THE GROUSE-DISEASE REPORT.

WE are indebted to the secretary for an advance copy of an interim report, issued by the Board of Agriculture and Fisheries for Scotland, of the Committee on the Grouse-disease Inquiry appointed in 1905, with Lord Lovat as chairman. It should be stated at starting that although this committee was appointed by Lord Onslow, no Government funds were allocated for its use, in consequence of which the entire expense has hitherto been defrayed by private subscriptions, of which a list is given in the document before us.

From one point of view, the committee has been decidedly unlucky in that during the period of its investigations no cases of the acute, or epidemic, phase of grouse-disease have come under its notice. In these circumstances, to say nothing of further investigations required in connection with the chronic, or endemic, phase, the work accomplished cannot be regarded as in any way approaching finality. Nevertheless, the committee (and we think rightly) decided to issue the interim report now before them, if only for the purpose of informing subscribers what has been already done, to point out the lines of future investigations, and, above all, to endeavour to obtain additional funds, without which the inquiry cannot be much further continued.

As pointed out in a covering letter from the secretary, there is naturally considerable difficulty in issuing a very instructive report in the middle of an inquiry. Many important questions are still under investigation, and even where apparently definite results have been obtained, it has been deemed undesirable to publish these until they have been fully verified. Nevertheless, there is a wealth of most important and valuable information in the document, and the committee is to be congratulated on having apparently identified the cause and nature of the chronic phase of the disease. In the course of the inquiry reports have been drawn up dealing with bacteriology, the causes of mortality in specimens submitted for examination, the economic value of the grouse-shootings in Great Britain, and heather-burning. These and other reports are held over for the present, but will form part of the final report of the committee.

Although great caution is displayed in giving any statement as final, it is pointed out in connection with the chronic disease that it appears to be a wasting, and usually fatal, illness, in which the parasitic intestinal worms affecting grouse at all ages and all seasons attain, probably owing to lowered vitality on the part of their hosts, an abnormal development, and are thus enabled to react injuriously on the bird's general health and condition. The most easily recognised symptoms are loss of weight, redness and acute congestion of the interior of the long blind-appendages (cæca) of the intestine, and an irregular moult and slow subsequent re-feathering, resulting in bare legs and a poor and dingy condition of the plumage.

The latter features, as pointed out by Mr. E. A. Wilson, the field-naturalist to the committee, in a separate section of the report, must not, however, by any means be regarded as absolutely diagnostic of the disease. They may, and frequently do, occur in a bird the moult of which has been delayed, and the recovery of which from the effects thereof has been slow. Such birds display the same appearance of dusky, faded plumage and bare legs and toes common to the majority at an earlier stage of the season (when they do not come under the ken of sportsmen), and likewise to birds afflicted with the disease.

In the earlier stages the grouse is less strong on the wing than ordinarily, and changes its station from the heather to the green ground; in many cases the feathers lose their freshness, while a tape-worm may frequently be seen hanging from the vent as the bird rises. In the later stages the power of flight is lost, the congestion of the intestine becomes still more acute, tape-worms are frequently expelled without the slightest beneficial effect, while both blind-appendages absolutely swarm with microscopic thread-worms. Loss of weight makes itself daily more noticeable, and the bird mopes about the banks of the stream until death puts a term to its sufferings.

The tape-worms have, apparently, nothing to do with the disease, being expelled merely on account of the abnormally irritable condition of the intestines. The real offender seems apparently to be the thread-worm, *Trichostrongylus pergracilis*, with which, as already mentioned, the inflamed cæcal appendages are crowded. This provisional conclusion is supported by the fact that while in other animals tape-worms do not generally give rise to fatal diseases, thread-worms certainly do so, as in the case of the miner's worm.

The report next takes into consideration the epidemic or acute phase of the disease, which, as mentioned above, the experts of the committee have hitherto had no opportunity of examining. It is true, indeed, that birds in full plumage and of normal weight have been sent in as examples of mortality due to the acute phase, but these, on examination, proved to have died either from the ordinary wasting disease or from the effects of accident.

The external signs of this disease are stated to be that the birds succumb rapidly, without loss of weight or deterioration of plumage, while the local action of the disease is reported in many cases to be intense. *Post-mortem* examination is stated to reveal patchy congestion of one or both lungs, comparable to the "hepatisation" of tissue occurring in undoubted pneumonia. The internal organs generally are also stated to be congested, and to exhibit other symptoms of acute and rapidly fatal fever.

By Prof. Klein this phase of grouse-disease was considered to be an acute form of infectious pneumonia, due to the presence of parasitic organisms probably belonging to the "colon" group, these being chiefly found in the lungs of infected birds, although, at any rate after death, they might occur in other organs.

The committee, without wishing to undervalue the evidence of a specialist of Klein's reputation, or the testimony of naturalists and keepers generally, remarks:—

"Klein's organism belonged to the widely distributed colon group, and, according to the limited cultural and morphological tests then used, differed in no way from other organisms of the colon group found in the grouse.

"Members of the colon group, apparently culturally and morphologically identical with Klein's organism, can be isolated from the heart, blood, lungs, and liver of both healthy and emaciated grouse that have been dead for a period of from twelve to twenty-four hours, the actual time varying with such factors as temperature and moisture.

"With regard to keepers' evidence and statements that birds die in full weight and plumage, it must be placed on record that already several times during this inquiry the acute form of grouse-disease with full-feathered birds of good weight has been reported, but in each case examination by the committee's experts has shown that the bird died only from the wasting disease, or as the result of accident.

"While it is not argued from the above that only one form of disease exists, it is, however, a fact not without significance that in the years 1905, 1906, and 1907 no instance of the acute pneumonic form of grouse-disease has come to the notice of the committee, though that committee has had field-observers, 283 local correspondents, as

well as keepers on the large majority of the more important moors constantly on the look-out for it."

In his own portion of the report Mr. Wilson observes that a condition similar to that supposed to be diagnostic of the acute form of the disease may be found in almost any grouse picked up dead upon the moors. Prof. Klein described and figured preparations of the lungs of grouse supposed to have died from the acute phase of the disease, in which the vessels are absolutely plugged by bacteria.

"Without doubt," writes Mr. Wilson, the observer "finds in his microscopic sections of similar lungs similar conditions, presumably of similar disease. But to the experienced bacteriologist a doubt occurs whether these plugs of bacteria in the vessels of the lung should not be considered *post-mortem* instead of *ante-mortem* productions; the result of *post-mortem* changes allied to decomposition, rather than to pathological changes due to disease in life. Following this comes another doubt, whether the more gross appearances of disease in the lungs on dissection are not really due to *post-mortem* changes rather than to disease in life. And upon examination of presumably healthy birds after a lesser or greater prolongation of *post-mortem* putrefaction and delay, suspiciously similar appearances in the lungs are certainly observed."

Again, experiment has shown that in a healthy pigeon killed by chloroform the appearances to the naked eye supposed to be characteristic of the acute grouse-disease make themselves noticeable in the lungs after a period sufficient to permit the development of *post-mortem* changes.

Reading between the lines, it seems to us apparent that the experts of the committee are very sceptical whether, in the first place, the acute phase of the disease really exists, and, in the second, if it be existent, whether it is of a pneumonic character. They do not, however, apparently "like to bet till they know."

To revert to the chronic phase, its place of origin and mode of dispersal are points to which special attention has been directed by the committee, but considerable difficulties have been experienced in these respects owing to the very natural reluctance of owners and keepers to report the occurrence of disease unless it is widely spread in their district.

One fact the committee considers to have been indisputably established, namely, the intimate connection existing between the food-supply and the health of the grouse, or, in other words, the fact that the capacity of the birds to resist the attacks of the intestinal worms depends mainly upon their physical condition and general fitness. Owners and keepers have for years been convinced of cycles of maximum and minimum development of grouse-disease. Records from various estates extending over a period of more than half a century indicate that the cycle comprises a good year, a very good year, the record year, the bad year, the recovery year, the average, and the good average year.

A regular sequence of events, culminating in an over-stock, a consequent shortage of food, the appearance of disease, and a sweeping of the moor, occurs in the rare cases where disease follows a bad year. Examination will, however, often show either that in such cases the effect of a previous outbreak had not passed away, or that exceptional conditions had reduced the food-yield of the moor to less than usual. Again, the exceptional occurrence of several consecutive good years may be attributed to a better heather-crop, through improved management, or to open winters or early springs which have allowed a larger stock of birds to be maintained.

The theory that disease is due to the consumption of frosted-heather is refuted by the fact that heather in this condition is never eaten by grouse. Investigation has shown that grouse have to do all they know in the way of eating in order to maintain themselves in condition, especially in winter and spring; consequently any food-shortage at the two latter seasons is bound to result in ill-effects. Further, it has been observed that the mortality among hen-birds is most noticeable in late summer, perhaps induced by shortage of food during the nesting-season.

As regards remedial measures, nothing really definite can be suggested until much deeper investigation has been made into the life-history of the grouse thread-worm—investigations to which Mr. Shipley is devoting his best attention.

As contributory measures to the checking of the disease, attention is, however, directed to the importance of proper estate-management, in the matter of heather-burning, the supply of grit of proper quality for the birds to eat, the draining of the ground, and last, but not least, the killing off of weakly birds —"cheapers"—which cannot but give rise to a poor and ill-nourished progeny.

In conclusion, we desire to offer to the committee and the experts by whom they are assisted, our congratulations as to the admirable and exhaustive manner in which this very difficult inquiry and investigation has thus far been conducted.

R. L.

THE INTERNATIONAL GEOGRAPHICAL CONGRESS AT GENEVA.

THE ninth International Geographical Congress was opened at Geneva on July 27, and the business portion of the proceedings came to an end on August 6. It is only possible here to give a brief sketch of the subjects discussed and resolutions adopted.

As regards the general intention and meaning of the congress, it may be assumed that that somewhat vague word geography is usually taken to denote a group of studies connected with the influence of the surface features of the earth on the human race. But, if the proceedings of the congress may be taken as a guide, this aspect of geography has no very full recognition. By far the most prominent discussions and papers were those dealing with mathematical geography, cartography and allied subjects, and those treating of physical geography. The latter subject was chiefly in the hands of the geologists; indeed, it is hard to imagine anyone but a geologist doing useful work in this field. It might almost be said that geography, in the opinion of the average geographer, as deduced from the proceedings of the International Congress, is mainly the concern of surveyors and geologists. Geography in this sense is earth-knowledge; its chief function is to determine and explain the shape of the earth, the positions, forms, and characters of its surface features, and, so far as may be, to predict future surface changes.

Of the 232 papers of which the programme was composed, 124 dealt with physical geography, survey, exploration, and kindred subjects; 11 with rules and nomenclature; 14 with the teaching of geography. Meteorology accounted for 15, biology for 10, anthropology for 14, historical geography for 15, and economic and social geography for 26. The sectional meetings in some of the last-mentioned subjects were not well attended.

At the opening session a paper of considerable historical interest, entitled the "Circumnavigation of Africa under Necho II.," was read by M. A. Moret,