International Union of Pure and Applied Chemistry (IUPAC): an adventure

The reflexions that follow are the fruit of a long engagement with the history of IUPAC, through its publications and archives. Many unanswered questions remain. Is it possible yet to present a coherent portrait of the Union? What image of the Union do I have as I write these lines? Do I see IUPAC as essentially an institutional structure that reveals little of the men and women behind it? And what underlying unity can we identify amid the striking diversity of its activities? These questions, about an organization of immense and shifting complexity, are ones that no single person can hope to answer. Hence what I offer here is necessarily impressionistic and incomplete.

The Union as an international body

IUPAC is a hundred years old in 2019 [1]. On 28 July 1919, in Brussels, it was recognized as a constituent union of the International Research Council (IRC), along with other unions, for astronomy, geodesy and geophysics, and scientific radio-telecommunications. The mission of the IRC was to reorganize international science, through regulations and procedures adapted to the different disciplines. In this way, it was hoped to avoid the dispersion and duplication of effort at the international level.

IUPAC was at once a successor to the International Association of Chemical Societies (1911-1919) and a product of specifically post-war ideals, including an alliance between science and industry in which science would chart a future that industry would then bring to fruition. This alliance, reflecting the support that the nascent union received from the French and British societies of chemical industry, accounts for the decision that IUPAC should embrace all chemistry, both pure and applied.

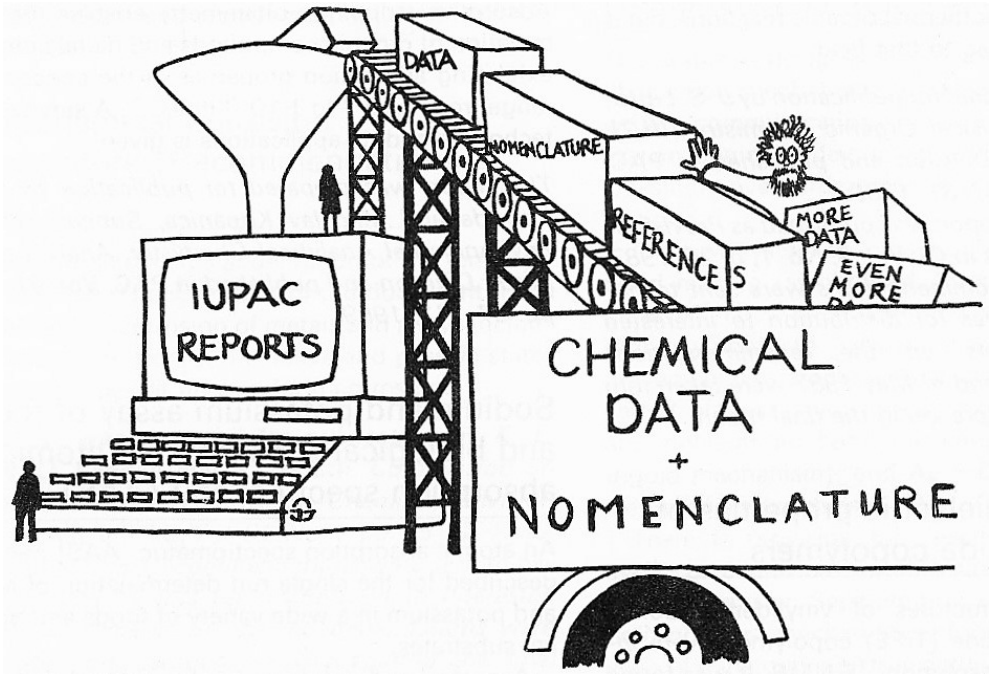
Created as an interallied union open exclusively to the nations that had fought on the Allied side in the war, IUPAC only became truly international in 1931, when its parent body, the IRC, was replaced by the International Council of Scientific Unions (ICSU). Along the way, however, there had been significant changes. In 1930, for example, the Union had already shortened its name to International Union of Chemistry. In doing so, it signalled a narrowing of its scope to pure chemistry and a severing of the explicit industrial links, which it considered to be adequately covered in the various congresses that took place under its auspices.

After the Second World War, the Union's very survival was in question. ICSU, recognized and supported by UNESCO as a force for world peace, faced approaches from a number of new specialized international committees, including some in chemistry that threatened the break-up of the Union. The result, in 1949, was a fundamental restructuring into six disciplinary sections, later named divisions: Physical Chemistry (I), Inorganic Chemistry (II), Organic Chemistry (III), Biological Chemistry (IV), Analytical Chemistry (V), and Applied Chemistry (VI). Each division was to enjoy a large measure of autonomy, with its president becoming one of the vice-presidents of the Union. The result was a body that once again embraced the whole of chemistry. It reverted, appropriately, to its original name of International Union of Pure and Applied Chemistry (IUPAC), and new specialities, such as macromolecular chemistry, were introduced. The restructuring of commissions continued through the 1960s and 1970s in response to revolutionary new analytical techniques, such as infrared spectroscopy and then NMR. And the development of biochemistry and clinical chemistry was the cause of frequent adjustments to divisions and standing committees throughout the last forty years of the 20th century.

Another challenge lay in advances in analytical and applied chemistry that made it necessary to plan a complete review of the two divisions in question. Since the late 1950s, gathering criticism among the general public had contributed to a feeling that science had been, for better or worse, a driver of rapid social change. The Union had no choice but to take account of such criticism and develop shared expertise with bodies primarily involved in such areas as education, health, nutrition, and the challenges of pollution. As the President Jacques Bénard (1971-1973) insisted in his report on the state of the Union: if IUPAC was being created in his day, it would surely have been very different; the original compartmentalization according to the traditional sub-disciplines of chemistry would no longer be appropriate [2]. Throughout its history, in his view, the Union had shown a capacity for adaptation, and if it did not adapt now, it would be condemned to sterility. In raising such questions, Bénard was expressing concerns that had been voiced for some time within the Union. And his successors heeded his warning.

IUPAC confronts its history

The move to rethink IUPAC turned thoughts to the Union's past. The history of IUPAC became a matter for discussion as early as 1968. Five years later, Stig Veibel, a titular member of the commission on organic nomenclature (III-1), wrote a detailed account. But this remained unpublished, and it was left for Roger Fennell, editor of *Chemistry International* (1983-1985), to take up the challenge. His *History of IUPAC, 1919-1987* appeared in 1994, followed in 2001 by a substantial supplement for the years 1988-1999 by Stanley S. Brown (a past president of the Division of Clinical Chemistry, 1985-1987). This meant that work on the first eight decades of the Union's history coincided precisely with the comprehensive review of its structure. Through the 1990s, the continuing will for reform left its mark, not least in *Chemistry International*, which reported



By courtesy of *Chemistry International*, May 1989, *11(3)*, p. 112.

on the various proposals under discussion. Among the working documents put to members were the *Strategic Plan* and the *Projects System*, which together provided the foundation for the major reform that was finalized during Edwin Becker's term as Secretary general (1996-2003) and Joshua Jortner's as President (1998-1999) [3].

Community and the individual in chemistry

This brings me to the chemists who have made up the Union and whose role is too easily obscured in the official record. Since it has never been the practice for IUPAC to give prominence to individual contributors, reports on the Union's work have had a rather anonymous character.

The fact is that IUPAC has been, above all else, a community of men and women who have brought to bear not only their scientific expertise but also their ideals and faith in chemistry. Some have served for long periods, occupying successive posts of responsibility. Among presidents whose names will be less known to members today are the multi-lingual physical chemist Ernst Cohen (Netherlands, 1925-1928), who did so much to promote IUPAC's transition from a still essentially interallied body to one that was truly international, and Marsten T. Bogert (USA, 1938-1947), who guided the Union through the difficult war years. We should also remember William A. Noyes Jr (USA, 1959-1963), who worked to ensure that the offices of the Union were open to members from any country; the first Russian President, Victor Kondratiev (1967-1969, decisive years for the Union); and the visionary Harold W. Thompson (UK, 1973-1975), the inspiration for a number of new departures between 1957 and 1975, including the establishment of the Triple Commission for Spectroscopy (a joint venture with the unions for physics and astronomy) and, in 1960, the journal *Pure and Applied Chemistry*.

The Secretary general too has had a crucial role, especially in the aftermath of the two world wars: first, after the Great War, when Jean Gérard (1919-1944) laid the foundations for what quickly emerged as a major inter-war union, and then after the Second World War, when Raymond Delaby (1945-1955) guided the relaunching of the Union in a context of reconciliation that served to maintain unity despite pressures that might well have led certain groups of chemists and specialities to withdraw. It would be impossible to mention all the other officers who have done so much to foster relations in an atmosphere invariably characterized by mutual respect. Over the years, many personal friendships have been struck in the context of debates on such potentially divisive matters as nomenclature, terminology, symbols, and analytical procedures. Far from being incidental, these have played their part in the resolution of differences that are largely glossed over in reports and publications, though plainly visible in the archives. At difficult moments, in fact, firmness and diplomacy have gone hand in hand with a degree of cordiality that has helped to achieve a solution acceptable to all concerned.

Continuity and change

As we look back over the Union's last half century, two turning points stand out: first, the establishment of the permanent secretariat in Oxford in 1968, and secondly, in 1997, the move to Research Triangle Park in North Carolina and the subsequent deposit of IUPAC's archives at the Chemical Heritage Foundation, now the Science History Institute, in Philadelphia. The period between these two events was one of transition. It was marked by the growing importance of standing committees (CTC, CHEMRAWN, COCI…) and an associated recognition that chemistry could not be treated independently of its social and environmental implications. The first turning point also coincided with IUPAC's heightened presence in international

organizations requiring its expertise, and its consequent involvement in defined, essentially administrative tasks of a less personal character. The second took place in the context of the restructuring of the Union that was completed at the beginning of the 21th century, after years of debate.

While the archives allow us to trace IUPAC's inner workings into the 1990s, the subsequent advent of electronic messaging has transformed both the Union's administrative procedures and its relations with members. Today, members store materials in their own computer systems, with consequences that present a challenge for the historian; at the very least, much risks being lost when a term of office comes to an end and offices move. This is something that those writing the history of IUPAC's next hundred years, with only published sources to work from, will necessarily regret, and we must hope that measures will be taken to preserve and manage the 21th century archives of the great lady that is IUPAC. Here the National Adhering Organizations (NAOs) could play a crucial role as vehicles for preserving archives on the national scale. And we should certainly seize the opportunity of recording oral accounts by the Union's many actors, especially those who have contributed to the changes of recent decades.

While the Union may appear remote from everyday life, two of its decisions speak to every one of us: the adoption, in 1961, of carbon 12 as the foundation for atomic weights and, ten years later, of the mole as the base unit of the International System.

Overcoming language barriers and laying aside political differences and considerations of race and religion, the men and women of IUPAC have given chemistry its vocabulary and rules. We should never forget, however, that today's present will become tomorrow's past. I leave members in this centenary year with that thought.

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[1] *Chemistry International*, 2019, *41/3* (July-September, special centenary issue), p. 1-58.
[2] Bénard J., President's report on the State of the Union, in *Agenda for XXVII Council Meeting*, Munich, **1973**. Also, in French: Rapport général du Président J. Bénard sur l'état de l'Union, *L'Act. Chim.*, oct. **1973**, p. 7-13.
[3] Jortner J., Future mission, goals and functions of IUPAC, *Chem. Int.*, **1998**, *20(1)*, p. 1-2; IUPAC adopts strategic plan, *Chem. Int.*, **1998**, *20(2)*, p. 21-24; Strategy development and Implementation Committee, Report to the Executive Committee, *Chem. Int.*, **1998**, *20(3)*, p. 55-76; Becker E.D., Secretary General's Report, *Chem. Int.*, **1998**, *20(6)*, p. 165-167.

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