Dental Microscopy. By A. Hopewell Smith, L.R.C.P., L.D.S., &c. Pp. 119. (London: The Dental Manufacturing Company, Limited.)

STUDENTS of dental microscopy will find this work a valuable guide to the preparation, observation, and photography of microscopical sections of hard and soft dental tissues. The volume is practical throughout, and is illustrated by eight lithographed plates, from which typical structures may be readily recognised. It should prove of great assistance to workers in dental histology.

Organic Chemistry, Theoretical and Practical. By Prof. J. S. Scarf, F.I.C., F.C.S. Pp. 240. (London and Glasgow: W. Collins, Sons, and Co., Limited.)

WE find no feature which distinguishes this text-book from others "adapted to the requirements of the Science and Art Department, and of the London University." The book may assist students to pass the examinations for which it has been constructed, but it is not a desirable introduction to the science of organic chemistry.

LETTERS TO THE EDITOR.

[The Editor does not hold himself responsible for opinions expressed by his correspondents. Neither can he undertake to return, or to correspond with the writers of, rejected manuscripts intended for this or any other part of NATURE. No notice is taken of anonymous communications.]

The Antiquity of the Medical Profession.

DR. BLACK displays a surprising facility of misapprehension—greater than I should have supposed possible.

The final sentence of his letter runs thus:—"It would seem, then, from history, that the medical profession is quite as old as either that of theology or law."

Now since the first sentence of my essay contains the clause—"In rude tribes it is difficult to distinguish between the priest and the medicine-man"; and since various illustrations are then given of the union of the priestly and medical functions in the same individual; and since it is thereafter shown that this union long continues among early civilised peoples—Egyptians, Babylonians, Hebrews, Hindus, Greeks—it is a necessary implication that, as Dr. Black says, "the medical profession is quite as old as either that of theology or law." For if two professions are at first exercised by the same persons they are necessarily of equal antiquity. So that, strangely enough, Dr. Black points out to me a truth which it is one of the purposes of my essay to teach. I can only suppose either that he did not read the first part of the essay at all, or that before he had reached the end he had forgotten the beginning.

Westerham, Kent.

HERBERT SPENCER.

Halley's Equal Variation Chart.

I HAVE read Mr. Ward's interesting letter on this topic in NATURE of May 30, p. 106. I embrace this opportunity to correct some typographical errors in my letter in the issue of May 23.

No. 974 (4) should be 977 (4).

In foot-note 3, p. 79, the title of atlas referred to should be 'Tabulæ Nautical Variationes Magneticas Denotantes.'

I have compared Mr. Ward's description of his own chart with my notes. He evidently is the lucky possessor of the exceedingly rare Halley chart 977 (4). I should be pleased to have him inform me if the word "Britanniæ" in the dedication is not spelt with two *l's*.

The size of the British Museum copy is about 48 × 57 cm., the shorter dimension being in an east-west direction; it is in a splendid condition.

The earliest mention made of Halley's Equal Variation Chart is found in "Histoire de l'Acad. de Paris," 1701, p. 9. The chart referred to there must be the above 977 (4), of which we now know that two copies exist—the British Museum's and Mr. Ward's.

L. A. BAUER.

The University of Chicago.

The Invention of the Net.

IN your number of February 28 (p. 417), Mr. R. I. Pocock suggests that the observation of a spider's web may have given rise

to the art of netting. It is of interest to note that the following citation is found in a Chinese cyclopædia: "Yuen-kien Lih-han" (1701, tom. ccccxlix. art. "Chi-chu," 2):—"In 'Pau-puh-tsze' it is said, 'Tai-hau [or Pão-hsi] made a spider his master and knitted nets.'"

In the "Yih-King," the oldest authority that ascribes to Pão-hsi the invention of the net, no mention is made in this connection of spider (see Legge's translation, in the "Sacred Books of the East," vol. xvi. p. 383); but the above-quoted passage of "Pau-puh-tsze" is tantamount to prove such a view, as suggested by Mr. Pocock, to have already occurred among the Chinese in the fourth century, A.D., when the book was written by a Taoist recluse named Koh Hung.

June 17.

KUMAGUSU MINAKATA.

The Bird of Paradise.

I DESIRE to call the attention of your readers to a fashion which in the month of May was at its height in London, and is now much patronised throughout the country. I refer to the wearing in hats and bonnets of a graceful spray of soft fine plumes with drooping or curly tips. These the milliners call Bird of Paradise feathers, the assurance being constantly given that they are *real*. They are often mixed with osprey tips, which, to the shame of womanhood, have so long been in fashion, and are still largely used. I may state on trustworthy authority that during the past season one warehouse alone has disposed of no less than *sixty thousand dozens* of these mixed sprays!

The Bird of Paradise most used in millinery is that obtained in the Papuan Islands and New Guinea. Mr. Wallace, in describing the *Paradisæa apoda*, says:—"From each side of the body, beneath the wings, springs a dense tuft of long and delicate plumes, sometimes two feet in length, of the most intense golden-orange colour and very glossy, but changing towards the tips into a pale brown. This tuft of plumes can be elevated and spread out at pleasure, so as almost to conceal the body of the bird." In his "Oiseaux dans la Mode" of October 20, 1894, M. Jules Forest bitterly deplores the destruction which has been going on during the last decade. He emphasises the fact that it is no longer possible to procure such perfect specimens as were common ten years ago, since the unfortunate birds are so hunted that none of them are allowed to live long enough to reach full maturity, the full plumage of the male bird requiring several years for its development! He further states that "the birds which now flood the Paris market are for the most part young ones, still clothed in their first plumage, which lacks the brilliancy displayed in the older bird, and are consequently of small commercial value." Since January 1, 1892, strict regulations for the preservation of the Bird of Paradise have been in force in German New Guinea, and M. Forest appeals to the English and Dutch Governments to follow their good example.

The common sense of every thoughtful woman must at once tell her that no comparatively rare tropical species, such as the Bird of Paradise, can long withstand this drain upon it, and that this ruthless destruction, merely to pander to the caprice of a passing fashion, will soon place one of the most beautiful denizens of our earth in the same category as the Great Auk and the Dodo.

The women of England are earnestly entreated not to countenance the sacrifice of this bird by encouraging the demand for its precious feathers. Let them resolve to do what they can to prevent the extermination of this "wonder of nature" by stoutly refusing to purchase or wear anything purporting to have once belonged to a Bird of Paradise.

MARGARETTA L. LEMON.

Redhill, Surrey, June 21.

THE TICK PEST IN THE TROPICS.

THOSE living in temperate climates have probably small idea of the virulence of insect and other pests in the tropics. A plague of caterpillars may destroy a season's crop in England, but there is the winter's frost to be passed through before a second attack need be feared. It is otherwise in the tropics. Vegetation is much more luxuriant, and the food supply is permanent; and, when once a plague has obtained a firm foothold,

there is no apparent reason why it should cease its ravages before it has entirely destroyed its particular host. It is fortunate for agriculturists that the great increase of any particular parasite seems ultimately to work out its own destruction; and frequently when all hope seems over, the plague rapidly and unaccountably disappears.

Surprise has been expressed that ticks infesting cattle have received so little real study. Quite recently the statement appeared that these parasites formed the least known part of the tropical fauna. But a great deal has been done in this direction of recent years, and there seems some hope of real progress being made.

Taking the conditions into consideration, it is a matter of great wonder that so few ticks exist in many parts of the tropics. No real attempt has been made to decrease their numbers, and there appears to be no season of the year when the climate is fatal to them. Vegetation is rank, and we know now that they can live to a great extent upon vegetable matter; further, even where there is a scarcity of small indigenous mammals, there are plenty of horses and cattle. The multiplying powers of ticks are enormous. In one case I determined the number of eggs from one female as over 20,000 (see Fig. 3), and almost all of these were fertile and produced young ticks. The increase in numbers of ticks in most countries is not marked, however, and we are driven to the conclusion that there is here, in the animal kingdom, a waste of material analogous to that in the seeding of parasites and saprophytes among plants.

It is not surprising now and then to hear of a long-continued plague of ticks from one place or another where cattle-rearing is a staple industry. In Jamaica, it is by no means uncommon for the traveller to get covered with "grass-lice." On pushing aside the branches overhanging the riding path, I have been immediately covered with firmly attached young ticks which needed much care and patience to remove. The ticks of Jamaica are now a very serious source of anxiety in cattle-pens, and much loss is attributed to these parasites.

During my stay in Antigua, complaints were loud and frequent of the ravages of a large tick, which infested the cattle between the months of May and September. In the cattle and sheep farms of the Cape of Good Hope and Australia the "tick" matter is absorbing much attention. Specially large and annoying forms are described from parts of India, Central Africa and Central America; while extraordinary tales are told of the destruction caused by these parasites in cattle-rearing districts of South America. Elaborate and expensive researches have been conducted in the United States Southern Experimental Stations upon the life-history of the ticks and their relations to cattle; and the exhaustive reports, issued from the Bureau of Animal Industry, form by far the most valuable part of our economic literature on these pests.

The books of travellers teem with references to the annoyance caused by ticks. Sir Joseph Hooker, in his "Himalayan Journals," describes their abundance in the frontier regions between Sikkim and Nepaul, in pathless tracts destitute of animal life. He writes the following concerning the neighbourhood of Tonglo: "A large tick infests the small bamboo, and a more hateful insect I never encountered. The traveller cannot avoid these insects coming on his person (sometimes in great numbers) as he brushes through the forest; they get inside his dress, and insert the proboscis deeply without pain. Buried head and shoulders, and retained by a barbed lancet, the tick is only to be extracted by force which is very painful. I have devised many tortures, mechanical and chemical, to induce these disgusting intruders to withdraw their proboscis, but in vain."

Bates, on passing through the grassy lanes of the second-growth woods on the Amazons, often found himself covered by ticks. It occupied him, he says, a full hour after his day's work to clear himself of the parasites.

Belt refers to the "grass-lice" on the plains of

Nicaragua, as quickly covering any one travelling through the country; so much so, that the herdsmen or "vacqueros" keep a ball of soft wax with which to rub themselves. The smaller ticks are thus removed from their skin, while the larger ones are picked off by hand.

Many a time, in walking through grass in the Leeward Islands, I have been conscious of the peculiar itching at the ankles caused by the attacks of "bête rouge." The bête rouge is not in reality a tick, although often confused with it. Horses seem to be particularly liable to its attacks, with the result that they lose all the hair about the face and eyes. In all probability the poor animals suffer a good deal, for the personal irritation is extreme. The bête rouge is exceedingly minute, and, as its name implies, is of a brilliant scarlet. At night, after retiring to rest, the warmth of the body seems to increase the irritation to the utmost pitch, and sleep becomes absolutely impossible. Rubbing or scratching the parts attacked merely intensifies the discomfort, the creature pushing itself deeper into the flesh. Most painful sores are the result if the greatest care is not taken. The one certain remedy seems to be to anoint the inflamed spots with vaseline. This substance not only soothes, but appears to destroy the bête rouge by stopping up its breathing pores. I have never succeeded in detecting the creature on the skin, but, when reading in or near an infested lawn, I have captured many by watching for the minute scarlet dots travelling over the white paper.

The damage done by ticks to cattle is undoubtedly very serious. According to observations by Leidy, the adult female tick is able to absorb 100 times its weight of blood, swelling during that time to an enormous extent. This food is rapidly changed into eggs. The adult male does not increase appreciably in size, but his demands upon the host have probably been greatly underrated. An account of tick-infested cattle in Queensland states that they were so completely covered that the branding-iron had to be burnt through the ticks before it was possible to reach the animals' skins. A case in Texas is mentioned where it was found impossible to lay a silver dollar upon the body of the animals without touching some ticks. Again in Texas, 100 full-grown ticks were collected from each ear of a pony, while many immature ones were left behind. The mere abstraction of blood must, in this case, be a very serious drain upon the system.

When one considers, further, the irritation experienced by travellers from the few ticks fixed upon them in their daily rambles, it may be safely concluded that the penetration of the countless proboscides into the skin of cattle must of itself be a source of great discomfort, especially as these animals are quite unable to get rid of them. Calves not uncommonly are destroyed by the formation of balls of hair in their stomachs; and in tick-regions this is undoubtedly due to an attempt to get rid of the parasites by licking and biting them off.

It is quite conceivable, then, that ticks do really cause the death of multitudes of cattle on the great estates where it is impossible to examine them closely. We should, however, approach this part of the subject with caution. Sickly cattle are usually covered by ticks, while the healthy ones have only a few; but it is questionable whether the ticks are the real cause of their emaciation. The case of ticks seems rather to be analogous to that of scale insects on plants. The latter pests appear in great quantities at any period of stress, when from lack of nutriment or other cause the plants become weakly. Thus, in Antigua, there is a marked disappearance of scale insects with the commencement of the rainy season. It seems probable that the prevalence of ticks upon certain cattle is rather due to conditions of the blood or skin of the animal, closely connected with its general nutrition. This is an exceedingly important matter for determination, for upon it, as will presently be shown,

depends the only means of freeing the cattle from these pests.

Thus far the direct effects of ticks upon cattle have been considered. Certain alarming facts have lately been brought to light with regard to the relations existing between ticks and different well-known cattle diseases. The subject is by no means new, having long been a fascinating one for cattle-breeders. The "louping-ill" or "trembling" of the north of Britain has been traced by some directly to the presence of ticks upon the sheep. The same may be said of a disease called "heart-water" at the Cape of Good Hope. Finally, the United States Department of Agriculture has for the last five or six years been conducting exhaustive experiments upon the connection between ticks and the Texas cattle fever, the results of which have appeared in the annual reports of the Bureau of Animal Industry already referred to.

There is, in this latter case, present in the blood of the cattle suffering from disease, an infusorian which quickly destroys the red blood corpuscles. This minute organism has also been detected in the body of the tick. It has been again and again transferred from diseased animals to healthy ones by means of the tick, and tick alone. The presence of this infusorian is regarded as diagnostic of

The Great Antigua Gold Tick.—*Hyalomma venustum*, Koch. (1) Mature male, natural size; colours, gold, scarlet, and black. (1a) Magnified ventral view. (2) Female, mature but not inflated; colours, shield black with flesh-coloured and gold spots; body dark green. (3) Female full of blood, natural size; colour, dark green. (4) The same female as in (3), after 20,000 eggs had been laid. (5) Female into which male had accidentally inserted his proboscis; both magnified.

the disease; and the effect of its corpuscle-destroying powers is seen all over the body, as well as in the red-coloured urine, which has won for the disease the colonial name of "red-water."

Ticks, then, are in certain cases connected with the transmission of deadly disease. In how many more cases this is so remains to be investigated. It is quite possible that some of the obscure cattle diseases in different parts of the world are caused by ticks, and that other countries will, in their turn, be forced to face this problem.

There is now and then an outbreak of a severe skin disease among cattle in Antigua; and this disease does not appear to be known in the neighbouring islands. Judging from the climate and peculiar conditions of Antigua, the scarcity of water and lack of nutritious food for part of the year might be considered sufficient to account for a local disease; but there is also a large tick present, which has not been recorded from the other islands of the group. A loose theory has thus arisen that this "gold tick" is connected with, if not the direct cause of, the cattle disease.

The evidence available does not tend to confirm this idea, but it is obviously impossible to solve the problem

in the absence of proper appliances. I was led, however, to commence observations upon the gold tick, which may be of interest.

Mr. A. D. Michael has determined it to be *Hyalomma venustum*, which Koch described in 1847 from a single male specimen collected in Senegal. There is a local tradition in Antigua that the tick was introduced some thirty or forty years ago with some imported Senegal cattle; and this determination lends probability to the belief. The male is a very beautiful creature, decked in scarlet and gold, whence he obtains his name. The female is very large, one specimen being nearly an inch in length and weighing 17 oz. I calculated the number of eggs laid by this female at over 20,000. She commenced laying on July 31, and finished, a shrunken mass, on September 10—a period of exactly six weeks. The accompanying life-size drawings are of Antigua gold ticks. The first is a mature male. He is not usually larger than this, and may be seen moving rapidly across the ground, or firmly attached to the skin of the cattle close to a female. The next three figures are of females, all mature, but at different stages. The first is undistended; the second gorged with blood, and commencing to lay its eggs; while the third is the same tick after the last egg was laid. There is also the drawing of a curious case, in which a male had by accident attached himself to a distending female—a mistake which resulted in the premature death of both.

The period of incubation observed in the tick's eggs varied from twenty-three to fifty-one days. The young ticks usually emerged in great numbers on the same day, and any eggs left unhatched quickly dried up. In Antigua the gold ticks appear upon cattle, in numbers, from May till September each year. It became important to determine what became of them in the meantime; and whether they passed the winter in the body of the parent, in the egg, or as young ticks. From experiments in the laboratory, it would appear that the little ticks pass the winter months huddled together in masses of several hundreds at the roots of the old dead grasses.

In considering the remedies for ticks, one is soon forced to the conclusion that direct measures against the parasite themselves will be of little avail. Methods of prevention are always preferable to those of cure, and in no case is this more so than with parasites of this class. Besides this, they are practically invisible at the most dangerous stage; and when we see the ugly, swollen, mature specimens, we know that their evil work is done. All large females should be carefully collected and burnt, however, as thus future attacks will be diminished.

The treatment of pastures is a very important matter. Here probably the parasite spends the greater part of his early life—usually on the ragged bunches of old grass left from previous years. The proper feeding or cutting of the grass, and the liming and draining of the pastures, will destroy myriads of the infant ticks or "grass-lice." For the sake of the animals, there is every inducement to render the pastures as nutritious as possible; and ticks do not seem to trouble the sleek cattle of the herd. It is an undoubted fact, moreover, that the improvement in food, due to change of pasturage, does in certain cases cause all the ticks to drop off infested animals. The first class of remedies will aim at cutting off the supply of ticks by treating the pastures.

The second class—one might say almost the only one which is attempted in the tropics—is the destruction of ticks upon the cattle.

The common method of tying the legs of the animal together, hurling it to the ground, and smearing some tick-destroying compound over it, cannot be too strongly condemned, especially as there is no need for it whatsoever. Cattle may be handled with impunity if some form of cattle-bail is employed; by this means they may be driven one by one into a small trap, where they

can be treated. But even this is hardly necessary if the application to the skin is in the liquid form; for with a powerful spraying machine, as many as one hundred cattle have been completely covered in the space of an hour.

Of pastes and powders and fluids recommended there is no end; and it will serve no useful purpose to give detailed lists discussing the merits of each. The points to be kept in view are that the liquid should be of an oily and non-poisonous nature, capable of clogging up the air-pores of the ticks. It should be cheap, and easily applicable without handling the cattle; it should, finally, not easily evaporate, or be washed off by the rains. A full discussion of remedies has recently been published by me, the following being taken from the summary at the end: "A number of types of washes for spraying are selected for description. All poisonous ones should be rejected, as there are non-poisonous preparations equally effective. Carbolic acid dips and other liquids, which evaporate quickly, need frequent applications, and should be discarded in favour of oily liquids or emulsions where the latter are equally effective. The best of all these is the kerosene emulsion regularly used for plants. There are many formulæ for the preparation of this; a useful one (for ticks) is given." The formula referred to is as follows: "In two quarts of boiling water dissolve half a pound of soap; remove from fire; immediately add one pint of kerosene, and agitate. In from three to five minutes the liquid becomes creamy. It may be stored in this form in bottles or barrels. For use, add three of water to one of emulsion; mix thoroughly, and apply with a spraying pump."¹

The third and most important class of remedies is closely connected with the nutrition of the animal. If we can render the skin or blood of our cattle so distasteful to the tick that the latter will not attach itself, we have a solution of the whole matter. We should confer immunity upon our animals, and, at one stroke, do away with the necessity of all the laborious and expensive methods now in vogue for the destruction of these parasites.

The first step in this direction has been taken; and, in various parts of the world, most excellent results are recorded from the addition of small doses of sulphur to the animal's food.

It has already been noted that the food of animals has an influence upon their infestation by ticks. Cases are not uncommon among cattle-breeders where a mere change of pasture will cause all the ticks to drop off. This change is obviously felt through the animal's skin.

It has also been mentioned that the ticks seem to congregate upon cattle in poor condition, while those with sleek skins are more or less untouched. Dr. Cooper Curtice (late of the United States Bureau of Animal Industry) suggests, as an explanation of this, that there is in well-fed cattle an oily condition of the skin obnoxious to the ticks; and this suggestion is the more worthy of consideration when we remember the aversion of these creatures to grease of any kind.

It is certain that *sulphur taken internally* will render the skin evil-smelling, by the exhalation of sulphuretted hydrogen, a substance highly obnoxious to all parasites. The following seem to be the physiological changes which take place during the passage of the sulphur through the animal's body to the skin. Sulphur taken in with the food passes the stomach unaltered. In the intestines a small portion is changed into sulphides of hydrogen and the alkalis. Part of these sulphides pass into the blood, and into the tissues from the blood, and act chiefly upon the central nervous system. The sulphides in the tissues are variously excreted. By the kidneys they are excreted as sulphates; if in excess, part is also excreted in the form of sulphides. By the skin they escape as sulphides, giving the characteristic foul odour to the perspiration, and somewhat increasing its amount.

The doses of sulphur should be small, but they should be constant. The form in which the medicine is offered to the animals will best be decided by the manager of the estate. With stall-fed cattle there can be no difficulty at all; but with the cattle of large estates, which are seldom handled and sometimes not seen for long periods, it will be necessary to prepare the sulphur with salt as a "lick," to which cattle will readily help themselves if it is scattered about.

The success of this sulphur treatment has so far been encouraging, both at the Cape of Good Hope and in the United States. Doubtless with continued study other similar preventive remedies will from time to time be discovered, and thus rid the stockowners of the tropics of one of their most dreaded enemies.

C. A. BARBER.

NOTES.

PROF. HUXLEY's health is at present a source of great anxiety to his friends. Symptoms of renal insufficiency appeared last week, and this, with the other complications which have attended his protracted illness, has made his condition a very critical one, but we are glad to learn that it is improving.

WE deeply regret to notice the announcement of the death of Dr. W. C. Williamson, Emeritus Professor of Botany in Owens College, Manchester. Dr. Williamson was elected into the Royal Society in 1854.

PROF. VERNEUIL, the eminent French surgeon, and Member of the Paris Academy of Sciences, died on June 12.

PROF. SIMON NEWCOMB has been elected Associé étranger of the Paris Academy of Sciences, in succession to the late von Helmholtz.

PROF. W. PETERSON, Principal of the University College, Dundee, has accepted the position of Principal of McGill University, Montreal, in succession to Sir William Dawson.

SIR E. MAUNDE THOMPSON, principal librarian of the British Museum, has been elected a Corresponding Member of the Philo-sophico-historical Section of the Berlin Academy of Sciences.

THE University of Pennsylvania has received gifts, within a few days, aggregating nearly a million dollars. This includes half a million dollars from Provost Harrison, already noted in these columns. Scarcely a week passes without our being able to record similar gifts from private benefactors to the universities and colleges of the United States. *Science* reports that Dr. D. K. Pearson has offered £10,000 to Mount Holyoke College if an additional £30,000 can be raised. It is said that Dr. Pearson has already given £400,000 to various colleges.

THE death is announced of Dr. A. Eliseief, known for his explorations and anthropological work.

THE St. Petersburg correspondent of the *Lancet* reports that the Emperor of Russia has appointed a committee to organise the collection of subscriptions for the monument which the Institute of France propose to erect to Lavoisier.

THE trustees of Columbia College decided, a few days ago, to grant the Barnard Medal to Lord Rayleigh and Prof. Ramsay jointly for their discovery of argon. Only Lord Rayleigh's name was mentioned in the previous announcement of the award.

DR. BACKLUND has been elected a Correspondant of the Paris Academy, in the Section of Astronomy, in the place of the late

¹ For further details, see papers in Leeward Islands *Agricultural Journal*, Nos. 1-3.