SCIENCE

VOL. LXVIII OCTOBER 5, 1928 NO. 1762

CONTENTS

SCIENCE: A Weekly Journal devoted to the Advancement of Science, edited by J. McKeen Cattell and published every Friday by

THE SCIENCE PRESS

New York City: Grand Central Terminal.

Lancaster, Pa. Garrison, N. Y.

Annual Subscription, $6.00. Single Copies, 15 Cts.

SCIENCE is the official organ of the American Association for the Advancement of Science. Information regarding membership in the Association may be secured from the office of the permanent secretary, in the Smithsonian Institution Building, Washington, D. C.

CHEMISTRY AND THE AMERICAN CHEMICAL SOCIETY[1]

IN sorting over some old papers recently I came across one to which I should like to make brief reference. If not to point a moral, it may at least furnish the starting point for a tale.

With due apologies for any personal factors involved, the paper in question was in the form of a certificate or receipt, and conveyed the information that the bearer had satisfied the formal requirements and had paid the matriculation and other fees for entrance as a freshman at a midwestern university. The date of the certification was September 18, 1878, and the name certified thereto was my own.

I should like for a moment to assume the rôle of a historian, for reasons that I trust will be evident a little later. I would not have it inferred that my chemical consciousness suddenly and decidedly sprang into full being on that date, or that I have experienced an even fifty years of chemical joys and sorrows. As a matter of fact, I would like to go back more than fifty years and make a very brief survey of science in general in this country. Several reasons may be assigned. There was at that time hardly enough of any one specific science to occupy all of any one's attention. There seemed to be time for consideration of the field of science as a whole. It was not unusual to have a professor of general science who taught everything from astronomy to chemistry, including between those limits such subjects as botany, zoology, geology, physiology and physics, or natural philosophy as it was more commonly called. It is not strange, therefore, that any one leaning a little away from the classics fifty years ago should lean toward science in general rather than to any specific field under that heading. In my own case there were additional reasons for interest along general lines. One of my most beloved instructors was an ardent admirer and disciple of Agassiz, with an infectious zeal born of direct association with him on the Isle of Penikese. Another instructor was at the time, and still holds active leadership as, the greatest authority in this country on birds and fishes. Another was direct from the laboratory of the great Liebig, and was just assuming charge of a department already well organ-

[1] Presidential address delivered at the 76th meeting of the American Chemical Society, Swampscott, Mass., September 16 to 19, 1928.

ized and for some years under the direction of an enthusiastic disciple of Josiah Parsons Cooke, of Harvard.

GENERAL SCIENCE HALF A CENTURY AGO

As already indicated we seemed to have more time in those days. And so it is not illogical if I say a few words about science in general of fifty and more years ago.

Out of the circumstances thus alluded to there is suggested the obvious fact that there was more time for wider interests because none of the fields of science had as yet entered upon that intensive investigational and developmental enlargement which has characterized each one of them in more recent years. And this is a main point which I wish to briefly emphasize.

I have said that there was more time for wider excursions in the general field of science and that this was because the detailed information in any field was relatively meager and not beyond the possibility of a reasonable degree of acquaintance by any one interested in several fields at once. This is simply saying in another way that research and the greatly multiplied and widely distributed investigator had not yet come into existence, though, as a matter of fact, the skyline of the scientific horizon was beginning to take on new and decided characteristics.

Let me set forth a bit of evidence by way of confirmation of this statement. I think it will be agreed that the published material in any field is a correct index of the activity in that field. If the demand for publication space is active, then publication space to meet the demand will develop. Conversely, if there is little demand for publication space, there will be but little publication in evidence. Let us develop this publication weather vane for a moment.

What were the channels of scientific publication fifty years ago? That is a good date from which to view the situation, for in a general way it constitutes a sort of dividing line between the old order and the new.

Previous to the year 1878, one could count the total number of journals published in the general field of science in this country on the fingers of one hand and still have fingers to spare. It will be of interest to name them: *The American Journal of Science and Arts, The Journal of the Franklin Institute* and *The American Naturalist.* We might extend the list to take up the remaining fingers by including the *Journal of the Academy of Natural Science of Philadelphia* and possibly the *Cincinnati Quarterly Journal of Science,* but it does not exaggerate the point I wish to make to limit the count to the first three named, which is, that the investigational activity in the entire field of science fifty years ago was in an elementary or at least in a beginning stage. Even if we were to include a list of such special or annual publications of proceedings of societies, transactions, bulletins and reports of bureaus, we could only augment the count for that period by about twenty.

Allow me to give some further specific illustrations. If we take as an index of a slight advance in the more intensive study of fuels the ultimate analyses of the coals of the country, which had been made up to the year 1878, they would number just about forty all told. What publication medium was open to them? Six of these results were published in the year-book of the board of trustees of the university where the work was carried on, four were included in a bulletin detailing a power test conducted by the engineering department of another university, and thirty were embodied in a report to the United States Government in 1844. This last was a most elaborate and scientific treatise of 600 pages. Ten thousand copies were ordered printed and it was listed as Senate Document No. 386. Outside of ten or twelve of the older and larger libraries of the country I think one would be reasonably safe in offering a substantial prize for the discovery of the existence of copies of this very interesting and valuable report.

Here is another illustration. The very momentous discovery of the bacterial character of certain plant diseases was made in this country during the years 1876 to 1878. Where did it find an outlet for publication? It was first reported in a paper read before a state horticultural society and published in its annual report for 1878. This was followed by a further article printed in the 1880 proceedings of the American Association for the Advancement of Science.

Here is another illustration of quite a different sort, but corroborative of the general proposition that scientific columns were not over numerous, and such as existed were not overcrowded. In the *American Journal of Science and Arts* certain articles occurred in 1819 and in 1824, from which quotations may be of interest. The title is: "A Notice of Col. John Trumbull's Picture of the Declaration of Independence." I quote:

> The painting represents the congress at the moment when the committee advanced to the table of the president to make their report. It contains faithful portraits of all those members who were living when the picture was begun and of all others of whom any authentic representation could be obtained. Of a small number no trace could be discovered and nothing was admitted which was not authentic . . . Col. Trumbull, himself an actor in the great scenes which terminated in the establishment of American Independence, very early conceived the design of preserving the portraits of some of the most distin-

guished men of that period and of transmitting them to posterity in situations in which they were real actors. It is believed that in this picture the United States possesses a treasure to which there is no parallel in the world. In no instance within our knowledge is there an exhibition to an equal extent of the actual portraits of an illustrious assembly concerned in so momentous a transaction.

The president of the congress was John Hancock, and the committee consisted of Jefferson, Adams, Sherman, Livingston and Franklin. Possibly the last name carries with it a scientific flavor sufficient to admit the article to the *Journal of Science* at that time. I repeat again that scientific publication channels, though meager, were fully equal to the demand for space.

But beginning with the time substantially fifty years ago, a remarkable increase in both the number and value of scientific publications is evident. During these years and following, there must have been a phenomenal growth in investigational activities if the multiplication of periodicals can be taken as a criterion. If we foot up the number of scientific periodicals published in this country at the present time, beginning with bacteriology and botany and running through the list to X-rays, the total count, not including trade journals, has advanced from the three or possibly five journals of 1878 to 288 at the present time. If to this we were to add the bulletins that appear from experiment stations, government bureaus and the annual transactions and supplemental publications of scientific societies, it could hardly be an exaggeration to say that this number represents only about one half of the total annual output for the presentation of investigational work for the country as a whole. The real significance of these figures can scarcely be realized.

It is obvious, therefore, that somewhere along about fifty years ago we might very properly draw a dividing line between the old order and the new. It was the starting point of a new period when the investigational type of procedure in all scientific lines was taking on new life and unprecedented activity. While it would be not without interest to continue our general survey down through the more recent years, it would not serve the immediate purpose in hand. These brief historical references, which may seem irrelevant and somewhat divergent from the realm of chemistry, are amply justified, I believe, in so far as they furnish a sort of background from which we can set over in more striking outline the developments in our own field of chemistry.

THE NEW ORDER IN CHEMISTRY

In this new era, therefore, of investigational activity in all scientific lines, it is entirely logical to assume in the very nature of the case that chemistry would be having its share. Let us, therefore, on this general assumption as to the significance of publications take the simple matter of publication space as an index of development in the chemical field. Prior to 1878 there was substantially no medium in this country devoted to the publication of the results of study in the chemical field.

Here again the development of periodicals in this country furnishes an interesting sidelight on the halting progress of chemical development. There was much stuttering before we really found our organs of speech. First, there was the old *Boston Journal of Chemistry,* founded some twelve years previous to the line of demarcation of 1878 which we have somewhat arbitrarily set up. But that journal was rather general in character, announcing that it was devoted to chemistry as applied to medicine, agriculture and the arts, and hardly attained the rank of a chemical journal, leaning more to popular topics than to chemistry. Then came along the idea of reproducing English journals in this country, and from 1867 to 1870 the *London Chemical News* was thus reproduced. This was not satisfactory and was replaced by the *American Chemist,* with C. F. Chandler as editor. In 1884 the same attempt was made with the *London Analyst,* but after a year it also gave up the chemical ghost and became the *New York Analyst* and then the *American Analyst* under the leadership of Henry Lassing. It so continued until 1894 when it became the *Popular Science News of Boston.*

With the organization of the American Chemical Society in April, 1876, a new publication was started, designated as the *Journal of the American Chemical Society,* but for several years it was a very crude mixture of proceedings and papers, the latter consisting of discussions presented at the stated meetings of the so-called society. The first volume was published in 1879. The minutes of the society up to that time had been printed in the news columns of the *American Chemist.*

In April, 1876, there had also been created the chemical section of the New York Academy of Sciences, which was the revamped and renamed New York Lyceum of Natural History, already sixty years old, but then enlarged to include chemistry and physics. The newly organized American Chemical Society, also born in April, 1876, was in fact and in membership nothing more than the chemical section of the New York Academy.

In 1879 Dr. Remsen, presumably not liking the provincial nature of the new venture, started a journal of his own and called it *The American Chemical Journal.*

Probably nothing is more illustrative of the trend at that period than the sporadic attempts to occupy this field of the physical sciences, stimulated no doubt by the activities connected with the World's Fair of 1893, blasted also no doubt by the financial collapse following that event. This is shown in a very graphical manner by the successions and survivals. For example, the old *Boston Journal of Chemistry* became the *Popular Science News,* and this in 1899 became *Popular Science,* under which title it had acquired by absorption or as legatee and otherwise: *The Field and School Naturalist, Health and Home, Health Helper, American Analyst, Minerals, Young Scientist, Industrial Monthly, Technologist, Geographical Magazine, Home Arts, Archaeologist, Youth's Journal, Health Monthly, Natural Science News, Technical Journal, Hall's Journal of Health, Nidologist, The Observer,* and *Natural Science Journal.*

But in the course of time order came out of chaos. The *Journal of the American Chemical Society,* whose first volume was printed in 1879, had attained a size, in the combined volume of proceedings and paper for the year 1884, of 300 pages and a magnitude otherwise indicated by saying that it was just one inch thick.

Some other illuminating items in that volume, No. 6, are worth noting. In the proceedings for February 1, 1884, we read, "As only twelve members were present there was no quorum and eight nominations for membership could not be acted upon," whereupon it was "suggested that Article 8 of the Constitution be amended that the quorum be reduced from 15 to 10 members." The report of the treasurer showed an expenditure for 1883 of $882.21 and the cost of printing the journal was $373.20. And this was the American Chemical Society just forty-four years ago.

But following our publication theme, it may be noted that the peak point of the journal of one inch thick in 1884 reached its minimum dimension in 1889 of a bare one half inch in thickness. From that date an upward trend occurred, possibly due to the rivalry attendant upon the starting of the *Journal of Analytical Chemistry* by Dr. Hart in 1887. This publication, under the title of the *Journal of Analytical and Applied Chemistry* from 1890 to 1893, was merged in the latter year with the *Journal of the American Chemical Society.* By this time the society membership had reached the number of 423. The journal printing bill for the year 1892 was a trifle over $1,000. The secretary received no salary, and the society after fifteen years of quiescence had broken its New York bonds and was actively seeking a status both east and west of the Hudson.

In the intervening thirty-five years, from a membership of a little more than 400, the society has grown to considerably more than 16,000, and from an expense budget of about $2,000 to a sum amounting to approximately $350,000 annually. Moreover, the publications of the society, five in number, are believed to be in their respective fields unsurpassed in any country anywhere in the world to-day.

Now if my line of argument is valid, and I believe it is, this means that investigation and research in this country in chemical science and its technical application command a leading place. Indeed, I doubt if we begin to comprehend the magnitude of the development that has taken place in chemical discovery and achievement and adaptation even in the last ten or fifteen years. It affects every phase of our daily living, in matters of sanitation, of health, of food requirement, of remedial agents, in matters of clothing and art and comfort of living, in transportation and conservation. The chemist and chemical science are now and are coming to be recognized as dominating factors in the promotion of human welfare.

The output of chemical products alone in this country has advanced from an insignificant sum fifty years ago to over $2,000,000,000 annually at the present time. It would be impossible to estimate in addition the enhanced value of other industrial products, the economies effected, the waste utilized, the new things done, and the old things done in a better way as a result of chemical guidance and supervision.

RÔLE OF THE AMERICAN CHEMICAL SOCIETY

And now what is the significance of it all?

(1) There are some factors, traditional and otherwise, which have had, I believe, not a little to do with the success of the American Chemical Society. When it broke over the boundary line of Manhattan and formulated a new constitution in 1891, and in fact became a new society, it emphasized a feature in the new order the value of which few could fully realize at the time. It should not be lost sight of, and from time to time needs restatement. To offset the exclusiveness that had for fifteen years characterized the society, the plan was adopted of establishing sections throughout the country to the end that the membership everywhere might know that they were in truth a part of a great society and had an actual voice in its direction and management. It is the old story of the democratic form of government, the secret and the success of which hinge upon the intelligent use of the powers delegated to the membership as a whole.

I think in this new method the society has very noticeably been free from the domination of the larger sections and has very happily escaped the pitfalls of bureaucracy, a disease that so frequently threatens the health of large organizations. But the same health

needs safeguarding. I believe one of the most potent influences is the simple one of acquaintanceship. In the earlier days there was a tradition that the leaders in the society were peculiarly gifted in their desire to form the acquaintance of the younger, oncoming members. Any young chemist especially who has had the whole-hearted greeting as that of an old friend by such men as Chandler, McMurtrie, John H. Long and the beloved Edgar F. Smith has not only received a feeling of cordiality and genuine friendship, but gained a sense also of a place and real partnership in the affairs of the society. Those who knew Will (Bill) Brady will appreciate the remark he made on one occasion to the effect that he attended the meeting of the American Chemical Society for the good he got out of the corridor sessions. There is real logic and value in this general idea. As we grow larger and more specialized along particular lines it may require new methods of expression. I believe there is great value in those smaller assemblies where the individual is not lost in the crowd, such as regional meetings, symposia, reunions by institutions of fraternal organizations, group dinners and the like. I believe even the visits of the president to the sections, for this reason of acquaintanceship if for no other, have their value and should be made possible of extension.

(2) The phenomenal development in chemical research in the past twenty-five or thirty years has accompanied a phenomenal growth and expansion on the part of the American Chemical Society. This is not a mere coincidence. I believe it can be shown that the greatest single factor in the development of chemistry in this country has been the society. One need only consider the influence naturally resulting from its publications, its general meetings with their crowded programs, sectional and regional meetings, symposia and institutes, to be made readily aware of the tremendous influence emanating from the organization as a whole.

(3) There is no other field of research which has to the same degree the potential contribution to human welfare as the field of chemistry. This needs no elaboration to a group of chemists. This is a chemical age and we live and move and have our physical and physiological being as a result of chemical processes. Whether we travel on foot in chrome-tanned shoes and rayon stockings or roll to work on rubber wheels and concrete roads we travel in comfort by chemical grace and good-will. If we land in the hospital, the chemist has anticipated our coming and is there before us with antiseptics and anesthetics and remedial agents for the relief of suffering and the restoration of health. Indeed, there is no phase of our modern life in which the chemist does not contribute in some form or other directly and substantially to our comfort and happiness.

We admire the work of the engineer—a great bridge, an imposing structure, an impressive skyline—but the skyline of the chemist is to be seen in the advancing status of human welfare, and from the towers and heights of his fabrication shine ever the rays of helpfulness and good-will.

(4) The funds now set aside in this country for scientific research are unprecedented in amount and run into the hundreds of millions of dollars. An analysis of the gifts and the purposes specified for their use affords a striking illustration of the fact that men of great wealth give most freely of their substance to projects that have for their ultimate purpose the bettering of the conditions of human living. The real story of chemistry is just beginning to be told. The real facts of chemical research are just beginning to appear. If the results of the last twenty-five years are impressive and even startling, there can be no other conclusion than that in the very nature of the case the accomplishments of the next twenty-five years will be even more striking and even more profoundly important in their influence over the welfare of men.

Should we not consider the propriety, indeed the desirability, of adding a board of trust or assigning to some well-established trust organization the duty of receiving and safeguarding the contributions and bequests that are certain to fall to the lot of the society? That simple fact would advertise the security of such funds, and in itself invite its use as a repository for funds to be spent along chemical lines. The accruing values would be turned over to the governing board of the society, who would be better able to judge of the most suitable channels or objectives for the wise expenditure of the available funds and best qualified to carry out the wish of the donors. This general plan is already well illustrated by the mechanism just now operative for the handling of the Frasch bequest of $1,000,000, the annual income from which just now becoming available is announced by the trust company named as legatee to be $40,000.

FUTURE OBLIGATIONS OF THE SOCIETY

In brief, does the American Chemical Society catch the significance of the passing days? Is it ready for the larger responsibilities that are certain to fall? Has it a conception of its duty and obligation to itself, to its membership, to the cause of chemistry and its mission, sufficiently comprehensive to move forward in the rôle of leader and guide?

It is not sufficient to be satisfied with commendations for past accomplishments. It is, of course,

heartening that we have come so well up to the duties and opportunities of the years that are behind us. They carry the best promise of competence in solving the problems of the future. My plea is for alertness and that our wisdom be limbered up and burnished a bit so as to be ready beforehand instead of a year or two too late.

This is not the time nor do I wish to assume the rôle of monitor concerning the future policy of the society, but I conceive it to be timely that the problem at least be stated, and with it affirm my supreme confidence in the wisdom and ability of the society to meet its enlarging opportunities and maintain its rank both in leadership and service in the almost inconceivably great and comprehensive cause of chemical accomplishment in the years immediately before us.

S. W. PARR

UNIVERSITY OF ILLINOIS

FRANCIS WELD PEABODY

FRANCIS WELD PEABODY was born in Cambridge, Massachusetts, on the twenty-fourth of November, 1881. Through many generations his family had been prominent in New England and included among its members distinguished and able citizens. His father, long associated with Harvard University, was at one time dean of the Harvard Divinity School. Peabody's early life was spent in Cambridge and in Boston and thus, not only through inheritance, but through environment, he was deeply imbued with many of the finest attributes of the New England character.

As a boy he lived in an atmosphere of culture and in early youth came intimately in contact with older men of intellectual achievement or of brilliancy of mind. He was frequently at the house of William James, where he became a close friend of the family, and it is interesting that the last year of his life was spent in that quiet old house with its spacious library and charming garden where, years before, William James had lived and worked.

Peabody entered Harvard College in 1899 and graduated with honors in 1903. That autumn he entered the Harvard Medical School. Here he proved to be a student of distinction and before the four years of study were completed, he had become interested in research and had found time during the busy days to devote himself to a bacteriological problem relating to typhoid fever. In 1907 he received the degree of doctor of medicine, conferred again with honors, by the Harvard Medical School. The following year, which was spent as interne in the Massachusetts General Hospital, completed the first period of his medical training, and laid the foundation for the future work which he was to carry out with such distinction.

He must now have had a desire to widen his experience in medicine and to enlarge his knowledge of the ways of men and their methods of work. Such an opportunity arose when an offer came to fill the position of assistant resident physician under Dr. Thayer at the Johns Hopkins Hospital. This he accepted and during the following year he devoted his time to the clinic in Baltimore. It was not long before he had endeared himself to all his associates, and was soon regarded with respect by both the junior and senior members of the staff. His unusual ability, his quiet perseverance and his gentle humor attracted many men, who recall now with pride and affection the happy days spent in his company.

At that time Dr. Welch was active in the pathological laboratory and there could be nothing more natural than that Peabody should wish to have a year in the study of pathology, particularly since it could be spent under the direction of Dr. Welch. During the year 1909–10, therefore, he served as fellow in pathology and came in frequent contact with one of the great men in American medicine.

These two years of varied activity were followed by a third year of preparation and study abroad, where now he went to receive training in organic chemistry. Again he chose to work under two eminent masters, Emil Fischer and Fresinius. One can not doubt for an instant the reason for this selection. With unfailing judgment and acute perception he could always recognize the superior qualities of mind in men. He sought invariably the master, and was accepted as the unusual pupil. In the many delightful relationships which he made in this manner there always seemed to be a mutual recognition of ability and an indefinable sense of attraction between the two men.

There was still another reason, however, why Peabody should wish to spend these years in an apprenticeship in medicine. It was becoming apparent that methods hitherto inapplicable to the study of disease in man were rapidly being adapted to this purpose. By chemical procedures, in particular, one could gain new information. Possibly he had some clinical problem in mind which he thought might be solved through chemical investigation. Certainly if this were true he desired to learn the best methods, to come in contact with the best minds, so that he might render the best service to his problem. One sees him actuated by this motive again and again. No effort is spared to elevate the work to a superior level. But as he himself has said, it is always the problem that must come first, the ardent desire to answer a difficult question propounded in the clinic. When unfamiliar methods are required for the solution of this problem, these must be learned under expert tutelage. Peabody has referred to this as the intellectual rather than the technical approach