a primary attack which confers a more or less lasting immunity in proportion to the gravity of the infection, each re-infection renewing the immunity. This resistance has undoubtedly saved Paraguayan cattle from destruction far more than any prophylactic measures that the Government could have devised. The widespread occurrence of the tick in the country, however, constitutes an obstacle to the progress of cross-breeding and the importation of the finer European breeds. The absence of any official action has been the cause of the extensive distribution of the tick in Paraguay; according to historical information, during the colonial period, particularly in the time of the Jesuits, who possessed extensive ranches, ticks were unknown on the stock-farms. Apparently the tick was introduced into the country in 1838 on cattle imported from Brazil. Since the colonisation period, the principal source of wealth in Paraguay has been its cattle; the presence, therefore, of a dangerous enzootic which impedes the development of its stock is of the most serious importance. While the acclimatisation of the best British breeds is a complex problem, by far the greatest obstacle is the tick, which is responsible for the deaths of 80 or 90 per cent. of imported cattle. The efforts of private individuals having proved ineffectual in controlling the tick, the Government has begun to institute public dipping tanks similar to those in use in the Argentine. The ports of exportation for cattle have been fixed by the Government and are enumerated in this paper; a dipping-tank has been established at each and a veterinary officer is present, who is entrusted with the inspection of the animals and the supervision of the dipping-tanks. A conference of delegates from the neighbouring republics is to be held under the auspices of the Sociedad Ganadera del Paraguay, for the purposes of studying the occurrence and means of eradicating the tick, when its exact geographical distribution will be determined and the question of establishing a convenient sanatorium for promoting international exchange of stock will be discussed. It is hoped that public and private action will combine to transform present conditions and promote the development of the country's resources.

Beyro (A. F.). **Perjuicios causados por la Garrapata del Ganado Vacuno: Inmunización contra la Tristeza: Lo que se hace en Estados Unidos.** [Losses of Cattle caused by Ticks: Immunisation against Tick-fever: What is being done in the United States.] —*Anales Soc. Rural Argentina, Buenos Aires*, li, no. 4, June 1917, pp. 329–333, 1 fig. [Received 12th September 1917.]

It is estimated that stock-breeders in the southern United States lose some £8,000,000 annually owing to ticks, besides the loss of capital. The problem of immunisation against bovine piroplasmosis has not yet been satisfactorily settled in Argentina. The value of the so-called vaccines against the disease that are placed on the market is still in dispute, some persons contending that the utilisation of these vaccines is practically identical with the simple process of an injection of parasitised blood from immune animals, and that the latter method is preferable; others report the successful use of them. The Instituto Biologico de la Sociedad Rural Argentina has just been inaugurated for the purpose of studying such problems.

The paper concludes with a quotation of Mohler's description of the immunisation of susceptible cattle [see this *Review*, Ser. B, ii, p. 102b].

McCulloch (Lieut.-Col. C. C.). **Sanitation in the Trenches.**—*Jl. Amer. Med. Assoc., Chicago, Ill.*, lxix, nos. 2 & 3, 14th & 21st July 1917, pp. 81–87 & 183–185, 4 figs.

This sketch briefly outlines the essential points in the prophylaxis of the most common and important diseases on the Western Front in Europe and includes descriptions of anti-fly latrines and of methods of destroying lice. There is also a note on malaria prophylaxis.

Cumming (J. G.) & Senftner (H. F.). **The Prevention of endemic Typhus in California.**—*Jl. Amer. Med. Assoc., Chicago, Ill.*, lxix, no. 2, 14th July 1917, pp. 98–104, 2 figs.

Early in 1916 typhus began to appear in California among newly arriving Mexican immigrants employed in railway section camps. From 1st June to 1st October 1916, 26 cases occurred, with one death. The railway authorities co-operated in the carrying out of the special typhus control regulations. These included the enforcement of louse-eradication measures in the section camps; the establishment of observation camps; and the reporting to the State of all new arrivals from Mexico. The typhus incidence dropped rapidly and since 4th January 1917 no case has been reported in California. In October 1916 there was louse infestation to the extent of 35 per cent. for *Pediculus humanus* (*vestimenti*) and 60 per cent. for *P. capitis*, while on 1st March 1917 reinspection showed no body lice and only 1 per cent. head lice.

Cameron (A. E.). **The Relation of Soil Insects to Climatic Conditions.**—*Agric. Gaz., Canada*, iv, no. 8, August 1917, pp. 663–669.

In the course of this paper the author, in discussing the association of certain species of insects with various altitudes, mentions the fact that a few species of Tabanids have been captured in British Columbia at an altitude of 8,500 feet; these include *Pangonia fera*, Will., and *Tabanus comastes*, Will., the latter having been taken in copula, indicating that the breeding ground was not far distant. *T. comastes* is also common at lower altitudes, and *T. sequax*, Will., occurs at altitudes ranging from 2,000 to 5,000 ft.

Foulerton (Major A. G. R.). **On Typhus Fever.**—*Jl. R.A.M.C., London*, xxix, no. 2, August 1917, pp. 224–228.

A noticeable feature of the typhus fever occurring in the Austro-German armies during the present war has been the frequent association in the same patient of typhus fever with some other infective disease, such as influenza, diphtheria, dysentery, malaria, typhoid and relapsing fevers; this varied association of infection is doubtless the result of cross-infection in military hospitals by the agency of typhus-infected lice. Similar cross-infection has occurred in at least one instance in connexion with relapsing fever. The spirochaete of relapsing fever is certainly carried by lice, by ticks, and possibly by other parasites, while it is equally certain that the louse is a carrier of the typhus fever virus, probably the only common carrier, so much so, that a typhus fever patient who has been freed from lice is considered to be no longer a source of danger to others. The seasonal prevalence of typhus among troops in the field is correlated with a seasonal prevalence of lice, this fever being, in temperate climates, essentially a winter disease, due to the wearing of additional clothing, less thorough washing, and the sleeping in a more crowded manner in billets. Similarly the association of typhus fever with times of privation and famine is probably due to a widespread neglect of personal cleanliness and consequent increased prevalence of lice. Relapsing fever also appears to be most prevalent under colder climatic conditions.

The parasite causing typhus fever has not yet been positively identified, but two suggested parasites must be considered, the Plotz-Olitsky-Baehr bacillus and *Rickettsia prowazeki* [see this *Review*, Ser. B, v, p. 110]. It is not apparent that the former has any causative relation to typhus infection, since its injection into the guinea-pig did not produce the sequence of symptoms produced by the injection of blood from a case of typhus fever, nor did it protect the guinea-pig against a subsequent inoculation with actively virulent typhus-infected blood. On the other hand it is highly probable that the organism, *R. prowazeki*, which has been identified in the cells of the intestinal epithelium of lice taken from cases of typhus fever, represents a phase in the development of the causative agent, which is probably a protozoon.

The comparison of the method of transmission of the spirochaete of relapsing fever with that of the unknown virus of typhus fever is interesting. In relapsing fever the transmission is direct, the louse being one of several accidental insect carriers. Its faeces contain the spirochaete, which probably could be also transmitted by the bite, it having been proved that the louse, after feeding on a patient with relapsing fever, could at its next feed infect a healthy individual. In the case of typhus fever on the other hand, the louse cannot transmit the virus until seven days after the infected meal and does not transmit it after the tenth day, the virus being contained in the body juices of the louse and not occurring in the faeces. In other words the virus of typhus fever after it has attained full activity in man must pass through a phase of evolution in the louse before it can be transmitted to a fresh human case, and the louse must be regarded as the necessary intermediate host, just as some species of *Anopheles* are in the transmission of malaria. On the other hand, direct transmission of the virus by means of infected blood occurred under experimental conditions in the guinea-pig and monkey. It is obvious that a quarantine of at least 21 days is necessary in dealing with an infected unit—allowing 6–10 days for the evolution of the virus in the louse, and 6–10 days for the incubation of the virus in man—after the last man of the unit has been freed from lice. There is the possibility, suggested by a single positive experimental result, of the transmission of the virus from an infected female louse to the ova, but experience shows the risk of such transmission to be negligible.

VAUGHAN-KIRBY (F.). **Game and Game Preservation in Zululand.**—*S. African Jl. Science, Cape Town*, xiii, no. 9, April 1917, pp. 375–396. [Received 19th September 1917.]

The outcry against game as being the reservoir of trypanosomes and against *Glossina* as the chief causal agent has been maintained for many years with varying intensity, though at least two species of animals in Zululand that have never been regarded as game are proven hosts of *Trypanosoma brucei*; these are the hyaena (presumably *Hyaena crocuta*), and the bush-pig, *Potamochaerus chaeropotamus*, the latter being a great wanderer and existing in incredibly large numbers. It has been argued that in Natal and the Transvaal tsetse-fly has died off through the destruction of its food-supply, the buffalo and kudu, by rinderpest. The zebra and wildebeeste were however immune and remained in large numbers and these would have furnished an ample supply of food, apart from such bush-pig, buffalo and kudu as survived. In the Transvaal the fly has never occurred again in the game preserve. It is considered probable that a certain number were killed by absorbing the blood of animals infected with rinderpest and this diminution in numbers may have been accentuated by existing climatic conditions.

In 1916 a proclamation authorised the destruction of the different species of game supposed to be responsible for the spread of nagana in all areas of Zululand, with the exception of game reserves and certain special shooting areas, where, owing to the presence of water and dense bush, and the proximity of the game reserves, nagana might be considered to be endemic, and in which game could be shot upon payment of a reduced fee.

The fact of allowing natives, who own stock and do not really believe in the harmfulness of the tsetse, to live in endemic centres of nagana and to move their infected cattle about, taken in conjunction with their careless herding arrangements, constitutes a grave danger to the community at large, which can only be counteracted by the segregation of infected stock.

It is generally admitted that the relation between tsetse-fly and game varies greatly in different localities, one authority declaring, that so far it is not possible to find fly except in areas where game abounds, while another remarks on its prevalence in the almost complete absence of game.

Another form of trypanosomiasis occurs in Zululand, known as "Munca," which some natives clearly distinguish from nagana, while others say that the word merely indicates the same disease. It is pathogenic to domestic stock, though in a lesser degree than nagana, and it has been suggested that it may be a chronic form of the latter, reduced in virulence by passage through the smaller antelopes.

With regard to game protection and the presence of endemic centres of nagana, there are two alternatives, that of completely exterminating all mammalian life, including domestic stock, or the devising of means to prevent the spread of the disease from these centres. The gradual extermination of game would bring the fly to the villages in search of food as represented by the domestic stock, and the increasing numbers of these animals constitute almost as serious a factor in the spread of the disease as do the wild ones, so that it is a mistake to suppose that, when the game only is destroyed, the fly will vanish.

Stordy (R. J.). **Disease of Cattle.**—*Ann. Rept. 1915–1916 Dept. Agric. British East Africa, Nairobi,* June 1916, pp. 62–71. [Received 20th September 1917.]

Fresh outbreaks of African coast fever have occurred on several farms owing to the shortage of immune transport oxen caused by military need for this type of animal, and the impossibility of enforcing strict quarantine measures. The spread of the disease in settled districts, since the war began, can be due only to the illicit movement of cattle from infected native reserves. About 80 dipping-tanks have now been erected in the Protectorate, some by the Government, one by the military authorities, and the rest by private individuals. It was noticed, when dipping cattle against the red-legged tick [*Rhipicephalus evertsi*], that those individuals inside the ears escape immersion: hence the necessity for frequently dressing the inside of the ears of infested cattle with a mixture of lard and Stockholm tar. The control by analysis of the numerous cattle-dips in the country has not yet been made systematic, the frequency of this operation being left to the discretion of the owner, who is often in ignorance of the capacity of the tank and hence cannot make the necessary corrections, relying on correction by trial instead of by calculation. Steps are therefore being taken to encourage owners to maintain their dips at an efficient strength, instead of taking unfair advantage of the privilege of free State analysis of their experimental samples.

An outbreak of trypanosomiasis occurred in June, which appeared to be largely disseminated by *Stomoxys*; the affected area was placed in quarantine and all the animals attacked were destroyed; the result of these measures has been to reduce the incidence of the disease.

Wood (H. P.). **The Chicken Mite: its Life-History and Habits.**—*U. S. Dept. Agric., Washington, D.C.,* Bull. no. 553, 10th August 1917, 14 pp., 1 pl., 2 figs.

The increase of the chicken mite, *Dermanyssus gallinae*, Redi, is favoured by dirt, etc., and dark and damp surroundings help it to live longer in the absence of food, which appears to consist solely of blood. Pairing normally takes place away from the host soon after the final moult and either before or after feeding; the females begin depositing eggs within 12 hours, several batches being laid, each after a separate feed. The rapidity with which it may reproduce is remarkable, the life-cycle occupying 10 days, or in warm weather $8\frac{1}{2}$ days, while a female may live for 8 weeks, in which time its progeny would total 2,600. A certain amount of moisture and moderate temperature favour longevity, the mites dying from want of food much faster in the summer months than in the winter; it should therefore be possible to eradicate them from a chicken-house by keeping fowls and other animals away from it for four months during the summer or five months in winter. Normal feeding takes place during the hours of darkness and the mites leave the fowl after engorgement, which takes from 20 to 30 minutes. The direct rays of the sun act as a powerful killing agent and a dark, protected place is necessary for oviposition and moulting, a crack in a board, dry manure or litter, and the perches themselves being favoured situations. Hence it is necessary to clear away all manure and rubbish before trying to kill the mites by spraying, while the perches should be of a type that can be easily removed. Among natural enemies a small black ant, *Monomorium minimum*, Buckley, has been seen to carry away recently-fed mites, while the fire ant, *Solenopsis geminata*, F., destroys many individuals, as also do certain spiders.

The mites may be disseminated by transferring infested fowls to clean localities; by using boxes and crates in which infested fowls have been kept; by mechanical carriers, such as the clothing of man, the feathers of sparrows and pigeons, and the skin of domestic animals and some wild animals, such as foxes, skunks and weasels; and by the migration of mites to buildings in contact with or close proximity to infested premises.

MOORE (W.). **Volatility of Organic Compounds as an Index of the Toxicity of their Vapours to Insects.**—*Jl. Agric. Research, Washington, D.C.*, x, no. 7, 13th August 1917, pp. 365–371, 7 figs., 1 table.

The question of relationship between boiling point and toxicity, as existing among volatile organic compounds other than the benzene derivatives, has been worked out by the author on lines similar to those employed in his investigation on the latter [see this *Review*, Ser. B, v, p. 131]. The insect used in the tests was the house-fly, *Musca domestica*, L., and the results are shown in a table and several graphs. A great variety of chemicals were dealt with and it was found that, generally speaking, the less volatile the chemical the more toxic it is, even when the compounds are strikingly different in their chemical composition. Exceptions, such as carbon bisulphide, ethyl mercaptan and particularly chlorpicrin, are due, not to vapour density, nor primarily to water solubility, but to their chemical composition or some peculiar action of the chemical concerned. Ethyl alcohol proved more toxic to insects than methyl alcohol, being the reverse of that which takes place in higher animals. The probable explanation of the relation between volatility and toxicity seems to be that the vapour present in the air is taken into the tracheae of insects and is condensed upon reaching their finer divisions. Hence, if the compound is very volatile, it will evaporate and readily pass out of the insect, but if slightly volatile, it will remain, penetrate the tissues and produce poisonous reactions. In higher animals on the contrary, when the compound is taken into the lungs, it is rapidly removed by the blood and carried to all parts of the body, giving it an opportunity to react chemically on the tissues. In short, with the higher animals, toxicity is more closely related to chemical composition than to volatility, the reverse being the case in insects. Compounds with boiling points of 225° to 250° C. are usually so slightly volatile that they do not produce death except after very long exposures.

MacCormac (H.) & Small (W. D. D.). **The Scabies Problem on Active Service.**—*Brit. Med. Jl.,, London,* no. 2960, 22nd September 1917, pp. 384–386.

Scabies is by far the commonest of the skin diseases found among soldiers, pediculosis excepted, and the wastage from this cause is considerable. The disease is rarely contracted except after prolonged and intimate contact with infected material, blankets having been found to be the chief means of dissemination, though a few cases have been contracted from horses. Preventive measures include regular medical inspection for the detection of infested individuals and their segregation; the inspection of horses, and the frequent sterilisation of blankets. The old method of treatment by sulphur vapour, recently revived, is a method that is often harmful to the patient, and always dangerous to the community in that it creates a class of scabies "carrier." The most suitable method of treatment is inunction with sulphur ointment on account of its efficiency, simplicity and cheapness, but it must be carried out in a methodical and thorough manner, and with careful attention to the necessary details.

Debreuil (G.). **Les Poux et le Chemineau.** [Lice and a Tramp.]—*Bull. Soc. Nat. Acclimat., Paris,* lxiv, no. 8, August 1917, pp. 318–322.

The author records an original method of ridding clothing of lice. In a wood in France he came upon a tramp who had divested himself of all his clothing, which he placed on and around a large nest of ants (*Formica fusca*). After leaving the garments for an hour he picked them up and, finding that they were free from ants, remarked that the work was finished and that the clothing would be more thoroughly free from vermin than any laboratory could make it. Some observations on carnivorous ants in Africa are recorded. In tropical Africa, especially in wooded regions, a group of ants occurs which are feared by both Europeans and natives, although in reality they are very useful on account of the destruction they cause among noxious animals.

The Mexican ant, *Pheidole valisti*, Perg., is said to swarm periodically about suburban dwellings, which it clears of the insects in all stages that frequently infest the walls and niches of the rooms after the rainy season. *Pheidole pallida*, Myl., is a similar species that occurs in southern France and in greenhouses in Belgium.

FERRARO (G.). **I Ditteri ematofaghi della Colonia Eritrea incriminati della Trasmissione delle Tripanosomiasi locali.** [The blood-sucking Diptera of Eritrea accused of transmitting local Trypanosomiasis.] *Clinica Veterinaria, Milan,* xxxx, no. 17–18, 15th-30th September 1917, pp. 487–493.

Since March 1912, when Pricolo reported the discovery of a trypanosome in dromedaries in Eritrea, the author has conducted a series of investigations on the trypanosomes of that colony. Camel trypanosomiasis is undoubtedly widespread there and the following blood-sucking flies may be considered to be transmitters of both this and cattle trypanosomiasis: *Stomoxys taeniata,* Bigot, *S. calcitrans,* L., *Tabanus leucostomus,* Lw. (*obliquemaculatus,* Macq.), *T. pallidifacies,* Surc., *T. gratus,* Lw., *T. cordieri,* Surc., *Haematopota abyssinica,* Surc., *Pangonia beckeri,* Bezzi, and *P. magrettii,* Bezzi. The two last-named are local, being found in or on the borders of Abyssinia. Additional species are *Tabanus sufis,* Jaenn., which apparently occurs in Morocco also, and *Hippobosca maculata,* found throughout southern Asia and in Upper Egypt. *T. leucostomus* seems to be the most common species in the colony. No species of *Glossina* has yet been found there. Though no reliance can be placed in the local names, which are very confused, the flies chiefly incriminated by the natives are blood-sucking, tropical species with the same geographical distribution as trypanosomiasis. According to Pricolo this disease has never been met with in Tunisia and Tripoli except in a few imported camels, from which the infection did not spread—a fact which points to the absence of vectors in those regions. In any case observed in Mediterranean Africa it is necessary to enquire if the affected animal has not journeyed farther inland than 20° N. latitude. There is no reason for attributing to *Stomoxys* alone the transmission of cattle trypanosomiasis, which is more local than camel trypanosomiasis and might well be carried by local species such as *Haematopota.* The lives of these flies appear to be governed by the humidity of the seasons and of the soil. In the districts between 2,800 and 7,300 feet, rains are usual in July, August and September, more rare in March and April, and *Stomoxys* is found throughout the year. It may, therefore, be assumed that all the flies recorded above occur in these districts, some of them all the year round. In the districts between sea-level and 5,300 feet the rainy season extends from December to April. Mists are common in this zone and flies are very abundant in wooded localities that are not excessively hot. As a rule the Tabanids appear after the first rains and the subsequent hot weather. *Stomoxys brunnipes* is said to prefer a cool climate and to be rare in flat, hot, low-lying land.

DAWE (M. T.). **Relación de un Viaje por el Río Magdalena, por el Departamento del Magdalena y por la Península de la Goajira (Colombia).** [Account of a Journey on the Magdalena River, in the Department of Magdalena and in the Goajira Peninsula (Colombia).]—*Memoria Ministro Agric. y Comercio, al Congreso de 1917, Anexos; Bogotá,* 1917, pp. 63–116.

The tick, *Margaropus* (*Boophilus*) *australis,* Full., and the fly, *Dermatobia hominis,* were found infesting cattle on this tour.

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Haas (—). **Description d'une Piscine anglaise destinée à donner des Bains aux Chevaux de l'Armée britannique.** [Description of an English Dipping Tank for the Horses of the British Army.]—*Recueil Méd. Vét., Alfort,* xcii, no. 16, 30th August 1917, pp. 324–328, 3 plans.

This paper describes a dipping-tank for army horses designed by Colonel Wilson for use with lime-sulphur solution.

Rène (C.). **Les Larves d'Oestres chez les Animaux.** [Oestrid Larvae in Animals.]—*Progrès Agricole, Amiens,* xxxi, no. 1546, 2nd September 1917, pp. 410–411.

The larvae of the Oestrid flies affecting horses, *Gastrophilus equi* and *G. haemorrhoidalis*, require treatment if present in any but limited numbers. From two to five 5-gramme carbon bisulphide capsules should be administered at two-hour intervals, followed on the next day by a saline draught consisting of 10 to 13 oz. of sodium sulphate. The best treatment for cattle infested by *Hypoderma bovis* is by squeezing out and destroying the larvae. Another remedy is the injection of 1 c.c. of tincture of iodine into the warble. Treatment of *Oestrus ovis* infesting the nasal sinuses of sheep is difficult. When the animals are valuable, the sinus may be trepanned and the parasites removed or benzine diluted with water may be injected by means of a special drill.

Miessner (H.) & Lange (W.). **Desinfektion mit heisser Pressluft in dem Vondran'schen Apparat.** [Disinfection with hot, compressed Air in the Vondran Apparatus.]—*Archiv. Wissenschaftl. u. Prakt. Tierheilkunde, Berlin,* xliii, no. 4–5, 13th September 1917, pp. 329–365, 5 figs.

Acting on government instructions issued on 26th February 1917, the Institute of Hygiene of the Veterinary College at Hanover tested the disinfecting power of the blast of dry, hot air in a laboratory model of the Vondran apparatus, a large type of which—used for destroying lice in uniforms and other military equipment—has already been described [see this *Review*, Ser. B, v, p. 43]. In the laboratory model an electric heater is fixed close beneath the disinfection chamber and the blast from the fan passes over it. There was no important difference between the temperature in the upper part of the chamber and that in the lower part when the chamber was empty, but when it was partly or entirely filled a difference of 36° F. [in the original, 20 degrees—by which, in this and other places, Centigrade degrees are assumed to be meant] or more were observed. This difference was reduced when the heater was switched off or when a constant temperature was maintained above the chamber in the bell-shaped mouth of the exhaust pipe leading back to the blower. Paper, books, cardboard, clothing, leather coats, boots (wet or dry), mirrors and catgut did not suffer from several hours' exposure to temperatures sufficient to register 266° F. in the bell and 320° F. in the lower portion of the chamber. Horn buttons became so brittle as to snap easily, and newly-flayed mouse-skins were shrunk and rendered brittle by the great heat. They did not suffer at 159°–177° F., which heat may be

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used for disinfecting the hides of horses affected with glanders, as the glanders bacillus is destroyed at 159° F. In testing this hot, compressed air against bacteria, spore-producing bacteria difficult to kill, as well as those easy to destroy, were experimented with, special attention being given to staphylococci and typhus bacilli. Fresh, fully virulent cultures were used and the exciting organism was kept infective by frequent passages through animals. Sterilised silk threads were dipped in the cultures and put up in sterile packages after being completely or surface dried. The packets were placed in the pockets of garments in the chamber. For the easily destroyed bacteria a temperature of 159° F. was maintained for 30 minutes, or 177°, 195° and 212° F. for 10 minutes. The more resistant micro-organisms were exposed to 212°–257° F. for longer periods. It was found that after the temperature has been raised to 159° F., this degree of heat, maintained for 10 minutes, would destroy the less resistant bacteria, while the other varieties, such as streptococci, typhus and paratyphus, require 212° F. for 10 minutes. Staphylococci proved very resistant, requiring 257° F. for 60 minutes ; even this did not affect anthrax.

In the electrically heated apparatus to which the above data apply the air is blown over the heater near the chamber. Tests were also made with a coal-heated model in which the air is drawn from the heater placed further away. With this arrangement, in which direct heat is not a factor, the differences in temperature within the chamber were slight at first and then disappeared. In other respects the results were practically the same as those given above. Anthrax spores were killed after two hours' exposures to 257° F.

In all cases the lower temperatures shown by the thermometer in the bell of the exhaust pipe leading back to the blower are the measure by which the efficiency of the treatment may be gauged. To attain the best results care must be taken to pack the chamber as uniformly as possible. As dry heat cannot act until all dampness has been removed, the electrically heated model is fitted with a condenser and suitable openings are provided in the exhaust pipe of the other model.

MOUSSU (G.). **Sur la Gale du Cheval.** [On Horse Mange.]—*Jl. d'Agric. Pratique, Paris*, xxx, no. 19, 20th September 1917, pp. 368–370.

The author criticises the decree by which mange in horses is added to the list of contagious animal diseases that are dealt with under the law of 1898 [see this *Review*, Ser. B, v, p. 120]. He points out that the military authorities have entrusted the care of the depôts for sick horses to cavalry or remount officers who are not technical experts, with the result that mange has been disseminated throughout the country, and the consequence has been the passing of this decree which weighs most heavily on the agriculturist. Article 3 stipulates that mangy horses must be kept apart and used only on the owner's premises, which practically entails their isolation in a stable and thus places them under the worst possible conditions for their cure. Article 4, which forbids the disposal of any mangy or contaminated horses otherwise than to the slaughter-house, precludes the possibility of placing sick horses under conditions where many of them would be rapidly cured, and the question arises as to what will happen to the numbers of mangy horses in the army when the war is over ; the only practicable measure under the present regulations is to send them all to the slaughter-house, or to maintain the depôts for sick horses until the last case is cured. The author suggests that the present and future needs of agriculturists should be more carefully considered, and that the preliminary step in this direction should be to entrust the depôts for sick horses to those whose business it is to cure them.

Snyder (T. E.). **Notes on Horse-flies as a Pest in Southern Florida.**—*Proc. Entom. Soc. Washington, D.C.*, xviii, no. 4, December 1916, pp. 208–211.

Tabanus trijunctus, Walk., and *T. lineola*, F., are commonly attracted to moving objects such as trains, motor-cars and wagons, and attack unprotected horses until their bodies become covered with blood. They also occur in buildings, especially stables, but are present in numbers sufficient to constitute a pest only during the latter part of March and the beginning of April. Other species are *T. mexicanus*, L., which is nocturnal in its habits, and *T. americanus*, Forst. Cats and dogs are also attacked and become emaciated from the irritation caused by these flies.

Davies (D. S.). **An Outbreak of Bubonic Plague in the City of Bristol.**—*Public Health, London*, xxx, no. 8, May 1917, pp. 176–180.

An outbreak of bubonic plague at Bristol was traced to a rag warehouse there. Over 8,000 rats were caught and examined in the city and port. Of the first 432 rats examined during August and September 1916, 6 were plague infected, all from the rag warehouse, and on one of them, *Mus decumanus*, the Indian flea, *Xenopsylla cheopis*, was taken. On the remainder of the rats the common rat flea, *Ceratophyllus fasciatus,* was found in large numbers, together with several species of lice.

Archibald (Capt. R. G.). **Seven-day Fever in the Anglo-Egyptian Sudan.**—*Jl. Trop. Med. Hyg., London*, xx, no. 12, 15th June 1917, pp. 183–185.

Nearly 300 cases were observed in two months during an epidemic of six- to seven-day fever which first appeared in the middle of July, soon after the commencement of the rains. The only mosquito then prevalent was *Stegomyia fasciata* (*calopus*). As a result of effective anti-mosquito measures, the epidemic diminished appreciably, but a few cases still persisted among the British troops quartered in barracks. An examination of the barrack rooms was made, when the walls were found to be heavily infested with *Cimex lectularius*. As any evidence implicating other blood-sucking insects was lacking, it was assumed that this bug was capable of transmitting the disease.

Townsend (C. H. T.). **The Head and Throat Bots of American Game Animals.**—*Jl. New York Entom. Soc., Lancaster, Pa.*, xxv, no. 2, June 1917, pp. 98–105.

The flies of the genus *Cephenomyia* deposit their larvae at the entrance of the nostrils or near the mouth of various members of the

Cervidae and certain allied families of ruminants, such as the prong-horn antelope, *Antilocapra americana*. The larvae cling by their spines and mouth-hooks to the mucous membranes and feed on the mucus secreted as the result of the irritation caused. On reaching the second stage they penetrate further and have been found in the nares, nasal and frontal sinus, eustachian tubes, pharynx, lungs, etc.: in the gullet and throat they occupy pouches formed by them to escape being swallowed.

Only three species are recorded from America, *C. pratti*, known both in the adult and third-stage larva, *C. phobifer*, known only in the adult stage, and *C. macrotis*, known only in the third-stage larva, the last two being probably the same species.

The larvae recorded from the nasal passages of man in California are third-stage screw-worms, *Chrysomyia* (*Cochliomyia*) *macellaria*, F., while those from the throat of pigs in Virginia do not belong to any known genus.

Hirst (S.). **Remarks on Certain Species of the Genus *Demodex*, Owen (the *Demodex* of Man, the Horse, Dog, Rat, and Mouse.)**—*Ann. & Mag. Nat. Hist., London,* xx, no. 117, September 1917, pp. 232–235.

Descriptions are given of *Demodex folliculorum*, Simon; *D. caninus*, Tulk., numerous specimens being taken from a dog suffering from the disease induced by this species; *D. ratti*, Hahn., very abundant in the skin of *Mus rattus norvegicus*; *D. musculi*, Oudms., in tame mice; and *D. equi*, Raill., causing a definite skin disease in hôrses.

Bostin (S. L.). **Notes: Eucalyptus Trees and Malaria.**—*Agric. Jl. India, Agric. Research Institute, Pusa, Calcutta,* xii, no. 3, July 1917, p. 495. [Received 20th September 1917.]

The author, writing in the "Scientific American" refers to the practice, common during the latter part of the nineteenth century, of planting blue-gum or eucalyptus trees in malarious districts under the impression that the essential oil produced by the leaves would counteract the supposedly poison-laden vapours rising from the swamps. Although this idea was dispelled by the discovery that malaria is a mosquito-borne disease, the fact remains that eucalyptus planted in a malarial district can and does stamp out the disease by absorbing so much water during its peculiarly rapid growth that pools and marshy places disappear, and with them the breeding-places of the mosquito.

Mitchell (J. A.). **Typhus Fever ("Black Fever" or "Mbetalala") in the Cape Province.**—*Med. Jl. S. Africa, Johannesburg,* xii, no. 12, July 1917, pp. 189–192.

An anomalous fever, occasional outbreaks of which have been reported in the Cape Province since 1900, has now been proved, on clinical and epidemiological grounds, to be a form of typhus. The usual measures against lice are included among those recommended against this disease.

CHRISTY (Major C.). **Notes on Malaria for Officers and Men.**—*Lancet, London,* cxciii, no. 4909, 29th September 1917, pp. 485–486.

These notes are stated to be an amplified syllabus of lectures delivered in the field to troops in East Africa. The best method of protection, where a mosquito net is not available, is the use of "Bamber oil," which is used extensively against mosquitos by coolies on plantations in Ceylon. This is composed of citronella oil (not lemon grass oil) $1\frac{1}{2}$ parts, kerosene (paraffin) 1 part, coconut oil 2 parts. To this mixture 1 per cent. carbolic acid is added. This affords protection for 4-6 hours.

ROSSI (G.). **Igiene, Malaria e "Questione meridionale."** [Hygiene, Malaria and the "South Italy Question."]—*La Malariologia, Naples,* Series I, x, no. 3, 15th June 1917, pp. 50–59.

In a recent paper Prof. C. Fermi has drawn attention to the utility of restricted drainage and anti-anopheline measures in rapidly freeing districts from malaria, instancing his work in Sardinia [see this *Review*, Ser. B, v, p. 117]. In criticising this, the author observes that Fermi treats the matter from the standpoint of the hygienist and considers the malaria of south Italy as a disease only, whereas it is in fact a calamity to agriculture that can be mastered only by drainage on an extensive scale.

FERMI (C.). **Deve preferirsi la piccola Bonifica e la Profilassi antianofelica, o la Bonifica agraria come Metodo smalarizzante?** [Should restricted Drainage and anti-anopheline Prophylaxis be preferred to extensive Drainage as a Remedy for Malaria?]—*La Malariologia, Naples,* Series I, x, no. 3, 15th June 1917, pp. 60–66.

In reference to the above criticism, Prof. Fermi states that he has never claimed anti-anopheline work to be other than a temporary measure for affording time for either restricted or extensive drainage to accomplish its task, or for freeing from infestation highly cultivated, well irrigated districts, where drainage is temporarily ineffective.

PICK (W.). **Ueber Pferderäude beim Menschen.** [Horse-mange in Man.]—*Wiener klin. Wochenschr., Vienna,* xxx, no. 27, 5th July 1917, pp. 849–850.

A female mite and two eggs were found in one of three instances where *Sarcoptes scabiei communis* f. *major* was seen in human cases of horse mange, thus proving that this parasite can breed in man. The spontaneous healing even of severe cases, and the fact that the mite was observed only when the disease had been newly-contracted, show that this mite is short-lived in man. Even when horses are severely affected, their attendants can avoid infestation by carefully washing themselves from the waist upwards with carbolineum-soap solution: Rp. Carbolinei 50, Sapon. Kalin. 60, Aqu. 1,000. Sulphur preparations and petroleum may be used for curative purposes as for scabies.

Scherber (G.). **Die Behandlung der Scabies mit Erdöl aus Kleczany.** [The Treatment of Scabies with Mineral Oil from Kleczany.]—*Wiener klin. Wochenschr., Vienna,* xxx, no. 27, 5th July 1917, pp. 850–852.

In treating scabies excellent results were obtained with Kleczany oil. This mineral oil is very pure and contains very little paraffin. Treatment consists in thoroughly anointing the entire body, except the head and neck, three or four times in one day, followed on the next day by a warm bath and a change of underclothing. The oil must not be rubbed in. This oil also kills *Pediculus* and *Phthirius pubis.*

Pilzer (—). **Ueber Scabies (Krätze) und deren Behandlung mit Erdöl (Rohöl) Kleczany.** [Scabies (Itch) and its Treatment with Kleczany Mineral Oil (Crude Oil).]—*Wiener klin. Wochenschr., Vienna,* xxx, no. 27, 5th July 1917, pp. 852–853.

The treatment advised here [see above] is to anoint the body once daily for three successive days, with a warm bath after a two-day interval. The oil loses its fluidity at low temperatures and may be warmed in a hot water bath. It is highly inflammable and neither smoking nor the use of naked lights are permissible while it is being used.

Deszimirovics (K.). **Klinische Beobachtungen über den epidemischen Ikterus.** [Clinical Observations on Epidemic Jaundice.]—*Wiener klin. Wochenschr., Vienna,* xxx, no. 30, 26th July 1917, pp. 935–943.

During the spring and summer of 1915, a large number of cases of jaundice were observed in south-east Galicia, and a lesser number in the autumn and winter. That the carriers were Anopheline mosquitos was shown, not only by blood examination, but by the disease being prevalent in districts where malaria is rife, by its spread to others where *Anopheles* occurs, and by its behaviour when quinine was administered, the effect of the drug being the same as in malaria.

Walker (E. L.). **Observations on Leishmaniasis and Pseudoleishmaniasis of the Amazon Basin.**—*New Orleans Med. Surg. Jl., New Orleans,* lxx, no. 3, September 1917, pp. 283–292, 2 figs.

In many regions of tropical America an epidermal leishmaniasis occurs, resembling to a certain extent Oriental sore, but characterised by the mucosa of the nose and pharynx being frequently involved, usually with a fatal result. It has been known as bouba, bouton de Bahia or ulcére de Bauru in Brazil, buba in Paraguay, espundia in Bolivia, uta in Peru, forest yaws in the Guianas, and ulcére de Torreaba in Colombia, though these names undoubtedly include skin lesions of various types. Minute blood-sucking flies, including chiefly Simuliidae, but also Ceratopogoninae, are the insects which appear to be the vectors in the Amazon basin.

MITZMAIN (M. B.). **The Malaria Parasite in the Mosquito. The Effects of low Temperature and other Factors on its Development.**—*U.S. Public Health Repts., Washington*, xxxii, no. 35, 31st August 1917, pp. 1400–1413. [Received 3rd October 1917.]

The author's summary of this paper is as follows:—In the work presented here it is indicated that development of the exogenous elements in the mosquito is restricted or prevented during an intermittent low temperature, even when temperatures favourable to parasite development are present in the early stages and subsequently. That the presence of even great numbers of oocysts in various stages does not give assurance of subsequent maturity and infectivity is evidenced in these experiments. Of the 18 infected Anophelines kept at low temperature only one appeared to give rise to mature parasites, while the one control specimen of *Anopheles quadrimaculatus* retained at room temperature reached normal maturity relative to sporozoite development. *Plasmodium falciparum* was the species of parasite used. The oocyst stage was maintained up to 59 days in the mosquitos employed in these experiments. A peculiar appearance of these bodies gave the impression that development would not be carried to maturity even if at this period mosquitos were exposed to salubrious temperatures. Sporozoites were not produced in eight mosquitos of this series which had been exposed as much as 60 days to intermittent low temperature, then transferred to an optimum temperature for two weeks longer. Two of the eight mosquitos proved to be infected by only a variable number of shrunken and ruptured oocyst capsules. A suggestion of the mode of evolution in the growth and subsequent degeneration of the bodies found in the mosquitos may be given as follows:—The nature of the oocyst throughout the incubation period was such as to indicate that development was practically negligible after about 19 days and up to 59 days. Taking as an illustration the development produced in a mosquito during 47 days of incubation, we find bodies indistinguishable in morphology and size from similar bodies seen in mosquitos during 13 to 19 days of development. Even up to 31 days the presence of malarial pigment could be demonstrated in numerous oocysts. This of course may be interpreted as aborted development brought about by low temperatures. Also up to this time (31 days) few sporoblasts were seen among the oocysts encountered, possibly another influence of low temperature. Beginning with the thirty-seventh day it was found that oocysts commenced to degenerate, rupturing prior to sporozoite development. Numerous ruptured oocysts were seen up to the fifty-ninth day, and in not a single instance was the presence of sporozoites revealed. During this interval many oocyst capsules were found unattached to the gut wall, probably having been dislodged in the process of dissection. The absence of sporozoites, with one exception, in the 18 specimens infected is significant. In the one exception it is to be noted that the presence of sporozoites is open to question on account of the uncharacteristic form and behaviour of the bodies seen. The loss of infectivity through temperature change is significant in relation to hibernation of infected mosquitos. Much can be explained if it should be definitely proved that low temperature prevents sporozoite development in mosquitos inactive during the winter. It is indicated in the results of these experiments that an intermittent low temperature does interfere with sporozoite formation; consequently it is explicable that mosquitos procuring gametocyte-bearing blood before winter sets in may become sterile or innocuous during the hibernation period.

The author has obtained a partial confirmation of the results of Daniels in the relation of infection to the number of bites which the mosquitos obtain. Fifteen examples of *A. punctipennis* gave the following results relative to infection with the parasites of malaria: One, two and three bites gave 12·5, 18·8 and 34·8 per cent. respectively. The results obtained with four specimens of *A. quadrimaculatus* were 20, 50 and 100 per cent. relative to one, two and three bites obtained. Another factor besides low temperature which possibly influences infectivity was found to be the loss of gametocytes through the "clearing process" in the mosquito. This is indicated in the blood count of the mosquitos' dejecta, in which numerous crescents were found. In one instance blood from the human host yielded 63 crescents to 100 leucocytes, and in the blood after passing through the mosquito 87 crescents to 100 leucocytes were counted.

In a recent paper King (1917), working in New Orleans, has shown some interesting results relative to low temperature influence on the sporogonic development [see this *Review*, Ser. B, v, p. 73]. He shows that the parasite of tertian malaria in *Anopheles quadrimaculatus* is able to survive exposure to a temperature of 30° F. for a period of 2 days, 31° F. for 4 days, 45° to 69° F. for 6 to 7 days, and in two mosquitos 38° to 59° F. for 17 days. In a smaller series of tests the sporonts of *P. falciparum* showed a resistance to 35°–57° F. for 1 to 2 days. In these experiments the parasites in the mosquito were permitted to develop during 7 to 23 days at room temperature before the insects were exposed to temperature of 29° to 69° F. for periods ranging from 1 to 16 days, following which they were maintained at room temperature for an additional period of 1 to 19 days. It is indicated from these tests that exposure to low temperatures, for a limited period at least, did not affect the viability of sporozoites, assuming that provision had been made for the mosquitos to develop sporozoites at room temperature.

BARBER (L. B.). **Report of the Veterinarian and Animal Husbandman.**—*Rept. Guam Agric. Expt. Sta., 1916, Washington, D.C.*, 3rd August 1917, pp. 41–58. [Received 5th October 1917.]

Until 1916, hand-picking and treatment with oil and kerosene were used in the attempt to keep down tick infestation on imported pure-bred Ayrshire cattle, but neither method kept them even reasonably free from ticks, two of the five imported animals dying of tick fever.

An arsenical dip made according to the formula used in the southern United States has been employed since July 1915 with very good results, the cattle, with one exception, having been free from ticks during that time.

Among the parasites of domestic animals causing disease during the year, were: *Margaropus caudatus* (common cattle tick), *Haematopinus tuberculatus* (carabao louse), *H. suis* (hog louse), *Trichodectes climax* (goat louse), *Goniocotes gigas* (large chicken louse), *Menopon pallidum* (*trigonocephalum*) (common chicken louse) and *Dermanyssus gallinae* (red chicken mite).

BRUCE (Sir D.). **Camping in the Tropics.**—*Trans. Soc. Trop. Med. Hyg., London*, x, no. 8, July 1917, pp. 199–206, 6 figs. [Received 11th October 1917.]

Various fly-proof devices, planned for the use of soldiers and others in the tropics, are described and illustrated. These include a fly-proof verandah to the ordinary double-roof ridge tent and a mosquito net made to fit the shape of the tent in place of the usual arrangement over the camp-beds. As a protection from *Glossina* and other biting flies, a helmet knitted of native string is described, which is similar in appearance to a Crusader's headpiece of chain-mail, leaving only a small opening for the features. A layer of coarse mosquito-netting is sewn on the surface of the knitted string, so that a fly trying to bite through it finds its proboscis too short to reach the skin. A large felt or terai hat can be worn over the helmet. Fingerless gloves with khaki gauntlets, made in the same way, may be used to protect the hands. For the protection of troops on active service in malarious countries from mosquitos, much can be done by a wise selection of camping grounds.

ROBERTSON (J.). **Flies and Stable Litter.**—*Public Health, London*, xxx, no. 12, September 1917, pp. 245–246.

The author describes experiments made during the past three summers to ascertain the variety of stable litter which is least attractive to flies and which least facilitates their breeding. In 1917, fresh straw, fresh sawdust and shavings, and fresh peat-litter were used. No flies bred out of the peat-manure, while there were a few (18) from the sawdust and shavings and 244 from the straw manure.

GRAY (C. E.). **Veterinary Division: Annual Report 1915-16.**—*Rept. Union of S. Africa Dept. Agric. for Year ended 31st March 1916, Capetown*, 1917, pp. 27–34. [Received 12th October 1917.]

African Coast fever is still the most important problem with which the Veterinary Division has to deal. Records are given from various parts of the Union of South Africa detailing the occurrence of new outbreaks and the number of farms that have been freed from quarantine in various provinces. Dipping operations throughout the Union have been greatly interfered with owing to the scarcity and increased cost of dipping materials. It is much regretted that many farmers are indifferent to the erection of dipping-tanks, and the number of these in use is increasing but slowly.

Mange has been very prevalent in the vicinity of Port Elizabeth, mainly amongst donkeys belonging to natives; outside this area the disease has given little trouble.

THEILER (Sir A.). **Veterinary Research: Annual Report of the Director, 1915-16.**—*Rept. Union of S. Africa Dept. Agric. for Year ended 31st March 1916, Capetown*, 1917, pp. 45–49. [Received 12th October 1917.]

Experiments conducted in consequence of a report published at Strassburg in 1914 to the effect that pernicious anaemia is produced by the agency of bots [*Gastrophilus*], showed that bots collected from the stomach of a horse that had died of this disease, when emulsified and injected into a susceptible animal, produced the symptoms in practically every instance. Bots collected from the stomach of a horse not affected with pernicious anaemia did not produce the disease when injected into healthy animals. The bots cannot therefore themselves produce the disease and the question remains whether pernicious anaemia could be transmitted through the medium of the adult flies, *i.e.*, from larvae taken from horses affected with the disease and thence by their eggs being deposited on a susceptible horse.

An investigation by Mr. Mitchell has been carried out in Zululand with the object of determining the extent of infection with trypanosomiasis and with particular reference to the spread of the disease and the best means of prevention and eradication. The conclusions reached were that wandering game is responsible for primary outbreaks of the disease; that *Glossina* does not travel from the original fly belt unless cover is continuous or it is in company with game. In the absence of tsetse it is considered unlikely that outbreaks of nagana could originate from recovered or partly recovered cattle or from game localised to the cattle-grazing area.

Certain recommendations have been made as a result of the investigations, with a view to localising game as far as possible and for their efficient protection in the reserves. These include the issue of permits to Europeans and natives living in nagana areas authorising them to destroy wandering game; these permits to be valid during the summer months as well as during the open season. The destruction of game in infected areas should be encouraged by the issue of licences at reduced fees to non-residents. In the low veld areas where there are few, if any, cattle, and in areas surrounding game reserves, shooting game under licence should be allowed. A European ranger should be appointed to supervise the game reserves in each district, the existing open area on both sides of the roads should be maintained for some time and the bush adjoining roads passing through tsetse-fly areas should be repeatedly burned. The assistance of owners is necessary to control nagana, as such matters as insufficient herding, transport riding in summer in areas where the disease is endemic, and lack of isolation measures are better dealt with by owners than by the State.

Ornithodoros megnini (spinose ear tick), which was first observed in South Africa in 1912, has been prevalent in various parts of the Union. Recommendations for the treatment of affected animals have been issued.

Mosquitos and Flies in the Epidemiology of Acute Poliomyelitis.—*Brit. Med. Jl., London,* no. 2961, 29th September 1917, pp. 429–430.

Experiments recently carried out do not support the view that acute poliomyelitis is spread by mosquitos or non-biting flies, but only by direct contact from one individual to another. Mechanical transmission has been effected by allowing many thousands of stable flies [*Stomoxys*] to feed on an infected monkey, and immediately afterwards on a normal monkey; the fly, however, does not act as an intermediate host, but only as a carrier. Experiments to determine if the mosquito, *Culex pipiens*, the common house-fly, and the blue-bottle can take up the virus and maintain it in their bodies have given negative results.

Mosquitos and Malaria.—*Selborne Mag. & Nature Notes, London,* xxviii, no. 334, Oct. 1917, p. 116.

Owing to the outbreak of malaria among troops in England, the Local Government Board has set on foot an enquiry as to the prevalence in this country of the three species of *Anopheles* found here, one of which, *A. maculipennis*, transmits malaria. Records are wanted of the occurrence of both adult and larval insects, as well as notes of the date of capture, time of day, locality and nature of habitat.

BAKER (A. W.). **Preliminary Notes on the Use of Repellents for Horn Flies and Stable Flies on Cattle.**—*47th Ann. Rept. Entom. Soc. Ontario for 1916, Toronto,* 1917, pp. 52–56. [Received 12th October 1917.]

Experiments were conducted with a view to securing, if possible, a fly repellent that could be prepared cheaply by the farmer, that would be effective for at least two days and that would not taint the milk, blister the animal, or make the coat unsightly. In the course of the investigation four commercial and ten home-made repellents were tested, it being found that, when cattle were thoroughly sprayed, the cost of all the commercial repellents was excessive. Milk emulsion could not be used as a practical repellent in itself, but could be made a medium for the application of some substance with a stronger repellent action. After several trials the following mixture gave good results in the proportion of 1 to 2, 1 to 3, and 1 to 4 of water, and therefore can be recommended as having a decided practical value: 1 gal. fish-oil, 1 gal. kerosene, 1 gal. slightly sour milk, 6 oz. oil of citronella. If spraying were continued throughout the whole season with the one mixture, one application every two, or even three days would be sufficient, and probably the strength of the spray could be reduced. The cost of thoroughly spraying each animal from horns to hoofs works out at about one farthing.

HOWARD (L. O.). **The Relation of Insects to Disease in Man and Animals.**—*47th Ann. Rept. Entom. Soc. Ontario for 1916, Toronto,* 1917, pp. 57–62. [Received 12th October 1917.]

The author briefly reviews the part played by insects as simple carriers of disease, as direct inoculators of disease, and as the essential hosts of pathogenic organisms. To this last class belong the malarial mosquitos, the yellow fever mosquito, and the rapidly increasing number of species that carry trypanosomiases, leishmaniases, spirochaetoses, the ticks that carry relapsing fevers and other fevers of man and animals, and the lice that carry typhus fever. Direct inoculators of disease are biting insects that carry anthrax, surra, and nagana in cattle. The house-fly is the most notable example of an insect that functions as a simple carrier of disease.

The Cause of Typhus Fever.—*Brit. Med. Jl., London,* no. 2963, 13th October 1917, p. 491.

Professor Kenzo Futaki, of Tokyo, since April 1917, has found a spirochaete, *Spirochaeta exanthematotyphi*, in sections taken from the kidneys of seven out of eight patients dying of typhus in Japan; also in the urine of six out of seven other typhus patients, and in the kidneys, urine, and suprarenal glands of a rhesus monkey injected with the blood of a human being suffering from typhus fever, while it did not occur in six other monkeys presumed to be normal. This virus is filterable and has been found in lice by the same investigator, while Nicolle in 1909 and 1910 showed that the clothes louse [*Pediculus humanus*] carries the virus, that it can pass on the disease only after the lapse of three or four days, and only over a period of four days.

CASTELLANI (Lieut.-Col. A.). **Notes on Tropical Diseases met with in the Balkanic and Adriatic Zones.**—*Jl. Trop. Med. Hyg., London*, xx, nos. 14–19; 16th July, 1st & 15th August, 1st & 15th September, 1st October 1917; pp. 157–164, 170–174, 181–186, 198–202, 209–214, 219–223.

These notes are based on the author's work in Serbia, Macedonia, etc., and, while little scientific importance is claimed for them, it is hoped that they may be of use to medical officers in those regions.

The prophylaxis of malaria should include both anti-mosquito measures and the preventive administration of quinine. Citronella oil is the best repellent, but a more agreeable preparation is a powder composed of menthol 2–5 grains and zinc oxide 1 oz. Papataci fever is widespread, *Phlebotomus papatasii* being extremely common.

MACGREGOR (M. E.). **A Summary of our Knowledge of Insect Vectors.** —*Jl. Trop. Med. Hyg., London*, xx, no. 18, 15th September 1917, pp. 205–209.

This summary deals with the more important insect-borne diseases, including important diseases of man, which are suspected of having insect vectors. The chief insects and Arachnids that are directly the cause of disease in man and domestic animals are tabulated.

ROUBAUD (E.). **Les Anophèles français, des Régions non palustres, sont-ils aptes à la Transmission du Paludisme?** [Are the French Anophelines from non-malarial Regions able to transmit Malaria?] —*C. R. Hebdom. Acad. Sciences, Paris*, clxv, no. 12, 17th September 1917, pp. 401–403.

The fact that the geographical distribution of *Anopheles* in Europe, especially in France, covers so much larger an area than that of endemic malaria, Anophelines being found in large numbers in regions formerly unhealthy and in fact everywhere when looked for systematically, has led to the conclusion that the absence of malaria in certain districts must be due to a natural immunity on the part of the mosquitos, since the recent introduction of the malarial virus by infected individuals from the colonies has not resulted in outbreaks of the disease. With a view to testing the truth of this theory, experiments were conducted on *A. maculipennis*, which had been taken in the larval stage from the neighbourhood of Paris, the human carriers being malaria convalescents from the Pasteur Institute who offered themselves as subjects. Out of six experiments performed, four conclusively proved the fallacy of the theory, the mosquitos in each case becoming infected, while in the other two, the lack of infection was due to the non-infectious state of the subject, and not to any immunity on the part of the mosquito.

In order to prove whether these infected mosquitos were capable of transmitting the disease to a healthy subject, the author allowed himself to be bitten, with the result that fever developed in due course and *Plasmodium vivax* was found in his blood. The existence of immune mosquitos therefore seems to be improbable.

LAVERAN (A.). **Remarques au sujet de la Note de M. Roubaud.** [Remarks on the Subject of M. Roubaud's Note.]—*C.R. Hebdom. Acad. Sciences, Paris*, clxv, no. 12, 17th September 1917, pp. 403–404.

There can be little doubt as to the occurrence of malaria in France arising from the presence of discharged soldiers from the Eastern armies, and a Commission has been appointed to propose suitable methods of control. These consist in sending malarial convalescents to localities free from Anophelines, in which places special hospitals for malaria patients should be established. When it has not been possible to send malarial convalescents to such a locality, the danger of transmission has been reduced to a minimum by the use of mosquito nets and by subjecting the patients to a long and intensive quinine treatment so as to free the blood from the parasites. Thanks to these measures and to weather conditions unfavourable to the spread of the insect, the transmission of malaria by returned soldiers to residents in the non-malarial parts of France has been extremely rare.

Commission du Paludisme. [The Malaria Commission].—*Bull. Soc. Etude Vulg. Zool. Agric., Bordeaux*, xvi, no. 9–10, September-October 1917, pp. 111–112.

In view of the possible danger of centres of malarial infection becoming established in France in consequence of infected soldiers returning from the Balkan Army, a research service has been instituted, under the control of a central committee, to direct the choice of positions for malaria hospitals and to issue circulars conveying information regarding Anopheline mosquitos that carry the disease. Acting on the advice of this committee, the Under Secretary of State has divided France into five great districts with sub-divisions, each under the direction of a zoologist who has specialised in the study of malaria and mosquitos. In addition to these measures, the public are invited to send to the specialist in charge of their district specimens of any mosquitos taken in houses and to report the discovery of any stagnant pools containing mosquito larvae, especially those of Anophelines. Medical men are also asked to collaborate by reporting the localities in which they have found cases of malaria.

GREGGIO (G.). **A propos de la Trypanose des Porcs dans la Vallée de l'Inkissi.**—*Bull. Agric. Congo Belge, London*, viii, no. 1–2, March-June 1917, pp. 148–155. [Received 15th October 1917.]

This paper has already been abstracted from another source [see this *Review*, Ser. B, v, p. 95]. Some discussion having arisen in connection with it, some supplementary notes are given. White pigs are extremely rare in the Inkissi valley, but they are attacked to the same extent by *Glossina* as are black or brown animals. While the fly certainly prefers a dark colour, when a herd is composed entirely of white individuals, it attacks them readily. Animals kept in the villages, which never go down to the river, are found to be equally affected, because other pigs that are running free bring back *Glossina palpalis* to the village, and animals that are tied up close to the huts are much worried by the flies.

In the Kisantu region, the villages are generally fairly close to the forest, while in the Tumba-Mani region, in addition to the fact that the district is less wooded, a certain amount of clearing has been done, so that the villages are separated from the forest by open spaces several hundred yards wide. In spite of this, though a notable diminution of sleeping sickness is observable in the former region, it continues to rage in the latter, the reason being that in Kisantu the examination of natives and the treatment of the sick has been carried on regularly for several years, with the result that the flies brought into the village by the pigs no longer constitute a source of great danger. In the Tumba-Mani region, on the contrary, where examination and treatment are difficult, the fly always finds carriers of the parasite in the villages and is able to spread infection.

SERGENT (Edm.) & SERGENT (Et.). **Nouvelle Méthode de Destruction des Moustiques par l'Alternance de leur Gites.** [A New Method of Mosquito Control by an Alternation of Breeding-places.]—*C. R. Hebdom. Acad. Sciences, Paris*, clxv, no. 14, 1st October 1917, pp. 436–437.

The subject matter of this paper has already been abstracted [see this *Review*, Ser. B, iv, p. 93]. A modification of the method there described consists in distributing the water to the right and left of its channel alternately, by means of a series of barrages, allowing it to soak into the soil from which it evaporates in less than a week, the same area not being flooded again for several weeks. This necessitates the making and removal of small earthen dykes in the channel each week, instead of cutting two alternative channels.

ARAGÃO (H. de B.). **Espirochetose (Treponemose) das Gallinhas.** [Fowl Spirochaetosis.]—*Rev. Vet. e Zootechnia, Rio de Janeiro*, vii, no. 1, 1917, pp. 3–10. [Received 15th October 1917.]

Spirochaetosis in fowls, which is carried by the tick, *Argas persicus*, may be successfully treated by serum injections or organic arsenicals, such as atoxyl (0·03 grammes per kilo weight of the animal treated) or salvarsan (0·035 grammes). Prophylactic measures should include hygienic methods in the construction and upkeep of fowl-houses.

CHAGAS (C.). **Processos patojenicos da Tripanozomiase americana.** [Pathogenic Processes of American Trypanosomiasis.]—*Mem. Inst. Oswaldo Cruz, Rio de Janeiro*, viii, no. 2, 1916, pp. 5–36, 2 plates. [Received 18th October 1917.]

This paper aims at giving a definite clinical conception of American trypanosomiasis or Chagas' disease. In Brazil the distribution of the characteristic swelling agrees with that of *Triatoma* spp., especially *T. megista*, which is more abundant in the interior, particularly in rural districts. The decrease of the disease accompanies that of *T. megista*, and in a certain zone the symptoms are practically non-existent in persons that have never left the district.

CHAGAS (C.). **Tripanosomiase americana. Forma aguda da Molestia.** [American Trypanosomiasis: The Acute Form of the Disease.]—*Mem. Inst. Oswaldo Cruz, Rio de Janeiro,* viii, no. 2, 1916, pp. 37–60, 5 plates. [Received 18th October 1917.]

In this paper 29 cases of acute American trypanosomiasis are described, most of them being children in their first year. *Triatoma* was nearly always observed in the dwellings where these cases occurred.

Reports of Bureau Meetings. Fly-Blown Sheep.—*Jl. Dept. Agric. S. Australia, Adelaide,* xx, no. 12, July 1917, p. 998. [Received 16th October 1917.]

It has been noticed in South Australia that in recent years the blowing of sheep by flies has become very much worse. While formerly only wounds on sheep were attacked, healthy animals with unsoiled wool are now infested on any part of the body. No treatment is known that gives more than temporary immunity from the flies. The most thorough dipping ensures protection only for a few weeks, and the same may be said of crutching. It is admitted that the only means of combating the trouble is constant attention to the sheep and immediate treatment of the animals blown and of those likely to be blown, at times when flies are particularly bad. The treatment recommended is to subject those parts of the animal attacked, or likely to be attacked, to a very strong jet of powder sheep dip, well stirred up and applied by an engine or other power adequate to carry the powder right through the wool into the skin. This method has several advantages over dipping: a large number of sheep can be treated in a very short time, the necessary plant can easily be carried from place to place and the sheep treated in the paddock or yard without the necessity for driving them to a dip, while the treatment can be given in almost any weather without risk.

MATTHEWS (A.). **External Parasites of Sheep. Eradication of Ticks in New Zealand.**—*Jl. Agric., Wellington, N.Z.,* xv, no. 2, August 1917, pp. 73–78. [Received 23rd October 1917.]

Melophagus ovinus (sheep tick) is not considered by the author a difficult parasite to destroy, as this Hippoboscid fly is unable to live away from the sheep for more than four to six days, even under favourable conditions. As the young are brought forth as pupae, which are attached to the wool-fibres and develop in about 21 days, it may be necessary to give a second dipping in order to exterminate these. The time strongly advocated for dipping is shortly after shearing, the author's experience being that sheep dipped only once in the year at that time remain absolutely free from either these flies or from lice. There are then but few living individuals to deal with, as the pupae cannot well adhere to the short wool of machine-shorn sheep, and the flies appear to be in a semi-dormant condition during the very hot part of the year and increase but little during that period. If dipping be left until late in the season, the flies are particularly active and there are many pupae, some of which will escape, while if heavy rains, which are beneficial to the development of the pest, set in after dipping, the animals will soon be re-infested. Late dipping is also more costly.

The author is convinced that, if all sheep-owners were compelled to dip carefully during a short period after shearing, it should be possible to eradicate both the sheep tick and lice from the Dominion, just as scab was cleared from the flocks many years ago. This will however never be possible, unless the present Stock Act is amended and sections similar to those formerly dealing with scab are brought into operation in connection with *M. ovinus.* The present conditions are compared with the apathy that exists in England relative to sheep scab, where it has existed for centuries, and where there should be no difficulty in effecting complete eradication. The dipping practice as it exists at present is costly and, while it checks the increase of parasites, will never eradicate them. Most of the poisonous dips give satisfactory results, when used carefully, but non-poisonous ones are not recommended.

MELANDER (A. L.) & SPULER (A.). **The Dipterous Families** SEPSIDAE **and** PIOPHILIDAE.—*Washington Agric. Expt. Sta., Pullman,* Bull. no. 143, April 1917, 97 pp., 1 plate. [Received 23rd October 1917.]

This paper gives keys to the genera of SEPSIDAE and of PIOPHILIDAE, and to the N. American species of *Sepsis* and *Piophila.* The SEPSIDAE include small, slender flies that breed in dung and carrion. Some of the common species that live in association with man, and have been spread by commerce over much of the world, are *Meroplius stercorarius,* R.D., *Nemopoda cylindrica,* F., and *Themia putris,* L.

Among the PIOPHILIDAE, *Prochyliza xanthostoma,* Walk., is a common species on garbage and the windows of houses. All the species of the genus *Piophila* act as scavengers. *P. casei,* L., in its larval stage is commonly known as the cheese skipper. It breeds, not only in cheese, but also in rotten fungi and dead adipose tissue and is found near accumulations of garbage. When taken into the alimentary tract during its early stages, it may continue its development, producing a form of enteric myiasis, and in the dog causing lesions of the intestines. A nasal myiasis has also been reported. This species is frequently found in houses and is attracted to windows.

A copious bibliography is appended.

ENTOMOLOGICAL NOTICES.

We regret to announce the death of Mr. C. W. Mason, Government Entomologist in Nyasaland.

Professor H. M. Lefroy is on his way to Australia in connection with an investigation into the pests of stored grain.

NOTICES.

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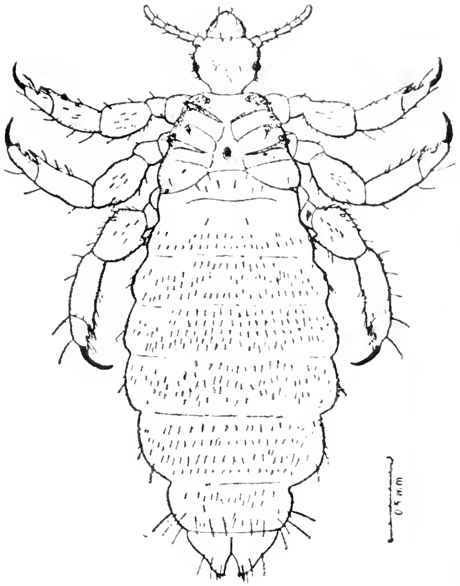

Fig. 1

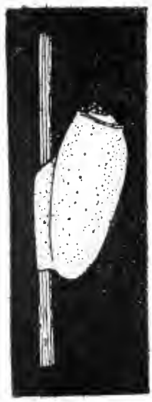

Fig. 2

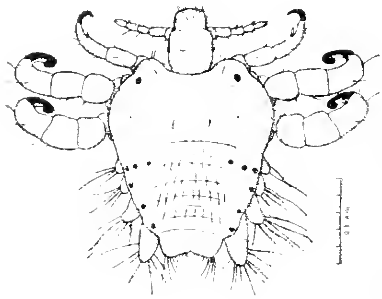

Fig. 3

Fig. 4

Fig. 1. *Pediculus humanus* (*corporis*), female, in dorsal aspect.
Fig. 2. *Pediculus humanus* (*corporis*), egg on hair, lateral aspect.
Fig. 3. *Phthirus pubis*, female, in dorsal aspect.
Fig. 4. *Phthirus pubis*, egg on hair, lateral aspect.

Note. The eggs are readily differentiated. Those of *Phthirus* are shorter, have an operculum or lid which is dome-shaped, and are attached to the hair with a larger amount of cement.

All of the figures are drawn to the same scale.

An Appeal for Specimens and Information relating to *Pediculus humanus* (incl. *capitis* and *corporis*) and *Phthirus*.

Being engaged in an investigation on human lice, the writer desires to obtain specimens and accurate information concerning these parasites from different parts of the world.

The specimens should be killed and well preserved in 70 % alcohol; about fifty adults besides larvae, if obtainable, are desired from each locality. Head-lice and body-lice should be kept apart. They should be accompanied by brief notes regarding their prevalence on the races or inhabitants of the region whence they are sent.

Where specimens are not procurable, any written communication on the subject will be welcome, and references to the mention of lice in works of travel may prove useful.

A careful survey of the literature on *Pediculus* has shown that there is a lack of precise information regarding these most common human parasites in respect to their distribution, prevalence, coloration when alive, and their site of parasitism on the host. Whereas most authors assert that "capitis" and "corporis" occur only upon the head and clothing respectively, there are several recorded observations disproving the statement since both have been occasionally signalled as present on the body with their nits upon the body-hair. It would be interesting to determine by careful inspection how frequently this more generalized infestation occurs. The data relating to the geographical distribution are scattered and insufficient, nevertheless they appear to have led to the assumption that *Pediculus*, under favourable conditions, accompanies man in all climates. There is extraordinarily little recorded regarding the geographical distribution of *Phthirus*.

The writer will gratefully acknowledge the source of any specimens or information which he may receive; the collected data, it is expected, will make the subject of a publication following a series of papers on human lice which have begun to appear in *Parasitology*. Communications may be written in any European language according to the convenience of the correspondent.

George H. F. Nuttall,
Quick Professor of Biology.

The Museums,
Cambridge,
England.

[P. T. O.

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