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INTERNATIONAL CHEMISTRY[1]

SCIENTISTS have always been internationally minded. Roger Bacon spent many years in Paris. Copernicus, a native of Poland, lived in several Italian cities. Robert Boyle's winter in Florence appears to have given him his initial interest in science. In the last century, as the result of Liebig's initiative, students from all countries migrated to the chemical laboratories of Germany. In times of peace, at least, seekers for truth have paid little heed to political boundaries but have gone to sit at the feet of the masters, wherever they might happen to be. Moreover, in earlier times the savants of different countries were eager to meet and to hear from one another's lips the descriptions of new discoveries. The Royal Society of London, which was founded in 1660 at the suggestion of a German residing in that city, from the beginning adopted a policy of hospitality to all nations. One of its first fellows was a foreigner, another was the first secretary, and the foreign correspondence of the society led to its well-known journal, the *Philosophical Transactions.*

Time has brought changes. None but the students in backward nations need travel abroad to receive good scientific instruction. A multitude of books and periodicals bring us far more information than any one person has time to read. Strong national organizations have sprung up for science in general, for individual sciences, for specialties in each science. Of these, chemistry has its full share. To-day we are seeking in international intercourse not so much news and instruction, although that still has its place, as some effective means of coordination. It is as if we had built separately, with constant interchange of plans, important scattered units, which still need to be tied together into a common structure.

Briefly, what can international organizations hope to accomplish? It seems to me that their possibilities for good lie chiefly in two directions: first, carrying out projects which smaller organizations can not undertake successfully; and second, promoting a great number of personal contacts between individuals of different countries.

Permit me to sketch for you the main developments in international chemistry in the last forty years. In 1889 an International Congress of Chemistry was held at Paris in connection with the exposition of that

[1] Presented before the Cincinnati Section of the American Chemical Society on March 13, 1929.

year. Three years later, as an outcome of this congress, thirty-four chemists from nine nations met in the Geneva Congress on organic nomenclature. It is interesting to note that but one chemist, Ira Remsen, was appointed from the United States and he could not go. The Geneva Congress adopted a system of names many of which, as methanol, butanone, cyclohexane, are in use to-day.

The series of International Congresses of Applied Chemistry which dated from this period and which were held every three years continued until interrupted by the World War. The eighth and last one took place in New York in 1912; very probably some in this audience attended it. These congresses were brilliant affairs, with many speeches, section meetings and dinners, and the papers read at each one, on all branches of applied chemistry, were published in several thick volumes.

Meanwhile, there was one matter in which the need for uniformity was very strongly felt—the values of the atomic weights of the elements. In 1900 a large international committee on this subject was organized, composed of more than fifty members representing various organizations. These delegated the task of digesting the data and constructing a table of international atomic weights to a committee of four; one from England, one from France, one from Germany and one from the United States. F. W. Clarke was the American member. The table authorized by them was published once a year in the journals and made it possible for chemists the world over to use the same figures in their calculations. The war interrupted this work also, and it has not so far been resumed, although national tables are published.

But the work on atomic weights was very limited, and the triennial congresses were on applied chemistry only. There was a demand for some form of organization that would federate the various chemical societies of the world and enable them to take concerted action on certain matters of common interest. Wilhelm Ostwald, of Germany, and Albin Haller, of France, in conversations together, conceived the idea of an International Association of Chemical Societies. Haller presented the matter before the council of the French Chemical Society, which approved it and submitted it to the German and English societies. The reply was favorable. A little group of delegates from the three societies met on April 25 and 26, 1911, in Paris, founded the association and constituted themselves the first council. Ostwald was elected president. Sir William Ramsay and P. F. Frankland were the British delegates. The object of the association was declared to be to form a bond between the chemical societies of the world in order to deal with questions having a general and international interest for chemistry. The council decided to organize international committees on three subjects: inorganic nomenclature, organic nomenclature and the unification of the symbols for physical constants. There was also talk of the promotion of a universal language, the unification of the sizes of book and journal pages and the publication of a chemical lexicon more complete than any now existing. At the second meeting, held in Berlin in 1912, the chemical societies of Switzerland, the United States, Russia, the Netherlands, Norway and Denmark were represented on the council. The American Chemical Society was represented by W. A. Noyes. The third and last meeting was held in Brussels in 1913. At that time seventeen societies, from fourteen different countries, were members, representing nearly 20,000 chemists. It was announced that Ernest Solvay, the well-known Belgian manufacturer, had made a gift to the association of 250,000 francs, and that he proposed to found an international institute of chemistry, in the government and revenues of which the association would be the principal participant.

The future looked bright. Then came the war, and the new organization, like the triennial congresses, died a violent death. What destruction the world conflict wrought on international science we can realize better in considering the many bonds that chemists alone had established among themselves, the scattered strands of which have not yet been completely reunited.

As throwing light on postwar developments, it may be well for us to take a glance at the nature of the International Association and at what it accomplished during its brief life. Its meetings were not congresses; they were select gatherings. The council might be represented by three delegates only from each country, chosen from one society. The other societies could be represented by one non-voting delegate each. The permanent seat was to be at Brussels, but meetings were to be held in various countries. As to accomplishments, several projects were started but the only one actually realized seems to have been the adoption of a list of international physicochemical symbols. These were published in the report of the meeting of 1913 and in some of the journals, and have found use since—for example, in International Critical Tables.

For the next four years chemists were too busily engaged in attack and defense to think of international cooperation except among allies and through the machinery of their governments for war purposes. But at the very close of the conflict the germ of a new international chemistry came into existence. In October, 1918, delegates from the scientific academies of the allied nations met in London to organize

an International Research Council, the purpose of which was to coordinate international activities in different branches of science and to promote the creation of international associations or unions in the separate sciences where these might seem useful. In November, in London, a reception was given to President Kestner, of the French Society of Industrial Chemistry, at which the idea of an international chemical union among the allied countries was discussed. When, in April of the following year, President Louis, of the Society of Chemical Industry, returned the French visit, a conference was held in Paris, attended by chemists from Belgium, France, Great Britain, Italy and the United States. The last-named country had eleven representatives. A second conference was held in London in July. It seemed natural that the new confederation should take its place in the scheme provided by the International Research Council. Statutes were adopted and officers elected. Charles Moureu, French academician, became president, and Jean Gérard, the efficient secretary of the French Society of Industrial Chemistry, was made general secretary. The seat of the confederation was fixed provisionally as Paris. The scene now changes to Brussels. Haller, president of the old Association of Chemical Societies, having received from his council a referendum vote, declared the association formally dissolved. In its place the International Union of Pure and Applied Chemistry was constituted and Moureu succeeded to Haller's place. The statutes of the union were approved by the International Research Council in the same city six days later.

The union is now nearly nine years old. It held its first meeting in Rome in 1920, and has since met once a year, in the following places: Brussels, Lyons, Cambridge, Copenhagen, Bucarest, Washington, Warsaw and The Hague. At the Hague meeting seventeen nations sent delegations. Bulgaria, first of the nations siding with Germany in the war, was admitted, and invited representatives from Germany, Austria and Soviet Russia were present. The union which originated among the allies is now well on the road toward its goal of complete international representation.

In organization the union differs somewhat from the old association. It requires that a nation, in order to be represented, must first establish a connection among its chemical organizations, either by forming a federation of these or by creating a national council. In the case of the United States, this coordinating agency is the National Research Council, acting through its Division of Chemistry and Chemical Technology. This division appoints the American delegates and councilors. The general assembly of the union is composed of delegations (of not exceeding fifteen members) from each country. The council, which is the actual governing body, is made up of from one to six members from each nation, based on population. The sums payable by the different countries for the support of the union are also graduated according to population. The eight vice-presidents are chosen by the council from its own number, and the president from the vice-presidents. These officers, together with past presidents and the general secretary, constitute what is known as the bureau, to which the executive power of the council is delegated. The office of the union is called the International Office of Chemistry;[2] it is the seat of administration of the union and remains, but still provisionally, in Paris. It functions under direction of the council and is in charge of the secretary.

Like the old association, the International Union seeks to accomplish results largely through different commissions on which the various nations are represented. These commissions are so large, however, that they usually delegate the actual constructive work to small *comités de travail,* or working committees.

Some of the subjects that have been entrusted to commissions are: chemical elements, inorganic nomenclature, organic nomenclature, biochemical nomenclature, chemical literature, chemical standards, analytical reagents, tables of constants, fuels, ceramic products, foods, scientific and industrial property rights and industrial hygiene.

The union is giving modest financial support to two enterprises. The first of these is the "Annual Tables of Constants and Numerical Data, Chemical, Physical, Biological and Technological," which were originated before the war under the auspices of an international committee established by the Sixth Congress of Applied Chemistry, and which are edited by Charles Marie, in Paris. These tables should not be confused with International Critical Tables, as they cover the literature year by year and will serve as annual supplements to the Critical Tables. The other enterprise is the "International Bureau of Physicochemical Standards," conducted under the direction of Jean Timmermans, at Brussels. This bureau has to do with the preparation of standards for thermochemical measurement, refractometry, etc., and the critical study of different constants for various substances. Both these enterprises are being conducted with great ability and are proving their usefulness.

The Commission on Chemical Elements has been authorized to resume the publication of international tables of atomic weights, discontinued during the war.

[2] But see foot-note 3.

The International Union has now been a "going concern" long enough to make possible an appraisal of its value. As an institution it has met with some rather severe criticism. One may very easily note from its organization that the union resembles the old association in being a select body, composed of a limited number of delegates. Attendance upon its meetings has never, I think, even including wives and other guests, reached two hundred. Moreover, the same delegates in many cases attend year after year. Such a structure should and does conduce to efficiency in transacting business, and is certainly delightful for the fortunate persons who thus hold reunions and are entertained together, but it is liable to lose the support and interest of chemists in general. A small deliberative body is no doubt a necessity, but there is also in evidence a decided demand for true international chemical conventions or congresses. The union talked of such a congress at each meeting but did not take any action about it until last year. Such a congress now seems assured for the year 1932, organized at Madrid by the chemists of Spain under the auspices of the union.

Another criticism is that the commissions are not functioning properly. This must have been evident to any one attending the meetings. The commissions are composed of one or more representatives from each of several countries. The chances are excellent that a large majority will be unable to attend the meeting. The president must then appoint substitutes from among the chemists who happen to be present. Most of these are not familiar with the situation. To such a group just about two possibilities present themselves: either to indorse the report of the working committee without change, in which case the commission meeting becomes a rubber stamp; or else to lay themselves open to the danger of being swayed by a special plea or by an argument that has occurred to some one on the spur of the moment. It must be apparent that the real work of the commissions is done by the working committees; if these were to report to their commissions by mail, and secure, first, criticisms and then an approving vote, the procedure would be improved. This is now being done in at least one case.

The subsidiary national committees must also do their part if there is to be satisfactory accomplishment. As one prominent member of the union writes:

> At present there is no effective team work. Each country works alone, or at least with only one or two others, and then when the meetings occur there is no common ground for anything. The question is, How can work be done in the intervals between the meetings, and how can the most effectual cooperation in each country be assured?

The work of the commissions has, in fact, been uneven. Some have considerable accomplishments to which they can point; others very little. The union has been criticized also for not having more scientific papers on its programs. This is to be remedied in the future.

The meeting held last year at The Hague was the liveliest of its history, and some housecleaning was done. President Cohen, concluding his three years' term, pointed out again what seemed to him the weak points of the organization which, as he phrased it, were: "We meet too often, and we make too many reports." Revisions in the statutes were adopted. Hereafter the union will meet only once in two years. The next meeting will be at Liége in 1930, and the following one will be the congress already referred to at Madrid in 1932. The work of the commissions was checked up more rigorously than heretofore. Some were discontinued and others were instructed to reorganize their work. The decisions of the council on international nomenclature, symbols, standards, etc., are to be provisional for one year and the final vote is to be by correspondence.

Those who have attended meetings of the union are not overoptimistic as to what the international body can accomplish in a formal way. They see that international accord is needed on certain matters such as atomic weights, nomenclature, standards, etc., but they also have had some experience of the difficulties that are in the way of achieving positive results. On the whole, however, the effort seems so worth while that many are inclined to persevere. International machinery and cooperation are still in a formative stage and can be greatly improved. Our own chemical division of the National Research Council has recently appointed a committee of four to advise it on ways and means of making American cooperation in the union more effective.

Whatever may be the formal contributions to international accord accomplished by the union, there is no doubt whatever of its indirect benefits in bringing together in social intimacy the chemists of countries from all over the world. One gets a new conception of the universality of our science, he finds friends with common interests from the most diverse countries, he goes home and forever after reads their articles with a new interest, and feels that he can correspond with them on a new basis. It is well to know that these benefits are not to be restricted to the few but are again to be extended, as in the former congresses, to all the chemists who can manage to attend.

The present movement is only in its infancy. Beyond the little projects on which progress has already been made there are dreams for the future. One of

these is the international coordination and distribution of literature. At the Copenhagen meeting of the union in 1924 a Commission of Documentation was created. Outlines have been made and meetings held from time to time. It is now proposed by the commission that a conference of experts be held in Paris to study the question. This conference will have a large and difficult problem to attack. We all realize how large our literature has become and how rapidly it is increasing. We also see the value that has come from establishing, under international auspices, the Annual Tables in France and the Critical Tables in America, and from the encouragement of such series of monographs as those of the American Chemical Society. Indeed, it would seem that at present the most profitable field of international direction or agreement lies in assigning specific tasks to specific countries to supervise and carry out with the assistance of the chemists of other nations. But the dreams do not stop there. Ostwald visioned an international institute of chemistry which should comprise a universal chemical library, indexes of chemical substances, of chemical theories, of chemical history and of individual chemists, an international abstracting bureau, the editing of handbooks and minor works of all sorts, and much more besides. Duplication was to be done away with, unnecessary expense was to be saved, and chemists everywhere were to be provided with the literature that each most needs. We are still far from such a goal and must arrive at it—if it should ever prove practicable in its entirety—with some caution. Too much centralization might conceivably do damage to the enterprises already built up with so much pains and might restrict individual and national initiative. The advantages of centralization can be overemphasized. Several years ago there was an agitation for a centralization of the activities of our own society in New York City. It came to naught because sufficient benefit could not be shown. The office of *Industrial and Engineering Chemistry* is conveniently situated at the seat of government and near the center of chemical industry; *Chemical Abstracts,* on the other hand, finds an advantage in being nearer to the center of the country, where manuscript and proof can move to and from abstractors and editors in the shortest possible time. If an international central bureau were to conduct an abstract journal it would find it difficult to please all its customers, some of whom would want first of all a complete index to the literature and others full abstracts, in some cases with drawings, of the more important articles or patents in their field. Such a journal would find it difficult to maintain a truly international character; abstractors in far-off countries such as America and Japan would cause unwarranted delays, and in the interest of prompt service it might be found necessary eventually to confine the editorial activities to one section of Europe. The distribution of such a journal would also have drawbacks. To furnish an American reader with the abstract of an American article would entail a double delay; and if, to avoid this, the journal were edited and published in two places, duplicate staffs would be needed.[3]

In all that we have said previously the language obstacle has been implicit but scarcely mentioned. The languages recognized by the International Union have been English, French and Italian, to which German has recently been added. These are the four chief languages of chemistry. The Dutch do not get much recognition for their own language because they are excellent linguists and seem to be able to speak all the others. At present all motions, reports, etc., are required to be in French, but there is considerable agitation to place English in the same category and to state all important matters in both languages.

To many of you the notion of an artificial language for universal use as an auxiliary to one's native tongue no doubt seems Utopian, yet I can not resist contrasting in my own mind sessions of the council of the union, in which English had to be translated into French and French into English, sometimes with consequent misunderstandings followed by translations, with the sessions of the International Esperanto Association of Scientists. In the latter gathering scientists of equally diverse countries indulged in lively oratory and spirited debate without a single question, translation or misunderstanding because each one had familiarized himself with one easy common tongue. No nation had a decisive advantage, as is the case when any current natural language is used.

The number of artificial languages that have been invented is legion, but most of them have few adherents. Ostwald was an enthusiast for Ido, an offspring of Esperanto. I have no special plea to make for Esperanto, but confess to a prejudice in its favor on

[3] Since the delivery of the address the author has received a letter, dated March 1, 1929, from Secretary Gérard, which states that it is not intended that the International Office of Chemistry should itself undertake chemical publications, but that it should study the international organization of literature, establish cooperation between the sources of literature production in the different countries, facilitate exchanges and loans of chemical documents between government bodies, universities, learned societies, libraries, etc., and aid in working for the unification of methods. However, M. Gérard calls attention to the fact that in the new regulations of the union there is no mention of the International Office (which has now been constituted independently by diplomatic convention). He also states that the Commission of Documentation has been discontinued.

account of the great lead it has over its competitors. A little conversation has been going the rounds which runs about as follows:

"What is Esperanto?"

"Why, don't you know? It's the universal language."

"Really! Who speaks it?"

"Oh, nobody."

Now, relatively speaking, this is true, but in an absolute sense it is not. It is estimated that about a million people speak Esperanto. A considerable number of European stations broadcast regularly in it. About one hundred periodicals are published in it. Esperanto is officially recognized for telegrams. Chemical articles are being published in it. It is used as a medium of correspondence. Just the other day a professor in the University of Ljubljana, Yugoslavia, wrote to me in Esperanto, asking if I were the inventor of the Patterson X-ray screens, of which he wished samples. I was able to refer him to the Patterson Screen Company of Towanda, Pennsylvania.

Esperanto has its defects and will probably ultimately be improved by international agreement. The International Auxiliary Language Association of New York City is studying the whole question. Its officers report increasing interest in an auxiliary language among scientists, business men and other classes. Why not? Chinese speaking different dialects use Mandarin as a common language. Educated Europeans formerly used Latin in a similar way, but its use was discontinued because it was too inflexible to be adapted to modern speech. It is not at all improbable that in the future our children in all countries may learn an auxiliary language in the schools and that a great many chemical articles, abstracts and books may regularly be published in the same common tongue. If that should come to pass, a great barrier will have been removed.

International intercourse and cooperation in chemistry must increase. If the union proves not to be a fit instrument it will be discarded, but something else will rise in its place. Such interrelations are growing steadily in politics, in commerce, in industry, and it is inevitable that they should do so in science as well. The task is a delicate one, abounding in difficulties, and our technique for handling it is still very faulty. Let us have large patience in working it out.

ANTIOCH COLLEGE AUSTIN M. PATTERSON

THE FORMAL OPENING OF DARWIN'S HOUSE AT DOWN, JUNE 7, 1929

AMERICAN journals from time to time have reported the purchase and restoration of Darwin's home at Down and prior to the coming opening on June 7 it will be interesting to readers of SCIENCE to review part of the statement issued by the British Association:

THE HISTORY OF DOWN[1] HOUSE

It may not be amiss to recount some of the circumstances which led up to the appeal for the preservation of Darwin's home. Some years before his death the late Sir Arthur Shipley, master of Christ's College, Cambridge, where Darwin was an undergraduate, wrote to a member of the British Association as follows: "It seems to me that Down House ought to be a national possession. Do you know of any means by which this can be brought about?" On the eve of the Leeds meeting of the British Association on August 31, 1927, the council of the association considered this matter and empowered the then president (Sir Arthur Keith) to make a public appeal at the close of his presidential address to the assembled association. An urgent S.O.S. was sent out with the happy result which all now know. It was with as much surprise as satisfaction that Sir Arthur Keith learned that the man who answered the call was a fellow of his own college. Indeed, he knew Mr. Buckston Browne as a generous benefactor to that college and to the Harveian Society, but was unaware of his love for Darwin and for Down. It was later that he learned that Darwin's friend Huxley had long ago exerted an abiding influence on the donor of Down.

DARWIN'S ASSOCIATION WITH DOWN HOUSE

Darwin was born at Shrewsbury, February 12, 1809. Down House was purchased for him by his father, Dr. Darwin, and he took up his residence there on September 14, 1842. Darwin was then in his thirty-fourth year; three years previously he had married his cousin, Emma Wedgewood. His two eldest children, William and Anne, were born in London; the third, Mary, was born and died just after arrival at Down. Then followed in 1843 Henrietta, who became Mrs. Litchfield; in 1845 George, who became Sir George Darwin, F.R.S., and whose son, Professor Charles Darwin, F.R.S., succeeded to the ownership of Down and is the fifth of a succession of father and son who have been elected fellows of the Royal Society—a unique record; in 1847 Elizabeth was born; in the following year Francis, who became Sir Francis Darwin, F.R.S.—a distinguished botanist and president of the British Association. His son, Bernard Darwin, is known to all as an exponent as well as an authority on golf. Leonard followed in 1850—Major Leonard Darwin, scientist, philanthropist and the founder and still active supporter of the Eugenics Society. Then came Horace, now Sir Horace Darwin, F.R.S., happily still alive. And last number 10, Charles Waring Darwin, who died in childhood. Down was thus the home of a large and happy family, perhaps the most gifted family ever born in England. There the great naturalist died on April 19, 1882, in his seventy-fourth year. He worked continuously at Down for almost forty years.

[1] On the ordinance survey maps the spelling is *Downe*, but as Darwin always wrote *Down* without an "e" the latter spelling has been adopted.