coccus heterospinus Green, *P. artemisiae* Green (name preoccupied by *P. artemisiae* Essig, 1909, from California), *Aspidiotus maderensis* Ldgr., *Targionia laurina* Ldgr., *Cryptophyllaspis bornmulleri* Ruebs. No doubt this list of endemics could be considerably increased by careful search. The first and third of the above are from Porto Santo, the third from the small I. de Cima. In Green's list *P. latipes* is said to occur also at Funchal, but there is no mention of this in connexion with the description. *Aspidiotus maderensis* is said to be on *Juniperus cedrus*, which is a Canarian species, not found in Madeira. Presumably it was on *Juniperus maderensis* (*J. oxycedrus* subsp. *maderensis*) of Menezes. I imagine that the ancestors of all the endemic species were brought to the islands as larvæ on the feet of birds.

(2) The remaining 40 species have, I believe, nearly all been introduced by man, *Ortheziola* being an exception. I had previously visited Madeira in 1879, and had the impression that the Coccidæ in gardens had greatly increased in the interval. This was confirmed by residents, who complained of the plague on cultivated shrubs and trees, and thought that the Argentine ant had a good deal to do with the dissemination of the coccids. An examination of Mr. Green's list shows the prevalence of common tropical species, along with several of those of temperate climates. The climate of the islands is suited to a very wide range of plants, and similarly of coccids. In the garden of Mr. Chas. O. L. Power at Funchal there are growing no less than 56 species of palms, 12 species of tree ferns, 9 of cycads, and great numbers of other trees and shrubs from regions as remote as New Zealand, Fiji Islands, Mexico, Brazil, Japan, South Africa, etc. Thus, were we to try to grow coccids in Madeira, we could probably have a larger collection than in almost any other locality. It naturally results from these conditions that by degrees the islands are stocked with more and more of these pests, brought in on plants, the outcome being very serious to the horticulture of the islands, which are in other respects extraordinarily favourable for horticultural work. The usually small properties in Funchal, with crowded vegetation, make any attempts at eradication by spraying or fumigation extremely difficult. There are also obstacles to the establishment of a satisfactory system of plant quarantine.

(3) The most practicable method of dealing with the coccid invasion is through the importation of the natural enemies of the scales. I found several such enemies already present, but the supply is evidently inadequate. Through Mr. de Noronha, this problem is being attacked by Dr. L. O. Howard and his staff in Washington. Material sent by Mr. de Noronha will show what enemies are actually present, and when sufficient information has accumulated, it may be possible to render important aid. This, however, is a matter for the future, and will be fully dealt with in due season by the Washington entomologists. It may be useful to add that all the localities cited in Mr. Green's list are in the main island of Madeira, except those given as "Porto Santo."

The *Aspidiotus hederæ* in Porto Santo was on native *Euphorbia* at the base of Pico d'Anna Ferreira.

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The Origin of Foot-and-Mouth Disease.

MAY I be allowed to say that I read with much interest the article by Dr. A. Landsborough Thomson, in *NATURE* of January 12, upon bird-migration in relation to infectivity in connexion with this disease. I noted particularly the writer's statement that

mystery still enshrouds the origin of the distinct outbreaks, and also that Dr. Thomson is by no means satisfied that even a *prima facie* case has been made out for the view that birds carry the virus into Great Britain.

I think, myself, that the question of the real nature of the causative agent in all these "virus-diseases" may be of great importance in its bearing upon their origin. I have recently devoted considerable attention to the question of the nature of "Rickettsia"—bodies, certain types of which are very closely connected with diseases such as typhus-fever and trench-fever, and indeed are to be regarded as, in all likelihood, representing or indicating the virus in these cases. I have formed the conclusion that such bodies are not living organisms, but merely the residual, persistent elements resulting from abnormal blood-digestion, karyolysis in breaking-down cells, and so on (*vide* Journ. Royal Army Medical Corps, February and April 1923, February 1924). The most reasonable inference from this is, I think, that the actual causative agent in the "Rickettsia"-diseases is an abnormal hæmetabolic enzyme or ferment, which induces (primarily) the particular abnormal type of blood-digestion. Similarly with another virus-disease, namely, hydrophobia, where I have found that the characteristic Negri-bodies are nothing more than the result of abnormal alteration of the red corpuscles. I think, therefore, in the case of many virus-diseases, the possibility—to put the matter at its lowest—that the causative agent is an abnormal ferment is one which must be seriously taken into account. We have in the remarkable series of phenomena now known in connexion with the Twort-d'Herelle lytic principle, a most illustrative guide, I consider, to what may be occurring in the virus-diseases.

Now, in my opinion, this view at once opens up an extremely important question bearing upon the incidence and epidemiology of such diseases. If a certain infectious or contagious disease is not due to a micro-organism, there is no longer any absolute necessity to account for the transmission or conveyance of the virus, as has to be done in cases where an organism is concerned (since, of course, a particular organism cannot be created *de novo*, *ad lib.*). On the other hand, given living matter, namely, cells of any kind, we certainly cannot exclude the possibility of some derangement of their metabolism or vital activities occurring, in which a particular pathological "digestive," or lytic enzyme may be developed. That is quite a different thing from the creation of an organism. Therefore, in so far as virus-diseases are due to ferments, we have to reckon, I think, with the distinct possibility that—at any rate, now and again—such a virus can originate and is not necessarily always transmitted from one case of the disease to another.

Applying this view to the instance under consideration, foot-and-mouth disease, I would suggest that the virus may at times originate in the soil or pasture. It may be that, in certain climatic, tillage, or other conditions, this particular enzyme is produced either by some type of living organism with which the soil teems, or by the grasses, etc., of the pasture, either as a result of abnormal metabolism in life or in the process of the break-down and decay of cells. Naturally, of course, it must not be thought that I wish in any way to minimise the grave dangers of infectivity and transmission: but I think the factor to which I have directed attention may also be of importance, in explaining the origin of new and distinct outbreaks of this disease.

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London, January 14.