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## ORGANIZATION OF CHEMISTS IN THE UNITED STATES<sup>1</sup>

IN consultation with fellows of the institute who have solicited this address, I find an expectation that, since I have chanced to be associated with the beginnings of several of these organizations and participated at several of the critical stages in their development, I shall be somewhat reminiscent and the address more or less of the nature of a narrative. However, the topic assigned me covers a period much antecedent to my appearance in my present state of existence, but fortunately this field was carefully and completely covered by Dr. H. Carrington Bolton, noted historian and bibliographer of chemistry, lecturer on the history of chemistry at the George Washington University during the last decade of the nineteenth century, and, who, besides his monumental works on chemical bibliography, was author of that graphic story of alchemy and the alchemists, entitled, "The Follies of Science at the Court of Rudolph II."

Bolton presented the results of his researches at a meeting of the Washington Chemical Society on April 6, 1897, under the title, "Early American chemical societies,"<sup>2</sup> while at the 25th anniversary meeting of the American Society, he dealt with the "Chemical societies of the nineteenth century,"<sup>3</sup> and thus supplied material for comparisons as to date of formation, rate of development, and the like, between domestic and foreign societies. In his first paper, Dr. Bolton records three societies, viz., the Chemical Society of Philadelphia, founded in 1792; the Columbian Chemical Society of Philadelphia, founded in 1811, and the Delaware Chemical and Geological Society, organized at Delhi, Delaware County, New York, September 6, 1821. The information Dr. Bolton was able to collect regarding these organizations was meager and his paper consists largely of brief biographical notes of members, showing chiefly that, at the time, such chemical activity and interest in chemistry as existed was largely confined to the medical profession. In conning these names, one notes that several of the more active of the members, like Dr. Robert Hare and Professor James Cutbush, have

<sup>1</sup> Address delivered April 6, 1925, at the annual banquet of the American Institute of Chemists.

<sup>2</sup> *J. Am. Chem. Soc.*, Vol. 19, pp. 719-732 (1897).

<sup>3</sup> Report of the Twenty-fifth Anniversary of the American Chemical Society, April 12 and 13, 1901. Supplement to *J. Am. Chem. Soc.*, pp. 21-35 (1902). This list has been brought down to 1924, by E. Emmet Reid, on pp. 73-77 of his "Introduction to Organic Research."

since received more complete and well-deserved biographical recognition at the hands of Dr. Edgar F. Smith.

Of these organizations, the first and third appear to have been local, but the Columbian Chemical Society appears, from the names and addresses of members quoted, to have been national in scope. The Chemical Society of Philadelphia appears to have existed for some ten years; the others, probably, for but a shorter time.

The statement "that chemical societies were organized and in operation in the United States of America long before they existed in Europe" is calculated to astonish almost every one, including many chemists, yet this assertion is made by Bolton in his address at the twenty-fifth anniversary of the American Chemical Society, and he proceeds to justify his statement by statistics of some sixty-six chemical societies existing in thirteen different countries. Bolton may really have intended his statement to be singular because in his list he cites the Society for Philosophical Experiments, founded in London in 1794, and the Société d'Arcueil, founded in 1807, but there is some doubt as to whether the former was strictly a chemical society, though it might have emphasized chemistry among other subjects of experiment, while the latter appears to have been a private club, which met at Berthollet's residence at Arcueil, then a village about three miles south of Paris.

Of the undoubted chemical societies, the oldest appears to be the Chemical Society, founded in London in 1841. This was followed by the Chemical Society of Paris, founded in 1857; the German Chemical Society, in 1867, and the Russian Chemical Society, in 1868. There were organizations devoted to industries, such as the sugar industry, which were older than some of these. There were, of course, organizations such as the Royal Society of London, the American Philosophical Society, the American Academy of Sciences, and the like, which embraced chemistry, with a wide variety of other topics, as subjects of investigation and treatment, which were older and some much older, than the Chemical Society of Philadelphia.

Among organizations embracing this catholicity of subjects is the American Association for the Advancement of Science. Founded in 1841, as the Association of American Geologists and Naturalists, it enlarged its scope to cover a wider range of sciences in 1848, and on reorganization adopted its new title. My first contact with the association was at the meeting held in Portland, Maine, August 20 to 26, 1873. At that time the association was organized for scientific meetings into Sections A and B, Section A including mathematics, astronomy, physics, physics of

the globe, chemistry and mechanics, while Section B embraced geology, paleontology, zoology, anthropology and practical science. This meeting was of special significance for several reasons. Thus, measures were inaugurated to ensure the permanent legal existence of the association. The volume of transactions published was much larger than any preceding it, or any succeeding it, up to 1879, when the record of the popular Saratoga meeting was issued. The number of chemists in attendance was unusually large, there having been, according to my count, forty-one chemists present out of a total of 195; that is, the chemists constituted more than one fifth of the membership present, they having been drawn, no doubt, partly by the location and partly by the fact that a highly esteemed chemist, Dr. J. Lawrence Smith, delivered an address as retiring president. But to us this occasion is of particular importance because of the fact that at this meeting the chemists practically formulated a declaration of independence, holding an impromptu meeting for the presentation of informal papers, and the consideration of the organization of a separate sub-section in chemistry, a resolution to this effect being adopted for presentation at the following meeting at Hartford.

It may be of interest to inquire how representative of American chemistry the chemists assembled at Portland were. I have applied some tests, finding seven out of them became presidents of the American Association for the Advancement of Science, twelve members of the National Academy of Sciences and twelve held the position of president of the American Chemical Society, during fourteen years, thus showing they enjoyed the respect and esteem of their fellow chemists in America. I believe the results of any other gage applied would support this conclusion.

It would not be surprising if, at this day, some wonder were expressed as to the reasons which led the chemists assembled at Portland to take the action they did, especially in view of the purposes of the American Association for the Advancement of Science which, as set forth in the first volume of Proceedings, were and still are as follows:

The objects of the association are, by periodical and migratory meetings, to promote intercourse between those who are cultivating science in different parts of the United States; to give a stronger and more general impulse, and a more systematic direction to scientific research in our country; and to procure for the labors of scientific men increased facilities and a wider usefulness.

There can be no doubt that all chemists would readily subscribe to the above and the many chemists who have held membership and fellowship in the

American Association for the Advancement of Science, including those at the Portland meeting, have heartily approved of these objects and earnestly co-operated toward their realization, but it was felt that, in the multitude of topics embraced in Section A, chemistry was somewhat submerged. This was the more true because in the then existing conditions of the sciences, chemistry seemed little related to the others, and it needed fuller and more independent expression to bring it to public attention and comprehension.

Following the recommendation of the chemists, the resolutions adopted by them at the Portland meeting of 1873 were presented at the Hartford meeting of 1874, preparations made for permanent organization of a sub-section in chemistry at future meetings, and Dr. Samuel W. Johnson, who had been present at the Portland meeting, was chosen chairman. The first meeting of the sub-section occurred at Detroit in 1875. Dr. F. W. Clarke, who had been most active at Portland, was chosen secretary, and a resolution was adopted by which it was made "the duty of the chairman of the sub-section of chemistry to prepare an address," thus setting the existing custom of vice-presidential addresses now prevailing at meetings of the American Association for the Advancement of Science, and furnishing another medium by which the public might be reached and informed, while Dr. George F. Barker was chosen chairman and Dr. H. Carrington Bolton secretary for the next meeting to be held at Buffalo in 1876. It is worth notice that both these gentlemen were among those chemists in attendance at Portland, for the record shows that those then present were ready to work toward the realization of the objects then sought and secure for chemistry a wider recognition.

In delivering his address on "The atom and the molecule" at the Buffalo meeting, Dr. Barker made a statement of such significance that both Dr. A. C. Hale, in his "History of the American Chemical Society,"<sup>4</sup> and Dr. Marcus Benjamin, in his "Organization and development of the Chemical Section of the American Association for the Advancement of Science,"<sup>5</sup> refer to it in identical terms as follows:

In beginning his address he alluded to the formation of the American Chemical Society, which he described as an event, "*which is of especial interest to the members of this section*" and in a spirit almost of prophecy said, "*The most agreeable relations exist between the Society and this sub-section. To continue these relations it might be desirable to hold the August Meeting of the Society jointly with that of this sub-section of the American Association.*"

<sup>4</sup> "Twenty-fifth Anniversary," p. 48.

<sup>5</sup> P. 89.

In 1881, the sub-section in chemistry was made a full section and met at Montreal in 1882, as Section C, with Dr. Bolton as vice-president. At the Cleveland meeting in 1888, steps were taken looking to the affiliation of the American Chemical Society and the American Association for the Advancement of Science. This was finally perfected and in 1891, at the Washington meeting, Professor Barker, president of the American Chemical Society, presided over a joint meeting of the two bodies. It was through the chemists that the system of affiliated societies of the American Association for the Advancement of Science, described in *SCIENCE* for April 3, 1925, was originated and put into effect.

An event of special importance to chemistry in this country, and one having a marked influence on the organizing of its chemists, was the "Centennial of Chemistry," held at Northumberland, Pennsylvania, on July 31 and August 1, 1874. This celebration originated in a letter from Dr. H. Carrington Bolton, which was published on page 362 of the *American Chemist* for April, 1874, in which he said: "The year 1774 was rendered memorable by great chemical activity. It is not possible to assign to chemistry any definite birth-year, but so many remarkable discoveries were made in 1774, that we may, with good reason, date the foundation of modern chemical science from that period." He then briefly alluded to the accomplishments in that year by Scheele, Lavoisier, Wiegand, Cadet, Bergman and Comus, ending his rehearsal with, "On the first of August, 1774, Priestly discovered oxygen, the immediate results of which were the overthrow of the time-honored phlogistic theory and the foundation of chemistry on its present basis." He then suggested: "American chemists should meet on the first day of August, 1874, at some pleasant watering-place, to discuss chemical questions, especially the wonderfully rapid progress of chemical science in the past hundred years"; adding, "Centennial celebrations are now in order. The Bostonians have renewed the memories of the Boston Tea Party. Already the country resounds with preparations for a National Centennial in 1876. Why should not chemists meet to enjoy a social reunion in commemoration of events important alike to science and civilization?"

This call promptly met with numerous favorable responses, among them one from Rachel L. Bodley, professor of chemistry in the Woman's Medical College of Pennsylvania, who proposed that "the Centennial gathering be about the grave of Priestly" in Northumberland, Pennsylvania, and that the meetings "be in the quaint little church built by Priestly, where might be exhibited the apparatus devised by the

great scientist, and used in his memorable experiments."

Professor Bodley's suggestion was universally approved and adopted and a most satisfactory meeting was held. It was presided over by Dr. Charles F. Chandler, and seventy-seven chemists, from widely separated parts of the country, were present, fourteen of them being among those present at Portland the previous year. The record of the celebration of the "Centennial of Chemistry" at Northumberland is quite extensive and it covers ninety-five pages of the *American Chemist*, in the August-September and December numbers for 1874. Of special historical interest are "A century's progress in chemical theory," by Dr. T. Sterry Hunt; "A century's progress in industrial chemistry," by Dr. J. Lawrence Smith; and "American contributions to chemistry," by Professor Benjamin Silliman. The last-mentioned address deals with the learned societies; early scientific foundations; the founding of the first professorships of chemistry; journals and periodicals devoted to science; and a list of papers on chemistry published in the United States prior to 1874; together with interesting biographies of the older American chemists.

At the business meeting Professor Persifor Frazer proposed the formation of a chemical society, which should date its origin from the centennial celebration, but this met with opposition on the grounds, by some, "that this country was too large and that it would be impossible to centralize its chemical research," while others, who opposed an independent body, advocated earnest cooperation with the American Association for the Advancement of Science, adding "that, if a National Chemical Society were formed, it should be a permanent section of that body." The outcome was that a resolution was adopted appointing a committee of five, with Dr. Bolton as chairman, to cooperate with the American Association for the Advancement of Science at its next meeting, to the end of establishing a chemical section on a firmer basis. This action was taken at Northumberland on August 1. The permanent sub-section of chemistry of the American Association for the Advancement of Science was organized at Hartford on the twelfth of the same month.

But, as well indicated in Dr. Bolton's original call for the centenary celebration, the national idea was permeating this country. The events of, and those following, the Civil War; the linking up of widely distant states and territories by rail and telegraph; the stand taken with foreign nations; the better comprehension of what this country was and its possibilities, developed a national consciousness, in the seventh decade of the nineteenth century, to even a higher degree than that which prevailed following the

winning of the Revolutionary War, and the establishment of the nation. This growth in national consciousness and of the belief that chemistry could be best advanced by independent self-expression inevitably led to the formation of a national organization of and for chemists, which was realized in the American Chemical Society. This occurred at New York City, where there was a large concentration of chemists, on April 6, 1876, the declared object being, "the encouragement and advancement of chemistry in all its branches."

Although from the outset the larger proportion of members enrolled resided outside of New York City; the presidential office was successively filled by eminent chemists; regular meetings were held; and a journal published for more than a decade, the society led a precarious existence.

By 1889, its membership, which had never exceeded 320, had fallen to 200; dissatisfaction was generally expressed, and a movement was on foot to form another rival organization. A meeting was called to ascertain the causes and the remedies, and the non-resident members were especially urged to present their views. As a result, it was learned that the organization had come to be looked upon as a local New York society with non-resident members, having very little association with it, attached: and the remedies offered were the holding of migratory meetings, by which the society might be brought to its members, and the formation of local sections.

These suggestions were accepted, migratory meetings and local sections provided, and the first meeting planned for Newport, R. I. It was held on August 6 and 7, 1890, and proved most successful. Immediately the chemists of Rhode Island proceeded to effect the formation of a local section, which was chartered in 1891, and to-day it stands first in seniority among the fifty now chartered. The effect of these changes, as reflected in the membership, was at once apparent. In 1891, the membership increased to 300, by 1896 to 1,000; by 1901 to 1,800, while in 1924 it was recorded as 14,400.

The society has grown by accretions and absorptions. It absorbed the Cincinnati Chemical Society in 1891 and the Washington Chemical Society in 1893, the *Journal of Analytical and Applied Chemistry*, the *Review of American Chemical Research*, and the *American Chemical Journal*, the expectations being that every chemist could find all his professional needs met in a single organization, and that by reducing the number of chemical organizations and publications, a marked economy in time, effort and money might be secured for the chemists. This condition actually obtained until about the beginning of this century, when new journals sprang up and new socie-

ties to cultivate special fields in chemistry formed, so that to-day, apart from the foreign chemical societies, having affiliations in this country, I find some ten additional societies for chemists, requiring in addition to initiation fees, yearly dues exceeding one hundred dollars, and issuing some ten journals, which must be read, or searched, in keeping up with the literature. With such development in a little over twenty-five years, one wonders what the condition will be at the end of this century. Evidently there should be an obvious purpose and an unoccupied field to warrant such additional burden being placed on chemists and the community.

The founders of the American Institute of Chemists recognized that as the practice of chemistry spread a need was created for an organization which should represent and promote the profession of chemistry, as the bar and medical association in various countries represent and promote the interests of the practitioners of law and medicine, while protecting the community by the formulation and proclamation of standards governing practice, procedure and professional conduct, and by certification of professional qualifications. The avowed purpose in the creation of the American Chemical Society was "the encouragement and advancement of chemistry in all its branches," and its record testifies that it has most admirably fulfilled the purpose for which it was created, but from the very nature of its organization it is unsuited to perform the functions for which the institute was created and moreover these are wholly foreign to the purpose for which the American Chemical Society was created. Fortunately, these two organizations occupy quite independent fields, complementing one another to the better advancement of chemistry and the chemist and to the better advantage of mankind whom both serve.

CHARLES E. MUNROE

### OCEANIC CIRCULATION<sup>1</sup>

FOR many years past the Museum of Comparative Zoology and the U. S. Bureau of Fisheries have carried on oceanographic explorations in harmonious cooperation; recently in collaboration with the North American Committee on Fisheries Investigations.

Since 1912, the chief field of exploration of this joint enterprise has been the Gulf of Maine, out to the edge of the continent, with the coastal waters to the east, and to the west and south, of that area. Commenced on the schooner *Grampus*, and continued to date on the fisheries steamers *Albatross*, *Halcyon* and *Fish Hawk*, the exploration has resulted in per-

haps as detailed a knowledge of the distribution of temperature and of salinity, regionally, with depth, and with the change of the seasons as can be claimed for any other part of the sea of like area.

A general survey of the plankton, vegetable as well as animal, has also been made. And as its own special province, the Bureau of Fisheries is carrying on a comprehensive study of the biology of the important food fishes, some of the results of which are included in the "Fishes of the Gulf of Maine" (Bulletin, U. S. Bureau of Fisheries, Vol. 40, Part I, 1925).

Besides the Gulf of Maine project, which is a continuing one, explorations of the coast water from Georges Bank to Chesapeake Bay were carried out by the *Grampus* in the warm summer of 1913 and the cold summer of 1916.

The oceanic triangle Chesapeake Bay-Bermuda-Bahamas and the straits of Florida were surveyed oceanographically by the Bureau of Fisheries and the U. S. Coast and Geodetic Survey jointly in the winter of 1914. And in the winter of 1919-1920 observations were taken along the south Atlantic coast and about Cuba by the *Albatross*.

Preliminary statements of the results of these various cruises have appeared in SCIENCE, in the annual reports of the Bureau of Fisheries and in the bulletin of the Museum of Comparative Zoology. A comprehensive account of the oceanography of the Gulf of Maine region nears completion.

During these explorations, it has become increasingly evident that the key to many puzzling phenomena, biologic as well as physical, is to be sought in the circulation of the water on the continental shelf. Problems of special interest are: (1) the extent to which the temperature of the coast water along Nova Scotia and to the southward is influenced by the Polar Stream, popularly known as the Labrador current, on the one hand, and by the so-called "Gulf Stream" on the other; (2) the source of the highly saline water of moderately high temperature which lies on the bottom of the deeper basins on the continental shelf, as, for instance, the Gulf of Maine, and (3) the involuntary drifts of pelagic fish eggs and larvae, and of the plankton.

The circulation of the sea may be studied by indirect methods and by direct; both are being employed.

At the suggestion of the North American Committee on Fisheries Investigation, a comprehensive survey of the surface drifts in Eastern Canadian and United States waters by drift bottles has been carried on by the Bureau of Fisheries and by the Biological Board of Canada since 1922. Some thousands of bottles have been put out along lines calculated either to give cross-sections of known or suspected lines of drift or to delimit the separation between opposite or eddying

<sup>1</sup> Presented at the annual meeting of the American Geophysical Union in Washington, D. C., May 1, 1925.