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Organic Chemical Research in relation to Industry.

AT the Bristol meeting of the British Association a discussion took place in Section B (Chemistry) on the position of the dyestuffs industry in Great Britain and the effect which the passing of the Dyestuffs Act, ten years ago, has had on the development of the industry and on activities connected therewith. The matter is of importance, because, unless some step is taken to renew the Act, either in its present or in a modified form, it will automatically lapse in December of this year.

Three questions arise in connexion with the working of the Act, and it is upon the answers to these questions that the issue depends. They are :

(1) What was the purpose of the Act ?

(2) Has it achieved that purpose ?

(3) If the answer to (2) is in the affirmative or qualified affirmative, will the lapse of the Act tend to re-establish the conditions which it was enacted to alter ?

In connexion with the first question, it is perhaps well to remember that the Act is an unusual measure, since it prohibits the import of all dyestuffs and intermediate products related thereto unless under licence. Licences are granted by a committee composed of dye-makers and dye-users, with a certain number of neutral members, and are issued in cases where the substances required are not manufactured in Great Britain.

The object of the Act is stated in an announcement made by the Government in 1920, which read as follows : " It is the settled opinion of the Government that for national security it is essential that synthetic colour-making factories should be in existence and be maintained in operation with their staffs of chemists and other experts in this country, and that the equipment should be equal in extent to that of any other possibly hostile nation."

This statement dealt with the subject from the point of view of national security in time of war—a matter of the highest importance, but one that has been stressed so often that no further comment is necessary here. The existence in Great Britain of highly trained chemists in control of plant and equipment of a type readily adaptable to the purpose of the manufacture of munitions of war is, unfortunately, essential until conditions are reached which will render the most elementary precautions unnecessary. Nevertheless, it is clear that the object of the Act was the establishment of a strong industry in connexion with the manufacture of dyestuffs and the intermediate products from which

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they are derived, which would serve as a means for development and progress in times of peace but which would also be available in time of war; for it must be remembered, in the latter connexion, that it is the simplest of operations to utilise, at a moment's notice, the plant and personnel employed in dye and intermediate manufacture for the purpose of producing munitions of war. Moreover, it should be realised that, although not expressly stated, the Act covered and has influenced a far wider field than that it was designed to foster, because many substances dealt with in the fine chemical industry, and in industries dealing with medicinal substances and organic compounds of chemo-therapeutic interest, are either directly or indirectly related to the dyestuffs intermediates and are, therefore, covered by the Act.

The answer to the second question—Has the Act achieved its purpose?—will be found by reference to the record of the meeting of Section B and to an excellent pamphlet just issued by the Association of British Chemical Manufacturers. The latter document deals with the views of the dyestuffs manufacturers on the progress which has been made under the Act of 1920, and although essentially an 'ex parte' statement, is nevertheless so concisely and clearly expressed that opponents to the extension of the Act, if such there be, will have some difficulty in combating the very cogent facts contained therein. The industrial and other difficulties which have militated against the development of the industry are enumerated and the conclusion is reached that, in spite of these, the Act has largely succeeded in achieving its main object, and that, as a consequence, we now have a well-organised, technically efficient, and virile industry. The 1929 production was more than six times that of 1913 by weight, and the home production now provides ninety per cent of the home consumption by weight and seventy-four per cent by value. The conclusion reached is that "while a sound foundation has been laid, and a strong structure is steadily being erected on efficient lines, there is still considerable headway to make before the industry can meet the full requirements of the colour-users, secure its proper share of the export trade, and withstand unaided the intensive foreign competition and price cutting which would result if this Act were allowed to lapse. The removal of the present protection would jeopardise the consummation of the work which it was the object of the Act to achieve." The dye-makers put forward the suggestion that, in order to ensure that no hardship should be placed on the colour-users, the Act should be extended in a

form which will provide that prohibition of imports will only apply where a British maker is prepared to supply an equivalent product at an equal price.

In the summary of conclusion reached by the dye-makers it is stated that "the industry employs a larger proportion of technically-trained men than probably any other manufacturing industry in this country, and its existence is essential for the adequate maintenance of instruction and research in organic chemistry which are vital to our national prosperity and security". In other words, our research schools in organic chemistry are dependent on the industry for the employment of the trained men they produce, and, on the other hand, the industry is dependent on the schools of research for providing the skilled chemists without whom its work would be impossible. Prior to the War, manufacturers in Great Britain did not realise the need for highly trained men for service in the industry. Usually, all that was considered necessary was that a man should have obtained a sound general training in chemistry and allied subjects. It is certain that the pre-War predominance of Germany in scientific manufactures, and the fact that, in this connexion, we were rapidly becoming a nation of merchants, was due to the difference between the methods of training in the two countries. In Germany every chemist received a training in the methods of research, whereas in Great Britain probably ninety per cent of those seeking employment after graduation obtained no such training but entered the industry directly they had finished their course. Of the ten per cent remaining, the greater proportion went abroad to receive further instruction. Nowadays all that is altered.

Manufacturers have come to realise that, whether it is intended to place a man in the works as a process chemist, or whether it is intended that he should, in the first instance, enter the works' research laboratory, it is essential that he should have received at least one if not two years' training in research methods after graduation. It is fashionable in some quarters to disparage the Ph.D. degree, and to doubt the wisdom of the universities which have introduced it. No one who has any knowledge of the working of a large organic research school would do this. The degree is usually conferred after two years' training in research and indicates that the holder has undergone this training. It is a definite hall-mark which manufacturers are beginning to recognise, because they understand that the chemist possessing it has been trained to think. They know that no system of education can supply a student with the technical minutiae of

their manufactures—these can only be provided by them on the spot; but they know full well that a man with a trained mind will pick up those details very much more rapidly and effectively than one without such an advantage.

When the whole field of organic chemical research is envisaged, one realises the vast importance of the subject and the need to prevent any occurrence which may in any way hamper or hinder its development. There are strong schools of research in most of our universities and university colleges, and from these emanates a steady stream of thoroughly trained men which is quickly absorbed into the industry. There is no lack of employment. Indeed, during the past few years the demand has been in excess of the supply and heads of organic research laboratories have often been unable to provide the men asked for. Moreover, the demand is increasing, and this must inevitably be so, because the number of industries based on organic chemistry is increasing and is bound to increase. Closer touch will also be effected between chemical industry and the research laboratories and further schemes will be devised for linking up the two, whereby the great potentiality for investigation and discovery resident in the universities will become available industrially.

It has been suggested that a certain measure of danger underlies the possession by a nation of strong and wealthy industries based on science, in that the best men turned out by the research schools may be attracted, by the offer of larger salaries, to abandon an academic career. If this were so, it would be fatal to the future development of both industry and academic science. If all the best men were attracted to industry, the second-rate men who remained would be unable effectively to control the research schools, which would then no longer be able to turn out first-class men. It is, of course, hopeless to suggest that matters could be adjusted by the universities paying salaries in any way commensurate with those obtainable in industry, but adjustment is certain to be reached by temperament: for in the future, as in the past, there will always be a number of first-class men to whom the 'loaves and fishes' of industry will offer no attraction, and who will be content to carry on research and investigation without any ulterior object. Moreover, there are many men to whom the love of teaching is a thing apart, and it is to these one must look for the adjustment of conditions which, at the present time, do undoubtedly present certain alarming features.

JOCELYN THORPE.

Taking Stock of Rubber.

- (1) *Latex: its Occurrence, Collection, Properties and Technical Applications*. By Dr. Ernst A. Hauser. With Patent Review compiled by Dr. Carl Boehm von Boernegg. Translated by Dr. W. J. Kelly. Pp. 201. (New York: The Chemical Catalog Co., Inc., 1930.) 4 dollars.
- (2) *Handbuch der Kautschukwissenschaft*. Herausgegeben von Prof. K. Memmler. Pp. xxiv + 766 + 10 Tafeln. (Leipzig: S. Hirzel, 1930.) 57.50 gold marks.

SCIENTIFIC investigation of rubber and rubber technology, apart from scattered researches, is a work of the present century. Growth of knowledge has been very rapid in the last decade, parallel with the enormous growth of the rubber planting industry in the East and of the tire industry in America and Europe. The two books under review give a timely and encyclopædic summary of current ideas in the field.

(1) Until a few years ago, latex, outside the producing countries, was only a colloid curiosity, but recent developments in its direct application, for example in the impregnation of textiles and in electro-deposition and dipping processes, have made it one of the most interesting materials in the rubber industry. Dr. Hauser was well fitted to write a monograph on the subject. He has made important contributions to our knowledge of latex, has investigated latex fresh from the tree in the East, and has studied one of the most urgent technical problems (that of latex concentration) intensively and on the works scale. In the result his book is admirably balanced and full of implications for further work. It may be said here, also, that the translation is done in lucid, enjoyable prose.

A historical introduction recalls the earliest patents for the use of latex, taken out in Great Britain by Samuel Peal and Thomas Hancock many years before the time was ripe for their inventions. The story is brought up to the foundation of the plantations from which the modern rubber industry dates. There follow chapters on the most important latex-bearing trees, on the collection of latex, the physical and chemical properties, non-rubber constituents of latex, less important latices, coagulation, evaporation, preservation and shipping, concentration, vulcanisation, and industrial applications. Chapter headings scarcely reveal the wealth of material dealt with in the book. Many difficult problems are critically examined and the text is frequently amplified by exhaustive bibliographies.