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History in Science

SPEAKING at Oxford a few days ago in connexion with the celebration of the 250th anniversary of the Old Ashmolean, Sir Frederick Gowland Hopkins, president of the Royal Society, made a strong plea for increased attention to the history of science in secondary schools and universities in Great Britain. He suggested that

"the history of science—the history of the gradual development of the fundamental ideas and conceptions, perhaps its effect upon civilisation—might form the subject of school teaching and take the place of the purely technical teaching of science which the schools at present give. That would turn out not only men who are going to take up science as a career, but the right sort of teaching would give that sympathy with and understanding of science which we would fain have in our public men and in our citizens generally."

Two main ideas seem to be expressed in Sir Frederick Hopkins' words—one that the usual science teaching in schools is too specialised for the educational equipment of the rank and file the other, that historical aspects of scientific achievement and progress afford a suitable means of creating interest in them without technical details. Both propositions have been given much consideration in recent years, and the results are to be found in various reports as well as in modern textbooks, a number of which are now available providing courses of general or everyday science, while others, dealing with specific branches of science, devote much more attention to the historical side than was formerly done.

These developments are all to the good and represent a reaction against the type of school science which seemed to assume that every pupil was to become a chemist, physicist or engineer. For the rank and file of pupils in secondary schools, who will not in most cases proceed to scientific careers, something more is needed than laboratory training in scientific method, and it can be found in descriptive lessons and reading on everyday applications of scientific discovery, such as are exemplified in industrial history, on the establishment of great principles, and on many interesting aspects presented by the broad field of natural fact and phenomena.

On account of pressure of school examination requirements, there are practical difficulties in making the science course extensive as well as intensive, but a way to overcome them is indicated in a report on "The School Certificate Examina-

tion" which was the subject of an article in these columns of February 18 last. The recommendation made in this report was that every candidate who presents himself in science in the School Certificate examination should take an obligatory paper covering an extensive field, of a general scientific knowledge character, and should take, in addition, special papers on physics or chemistry or biology, but if these three papers are taken then the candidate can be excused the general science paper. It is greatly to be hoped that the university authorities responsible for the conduct of School Certificate examinations will give serious consideration to this scheme and will introduce syllabuses which will encourage its adoption in schools.

In a general science course of the kind contemplated, the history of science would, however, only be incidental. The main aim would be to encourage intelligent interest in the objects and manifestations of Nature and the endeavours of men of science to understand and use them. The place of history in the development of a particular branch of science is another matter. Precise knowledge of the subject itself is required to understand the significance of the steps by which particular discoveries have been reached, and such details are inappropriate to a general science course.

Fifteen years ago, when Sir. J. J. Thomson was president of the Royal Society, he presided over a Government committee which produced a valuable report on "The Position of Natural Science in the Educational System of Great Britain". Among the chief recommendations of that committee was one on the importance of increased attention to the history of science. It was suggested that such courses are particularly suitable for students not specialising in science, and that they should deal, not only with the history of specific branches of science of general interest, but also with the development of scientific ideas, the lives and work of scientific men, the bearing of scientific inventions on industrial progress, and the method and philosophy of science historically treated. Among the subjects which come appropriately under one or other of these heads are historical considerations of the development of views on the constitution of matter; the conservation of energy; the doctrine of evolution; methods of transport by land, water, and air; means of communication, such as telegraphy, telephones, broadcasting; methods of lighting; and the schools of thought represented by Aristotle, Archimedes, Galileo and Newton, as well as the work of Pasteur, Lister, Faraday, Darwin and Mendel and other experimental philosophers. Courses of this kind give special opportunities to teachers who combine some knowledge of history with a knowledge of science, and they appeal to students with historical tastes.

Many science teachers to-day realise the value of courses in which the humanising aspects of history and biography are combined with the practical study by which the meaning of experimental method is appreciated. It is, however, one thing to point out the stepping stones which have been the path of scientific progress in a particular subject and another to show the bearing of discoveries upon the advance of civilisation. To the student of chemistry the relative contributions of Priestley and Lavoisier to the discovery of oxygen and its bearing on the phlogiston theory are of interest and importance, but in human history the discovery itself is not so significant as the use of oxygen in medicine, aviation and the arts.

The history of science may, indeed, be approached from two points of view. It may be regarded purely as growth of knowledge of natural objects and phenomena along the corridors of time, or it may be viewed selectively according to its influence upon social and economic conditions. Hitherto these two provinces have been surveyed by different groups of students, and only occasionally have the qualities required for the effective description of both been possessed by a single worker. The result is that we have on one hand histories of astronomy, chemistry, biology, and other branches of natural science, none of which discusses the relation of the knowledge to social conditions or effects, and on the other hand histories of countries and periods giving scant attention to scientific genius and its influence upon human life and institutions.

What is wanted is a closer co-ordination of these separate points of view in works on general history. No one now supposes that a descriptive catalogue of kings and the intrigues of their courts and governments constitutes the history of a country. The determining factors in social development may be rulers or governments or peoples or scientific knowledge; and the power exerted by these respective influences decides the extent and character of the national or international changes effected. Just as, in mechanical science, work is not considered to be done until the point of application of the force is moved, so history is being made only when the power used produces an effect. Regarded in this way, science in the

history of civilisation becomes a study of scientific causes and human consequences, and not a continuous chronological record of the growth of natural knowledge.

For the education of most young citizens, therefore, whom Sir Frederick Hopkins appears to have in mind, we suggest that what is wanted is not the history of science as such but of its social and industrial influences. "No one," said Comte, "can be really master of any science unless he studies its special history, which again is bound up, at every step, with the general history of humanity." We have often been reminded in recent years of these social and economic contacts; and it is upon them that the chief emphasis should be placed when attention to the history of science is being advocated for students in schools or universities.

Preservation of Wild Life in India

AN appeal made by the Association for the Preservation of Game in the United Provinces of India, in the first report of the Association recently issued (Agra: Hasan Manzil, Shahganj) shows the need for concentrated and swift action in its support. For long years this area of India has suffered heavily; in part from the toll of life taken by sportsmen, and in part by the natives under one pretext or another. It is not only the existence of the larger mammals which is threatened, but also of bird-life, especially of the ducks, which have been, and are being, destroyed by thousands either by shooting or by netting.

The existing close-season regulations are more honoured, we are told, in the breach than in the observance, while the issue of licences to all and sundry is reckless; and these include not merely ordinary firearms but quick-firing and magazine rifles. A plea is urged for a revision of the present system of licensing and an embargo on shooting from motor-cars, over water-holes and salt-licks, and between the hours of sunset and sunrise. It is proposed to reduce the abuses which now exist in licences for the protection of crops. Here, as in Africa and elsewhere, this need for 'protection' has again been advanced for commercial ends.

Having regard to the innumerable devices which exist in the United Provinces for the slaughter of game, there is no occasion for surprise at the note of alarm which has been sounded. In some areas which were once prolific, game has been absolutely wiped out. All good sportsmen, we feel sure, will deplore the state of affairs which now exists, and will join hands with those who are anxious to beat out the fires of destruction before they spread further, for there is still a remnant of a glorious heritage to be saved.

More than this; the members of this Association realise that they are the trustees for posterity. The present generation has no right to slay until the slaying stops for lack of victims. It is their duty to see that this does not happen; and this not so much in order that generations yet unborn may have something left to shoot, but that those who come after us may be able to make amends for our own abuse of the opportunities presented for the right use of this game.

Hitherto, game has been simply exploited, either to serve the ends of 'sport', or of commerce. Of the haunts and habits of these creatures, all that has come to light only suffices to guide those bent on killing to their prey. The tiger knows as much. What is needed is a concentrated study of the various types of game as they live their daily lives, unsuspecting the presence of man. Here we shall find the key to the problems presented by their evolution—what governs their choice of food, and its abundance, what governs their coloration, and their 'behaviour' in varying circumstances, their adjustments to their environment, and a hundred other similar problems.

These aspects in the life-history of game-animals never entered the heads of the older sportsmen: they are beyond the ken of the native *shikaree*. But they will be of vital importance to those who come after us; and we have no right to deprive them of their birthright, merely to satisfy the thirst for securing records, and 'trophies'.

The United Provinces, and the world at large, owe a debt which cannot easily be repaid, to His Excellency the Governor, Sir William Malcolm Hailey, the patron of the Association, and to its founders, the joint honorary secretaries, Major J. Corbett and Mr. Hasan Abid Jafry, who are sparing no efforts not merely to secure the necessary legislation, but also, what is quite as important, to spread a knowledge of the wild-life of India among the rising generation, by propaganda work. The Association seems at present to be the only one of its kind in India, but as conditions in the United Provinces apply also to many other parts of the country, it may be hoped that similar organisations for the preservation of game will be established.