SCIENCE

VOL. LX SEPTEMBER 26, 1924 No. 1552

CONTENTS

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

THE SCIENCE PRESS

Lancaster, Pa. Garrison, N. Y.
New York City: Grand Central Terminal.
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.

Entered as second-class matter July 18, 1923, at the Post Office at Lancaster, Pa., under the Act of March 3, 1879.

PROSPECTS AND RETROSPECTS[1]

IT is a time-honored custom that, once a year, the president of the American Chemical Society should deliver a "presidential address." As the years roll by, the list of these addresses has become quite formidable and various subjects have been touched upon by my distinguished predecessors. But through many of them runs an ever recurring trend of thought relating to the problems and scope of chemistry in America, from the standpoint of each period at which the different addresses were delivered.

In masterly presentation, in broadness of view, or in confidence in the future of our science, I doubt if any of these addresses have surpassed the first of them all, delivered in 1876 ("Science in America," *J. A. C. S.*, Vol. 1, 1877) by our earliest president, John W. Draper.

In some of these addresses, difficulties were pointed out or doubts were expressed as well as optimistic wishes. To-day, after I have reread every one of them, I find comfort in the fact that the most cherished hopes of earlier years have already become a solid reality.

We may well devote a few minutes to this subject before we touch upon other matters. Our growth has been enormous, nevertheless it was gradual. Even in 1890, after fourteen years of existence, we counted only 256 members. At that time we printed a modest journal, hardly known then outside of the United States. To-day, our membership, approaching 15,000, exceeds by far that of any other chemical society in the world.

The scope and variety of our publications have increased in the same way. Besides our older journal, which now mainly prints subjects concerning purely theoretical research, we have our *Journal of Chemical Abstracts* which since 1906 has made us the only country independent of the heretofore indispensable German *Chemisches Centralblatt.* Then in 1909 we launched our *Industrial and Engineering Chemistry,* particularly devoted to applied chemistry or scientific research related thereto and which lately has been reinforced by its semi-monthly supplement, the "News edition." Nor should we fail to mention the *Chemical Monographs,* published in book form, and the more recent *Chemical Review;* truly a handsome list of publications covering every department of chemistry—and which have acquired such interna-

[1] An address delivered by the president to the members of the American Chemical Society at the September, 1924, meeting, held at Cornell University, Ithaca, New York.

tional importance that no chemical library can be considered complete without them.

I feel no hesitation whatever in making this short survey of our flourishing condition, because I know very well that in this matter I can not assume any personal credit, beyond that which belongs in common to every one of the thousands of devoted members of the past and the present, who have helped to bring our society where it stands to-day.

But I want to put special stress upon the fact that this healthy growth of the American Chemical Society came from within, from the spirit of its own members. We had to rely on our own efforts without any outside help or gifts or subsidies.

If it were not for that inner spirit of cooperation and high purpose, our society could not continue to exist in its present robust condition. With its sixty-nine local sections spread out over the vast territory of our Republic; with its fourteen divisions covering as many special fields in chemistry; with each section, each division, autonomous in action within certain limits, each having its own chairman, we practise a method of decentralization leaving abundant scope for initiative, yet requiring a community of purpose subordinate to a general plan of action. This plan of action is formulated by the council of the society where every section, however small, has its representatives who express and decide the general policy and aims of the society.

The magnitude of the present responsibilities incumbent upon the business management of the society seems rather obvious by the fact that our yearly expenditures amount to about $370,000; more than a thousand dollars every living day. Most of this money is spent on our publications, relatively little on salaries. The details of the expenditures are set forth in our yearly published balance sheet.

The greatest single work of the society has been the dissemination of chemical literature. Our publications are not undertaken for monetary gain so that our main source of revenue still consists in membership dues. Our income and expense accounts balance rather closely at the end of the year and we are compelled to use the interest money of our surplus funds for this purpose. This in itself is quite an achievement which has only been possible by paring expenses and by most devoted business management.

I do not present these statements so that we may rest on our laurels and indulge in self-satisfaction, but so that they might spur us on to further efforts and to new opportunities of service.

Our present resources are becoming too scant to keep pace with the rapidly increasing chemical literature which has to be reported in our *Chemical Abstracts*. The same can be said of our other journals where valuable papers from our members have sometimes to be refused for publication on account of lack of space. Yet the most important purpose of our journals is to publish chemical information. It is quite significant that the greatest increase in our membership dates from the time when we extended this service by the publication of our newer journals. During the latter months plans for securing additional funds have been devised which are now ready to be put into operation.

The American Chemical Society through its members has much helped to develop or to create various industries in this country where chemistry plays an important rôle. It has also contributed in no small measure to extend and to perfect our methods of teaching chemistry in our universities and engineering schools, thus furnishing to the nation an increasing number of men better fitted for the research work and the chemical engineering fundamental to our industries as well as to the development of our science.

The period when Americans were compelled to go abroad to study chemistry has long since passed. It was quite natural that the United States should have had to evolve through the same phase through which Germany had to pass when in 1822 Liebig had to travel to Paris and study chemistry there under Gay-Lussac, Dulong and Thenard. Later on, the disciple became himself a master in his own country. But the great development of chemical science and chemical research which followed in Germany would hardly have been possible but for the new favorable conditions brought about by the early manufacture of synthetic dyes in that country after the original discovery of Perkin in England. The very nature of that new industry put an unprecedented premium on research in organic chemistry. Fame, honors and monetary rewards were the alluring inducements offered to the best available chemical talent in Germany. No wonder then that startling discoveries occurred in rapid succession. The organic chemist had suddenly become more important than the engineer who heretofore had been guiding the destinies of the older well-established soda and acid works. Whether we like to admit it or not, much of the history of science has been shaped by the needs and the outside influences of commerce or industry.

But the importance and the money value of the German dye industry were not the only factors which brought about this result. Some of the men at the head of these chemical industries in Germany were chemists of no mean ability, who by their very training were able to realize how most of their business problems were immediately dependent upon the latest discoveries in science, and who could think as chemists as well as business men, an art not easily acquired.

Nor is it astonishing that not only in Germany but

also in other countries some of the most successful chemical enterprises were mainly owned and directed by men well trained as chemists or as chemical engineers.

Such men succeeded in building up their chemical enterprises with a broader perspective, a greater attempt at permanency and a congenial feeling toward their work. In other words, their business was not merely a means for immediate gain; nor were they ever ready to toss over their holdings in their company to the highest bidder as soon as a better field for money-making presented itself.

I believe that in the future the most permanent chemical enterprises in the United States will be those in which chemists and engineers of ability play a considerable part in the general business policies.

This does not mean that chemical enterprises directed exclusively by men who are chemists but who lack sound judgment or business common sense are likely to be successful. Examples to the contrary make up the endless story of wrecks and unsuccessful ventures in the chemical industries of every country. Some of the most exalted names in chemical science have been connected with such defunct enterprises.

Scientific thought often compels intense concentration on one single subject, one single factor of a many-sided problem. To some scientists that single factor may appear of paramount importance while other equally important factors entering into a practical problem are apt to be underestimated.

Any such one-sided points of view may cause little harm to their author in the publication of a book or of a purely scientific paper, even though sometimes they result in stubborn scientific polemics. Stubbornness in purely scientific points of view is not always easily cured, and sometimes clings like a dogma; but the man of affairs or the industrial chemist who refuses to be taught by his mistakes risks ending in the poor-house.

These considerations, simple as they may be, have not unfrequently been overlooked by men of great erudition and superior intelligence who in their career as teachers or writers or research workers were able to live by themselves in a world confined by their lecture room, their library and their laboratory.

If such men are given opportunities to cut their teeth on some practical problems they may grow to be of decidedly greater service to their science or its applications.

It has been my privilege to live and work amongst every kind of chemist and I have known of very few instances where a chemist exclusively engaged in purely theoretical work did not broaden his conceptions and increase his abilities after he had been given an opportunity to deal with a practical problem. Some of the most distinguished of them only attained their full value as teachers or research men after they had become consultants on problems of applied chemistry which taught them to grapple with hard, real facts instead of basking in the sun of self-satisfying hypothesis.

Far be it from me to urge the teacher of chemistry or the investigator of purely scientific problems to sell his birthright for a mess of pottage. Any one who looks in chemistry for nothing but a means of getting rich has chosen the wrong career. The same efforts would lead him sooner to that goal by following more direct money-making pursuits which do not require such a long and difficult preparation.

All these considerations point to another phase of the great mission of the American Chemical Society, by its drawing together of all chemists in whatever different line of work they may be engaged. Undoubtedly, the present age requires specialists, but the most limited being as man or citizen is the over-specialist.

The gospel of research has now been so well preached in the United States for so many years that to-day no other country spends so much money and effort along these lines in industrial as well as in educational and special research institutions. On the other hand, I wonder whether our efforts towards good teaching, good lecturing on chemical subjects, have not relaxed somewhat. Teachers who captivate their classes and arouse enthusiasm for their subject have never been very common among chemists and, I should add, physicists.

Dull and uninteresting presentation of some of the most inspiring conquests of science occur too frequently. Even in very elementary lectures on chemistry or physics unnecessary recourse is frequently made to exclusively mathematical methods which makes it easier for the teacher, but the lack of visualization, the very spirit of the subject, is often lost upon his hearers. Pasteur, Tyndall, Huxley and Darwin used the simplest possible language when explaining science to the general public. They were not afraid of making science accessible to everybody. If more scientists had followed their example, science might have had a more humanizing effect on the present generation. Many people who glorify themselves in a purely literary or artistic education might have been kept in closer touch with the trend of our modern world. They would have been able to realize that it is idle to dream and think and act in the spirit of past centuries, that it is dangerous to cling exclusively to teachings of the history of long disappeared ages while in our problems of to-day and to-morrow we are confronted with new conditions,

new possibilities so radically different from the life of the past and all created by the developments of scientific investigation and invention. Whether we like to or not, we must adapt ourselves to these newer conditions which also shape our newer duties. If not, we place ourselves in the same dangerous attitude of those Bourbons of whom it is said that "they could not forget anything old and could not be taught anything new."

Science, and chemistry in particular, has been repeatedly reproached for all the horrors of the late war, for all the present unrest, dissatisfaction and—what not? By whom? By the very people who have least tried to grasp the immense strides of our knowledge and the undreamt-of new powers it brings along; by men who have failed to perceive in time the vastly increased responsibilities the new powers involved.

The militarists and politicians who started the European war were steeped in Bourbonism. They knew all the tricks of former wars. If they knew anything, it was the political history of the past. At best they were thinking in terms of the eighteenth century instead of the twentieth. It did not appear obvious to them that the wars of Napoleon were much nearer the conquest of Gaul by the Romans than 1870 was to 1914. Unfortunately, just that class of people ruled the destinies of nations.

If they had been able to contemplate the awesome responsibilities of the present age they might have hesitated starting that conflagration. Chemists certainly did not start nor encourage that war. They were called in only after the conflagration seemed to get beyond control. Some clergymen and some moralists now reproach us for our science—they say that we have not grown up fast enough with our moral responsibilities. Some of them have gone as far as to suggest that we should stop teaching science and research in our schools and that we should find our mental food exclusively in the classic lore of the past. It does not occur to them that theologists and preachers in Germany were amongst the most rabid jingoists. That great educator and philosopher, Dr. Charles W. Eliot ("A Late Harvest," The Atlantic Monthly Press, Boston), writes: "For the last six hundred years the Christian nations have fought oftener and harder than the so-called heathen. Within the past two centuries all the great wars have been fought on Christian soil by Christian soldiers."

After all, the men who belittle science do not appear very different in their attitude from the so-called noble Indians who, proud and blissful in the traditions of their successful tribal wars and their skillful use of bows and arrows, were suddenly confronted with cannon, rifles and gun powder which had come into existence without their knowledge.

We must not overlook that potent factor that our present generation, even in the most civilized countries, is extremely heterogeneous, although all wear the same clothes and externally seem rather alike. The great majority amongst us have been dragged into a civilization into which they do not belong; for which they are not prepared. Under the surface run the thoughts and aspirations of past centuries, an attitude utterly irreconcilable with the new conditions which have arisen in the meantime. This state of mind is bad enough with the average person who meekly realizes his lack of knowledge. It may become supremely dangerous with the man or woman of power who has had a classical college education and who remains unaware that we live in an entirely new world and who stubbornly continues to think and argue in terms of the past.

Our new means of communication and transportation, and the latest engines of destruction, chemical and mechanical, have upset all former conditions of war. At the same time our cities, our industries, our agriculture and our whole modern civilization are all based and organized upon the endless applications of science and are decidedly dependent upon peace. Similar to a delicate watch, one single broken cog will stop it all. Men have quite a different impression about war, according to whether they are in the front line trenches or whether they read about it casually in the newspapers or if they are nicely sheltered in distant cities or live with the staff at general headquarters.

For the first time in history London and Paris had a slight demonstration how bombing airplanes can mock city walls, fortifications, or warships. But these were only some of the merest beginnings amongst the many new tricks which have become available since then.

Any one who is acquainted with later developments of the means of scientific destruction knows very well that the limit has not yet been reached, and that in future wars nobody will find a snug place where he may think he is safe or can escape the consequences. The largest and best protected cities, irrespective of their size or distance, will be continuously exposed to destruction and mutilation. Death and torture of the inhabitants will occur whether they are slumbering in their beds at night or whether they are reading their newspapers in their comfortable clubs or saying their prayers at church. There will be no way of safeguarding women or children or the old or the infirm.

But the remedy to these horrors lies not in stopping the use of chemistry in warfare. Chemistry has been used in war since early ages. Whether it was under the shape of the stinkpots or gunpowder of the Chinese against sword or bow and arrows, or whether it was the twentieth century chemical methods, in every instance the soldiers who were subjected to it at first indignantly protested, until pretty soon they used the same or even more drastic means in return.

The greater remedy seems to be more of a plain generous week-day religion of deeds, rather than a Sunday religion of words; less hypocrisy, haughtiness, lying and suspicion, and more decency and good will amongst peoples, in place of smug pedantic theology.

But do not blame the chemists for what will happen if irresponsible, tactless politicians or writers continue needlessly to arouse the worst feelings in other nations. Pin pricks hurt as much as stabs. But after the harm is committed the chemist as well as the soldier and the sailor has no choice left but to do his part and to help straighten the mess into which they have been drawn by the silliness or boorishness of others.

In the meantime these reproaches recklessly hurled at us should not make us lose faith in the noble purposes of our real mission. At the recent meeting of the British Association for the Advancement of Science, one of Britain's most distinguished physicians stated that every town in the world owes a statue in gratitude to Pasteur, the great French chemist. The rôle of chemistry is essentially constructive; to make this world more comfortable, happier and better to live in, to elevate the human race. Never has our field along these lines been more promising than today. I am not one of those who tends to exaggerate the benefits of chemistry in the creation of thousands of new synthetic dyes except for the enormous fund of new chemical knowledge we have gathered thereby and which has helped immensely in other more valuable directions.

In the meantime our fickle and over-dyed world now seems to have been supplied abundantly enough. Incomparably more promising fields beckon us to better endeavors. Amongst those fields none is more inspiring than that of the biochemist. Biochemistry, one of the younger branches of our science, has been confronted by many handicaps and its progress has been necessarily slow. It is still harassed by great experimental obstacles, but the newer revelations, technique and methods of other departments of science are now being used there to excellent advantage. Lately the study of the chemistry of endocrine glands seems to open the most startling possibilities.

If our predecessors in science scarcely ventured to foresee the realities of the present in what were then called visions or idle dreams, what dreams of the future may we indulge in if the mere chemical functions of some gland may make a man good or bad, strong or feeble, intelligent or stupid, peevish or happy, courageous or cowardly, generous or greedy?

Shall the biochemist become gradually a factor in the elimination of our houses of correction, our poor houses, lunatic asylums, as well as in the organization of our educational institutions? Who knows?

L. H. BAEKELAND

THE NEEDS OF PUBLICATION IN TROPICAL MEDICINE[1]

A CRITICAL survey of all the publications in the world devoted to tropical medicine would be an attractive and desirable achievement, but it is more of a project than I can undertake at present, and instead a few observations are submitted on the records of the English-speaking countries. These records are, of course, only a small part of the expression of creative racial energies in our civilization as a whole. They are of great significance, however, because many social as well as individual failures in the tropics have been due to the neglect or lack of scientific medicine, while many successes can be credited to its cultivation.

Practically all our special records in tropical medicine have been born in the last thirty years. In other words, we are in the midst of a movement and can not fully appreciate just what is going on. The message of science, however, is that man's life on this globe is more or less in his own hands, and it is indicated to see, if possible, in what direction we are traveling.

In view of the proved economic value of scientific medicine in the tropics, it might be thought that adequate avenues of expression would be provided. It might be thought that the recording of the precious workings of consciousness would be a first consideration. Such, however, is not the case. While a good deal has been done along these lines, too often immediate results and financial and administrative factors are given precedence. Scientific records are apt to be the last to be established and the first to feel the cut of economy. For example, it has been reported that some of the medical records of the Panama Canal Zone have been discontinued as not necessary for the operation of the canal. Again, when a study has been made, an author often has difficulty in placing his work. If finally placed, it may be delayed many months in publication and the author may have to share the expense. Many publications are operating on a slender margin, and editors have a difficult time between pressure for reduction of expense, on the one hand, and on the other the demands of the subject for adequate and dignified expression.

What is to be said about this situation? If scientific medicine is really so valuable in tropical civilization, its fruits should be guarded and treasured.

Of course scientific publication, like everything else, must in a measure make its own way in the struggling world. There is a healthful and saving

[1] Read at the International Conference on Health Problems in Tropical America, at Kingston, Jamaica, under auspices of the Medical Department of the United Fruit Company, July 23–31, 1924.