SUMMARY.

To make the soldier as perfect a marcher as is consistent with the human foot, I would, in addition to what is being done at present, suggest the following:

Feet.

(a) No recruit with any bad degree of foot deformity should be accepted as medically fit until the condition is cured.

(b) Every soldier, on enlistment, should be given a printed pamphlet explaining the importance of foot cleanliness, and he should be periodically lectured on it by an officer.

(c) Foot parades should be more thorough and more frequent.

(d) The battalion chiropodist should be more often and sooner consulted.

(e) It should be made compulsory for the feet to be washed after every long march.

(f) No medical officer should find any difficulty in obtaining adequate supplies of chromic and picric acids, formalin, and dusting powders, or any other drugs he considers necessary.

Boots.

(a) The army boot might be improved by allowing more depth over the toes. This could be accomplished by boxing up the anterior part of the vamp and having the end more rounded.

(b) Printed instructions and lectures should be given on the best means of keeping the boots in good condition.

(c) No man should be allowed to wear new boots until they have been well softened.

(d) The proper fitting of a boot should be considered an art and not a nuisance. Fully one half of the foot troubles are caused by careless or too rapid fitting.

(e) The boot should allow more ventilation of the foot. It is a debatable point which is the worse of the two evils, namely, the possibility of a little water percolating into the boot or the continuous saturation of the foot and sock with stale sweat. In my opinion a wet foot in free communication with the air is less likely to cause trouble than one which is rendered sodden, soft, and offensive by being bathed in its own sweat, without aëration. To give more ventilation, the tongue of the boot should not be attached to the uppers to the exclusion of all air, and the quarters should be perforated by ventilating holes so as to admit fresh air and allow the escape of foul emanations and gases arising from the heated and fatigued state of the foot.

Socks.

(a) These should be fitted as carefully as the boots.

(b) They should be issued *after* having been shrunk.

(c) They should be washed after a long march, and different pairs should be worn on alternate days. This should be compulsory.

It may be argued that many of these points are already known to the men, who have been lectured on them by their officers. Even so, it does not follow that they carry out what they are taught and know to be correct, any more than when a man is taught to be good he becomes a saint, or a gouty subject abstains from port because his medical adviser told him to do so. Further, we must remember that we are discussing the feet not only of the regular army but those of the Territorial Force and Kitchener's Army. If every soldier were taught to take as much care of his feet, boots, and socks as his rifle, and, in addition, were compelled to do so, sore feet would cease to give trouble. The civil surgeon may inquire, "Why all this toil for the triumph of an hour?" and my answer is "*Finis coronat opus*." The crowning hour of success may be gained by men whose feet can carry them to victory, but can never be won by those who cry in despair, *Volo, non valeo*.

REFERENCE.

¹ BRITISH MEDICAL JOURNAL, August 29th, 1914, p. 385.

DR. H. P. PICKERILL, Professor of Dentistry in the University of Otago, informs us that with the New Zealand Expeditionary Force coming to Europe are two dental lieutenants. These gentlemen were senior students at the Otago University, but on the outbreak of war were given special examinations, and thereafter granted special dental commissions.

INSECTS AND WAR:

VII.—MITES: THE HARVEST MITE
(*Trombidium*).

By A. E. SHIPLEY, Sc.D., F.R.S.,
MASTER OF CHRIST'S COLLEGE, CAMBRIDGE.

Natura in minimis maxime miranda.

LINNAEUS.

WE do not know what life is, but we can at any rate record its manifestations, and we know that it is always associated with an extremely complex substance called by Purkinje "protoplasm." This substance Huxley described as "the physical basis of life." Protoplasm, though we know of what elements it is composed, defies accurate analysis, and, indeed, is never the same for two minutes together. It is constantly changing, it is in a state of flux, and is, in effect, a stream into which matter is continuously entering and continuously leaving.

Protoplasm may be living, or it may be dead, and when dead it soon undergoes dissolution; but there is no life without protoplasm. Somewhere or other Dr. David Sharp has stated that out of the total amount of protoplasm "in being" in the world, the real volume of the life-material, at least one half is wrapped up in the body of insects. But insects only form one group out of the several which make up the Phylum *Arthropoda*, or those animals which are distinguished from others by possessing externally jointed legs—that is, jointed appendages. This phylum includes also the Crustacea, the multi-segmented Centipedes, and the Arachnids or spider-like animals.

Insects, like acropalanes, dominate the air; the crustacea, like submarines, inhabit the water; the poet has passionately asked:

Ah! who has seen the mailed lobster rise,
Clap her broad wings and soaring claim the skies?

But the answer is, in the language of those curious creatures the politicians, "in the negative." Crustaceans are essentially aquatic. On the other hand, centipedes and spiders are earth-loving animals, and some have unhappily developed parasitic or pseudo-parasitic habits.

The last-named subgroup, the Arachnids, comprise many subdivisions. There are the spiders, the harvest-men, the scorpions, the king-crabs, and so on. But one of the most numerous of the subdivisions of the group are the mites and ticks (*Acarina*). I have for years been trying to find some organ or structure shared by insects and mites and ticks, and not found in any other group of arthropods. If I could do this I would invent a long polysyllabic word—with lots of Greek in it—which would replace the word "insect" at the head of this article; it is, of course, hopelessly bad zoology to class Mites with Insects. These Acarines are for the most part small, and they differ from spiders in having no waist. In fact, the three divisions in which the body of an arachnid is divided—head, thorax, and abdomen—are indistinguishable in mites, the body forming an unconstricted whole. As a rule, these little creatures breathe, as do Insects, by tracheae, or, if these be absent, by the general surface of the body. They live for the most part on vegetable and animal juices, and their mouth parts are, as a rule, piercing and suctorial; but in some species the appendages of the mouth are capable of biting as well as piercing. The adults have typically eight legs. The larval stages are very numerous, and at times six distinct moults of the skin are recognizable. With few exceptions the larva emerges from the egg as a six-legged creature. In fact, mites undergo a metamorphosis

Fig. 1.—*Trombidium holosericeum*.
Female, dorsal view. $\times 20$.

which varies in complexity and in completeness in different groups, and it is often one of the larval stages which causes the greatest trouble to man.

One of these six-legged larvae has been long known as the harvest mite, under the name of *Leptus autumnalis*. But this is not a real species, and there is still considerable confusion as to what the exact status of *Leptus autumnalis*, the harvest mite, is. Probably the larvae of several species are involved, but it seems pretty certain that in many cases the larvae will grow up into a species of the genus *Trombidium holosericeum*, though a certain and at present unknown percentage of the larvae will grow up into *Trombidium* something or other else.

They are minute bright red little creatures of a beautiful satiny red, decorated here and there with blackish spots. The body of the adult is somewhat square, tapering slightly to the hinder end. Both legs and body are covered with red hairs. The eyes are borne on little pedicels—like lighthouses. The legs have six joints and end in two little claws. The male is usually smaller and more feeble than the female, the latter reaching a length of 3 to 4 mm. The adults are commonly met with in the spring or commencing summer. Apparently they nourish themselves on vegetable sap. The larval form of this species is undoubtedly one of the forms confused under the discarded name of *Leptus autumnalis*. When starving, the body is orbicular in outline, but it becomes oblong when it is fed, and in this case it may attain a length of $\frac{1}{2}$ mm. Its colour is of a deep orange.

This harvest mite, or, as it is called in France, *le rouget*, is most troublesome at the end of summer or at the beginning of autumn, when it is found in enormous numbers in grass and amongst many other plants—gooseberries, raspberries, currants, haricot-beans, sorrel, and elderberries. From these plants it passes on to any warm-blooded animals; particularly it attacks small mammals,

Fig. 3.—*Leptus autumnalis*, with the so-called proboscis. (After Gidden.) Magnified.

Fig. 4.—*Leptus autumnalis*, $\times 100$. The so-called proboscis is formed around the hypopharynx sunk into the skin. (After Trouessart.)

hares and rabbits; moles are often covered with them, but they leave their victim, should it be shot, so soon as the body chills. They are particularly common in

Great Britain and in the centre and west of France, and in certain parts of Germany. These irritating little semi-parasites may be dislodged by the application of petrol or benzene, both very inflammable, and

Fig. 5.—*Pediculoides ventricosus*. Male; ventral view. $\times 250$.

Fig. 6.—*Pediculoides ventricosus*. Female, before fertilization. $\times 225$.

the itching they cause allayed by the application of acid or alcoholic lotions.

Men working in the fields are frequently attacked. During September the soldiers of the Sixth Division, stationed in and about Cambridge, suffered severely from their "bites." They mostly attacked the ankles, the wrists, and the neck, but they rapidly extend over the body. If they be checked by the presence of any stricture, such as a garter or wrist-band, they accumulate behind it, and the irritation is accentuated. The presence of their proboscis in the skin causes the surrounding tissues to harden and form a cylindrical tube.

The amount of trouble they cause varies very greatly in different people. Children and women with soft skins suffer as a rule most, but as happens in the case of other biting insects, certain individuals seem to be almost immune, whilst others suffer very considerably. The trouble is caused by the mite implanting its mouth parts in the skin, preferably in hair follicles or sweat glands. When it is once fixed it rarely moves. The body remains, of course, on the surface of the skin as a little reddish-orange point, scarcely perceptible unless many of them are congregated in the same position. The effect of their presence is to produce a swelling in the skin which may be as large as a split pea, accompanied by an intense itching and a smarting which banishes sleep. This leads to the patient's scratching, and this scratching is the departure-point of many troubles. Scoriated papules appear and eczematous patches, and when the mites are very numerous an erythema, named by Rabies *Erythema autumnale*, supervenes. The skin

near the point of puncture swells, becomes red, sometimes almost purple, and irregular patches, which may be confluent, appear a centimetre in diameter.

These skin troubles, which may end in a kind of general

Fig. 7.—*Pediculoides ventricosus*, after fertilization; the abdomen has begun to swell. $\times 250$.

Fig. 8.—*Pediculoides ventricosus*, with abdomen fully swollen. $\times 40$.

ized eruption, are accompanied by a rise of temperature and a certain, sometimes a high, degree of fever. Besides men, dogs and cats suffer from these pests, and in these domestic pets the parasites give rise to a miliary eruption.

Domestic cattle—sheep and horses—are also attacked. But, according to some authorities, poultry are not only attacked but killed by these parasites. The larvae apparently can only live a few days in the skin of the victim.

As far as is known at present the larvae of *Trombidium* convey no protozoal disease, but there is a terrifying little creature, known as the Kedana mite, which in some districts of Japan causes a serious illness, with a mortality of some 70 per cent. Apparently it does not act as an inoculating agent itself, but the papule surrounded by the red area which forms as a result of its bite changes to a pustule, and the lesion becomes the point of entrance of bacteria which produce the so called "river" or "flood" fever. If these mites be carefully removed the patient suffers no harm.

Another species of mite, *Pediculoides ventricosus*, lives in stalks of cereals and is very apt to attack labourers who are dealing with grain. Their bites cause severe irritation, local swellings, reddening of the epidermis, and fever. In this particular species the female before she is fertilized has an elongated form 0.2 mm. in length and 0.07 mm. in breadth; but when fertilized the ovaries increase to such an extent that the posterior end of the body becomes spherical. In this respect it resembles that remarkable flea, the chigo or jigger. The larva is born with four legs and pairs almost immediately after emerging from the egg-shell.

A SIMPLE AND RAPID METHOD OF LOCALIZING BULLETS.

By FRANCIS HERNAMAN-JOHNSON, M.D.,

MEDICAL OFFICER AT PRESENT IN CHARGE OF X-RAY AND ELECTRICAL DEPARTMENT, CAMBRIDGE HOSPITAL, ALDERSHOT.

A MEANS of localizing bullets which does not require the use of any special apparatus, nor involve the taking of radiographs, is often of value. A method of which I have made considerable use is the following. So far as I am concerned it is original, though it may, of course, have been described by others without my knowledge.

Suppose a bullet has lodged somewhere about the middle of the thigh. The patient is placed on an ordinary examination couch having the tube beneath. His feet are placed together, with toes pointing directly upwards. The x rays are turned on with a widely open diaphragm, and the general position of the bullet ascertained by the fluorescent screen.

The aperture is now gradually narrowed, and the tube moved about so that the image comes into the centre of the field, which, if the anticathode has been correctly centred, will be a perfect circle. This process is continued until the illuminated patch is not more than 1 in. in diameter. The image of the bullet is now vertically above the bullet itself.

The only special device necessary is now used. It consists of a metal ring having an internal diameter of about $\frac{3}{4}$ in., fixed to the end of a flat wooden handle 1 ft. in length (Fig. 3). The ring is slipped under the screen, and moved until its shadow encircles that of the bullet. A mark is made on the skin with silver nitrate in the centre of the ring, the screen being first removed, but care being taken not to displace the "ring-localizer."

Next, the screen is readjusted, and the ring is now slipped between the patient and the couch. The encircling position is again found, and a second mark made, this time on the skin of the lower aspect of the limb. If everything has been carried out properly, this second mark will be found vertically below the first.

I have tried to illustrate this diagrammatically in the accompanying figures, which represent a vertical section through the patient's limb, couch and tube, at right angles to their long axis. z B (Fig. 1) is the vertical beam of rays passing through the narrow aperture x and casting a shadow of the bullet B , which is marked at c ; A is the mark below the limb, obtained as above described. An incision commenced at c , and carried downwards at right angles to the surface along the line c A would eventually strike the bullet, but it is not yet possible to say at what distance below the surface it will be found.

To ascertain this the patient is rolled over on his side, so that the line A c is parallel with the plane of the couch

—that is, B is made to move through an arc of 90 degrees. The original procedure is now repeated and two other marks are obtained, a line joining which, B D , cuts A c at right angles (Fig. 2).

The patient is now returned to his former position, and an inspection of the marks will enable one to judge within half an inch the distance at which B lies below the surface along the line c A .

Should the surgeon desire an exact quotation in inches, a strip of lead, thick enough to retain the shape into which it is bent, is moulded to the surface of the limb from E to D . A nick is made in it corresponding with the mark c . It is then placed on a flat surface, so that a line joining its extremities represents the chord E D . A vertical measurement with a ruler from the nick (c) gives the distance c B .

Fig. 1.

Fig. 2.

Fig. 3.—Ring-localizer; scale $\frac{1}{2}$.

The above method is not readily applicable to foreign bodies in the neighbourhood of the pelvis, as the transverse line is difficult to obtain. Here I find the simplest thing is to ascertain the vertical line as above, and then to take stereoscopic negatives. These, as a rule, enable one to get a sufficiently good idea of the depth for practical purposes.

Points essential to the success of the method are:

1. The beam of x rays must be vertical, and the shadow of the bullet must be manoeuvred into the centre of the small illuminated field.
2. The "ring-localizer" must accurately encircle the bullet shadow.
3. The nitrate of silver marks must be placed at the centre of the ring. It is better to make dots for the vertical marks, and crosses for the horizontal, in order to avoid subsequent confusion.
4. Whenever the nature of the case permits, the patient should be operated on, in one or other of the positions in which the localizing was carried out.
5. Lastly, wherever possible, the patient should be taken directly from the examining couch to the operating theatre. Bullets sometimes alter their position to some extent even in twenty-four hours, and undeserved discredit is thereby brought upon the art of the radiographer.

Although the procedure described depends entirely on screen examination, it is not dangerous to the operator. The small field makes it unnecessary for him to expose his eyes to a direct x -ray beam, and the handle of the "ring-localizer" does away with all risk to the fingers.

THE Registrar-General, Somerset House, London, W.C., has been entrusted with the duty of compiling a Central Register of all Belgian and other war refugees who have been received in the United Kingdom, and the secretaries of local committees formed for providing accommodation for refugees are asked to apply at once to him for a supply of forms upon which to record the particulars required. Letters sent to the Registrar-General, Somerset House, London, W.C., do not require to be stamped. The envelopes should be marked "War Refugees" in the top left-hand corner.