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Science and Human Life.

DISCUSSIONS centring round the application of scientific knowledge to the solution of social problems result too often in generalisations which have no regard to the very different positions in which the physical, biological, and social sciences find themselves to-day. It is a commonplace to say that if science is to be of use, research must be entirely unhampered. Generally speaking, there is nowadays freedom of research in all branches of science, though it can scarcely be supposed that, in countries such as Russia, social scientists are wholly free to investigate the institution of private property and the system of private enterprise.

The situation of the physical, biological, and social sciences is thus much the same so far as pure research is concerned. When, however, we come to consider the application of scientific knowledge, the situation is very different in each case. Where research continues unhampered there arise from time to time opportunities of employing the results of research, and our attitude towards these possibilities may be either scientific or unscientific. By a scientific attitude is meant the realisation that what research has disclosed is merely a method of producing with a greater or less degree of certainty a particular result. Methods themselves are neither good nor bad. Questions of value do not arise at this point, but only when we go on to consider the effect of the employment of these methods upon those persons who use or are in any way touched by the methods. Methods of mass production either do or do not result in greater productivity. This is a problem preliminary to and wholly separate from the question of the moral effect of mass production upon the workers.

So far as the physical sciences are concerned, we are no longer in the mood to regard aeroplanes as 'unnatural' or flying as 'impious.' Here the scientific attitude is in fact general. The social sciences stand at the opposite pole and there is as yet little sign of the emergence of the scientific attitude. Divorce, nationalisation, and capitalism are held to be good or bad in themselves; they may be worshipped or regarded as the evil one barely if at all disguised. The biological sciences occupy a midway position. Prof. Julian Huxley,<sup>1</sup> in his lecture on "Biology and Human Life" delivered before the British Science Guild on

<sup>1</sup> Biology and Human Life. Norman Lockyer Lecture, 1926, by Prof. J. S. Huxley. (London: British Science Guild, 1926.) 1s.

Nov. 22 last, discusses the use of the results of biological research in relation to health, quantity, and quality of population. The consideration of health raises the question of the use of vaccines, of the quantity of population that of contraceptive methods, of the quality of population that of controlled breeding.

No one at all well acquainted with popular discussions of these matters could claim that the scientific attitude is predominant. It is probably growing. It does not, however, seem to be more prominent in certain of the groups, social, religious, or political, into which the population is divided than in others. People regarded by others or regarding themselves as possessing 'advanced' views do not seem to be remarkable for their scientific outlook as defined here. A recognised leader of advanced political thought recently described inoculation as 'unclean.' This is equivalent to thinking that the taking of a census is a wicked act displeasing to Providence, and likely to be visited by an 'epidemic distemper,' as widely held in the eighteenth century. There are passages in Mr. H. G. Wells's "World of William Clissold" which suggest that he regarded birth control as an excellent thing in itself—precisely the same error the other way round.

Just as it cannot be said that people of certain religious views or of particular political opinions are more scientific than others in their attitude to the possible use of the results of research, so it does not appear that men of science as a whole are especially remarkable for their power of distinguishing between the efficiency of methods and the reactions upon moral conduct of the employment of the same methods. They are apt to think that because a method is effective it is therefore good.

This statement cannot, however, be made of Prof. Huxley. He does advocate, it is true, the use of contraceptive methods and the control of breeding, but he sees that he must justify his advocacy not merely by observing that problems of the quantity and quality of population present themselves which these methods might solve, but also by a demonstration, so far as it can be given, that the moral effects would be good. It does not seem, in fact, to be difficult to build up a case to show that few scientific methods have ever offered so much opportunity for the unselfish regard for the welfare of others as those which permit us to regulate numbers—which is a necessary precedent to a life of decency in any community—and to go some way at least towards ensuring that the next

generation shall begin life reasonably well endowed with all that makes possible a full and useful existence.

It is thus of primary importance that if, as Prof. Huxley desires, use is to be made of our rapidly increasing biological knowledge, what has here been described as the scientific attitude towards the application of the results of research should become more widespread. It cannot be too strongly urged that those who press upon the public the use of contraceptive methods as admirable in themselves are just as reactionary as their opponents.

If we now leave this point and pass on to consider the knowledge available for dealing with the problems of quantity and quality of population, it is evident that we are better informed regarding methods of controlling quantity than of controlling quality. It is true that much remains to be done in the way of investigating the precise efficacy and incidental results of methods of controlling quantity. But the problem is of far less magnitude than that of quality. Progress can be made by independent research workers, which is by no means the case in some of the most important aspects of the quality problem.

If we are to have adequate methods of dealing with the quality problem, research must be prosecuted in four distinct fields. There is first the problem of the mechanism of heredity, and secondly that of the mode of inheritance of human character. These are problems which the independent investigator can attack. It is unnecessary to refer here to the amazing developments in our knowledge of the mechanism of heredity, which appears to be essentially of the same nature in all organisms. Progress in the second field is of necessity slow because of the impossibility of experiment. The research worker must make the best of such data as are available resulting from the uncontrolled matings of the human species. There is next the third field concerned with the distribution of inherited characters within the population, and the fourth concerned with the change in that distribution. We must know where certain qualities are to be found or, to put it in another way, how far social classes, occupational and economic groups, differ from one another now in respect to these inherited characters, and whether these differences are becoming greater or less.

Within these third and fourth fields the independent research worker is nearly powerless so far as the collection of data is concerned. A very little reflection will show that the efforts of

independent research workers can never alone be expected satisfactorily to elucidate the position. It would be as reasonable to expect the unaided efforts of research workers in economics to obtain a satisfactory review of the trade or income of the country without recourse to government figures of imports, exports, and income tax, as to expect biologists by their own unaided efforts to give us at all full information as to the genetic composition of the population. It follows that adequate guidance cannot be given, even if the will to use it is there, unless government machinery can be set in motion to collect the data. If we have to wait for a government of this degree of enlightenment, a bleak prospect opens out. But encouragement may be obtained if we refer again to the economists. Income statistics are not collected because an enlightened government wishes to keep a watch upon the national income, but because a hard-pressed government has to find money. Economists have to use these data, inadequate as they are, for their own purposes.

There is similarly a possibility of the use by biologists of government data regarding the medical inspection of school children and of official data from the census, for the purpose of elucidating in some detail our biological heritage and the changes which are taking place. The difficulties at present are great, but government machinery exists which, if slightly adapted for this other purpose, would allow an examination to be made of the position and a watch to be kept of changes at least from decade to decade. The most urgent needs are that the medical examination of school children should be standardised in order that the data could be aggregated and the results of one year compared with those of another, and that the questions asked in the census of 1911, which rendered an inquiry into differential fertility possible, be made a permanent feature of the census. At the present time, we can do little more than guess what the position is.

The community must be brought to learn that there is no more fruitful use of communal resources than when applied to keeping a watch upon the biological inheritance of the community. It may or may not be desirable for us to copy Sweden, where a State Institute for Race-Biology has been founded for this purpose. But until ways of accumulating the necessary knowledge are found, we shall not be in a position to take effective steps, as Prof. Huxley desires, to "weed the garden of humanity."

A. M. C.-S.

### Research in Historical Chemistry.

*Studien zur Geschichte der Chemie. Festgabe Edmund O. v. Lippmann zum siebenzigsten Geburtstag.* Dargebracht aus nah und fern und im Auftrage der Deutschen Gesellschaft für Geschichte der Medizin und der Naturwissenschaften herausgegeben von Julius Ruska. Pp. vi + 242. (Berlin: Julius Springer, 1927.) 19.50 gold marks.

THE cause of research in historical chemistry owes much to the work and influence of two men: Marcelin Berthelot in France, and Edmund O. von Lippmann in Germany. It is an interesting coincidence that the approaching celebration, in October next, of the centenary of Berthelot's birth should follow so closely upon a public recognition of von Lippmann's activities in the common field of these two eminent chemists and chemical historians. At the recent jubilee of the Deutsche Gesellschaft für Geschichte der Medizin und der Naturwissenschaften, von Lippmann was awarded the Sudhoff medal for his researches in historical chemistry; the volume under review has now been issued under the auspices of the same society to mark the seventieth birthday of one whom Ruska acclaims in an eloquent dedication as "Meister und Führer" in this field.

It is to be remarked with regret that the volume contains neither a biographical notice of the doyen of chemical historians nor a discussion of his work and its influence on the progress of historical chemistry. Von Lippmann's industry and versatility may be gauged, however, from the accompanying list of 18 books and 159 original papers, etc., published by him since 1878. Among the more familiar book titles are "Geschichte des Zuckers," "Die Chemie der Zuckerarten," "Entstehung und Ausbreitung der Alchemie," and "Zeitafeln zur Geschichte der organischen Chemie"; while the papers contain historical references to such diverse subjects as sugar, the thermometer, aluminium, gunpowder, alchemical poetry, the Ebers papyrus, distillation, alcohol, Petrarch on alchemy, the use of petroleum in the Middle Ages, the name 'Berzelius,' chemistry and technology in Herodotus and in Dante, and so forth.

Apart from the items which have been mentioned, the book consists of a series of twenty-two essays by acknowledged authorities on subjects of special interest in historical chemistry. The contributions, which are arranged chronologically, touch upon the development of chemistry from the Babylonian