A Half-Century of Chemistry in America: 1876–1926.

IN commemoration of its fiftieth anniversary, the American Chemical Society has issued a "golden jubilee number" under the above title. In the earlier part an account is given of the origin and development of the Society. Four of the first chapters in the section are written by original members: I. on The Priestley Centennial, by Samuel A. Goldschmidt; II. on The Organisation of the Society, by William H. Nichols; III. on The Evolution of the Society, by Frank Wigglesworth Clarke; IV. on The First General Meeting and the First Local Section, by Charles E. Munroe; V. on The Activities of the Society, by Dr. Parsons, the Secretary. Part 2 consists of articles on progress in various branches of chemistry in America—Mineral Chemistry being discussed by Edgar F. Smith; Physical, by Wilder D. Bancroft; Inorganic, by James Lewis Howe; Organic, by Treat B. Johnson; Agricultural, by Charles A. Browne; Industrial, by Charles E. Munroe; The Chemistry of Physiology and Nutrition, by Graham Lusk; Chemical Education, by Samuel R. Powers. The Society is to be congratulated upon the issue of a historical volume full of interest, containing not a little that is informative to chemists generally.

The first important chemical meeting of a national character to be held in the United States was the Priestley Centennial celebrated at Northumberland, Pennsylvania, on August 1, 1874. The Society owes its origin largely to influences then set in action. To-day, it numbers little short of 15,000 members. At first, the Society held monthly meetings in New York but the best American contributions to chemistry were not published in its journal and the Society had little more than a local existence. Other societies were established. The need of uniting the several existing organisations as local sections of a national society was not fully realised until 1891. The change was gradually effected and the present constitution came into force in April 1901. At first, the reorganised society had four local sections. Others were soon organised and now the sections number seventy, fairly covering the whole area of the United States. The sections hold their own meetings but general meetings, for the transaction of general business, are held twice a year.

The Society publishes three journals: *The Journal of the American Chemical Society*, *Chemical Abstracts* and *Industrial and Engineering Chemistry*: the first accommodates the academic, the last the industrial element. The United States is far in advance of Great Britain in the way in which the interests of chemists have been consolidated, especially is it to be congratulated upon having established and maintained a firm union between science and practice. With us cliques and chaos reign and receive almost monthly additions; the interests are in no way co-ordinated and there is constant overlapping and great waste of energy and funds: the consequence is, chemistry has no acknowledged place in the State, whilst in America it is not only publicly recognised but even regarded with respect and highly valued by the commercial class. Our Chemical Society is now a positive danger as it is supposed to be representative of the subject generally, whilst, in effect, it is but the preserve of a narrow academic clique, aloof from the world. On the other hand, the Society of Chemical Industry does not sufficiently represent the higher industrial interests. Here there is no bond of social union, as chemists acknowledge no leadership: our subject has yet to rank socially. No mere *Corner House* will give it status.

The American Society has done much to consolidate publication but still allows the separate publication of a *Journal of Physical Chemistry*, which it even patronises. There is no reason why this should be continued. It has recently instituted a new publication, *Chemical Reviews*, but on the 'penny-wise, pound-foolish' plan of not paying contributors; this is not supplied to its members. Under strong editorship, such a journal might well be made an invaluable asset—nothing is more in need of encouragement at the present time, than the writing of considered, critical scientific essays—thus far, the journal has contained useful but usually limp, monographic surveys. Chemists have yet to learn to put their thoughts into satisfactory essay form. The Society has also undertaken the issue of *Book Monographs*. The enterprise is one of extreme difficulty. Men with sufficient experience and literary ability, who will study a subject until they have mastered it and then deal with it critically, dispassionately and judicially, are scarcely to be found.

The American Society began to publish *Abstracts* in 1907. Our Society's activity in this direction dates back to 1872. There never should have been two such publications *in English*. A real effort *was* made, on both sides, to institute a joint publication, but adverse influences in Britain, the narrow outlook of a few leading members of the Society of Chemical Industry, made this impossible. The magnitude of the enterprise grows daily; the number of abstracts published by the American Society in 1918 was 13,357, whilst in 1925 it was 26,426. The average length of the abstract has been reduced from 0·251 of a page in 1917 to 0·190 in 1922.

There is little to choose between the two publications, except that the English abstracts are at least readable, whilst often the American are not, on account of the contractions used. The American survey of the literature is probably the more nearly complete. To-day, neither is much more than a subject index and the sooner we recognise this and so treat the work, the better it will be.

Having been an abstractor at the beginning and being able to overlook an even longer period than that covered by the English enterprise, I am of opinion that the gross effect of the publication of abstracts has been greatly to the detriment of chemistry. In my early days, we read everything as it appeared: many of us bought at least the leading English and foreign journals. We were, therefore, constantly learning and constantly kept in training: the voices of the master-workers were continually in our ears. To-day, very few read and scarcely any one maintains a library. Students and even workers glance through this or that section of the abstracts, just as they skim *Tit-Bits* in the train. 'Tit-bitry,' in fact, prevails everywhere, the

art of reading is uncultivated and all but unknown, the whole chemist is a fast disappearing species, the 'bit-o-chemist' will soon be sole survivor. As of Cock Robin, we may ask—"And what will the chemist be worth then, poor thing?" To-day, already, he can scarcely be hired. Abstracting and examining together are killing chemistry as a science and preventing the upgrowth of men of real worth. Our younger generation cannot even appreciate its own work, cannot criticise, because it is not sufficiently informed and is being 'trained' on unscientific, dogmatic lines.

The *Journal of Industrial and Engineering Chemistry*, we are told, is the one journal of the American Chemical Society which is financially remunerative, yielding through its advertisements a net income of approximately 70,000 dollars a year: this has enabled the Society to publish at a reduced cost to its members the Journal and Abstracts. Everyone knows its taking 'get-up'—the area and mass of polished china clay to be handled. Obviously it is highly attractive to advertisers but has it any special value for industrial and scientific workers? Might it not, with advantage, be less loosely strung together and more compact in form? Yes! but then it would not appeal to advertisers—our *Blue Bits*, we know, is not specially attractive to the class. Ought not we to face this problem squarely, in the interests of our science—whether pure or applied? Surely, in a country like the U.S.A., a country of high ideals, a country of untold resources with a vast superabundant wealth, a country which can spend millions upon 'the pictures' (the industry ranks fourth), it should be possible to find the 20,000*l.* a year necessary to enable the corporation which represents chemistry to dispense with advertisements. Chemistry being the science of life, the science underlying all earthly, if not heavenly change, advertisements are no more in place in its journals than in a Family Bible. Surely, we may say to America and to ourselves in lesser degree, *Schäme Dich*! at such failure to recognise what is owing to our *science*! To what better purpose could a multi-millionaire wishing to save his soul devote his fortune than to the endowment of a great organisation charged with the publication of the considered results of real chemical inquiry by English-speaking peoples? That the English and the Americans are destined some day to work together in this direction cannot be doubted. The task is not difficult: given the will! given a few leaders!

It is disappointing that these and similar problems should not have been considered by the Americans in their survey of progress. Much will happen during the next fifty years but dare we hope that, at their centenary, they will be able to come forward and paint chemistry as a pure religion? There is nothing in the chapter on chemical education to show that such is their aim. In America, as here, leaders are called for to fashion higher ideals.

Turning to the reviews of progress, that on mineral chemistry by the veteran Edgar F. Smith, whose worn-out Göttingen degree was returned to him replated at the meeting in Philadelphia, is specially interesting, inasmuch as he chiefly portrays the activities of five past presidents, all remarkable men, Frederic Augustus Genth, J. Lawrence Smith, T. Sterry Hunt—with whom he links Wolcott Gibbs—William Francis Hillebrand and Frank Wigglesworth Clarke. Essentially, the essay is an appeal for greater attention to mineral chemistry.

Wilder D. Bancroft follows with a rambling essay, without any clear, logical, underlying *leitmotif*, in which the *Impresario* plays the veritable 'bull in the china shop of physical chemistry' to perfection—little is left unbroken. Recognising this, apparently, and the need of glue to mend things, he ends by asking for two new institutes of colloid chemistry. To comfort us he quotes a leading American chemist as saying—

> Physical chemistry exists no longer. The men who have been called physical chemists have developed a large number of useful methods by which the concrete problems of inorganic chemistry, organic chemistry, biochemistry and technical chemistry may be attacked. As the applications of these methods grow more numerous, it becomes increasingly difficult to adhere to our older classification.

It will be interesting to "Kahlenberg in America and Traube in Germany," as it is to "H. E. Armstrong in England" to be told that they are members of a Triptych: "three irreconcilables who do not believe at all in the electrolytic dissociation theory" and that whilst "they have not accomplished what they set out to do, they are not likely to." The only interpretation I can give of this cryptic statement is, that we set out hoping to find an intelligent appreciation and interpretation of the facts of chemistry and are now persuaded that such is non-existent. Still, there is hope for the sinner that repenteth, as follows:

> It is easy enough to point to one factor which has been neglected practically completely and which may be the one which has caused most—and perhaps all—of our difficulties. For years H. E. Armstrong in England has chided the physical chemists for considering water only as water, whereas it is a complex and variable mixture. This criticism seems well founded; but, unfortunately, Armstrong has never succeeded in showing what could be done with his idea and consequently the idea has been valueless hitherto.

To have an American 'high priest' admit that water has been left out of account is certainly amusing. The gibe is proof of the thesis I have long advocated that publication in the *Proceedings of the Royal Society* is a form of decent burial. However, Bancroft is evidently 'reading some' and perhaps, having swallowed the water-complex in this age of prohibition, will ultimately come to realise what are the essentials of chemical change. It is pitiable that we should have wandered these fifty years past in the wilderness of doubt on such a subject. I await the day when he will call out—

> O ——, speak no more:
> Thou turn'st mine eyes into my very soul
> And there I see such black and grained spots
> As will not leave their tinct.

In the remaining essays, a rapid survey is given of American contributions; we all know these to have been of consequence in many fields and it is interesting to be reminded of particular cases, to be led to think back to work such as that done by Morley and Richards, by Michel, by Osborne, by Franklin, by Gomberg. What

is missing from all the essays, however, is the attempt to assess the value of chemical study in its various branches. That chemical discovery has contributed greatly to public and industrial welfare is beyond question. What, however, has been done, what is being done, to make the study of mental and moral value? Is not its value for all purposes steadily diminishing under the influence of examinations and the degree-hunger? Instead of being severely trained in scientific method and the worship of truth, the student to-day is taught didactically and dogmatically and 'faith' now plays as great if not a greater part in science than it does in religion. The 'research' work for the degree, for the most part, is mere exercise work, the equivalent of figuring out an untried example in the mathematical primer: there is no element of imagination or discovery in it. The teacher dare not set a task of difficulty of doubtful outcome. We talk ecstatically of the great increase in the number of papers published in our journals but the work, in large part, is of no real scientific merit or value. Much of it were better left unpublished.

The pursuit of science is necessarily an anti-human practice as it involves an all but impossible self-abnegation and a modesty which is more than rare. Let us admit that publication is largely a matter of personal advertisement: we shall then realise what is desirable in the interests of scientific altruism.

Problems such as these are in sore need of attention in Britain and America, if the faith of our forefathers is to be justified. Science to-day is as much in danger as is religion—there is a lack of morality behind it as there is behind religion—it is being overcome by the democracy of ignorance, by our failure to recognise that it is probably only attainable by the few, by the lack of discipline owing to lack of leadership. The American Jubilee proceedings are particularly disappointing in this respect. Chemists are in no way alive to the greatness of the subject of which they are guardians. HENRY E. ARMSTRONG.

The Cretaceous Plants of Greenland.[1]

IT was a noteworthy event in the annals of the University of Cambridge when a Master of a College undertook a successful expedition to Arctic regions shortly before becoming Vice-chancellor, and the publication of the scientific results of the expedition must also be described as an important event. For the significance of this work goes beyond the confines of palæobotany and geology into the regions of cosmic history. A knowledge of the plants which grew in Greenland in the far past provides, within certain limits, good evidence as to the former climate of the region, and so provides data for the study of secular climatic changes. This paper concerns the evolution of plants and the evolution of climate.

It has long been known that the remains of abundant vegetation are found in high latitudes. These are not merely fragments of plants which have been drifted by ocean currents far from their place of origin, but, as Prof. Seward has shown, may be accompanied by beds containing remains of roots and rhizomes *in situ*. In one place a great mass of remains of the fern Gleichenia indicates a district covered with this bramble-fern, while at another locality the abundance of conifer leaves reminded Heer of the carpet of fir-needles in a modern forest.

The Cretaceous plants of Greenland are of especial interest because the majority are allied to plants now living. It has been assumed that the Cretaceous forms grew under climatic conditions closely approximating to those under which their modern representatives grow to-day. Prof. Seward points out, however, that as times have changed in the world the plants themselves have in all probability changed in their relations to external factors. But no conclusions can be drawn without a thoroughly sound knowledge of all the forms making up the flora. Hitherto our information has been mainly based on the determinations of the famous Swiss palæobotanist, Oswald Heer, but his work belongs to an epoch when fossil species were established somewhat less critically than to-day. Seward has had the heavy task of working through Heer's results and reducing them to data which will satisfy modern requirements. A part of this critical review recently appeared in the jubilee volume of the Geological Society of Belgium, and it is here completed.

The list of species now given is very different from that of Heer, for many of his specimens were found to be too fragmentary or too badly preserved for reference even to their genera, while other remains of leaves were referred to modern genera on quite inadequate grounds. The names of many modern genera have therefore disappeared from the list, while others have been altered to indicate that leaves of the form possessed by certain modern genera were present, though their actual identity with these genera is not yet proved; for example, some leaves previously called Magnolia are now called Magnoliæphyllum. But while the author is very cautious in attributing fossil-leaf impressions to modern genera, he considers that many of them belong to modern families, and, after considering the distribution of some of these, he comes to the unquestionable conclusion that the fossils point to an Arctic environment very different from that of to-day. From the study of the chief forms he infers that "the climate of Greenland in Cretaceous times was probably comparable with that of Southern Europe to-day. Genera that are now characteristic members of tropical floras, the floras which are in part legacies from the Cretaceous age, were then represented by species less sensitive than their modern descendants to external factors."

The importance of these conclusions is that the changes in temperature needed to enable such a flora to live at high latitudes is not great. A freer interchange between the Arctic Ocean and the tropical oceans might be quite sufficient to allow the growth of the flora described, in the absence of the Greenland ice-sheet. There is no need to postulate considerable movements of the pole.

On the evidence of fossils, the view has been widely maintained that during the Mesozoic period the climate

[1] "The Cretaceous Plant-Bearing Rocks of Western Greenland," by A. C. Seward, *Phil. Trans. Royal Society*, Ser. B, vol. 215, pp. 57-175. London, 1926.