

include density, change of state, viscosity, capillarity, indices of refraction, calorimetry, and photometry. For each of these constants, the author briefly describes the most exact and convenient methods of determining them, and gives in tabular form the results of observations made on various substances. In the descriptions of methods of experimentation, preference is given to those which are actually used in practice outside the physical laboratory, so the book will be a real aid in technical work. Physicists and physical chemists will find the volume a handy epitome of methods and results.

*By Roadside and River: Gleanings from Nature's Fields.* By H. Mead Briggs. Pp. 204. (London: Elliot Stock, 1897.)

"THE hand of destiny has scattered broadcast through the land the seeds of hope, and yet how many of them all have reached the harvest of ambition." If we rightly understand the purport of these opening words of the preface, the author is expressing some anxiety as to the fate of his literary efforts, and wondering whether his work will be appreciated. We wonder also what becomes of the host of books like this one, well printed and daintily produced, but amorphous in structure, and having no particular aim. There are, we suppose, people who enjoy reading insipid remarks based upon casual observations of nature, and to their kind attention we commend this book. A scientific mind soon wearies of trying to pick out the slender threads of fact which meander through the mass of sentiment.

#### LETTERS TO THE EDITOR

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##### The Dugong.

IN the Hakluyt Society's last book, "The Christian Topography of Cosmas, an Egyptian Monk" (London, 1897), there are some interesting notices of "Indian Animals" with figures, copies of those in "the Florentine Codex"; which, in their turn, may have been "drawn by Cosmas himself (or under his direction)," according to an excellent modern critic.

In one passage Cosmas says "the flesh of the turtle, like mutton, is dark-coloured; that of the dolphin is like pork, but dark-coloured and rank; and that of the seal is, like pork, white and free from smell."

For reasons too long to give here, I suppose Cosmas' "seal" (phoke) to be the dugong; (halicore), which is generally described as very eatable; but I cannot anywhere find its colour, as meat, described.

"Potted dugong" from Queensland was on the London market not long ago; and I tried it, once. It was much of the colour of potted tongue.

The figure is more like a conventional sea-horse than anything else, and cannot be relied on much. It is, perhaps, a little less unlike to a dugong than to a seal.

The confusion of dugongs with seals still exists amongst seamen; though, of course, dying out amongst officers.

W. F. SINCLAIR.

##### Potato-Disease.

IN the "Life and Letters of Charles Darwin," Darwin writes as follows:—

"Mr. Torbitt's plan of overcoming the potato-disease seems to me by far the best which has ever been suggested. It consists, as you know from his printed letter, of rearing a vast number of seedlings from cross-fertilised parents, exposing them to infection, ruthlessly destroying all that suffer, saving those which resist best, and repeating the process in successive seminal generations" (vol. iii. p. 348).

Can any of your readers inform me whether the plan was ever carried out, and if so with what amount of success?

Newcastle-on-Tyne, December 11.

G. W. BULMAN.

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#### THE PREVENTION AND CURE OF RINDERPEST.

IN the second fortnightly number for October of the *Agricultural Journal* of the Cape of Good Hope is given a long report of a Conference between the Hon. Mr. Faure, Minister for Agriculture, Mr. Hutcheon (C.V.S.), Dr. Turner, Dr. Edington and Dr. Kolle on the question of inoculation against rinderpest. This account is followed by the Resolution of Conference, by a letter from Dr. Edington and by one from Mr. Hutcheon, in the latter of which is given a review of the different methods of inoculation now used for the purpose of obtaining a certain degree of immunity against rinderpest in the cattle of South Africa. As so many different statements concerning the exact methods used at the Cape by Koch, by Edington, and by Turner and Kolle, and also by Messrs. Danyz and Bordet, have been promulgated, a summary of these various methods may be of interest.

In Koch's method of using the gall obtained from sick animals as a protection against rinderpest, the bile is taken from animals that have contracted the disease by natural infection. It was at first recommended that only green bile and bile free from blood should be used; later this recommendation was modified by Drs. Turner and Kolle, who say "that the difficulty of obtaining good bile has been much exaggerated. If the animals destined to produce immunising gall are injected with a small dose of really virulent blood, say 1 c.c., and are killed at the end of the sixth day of the fever, at least four out of five will give typically good galls, and the gall of the fifth will, in all probability, be fit for use. As a matter of fact, all galls which do not smell, and which are not absolutely red from the presence of a large quantity of blood, can be used without danger by Koch's process"; it is afterwards stated that those galls which have the highest specific gravity appear to possess the highest immunising power. It would appear, however, that the gall-produced immunity is only temporary, and that before long the animals again become susceptible to infection by rinderpest. Another of the great drawbacks to this method of inoculation is the fact that in certain cases the galls appear to contain septic organisms, which not only diminish the immunising power of the gall, but also in some instances seem to have set up a septic condition in the cattle injected.

Applying the method now in vogue in connection with the preservation of vaccine lymph, Dr. Edington added a quantity of glycerine to the gall with the object, first, of preserving for some time the gall in a pure condition, and, secondly, of killing any septic germs which might be present in the gall before it was drawn off from the gall-bladder of the infected animal. Of course it was necessary to use a somewhat larger quantity of this mixture in order to produce immunity. Dr. Edington injected from 15 to 25 c.c. into the subcutaneous tissue of the dewlap. Animals so protected when injected with small quantities of virulent blood, certainly appeared to take the disease in a milder form; in some cases this was accompanied by local reaction and by a rise in temperature, and wherever this occurred there was a marked degree of active and more lasting immunity conferred on the animal. When  $\frac{1}{4}$ th of a c.c. of virulent blood—that is, blood taken from an animal suffering from an acute attack of rinderpest—was injected, a local reaction was, in most instances, obtained, but in certain cases the preliminary temporary immunity was so slight, that the animal succumbed to the disease set up by the second injection. If, on the other hand, only  $\frac{1}{10}$ th of a c.c. was used, the local and constitutional reaction was not always obtained, and although a much smaller number of animals succumbed to the contracted disease, a much larger proportion remained susceptible to natural infection. In connection with this bile method, also, it

must be pointed out that when the raw or unglycerinated gall was used as the protecting medium, a certain small proportion of cases contracted severe and even fatal attacks of rinderpest; though whether this was due to the gall itself or to the accidental contamination with virulent blood is not stated in the report, though we should imagine that this latter accident might be by no means uncommon.

Finally, there is the method based on the use of the "anti-bodies" found in the blood of salted cattle, *i.e.* cattle that have suffered from a severe attack of the disease, but have recovered. By injecting gradually increasing quantities of virulent blood into such animals, the anti-bodies appear in still larger proportions in the blood, and can then be used either in the form of a serum solution or as a defibrinated blood solution. This serum may be used to confer such a degree of passive immunity on the animal, that it either escapes the disease altogether, or contracts it in a much modified form; again, the serum may be used to cure an animal in which there is already a rise of temperature accompanied by other signs of a naturally acquired attack of rinderpest.

All these methods have now been used at the Cape, and it may be of some interest to our readers to learn what is the consensus of opinion as laid down in the Resolution of Conference. It is agreed "that inoculation with bile, either pure (Dr. Koch's) or glycerinated (Dr. Edington's), should not be adopted in any district in which it has not already been commenced, as more satisfactory and more permanent results are obtained from the use of serum, and the latter method can be more successfully applied in clean herds than in herds which have been previously inoculated with bile."

The "Conference" then arrive at the conclusion that it is better not to recommend that the inoculation with Koch's bile should be followed by an inoculation with virulent blood on the tenth day, as formerly recommended, as it is found that unless this blood inoculation is followed by a decided reaction—which occurs very rarely—the immunity already conferred by the bile is not increased. It is recommended, however, that in the case of dairy cattle which have already been inoculated with Koch's bile a second bile inoculation may be made, as this will confer a protection for several months, and at the same time will not interfere with the secretion of milk.

The glycerinated bile method should be followed on the tenth day by the inoculation of one-tenth of a c.c. of virulent blood; and although a second blood inoculation fourteen to seventeen days later increases the active immunity in certain cases, its use has been followed by considerable mortality, and the Conference, while not opposing a second inoculation of blood, does not recommend its universal adoption, as it is attended with considerable risk.

There appears to be a decided opinion that serum, when properly prepared, is superior to, and much more convenient for use than defibrinated blood, and its use is strongly recommended in preference to the latter when it can be obtained, though it is also recommended that a certain number of fortified salted cattle—*i.e.* immunised cattle—be sent to districts far removed from centres where serum is prepared, in order that defibrinated blood may be prepared in cases of sudden emergency.

It seems to be the general experience (as in other diseases in which the serum treatment is used) that in healthy herds the use of serum alone does not confer a very permanent immunity; it is therefore considered necessary, in infected districts, to infect healthy animals with rinderpest, and keep the attacks under control by means of the serum. This may be most safely and satisfactorily accomplished by injecting virulent blood subcutaneously on one side of the animal, and serum on the other. If necessary, *i.e.* if the disease takes

too active a form, a fresh dose of serum will usually enable the animal to pull through the attack. For all practical purposes, however, it has been found that clean herds, in which there is no disease already, should not be inoculated with serum until the disease makes its appearance amongst them, or in their immediate neighbourhood. The whole of the animals should then be injected, after which, or simultaneously, they may be injected with virulent blood, or be kept in close continuous association with infected animals by kraaling them together every night. In this way the animals become salted or protected; under these conditions the immunity produced is active and of long duration, as opposed to the temporary and passive immunity that is conferred by serum when used alone, and perhaps also by bile. Where bile has already been inoculated, it is no use to inject serum and then virulent blood; for, as already mentioned, the immunity conferred by the bile varies very greatly in degree in different cases. Where such bile inoculation has been resorted to, the most satisfactory course for the owner to pursue is to keep a supply of serum by him and inject all cattle as soon as they are observed to be ill, or as soon as the thermometer indicates a rise of temperature. Where serum cannot be obtained, as already mentioned, the blood from salted cattle may be used. These salted cattle are usually fortified by injections of virulent blood, commencing with 10 c.c., and then going to 20, 50 and, lastly, 100 c.c. at intervals of ten days. Either serum or blood is injected in quantities of 100 or 200 c.c. into the animals suffering from the disease. This injection may be made subcutaneously, and not into the muscles, either behind the shoulder or into the dewlap.

It is, perhaps, too early to be dogmatic on the question of the best method of treating cattle for the prevention and cure of rinderpest, but when the exceedingly fatal nature of the disease is borne in mind, and when it is remembered that the disease is so markedly infective and fatal that whole herds are practically exterminated when once the disease is introduced (the objections that are brought forward against inoculation against anthrax, that the percentage mortality from inoculation is almost or quite as great as the percentage mortality from the disease itself not holding good in this case), it is not to be wondered at that the South African farmers received with enthusiasm any method which would preserve to them even a large percentage of their cattle, and that many of them were quite willing to run the risk of introducing rinderpest through the bile inoculation if they could only be sure that some 60 or 70 per cent. of the so infected animals would recover, and would then be protected to a certain degree against future attacks.

As Koch's bile method complied with such conditions it was undoubtedly a marked step forward, whilst it also made it possible to obtain salted cattle with which serum experiments might afterwards be carried out.

These serum experiments—showing that in serum the veterinary surgeon has in his hands a weapon by using which he is able to control the course, even of a severe attack of rinderpest—have given the farmers confidence enough to make them actually anxious to produce the disease under such conditions that they may keep it under control, and so salt their cattle artificially; thus rendering them immune for a considerable period against infection, even of the most virulent character.

With the vast agricultural and cattle-breeding interest at stake, we may anticipate that Koch's earlier experiments will, in the very near future, be improved upon, that South African cattle raisers and dealers will in the long run be enormously benefited, and that a source of wealth, which until a very short time ago was threatened with almost immediate extinction, will continue to be one of the principal resources of a great and flourishing colony.