unsolicited confession of Major Weir, who was burned as a witch at Edinburgh in 1670. The evidence on this point would not be strong in itself, if it were not fully in keeping with Miss Murray's view of the witch-ritual. As is well known the central features of the Sabbath were a feast and sexual licence. This suggests inevitably that it was a fertility rite of the type familiar to anthropologists. It was only at a later date, and in the first instance by popular perversion that the function of the witch became the blasting of crops and herds as set forth in the famous Bull of Innocent VIII.

Many other topics are discussed in this important study which are of the greatest interest to anthropologists, and it bristles with points which call for further consideration did space allow. It has, however, one aspect to which reference must be made, and that is its bearing upon mediæval history. From this point of view it is a book which no historian or student can afford to neglect. The position of the Church and its relation to witchcraft before the beginning of the fifteenth century must be reconsidered first in the light of Miss Murray's conclusions and, secondly, with reference to the numerical strength the cult could command as an organisation—a point upon which Miss Murray does not touch.

The Riddle of Bird Migration.

Die Rätzel des Vogelzuges. Ihre Lösung auf experimentellem Wege durch Aeronautik, Aviatik und Vogelberingung. Von F. von Lucanus. Pp. viii+226. (Langensalza: H. Beyer und Söhne (Beyer und Mann), 1922.) 30 marks.

THE migration of birds remains one of the most tangled problems, as it is one of the greatest marvels of the zoologist's world. In the old days known facts were few and hypotheses were correspondingly simple (and as a rule erroneous), but with multiplicity of data, theories, guesses and suggestions have so increased in number and complexity that they form in themselves a new problem for the seeker after truth. In the matter of precision of data the present generation holds a great advantage over its predecessors.

The institution of bird-ringing in Denmark by Mortensen in 1899, and its subsequent development in Germany by Thienemann and others, and in this country by the University of Aberdeen and Mr. Witherby, raised hopes of an early solution of many difficulties; while the development of air-craft and of their use in bird-watching, in which von Lucanus himself was a pioneer, has led to information which appeared once to be beyond man's grasp.

In the light of the results of these new methods, von Lucanus restates the problems of the origin and causes of migration, of its direction, height and speed, of its meteorological relations, and, most subtle of all, of the pathfinding of the birds, and re-examines the solutions which have been suggested. It may be said at once that there are here many new facts, and that in many respects the work of the former generation of observers has been superseded; but with it all, the reader is left with the feeling that while precision has been gained in problems of observation, the great problems of interpretation remain still beyond ken. Time after time the author is driven back for explanation upon an incomprehensible "migratory instinct" or "impulse" (Zugtrieb). Thus, having rejected, on account of their inadequacy as imminent causes of autumn migration, the fall of temperature, the shortening of the day, the lack of food, the changed atmospheric conditions due to the passing of the summer solstice, he concludes, "a bird departs as soon as the time for its departure has come and the migratory impulse has been awakened, without requiring any particular external stimulus.' Or again, having found tradition, warmer zones, anticyclonic conditions, wind guidance, a supposed magnetic sense, power of vision, each and all insufficient to account for the orientation of a bird's migratory flights, he says, "on its journey a bird requires no particular guidance, but follows an instinct which decides the direction automatically."

Von Lucanus has long been recognised as the champion of migration at comparatively low levels in the air, as against the idea of high-level migration which Gätke made popular. Many observations by airmen have been added to his early balloon observations, and he still regards the general height of migration to be under 400 metres, and flight at 1000 metres or over to be exceptional. Many records support his view, but conflicting evidence involves us in difficulties, for the author makes no mention of the observations of such of our airmen as Capt. Collingwood Ingram, who saw a flock of five hundred geese or ducks at about 11,500 feet, cranes (possibly) at 15,000 feet, birds resembling linnets at 10,000 feet, sandpipers at 12,000 feet, and so on. (*Ibis*, 1919, p. 321-5.)

The riddle of migration is not solved, but this volume, rich in observations and analyses, gives an excellent synopsis of the present state of knowledge, and points the way for future research. We may express the hope that the German bird-watching stations, disorganised owing to post-war conditions in Germany, may soon be able to resume their activities and add to the vast contributions they have already made to a fascinating study.

J. RITCHIE.