PRESIDENTIAL ADDRESS.

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THIS is the first occasion on which the Chemical Society has departed from a custom, which has persisted since its foundation in 1841, namely, that of holding all its official meetings at its premises in London. The opinion has often been expressed that our provincial members do not have a sufficient say in the management of the Society's affairs, and certain alterations of Bye-Laws have recently been made, which materially affect this state of affairs. When the suggestion was made to the Council that every alternate Annual Meeting should be held in the Provinces, it was unanimously accepted and it is by virtue of that decision of the Council that we meet to-day in Manchester.

It seems particularly appropriate that our meeting should be in this Institution and in this lecture theatre; for through the Professors who have taught here and who have also been Presidents of the Chemical Society there are very close ties with us, and I am confident that I may record the most grateful thanks of the Society to the University of Manchester for granting permission for us to assemble here to-day.

The first professor of chemistry in the Owens College was Edward Frankland (1851—1857), who was President of our Society from 1871—1873. For the twenty-nine succeeding years, 1857—1886, he was followed by Henry Enfield Roscoe, who was President of the Chemical Society in 1880—1882. It was my privilege to be one of the later students of Sir Henry Roscoe, and I have often heard him lecture in this room. He was truly a remarkable teacher and one who had a very unusual hold and influence on his students. He was not a polished lecturer from the point of view of delivery, nor because he gave deep-seated discourses into abstruse chemical problems, but he was a lecturer who had the faculty of interesting his students in a marked degree, in consequence of which they became anxious to learn for themselves. That, to my mind, is the essence of real teaching.

Roscoe was followed in 1886 by Harold Baily Dixon, who occupied the Chair for thirty-seven years, namely, until 1923, and who was President of our Society during the period 1909—1911. My main student years were spent under his direction, but since he is here with us to-day, I will only say of him that he is as young as ever,

still hale, hearty, and active. Long may he remain so! There is, however, one very special reason why we may to-day offer him our warmest congratulations, inasmuch as he was elected a Fellow of our Society in 1876 and has therefore attained his Jubilee of Fellowship.

Two other past Presidents of our Society have also been Professors in this University: Professor W. H. Perkin, who was Professor of Organic Chemistry from 1892—1912 and our President for the period 1913—1915, and Sir William Pope, who was Professor of Applied Chemistry from 1905—1908 and our President from 1917—1919. To them also we would express our sincere wishes for long-continued health and activity.

The Co-operation of Science and Industry.

It is a simple economic fact that since this country does not produce a sufficiency of foodstuffs to feed its population, it must manufacture goods and sell these in foreign markets at a profit, in order to purchase the food which is necessary to sustain life. The more the population grows, the more of our manufactured goods must be sold abroad, if our existence is to continue. It follows from this fact that the maintenance of our industries is a national necessity, and they must not only be maintained on the same standard as in the past, but we must always be attempting to reach a higher efficiency, in order to cope with foreign competition. There was a time when Great Britain, as the pioneer of industrial development, could afford to select her own pace and her own methods, for she alone was in the field. The results obtained, largely without the aid of science, were indeed astonishing, but they came as a result of the breaking of new ground. Virgin soil may give wonderful crops for a few years, but to take from it continually and give nothing to it spells, as everyone realises, ruination, and in order to maintain the harvest it is necessary to nurture the soil or to manure it.

British industry worked on virgin soil in the past, and has worked it well-nigh to starvation point, owing to the lack of appreciation of the importance of science generally from the point of view of our national welfare. Numberless examples of the importance of science to industry and to the general welfare of mankind have been and are being constantly brought to our notice, and the years 1914—1918 gave signs that the nation had at last realised that science and scientific method were our only hope. Yet the lesson then apparently learnt seems to have been forgotten, because as a nation we still fail to realise that all real industrial progress is the result of the application of scientific facts and data and that those

who fail to utilise science to the full must inevitably fall behind in the race of nations which is now in progress.

Instead of being, as in the past, almost the only industrial nation, we now realise that other peoples have become industrialists, to whom we have given all our past experience. But they have forged ahead owing to their full appreciation of the possibilities of science in its application to industrial problems; from being the teachers in the past, we have now become pupils, and not very apt or willing pupils at that. We do not seem able to forget our unprecedented and unopposed success in the past; we think the same methods should still lead to success now and in the future, and we waste much precious time in wondering why our industries are not as prosperous as they used to be.

We can scarcely look for more new raw material within the country other than brains, in which respect we have good reason to think that our raw materials are at least equal in quality to those of any other country. Our brains must be used to resuscitate our industrial soil, which must be nurtured or manured, and new scientific facts and data are the nourishment which must be given if industry is to continue to be a profitable undertaking; if we are to be, I will not say as successful as we were in the past, but if we are to hold a place amongst the foremost nations of the world, or if our existence as a nation is to continue.

An anonymous author writes * as follows in the *Round Table* under the heading " British Industry and the Future " :

" It is not only in the actual processes of manufacture that ' science can be used, but in the whole conduct of business, from ' the purchase of raw materials and the distribution of machinery, ' to the training and selection of labour, transport and sales. All ' these problems are more or less solved by a business that pays ' its way, but in too many cases rule of thumb and antiquated ' methods make the yield much poorer than it might be. For ' the higher branches of management there is little or no systematic ' training attempted. . . . In an age of super competition nothing ' but the best-equipped brains will be able to stand the pace. . . . ' Modern industry is as complex and difficult a profession as any. ' Its leaders need as thorough and prolonged an intellectual train- ' ing as the doctor or the lawyer."

If a country can manufacture goods of superior quality, of constant novelty or of exceptionally high performance, at reason-

* Several quotations in this paper are from an article entitled " British Industry and the Future," to be found in the September 1925 number of the *Round Table Review* : also from a pamphlet " What Price Progress ", published by the " Chemical Foundation," New York, 1925.

able prices and keep on doing so, other countries are compelled to buy from it. Science is the modern key to such a situation and new discoveries in science are essential to maintain the industrial position of this country; in fact, science is the sentinel that must be posted at the door of every business house with the main object of preventing loss from want of knowledge. If we look round, surely nothing can bring greater hope to us than the realisation of the many comforts we enjoy as the result of research—electric light, the telephone, the telegraph, wireless, the internal combustion engine, to mention only a few of the more obvious.

But on one point let there be no doubt; although science should bring great hope to all for the future, it gives no hope whatever for less strenuous efforts, but rather the reverse. Science of all taskmasters is the hardest, the most uncompromising, the most severe, punishing relentlessly any slack or slovenly work done in her name and exacting to the uttermost limit faithful and untiring devotion, if she is to reveal her secrets.

It is always interesting to know the opinions of successful men on such matters, and Mr. Filene, an American business magnate, writes in his book, "The Way Out," as follows:

"This period will ultimately witness a ruthless weeding out of 'the businesses that do not go beyond mere price cutting and 'wage slashing. The survivors will be the businesses in which 'waste has been conquered and scientific method introduced."

Again the American wood alcohol industry has recently suffered a severe check as the result of a new scientific discovery, and in commenting on the fact a celebrated American professor of chemistry says:

"American manufacturers have failed, on the whole, to under-'stand the need for research to keep their industries at the front. 'The backwardness of the manufacturer in this respect only reflects 'that of the general public in this country. The principal trouble 'here, in comparison with Germany, France, and England, is that 'we do not appreciate to the same extent the significance of science 'to the present day civilisation. . . . The whole thing will have its 'value if it is appreciated by American manufacturers and the 'public, as an object lesson of our backward-looking attitude 'towards research."

This writer is evidently of opinion that the general appreciation of the importance of research is greater in this country than in America. Although I have no personal knowledge of America, I do not think this can be possible, nor does the writer in the *Round Table* who, in comparing the trade possibilities of this country and America, points to many of the immense initial trade advantages

possessed by America, and then adds : " If, in addition, they obtain a lead in the application of science to industry it is difficult to see how we can hope to compete with them."

It is not only research that is needed in this country, but research on well-ordered and organised lines. If the suggestion made at the first meeting of the British Association had been carried into effect it is probable that the general appreciation of the importance of science in this country would now have been widespread : but as it is, research has been allowed to be carried out by the individual on his own lines and in accordance with his own fancies, without in any way attempting to produce organised effort for the general welfare of the nation; and the pure research worker has been left to himself to become " a member of a priesthood which prides itself on its detachment from worldly things, a priesthood which refuses admission to any who bear the taint of hope of material gain."

Yet despite this splendid isolation of the pure research worker, what a glorious record of important discoveries is his and how much his country might have benefited if some few of them had been put to industrial use here, instead of becoming milestones in the development of foreign industrial capacity.

It was not until 1914 that any real attempt was made to organise the scientific workers of this country, with what results everyone knows and we have to thank some unknown persons whose ideas led, in July, 1915, to the establishment of an Advisory Council to make recommendations and proposals for :

I. Instituting specific researches.

II. Establishing or developing special institutions or departments of existing institutions for the scientific study of problems affecting particular industries and trades.

III. The establishment and award of Research Studentships and Fellowships.

From this suggestion has developed the Government Department of Scientific and Industrial Research, which in the short time it has existed has done more for the organisation of scientific effort than has ever before been done in this country.

Professor Wynne in his Presidential Address last year spoke in no uncertain terms of the benefit which had accrued to research students as the result of research grants made by the Department, and I need not refer further to item III above. Those who are interested in the other activities of the Department will do well to study somewhat carefully its annual report for the year 1924—1925. Under item I above are included such important problems

as researches connected with fuel, building materials, illumination, adhesives, forest products, foods and cold storage, and many others which have been initiated as a result of co-ordination of research in Government Departments by a series of co-ordinating Research Boards. And under item II come the National Physical Laboratory, the newly-established Chemical Laboratory, the Geological Survey and Museum of Practical Geology, the British Museum Laboratory and Industrial Research Associations.

Many of the difficulties of applying science to an industry as a whole were evidently fully appreciated by the Committee of the Privy Council, and under the title "Impediments to Industrial Research" the following words appear in the Report of the Committee for 1915—1916 *:

"Our experience up to the present leads us indeed to think 'that the small scale on which most British industrial firms have 'been planned is one of the principal impediments in the way of 'the organisation of research, with a view to the conduct of those 'long and complicated investigations which are necessary for the 'solution of the fundamental problems lying at the basis of our 'staple industries. What, for instance, is the exact nature and 'constitution of the cotton fibre, of rubber or of the resins? How 'does the structure of an alloy depend on its chemical composition 'and on its mechanical and heat treatment? . . . These are ques-'tions which none but the greatest of individual firms or a big 'combination of firms could venture to attack."

Yet the initial difficulties seem to have been overcome with great skill and Research Associations have been formed by specific industries, on the principle that the Department would provide money in definite proportion to the amount raised by the industry and would continue these grants for five years. In the case of the cotton industry, the subscriptions from the trade are regulated by the number of spindles or looms in a mill or by the declared capital of the company, and are on a unit principle. Since nearly 90 per cent. of all the firms in the industry are members of the Research Association, and also owing largely to generous help which has been afforded by the Cotton Trade War Memorial Fund Committee, the annual income of this Association is for the next four years approximately £54,000. It has therefore been possible to establish laboratories wherein "the fundamental problems lying at the basis" of the industry can be attacked, for which purpose organised and co-operative research is absolutely necessary. It is true that there are many purely botanical, chemical, or physical

* Report of the Committee of the Privy Council for Scientific and Industrial Research for the year 1915–16, page 25.

problems to be solved, but fundamental research directed towards the general advancement of this industry more often than not means the close co-operative efforts of botanist, chemist, and physicist, and where results are forthcoming, further co-operation with technical men and practical works experience become essential.

Undoubtedly, organised research has been carried on in the past by some firms or industries—the results achieved allow us to make this deduction; but the information gained has naturally remained the property of the firms concerned and does not touch the national programme of scientific work. The aim of the Department's scheme is to advance the industry as a whole.

The grants made by the Department were originally for five years, in which time it was hoped that the Associations would have done so much for their trades that further Government help would not be necessary. But the First Report of the Committee of the Privy Council (page 30) contains these words : " The shortest period in which any considerable results can be expected is five years, while results so considerable as to affect the whole industry cannot be looked for in less than ten years' consecutive work." It has now been proved that five years is too short a time in which firmly to establish such an enterprise, which necessitates the selection of a scientific staff, the building of laboratories, and the collection of a library, together with other research facilities. The British Cotton Industry Research Association was founded in 1920, its laboratories were opened in March, 1922, and it is only now, six years after its creation, that the Association is really getting into intimate contact wth the trade, which is recognising that science is capable of rendering assistance. It may appear to some that progress from the point of view of the trade has been slower than it should have been and it is just possible that more work of immediate use to the trade might have resulted, if those responsible for the foundation of the Association had not decided that the large fundamental problems lying at the basis of the industry were to be the main objects of inquiry. But the founders made a wise decision, for although initial advances may have been slow, future progress will be greatly accelerated by the better understanding of these fundamental problems.

The idea of these Research Associations and the plan on which they have been brought into being seem to me to be the only possibility for the general introduction of science and scientific method into some of our large industries, and the work of the Department in this direction is destined to prove of immense value to the trade of this country, indeed it would not appear too much to say that the whole concept is one of the utmost national importance. The

movement must lead ultimately to greater trade efficiency, to the expansion of trade, and to greater employment both of scientific and industrial workers.

Further, the movement has led to the increase of the number of research workers in laboratories connected with individual firms, and will lead to the larger employment of scientists in works, to establish scientific control, and to form the intelligence departments which will search into the results obtained and endeavour to apply them to industrial progress.

But the Department's scheme has none the less been severely criticised, largely by those who are always willing to pour forth destructive criticism, without attempting to supply anything in the nature of a constructive policy.

Sympathy has often been expressed for me in my supposed efforts to divest my surroundings of Departmental red tape, which, as my well-wishers put it, must stifle any freedom of action relative to research. I can only say that I have not encountered any of this flaming cord. Naturally an Association receiving money from public funds must be required to conform to certain rules and regulations, but these have not been in any way irksome, nor have they in the least interfered with research progress. On the other hand, I am glad to have this opportunity of acknowledging the great help which the Association has received from the Department on all and every occasion on which such help has been sought. One of these aids, which is becoming of increasing importance, is the Department's Information Bureau, which not only serves as a clearing house for research information relative to this country, but is taking on a much wider scope.

It has been frequently urged that it is undesirable, not to say wrong, to devote public money to industrial research, which should be supported entirely by the trade concerned. There is, I think, a very good answer to this criticism. Truly successful research is rarely without benefit to mankind at large and one need not do more to emphasise this point than refer to the life work of such a man as Pasteur. As regards industrial research, it may safely be said that the fruits of such research are always for the public benefit. It has been estimated, for example, that the research work of the General Electric Company of America is saving the American nation at least a billion dollars a year in the matter of electric light.

Those industrialists who found research laboratories with the avowed intention of investigating the fundamental problems of their industries, of ascertaining all there is to be known about the materials which they use, do so perhaps mainly in the hope that

their businesses will thereby be expanded, as the result of the introduction of new or the improvement of old materials and processes. They further realise that this must lead to greater employment, both industrial and scientific, for scientifically controlled production means methodically certain production, with less expense of mental effort and therefore more of the latter for devotion to other work. But they take a chance, for no one can assure them that results of value will be obtained in any stated period. When, however, results are forthcoming, the public, which has staked nothing, gets the benefit every time, whether it be in the way of electric light, artificial silk garments, or more skilful medical treatment. Why, then, should not the public contribute to the cost of research from the results of which they benefit so largely?

But no matter how much criticism is levelled at the Department of Scientific and Industrial Research, it still remains a fact that its activities have led to an organised effort to bring science and industry together, an effort which has already been crowned with distinct success and will lead to a great future, if all those interested will look at the movement in the true national spirit and do what they can to support and further it. For in reality it is a distinct step towards the organisation of the immense research power of this country.

If, however, the results of research are to be effectively applied, it is absolutely necessary that industry should meet science at least half-way. It is useless for the industrialist to complain that he does not understand scientific papers and that they must be put into everyday language, so that he *can* understand them. It is not to be expected that every industrialist can be a trained scientist, but he can at least guard himself by employing trained scientists in his business, thus establishing the position of the man of scientific training in industrial management. The position could not be more clearly stated than in the following words of the Prime Minister, when speaking in the House of Commons in the summer of 1925:

"No one will assert that British industry can be saved by science 'alone, but it is none the less true that until scientific methods 'and scientific men can take their place in industry and an equal 'place with the administrator and the financier, British trade will 'never be strong enough or resilient enough to meet the shocks 'that it is bound to meet as the years go by, or to meet the sudden 'and unexpected changes which will always arise in international 'trade."

Reference has just been made to the immense research power possessed by this country. Are there not other ways in which this power can be put to the nation's benefit? Cannot we so organise

ourselves that at all events some portion of this vast research force is utilised in the solution of some of the problems which are vital for our welfare? In foreign countries much of the research energy of the Universities and higher Technical Institutions is directed by the Professor, himself in the closest contact with the heads of some great industry, towards the solving of important technical problems. Immediate solution is not looked for, but gradually a mass of new information is forthcoming, which in very many cases has led to results of the greatest importance, in regard to the elimination of waste, the utilisation of what have been regarded up to the time as waste products, and the discovery of new materials of commercial value. Frequently this means that a young scientist is sent into a works to watch his laboratory experiments gradually translated into manufacturing possibilities and hence the Professor and also the works authorities have opportunity of judging in which direction his future capacity lies, whether solely for pure research or for the application of science to works problems, etc.

Could not funds be found from somewhere to provide for the training in research method of those who are willing to undertake work on one of the many urgent national problems?

Cannot facilities be provided for sending trained men of science at an early point in their industrial career, to study the industrial methods of other countries?

Neither science alone nor industry alone can set any such ideas in motion, it is only by the honest and hearty co-operation of both sides that any success will be gained.

Is there any amongst us who can truthfully say, These are matters which do not interest or affect me and towards the solution of which I can add nothing of value? Surely, as a result of the simple fact with which I opened my remarks, we are all, without exception and no matter what our every-day work is, ultimately dependent for our existence on the success of our great industries, and although there may be some slight indication of trade improvement, the present situation is sufficiently serious to warrant every thinking man making it the principal national thought for the time being.

Someone has said that the Britisher is a confirmed individualist, from which fact his failures and his successes have arisen; but is it not time that we brought ourselves to realise that there is much unselfish and co-operative national work to be done? The never-ending search for new knowledge is the exacting price which must be paid for survival under modern industrial conditions.

There is another important aspect of the situation which I should like to consider for a few moments: as a teacher, or at all events one who, if not active at the present, has spent a large portion of

his life in the teaching of chemistry, I would ask if we are satisfied that we are doing all in our power to train up a body of young chemists, who will be able to fill the openings which industrial life offers and will in future offer always in increasing numbers, provided we continue to progress. I have given much consideration to this question, especially during the past six years, and I am bound to say that I do not think a wholly positive answer can be returned to the question. One often hears it urged as a serious fault of British manufacturers trading in foreign markets that they supply goods which they " think should be required " by the said markets without troubling to ascertain whether the purchasers have any tastes, desires, or special requirements of their own or whether their natural surroundings render desirable modification of goods made for this country, whereas our competitors do make the necessary inquiries and are constantly reaping the benefit. I rather think the same accusation might legitimately be brought against the teachers of chemistry in this country, who might be considered to be providing chemists who have had the training which the teachers " think should be required " by industry, without troubling to inquire whether industry has any special needs of its own, whether industrial surroundings demand special consideration, or whether one industry differs in its requirements from another. It is granted that such inquiries would demand more than a bowing acquaintance with any special industry. Is it not, however, the duty of the teacher to make such inquiries as equally, in my opinion, it is the duty of the industrialist to make known his requirements to the teaching profession ?

It needs but little consideration of the question to reveal the fact that industry requires chemists with broadly differing lines of training, according to the special branch they are going to take up. To my mind, our present training is much too stereotyped, leading to the production of one type of man only. The system produces many extraordinarily good men of this type, but it leaves out of consideration the fact that there are many differing types of men who are not all capable of showing their best qualities as a result of one set method of training.

Take, for example, the industry with which I am connected, namely, the cotton industry; here the chemist has to deal with a biological entity, and if he has not had a training in some biological subject and cannot think from the biological standpoint, much of his time and of his employers' time will be wasted, for it is hopeless to look upon the cotton hair as a definite " substance " from the chemist's point of view.

Among the various types of chemists required by industry is

the research worker pure and simple, who will be free to devote his abilities solely to the advancement of knowledge and who need not of necessity have any business qualifications or adaptability for applying his knowledge to industrial problems. He may be the true specialist in some branch of his science.

A second type of chemist, quite as rare as the true research worker, quite as important in industry, and yet possessing an entirely different outlook of mind, is the man who can apply new scientific data to industrial development and can convert laboratory experiments into industrial operations. Then there is the process chemist, whose duty is not the furtherance of abstract knowledge, but the careful scientific control of works processes. He again is a most important type, for there are few industries in which better technical results could not be obtained by more careful scientific control. One of the main requirements from such a man is his capacity to do, or to supervise, accurate analytical work, requiring frequently a high order of attainment as an analyst, a qualification not always demanded by our present examination system. As a fourth type may be mentioned the chemical engineer, probably more wanted in this country than any of the other types.

Now, are we doing our best for our future chemists or for industry by putting them all, together with future school and university teachers, through the same courses of study? Personally I do not think that we are. I shall probably be met by the criticism that there is only one chemistry and therefore there can be but one way of teaching it. Here I disagree, because I feel that the present system leads to the production of narrow specialists, who have not a wide outlook on science generally. In most chemistry schools, especially those of the newer universities, the Honours chemistry course extends over three years, and although classes in physics and mathematics may be a part of the curriculum, this does not of necessity imply any real absorption of these sciences. I am a firm believer in a broad general training in, say, three sciences before the student proceeds to specialise in any one of them; the system, in fact, which used to prevail in the University of London and is still in vogue in a few of our Universities.

Moreover, I do not think the present method of examination is giving us the desired information about candidates or is enabling them to realise what is before them in the future. Far too much is expected from them in the way of book work and far too little in the way of accurate straightforward chemical manipulative skill. Here is what a friend wrote to me the other day, when calling my attention to a really capable young chemist: "My recommendation

is only based upon the possibility of your happening to need a pair of well-trained and capable hands, backed by a mind that is naturally endowed with the scientific curiosity which leads to research. I dare say that, like myself, you have often found that sound scientific training and even brilliant chemical knowledge is sometimes acquired in a University, without the acquisition of any ability to use the hands for sound accurate quantitative work, partly because in some of the University laboratories the value of manipulative skill is not appreciated, and partly because nowadays such an immense amount of theoretical work has to be crowded into the college course that there is little time for the humble utilitarianism of routine analytical operations, though the accurate acquisition of facts is not less important than the projection and co-ordination of the inquiry on which they bear."

I agree with these sentiments entirely and can say with certainty that much has been done to make industry sceptical of the value of trained chemists by the fact that Universities have sent out into the world as first class honours graduates men who could write reams on ill-digested facts concerning molecules, atoms, and sub-atoms, but who had no competency whatever for conducting a straightforward piece of ordinary analytical work. By all means let us give our students a good theoretical grounding and, provided this foundation is sound and on broad lines, the good men will be able to build for themselves upon it, in accordance with the necessities of their future occupations.

I could not attempt to trace here the training that a chemical engineer should be put through, but I do think that everyone going into industry should at all events have some slight knowledge of the subject. Might it not reasonably be made a third subject for a pass degree? I do not by this mean to imply that such a training would be adequate for anyone who wished to become a full-fledged chemical engineer, but it would at all events help a young man going into industry to bridge over the chasm, which exists at present, between the laboratory and works operations. I have often seen a look of astonishment and blank dismay come over the face of a young chemist when he has been shown for the first time a working drawing of a piece of chemical plant. There is certainly no reason why every future industrial chemist should not be taught sufficient of machine drawing and design to enable him to read these drawings with ease.

It must, of course, be granted that there is much, very much, concerning industrial chemistry which cannot be taught in University laboratories and can only be learnt in the works itself, but I think it should be possible, with more co-operation between industrialists

and teachers, to make the learning considerably easier than it is at present.

If it be admitted that our training of future industrial chemists is not all that could be desired, can the blame for this state of things be placed on the teachers only? This question can undoubtedly be answered by an unqualified negative, and others may be asked, for example, What have industrialists done to co-operate with the teaching profession in the training of young chemists? Have industrialists offered any slight advantages to students during their training, or have they in any way made clear their wants, and have they helped as far as possible in making their wants practical possibilities? It would appear that little has been done in any of these directions, and the idea is still prevalent among many industrialists that "the young man who grows up with the business will acquire all the knowledge he needs."

In these circumstances it is an encouraging pleasure to record the fact that the Managing Director of the British Dyestuffs Corporation forwarded in July, 1925, for the information of your President, a copy of a letter which had been addressed to Professors at the various Universities, pointing out that the progress of the synthetic organic chemical industry in Britain depends so largely on the achievements of British chemists, both within and without the industry, and is a matter of such national importance that the most sympathetic co-operation is necessary between the Universities, Technical Schools, and the industry. The letter then invites co-operation in several ways, such as advising the Corporation of likely students for research departments or works processes; giving early notice of laboratory researches likely to have an industrial application; allowing students to carry out researches in conjunction with the Corporation, etc. Finally came the information that the question of permitting a limited number of students to gain works experience with the Corporation during the long vacation was receiving sympathetic consideration, so sympathetic, in fact, that the suggestion materialised and I believe some fifteen students were given, during the summer vacation of 1925, the opportunity of acquiring knowledge in the works of the British Dyestuffs Corporation. The result from the students' point of view was an unqualified success and can scarcely have been a failure from the point of view of the Corporation, since this body is again granting similar facilities to students this summer. The warm thanks of all interested in the training of industrial chemists may be given to the Corporation for this example of the co-operation which is so greatly needed, and for so definitely disproving what in the past was frequently stated to be an impossibility, owing to the dis-

organisation of works practice that it would cause, and also to the danger of works secrets leaking out. If such difficulties have arisen in the present case, it is obvious that the Corporation is willing to face them in view of the importance of the whole question.

In his address last year Professor Wynne directed attention to the desirability of such experience being made possible for students, and stated that in Sheffield the problem had been faced and solved, since it is now the custom for intending graduates in Metallurgy to spend part of the long vacation in certain of the steel works in Sheffield, to be welcomed there and to be placed under foremen to do such work as may be suggested. Now we have the proof that such a state of affairs is not an impossibility in chemical works, and it is to be hoped that the important example set by the British Dyestuffs Corporation will be largely followed by other firms.

Much has been heard recently of the necessity of co-operation between employer and employed, but there is at least as much need for co-operation between business men and teaching institutions regarding educational matters. No one can afford in the interest of our national welfare to say that he has no interests in education, for it is an essential part of the life-work of everyone.

This nation possesses, in addition to others, two most powerful assets which individually have reached great heights. I refer to practical industrial experience and scientific research capacity. If these two forces can be linked together, if the exponents of each can be brought into intimate contact and will in every way possible heartily co-operate with one another, then there is no reason to be pessimistic about the future, for the possibilities such a co-operation opens out are unlimited.

And now, in conclusion, I would express to the Officers, Council, and Fellows of the Society my great appreciation of their kindness to me during my term of office and my deep regret that I have not been able to complete the usual period of two years. I can only say that my interest in the Society has not waned and that I hope in the future to be able still to be of service to the Society.

I should like to add a very special word of thanks to the permanent officials of the Society with whom I have now worked uninterruptedly for 21 years: to Mr. Carr and to Mr. Clifford my sincere thanks are due for the willing and pleasurable way in which they have co-operated with me: and I should also like to thank Sergeant Holland for the share which he has taken in helping me with the work of the Society.