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Reorganizing chemistry after World War I: The birth of the International Union of Pure and Applied Chemistry (IUPAC)

Summary – Established by the International Research Council (IRC) in Brussels on 28 July 1919, IUPAC was among the first of the Council's international unions. The IRC proposed a common structure for the new unions, one that excluded the Central Powers. IUPAC emerged from two competing projects: one for a successor to the prewar International Association of Chemical Societies (IACS), the other responding to specifically post-war ideals, including an alliance between science and industry. The statutes were drafted in Paris in April 1919 and discussed through to the Brussels IRC conference. They were definitively established on 24 July.

Keywords: IRC, IUPAC, IACS, international unions.

Riassunto – La IUPAC (Unione Internazionale di Chimica Pura ed Applicata), istituita a Bruxelles il 28 luglio 1919 per iniziativa dell'IRC (Consiglio Internazionale delle Ricerche), fu tra le prime associazioni internazionali create dal Consiglio. La IUPAC prese vita da due progetti concorrenti: uno si proponeva di sostituire la IACS (Associazione Internazionale delle Società Chimiche) di origine prebellica, l'altro ispirato agli ideali specificatamente post-bellici, comprendenti un'alleanza tra scienza e industria. Gli statuti della IUPAC, redatti a Parigi nell'aprile 1919, furono discussi a Bruxelles e varati in maniera definitiva il 24 luglio.

Parole chiave: IRC, IUPAC, IACS, unioni internazionali.

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I. REORGANIZING SCIENCE AFTER WWI

1. *The general frame*

Both the Unions themselves and their historians have considered 28 July 1919 to be the date of the foundation of the first international scientific unions and the place to have been Brussels. In reality, their foundations followed tough and complex discussions that had taken place over the two previous years.

In 1917, as a starting point, we find an «Entente» between, on the one hand, the mathematician Émile Picard from the Académie des sciences in Paris and the physicist Arthur Schuster secretary of the Royal Society in London and, on the other, the astronomer George Ellery Hale from the United States National Academy of Sciences (NAS). Discussions followed in the course of two interallied conferences in London and Paris in 1918. What emerged was the International Research Council (IRC), conceived as tutelary body for world science, along with the first interallied, later international, associations to replace the pre-1914 disciplinary associations, but with the crucial difference that the new associations excluded the Central Powers (Fauque *et al.* 2020a).

The IRC's statutes, intended to remain unchanged for twelve years, were approved at the Constitutive Assembly in Brussels in July 1919. Also approved were the statutes of the first three international unions (astronomy, geodesy and geophysics, chemistry). By 1931, when the IRC was replaced by the International Council of Scientific Unions (ICSU – what we now know as the International Science Council, ISC), eight affiliated unions (Astronomy, Biological Sciences, Chemistry, Geodesy and Geophysics, Geography, Mathematics, Physics, and Scientific Radiotelegraphy) had joined the IRC (Greenaway 1996).

It is in this international context, profoundly marked by WWI, that the creation of the International Union of Pure and Applied Chemistry (IUPAC) has to be viewed (Fauque 2011).

2. *The French-British «Entente» (1916-1917)*

First, then, the context began with the destruction of Leuven Library and the massacre of civilians, the 1914 Manifesto of the 93, and the first use of gas warfare in April 1915. The idea of excluding Germany from all post-war international scientific organizations took shape in the aftermath of these events. This set the German question unavoidably at the heart of future decisions about international relations in science and meant that for several years after the war, it was inconceivable for Allied scientists to be seated at the same table as their German colleagues (Fauque *et al.* 2020a).

It was against this background that at the end of 1916 Gaston Darboux, permanent secretary for mathematical sciences at the Académie des sciences in Paris, wrote to Schuster, suggesting a meeting to discuss the international organization of

science after the war. Darboux, though, died some weeks later (Royal Society 1945 pp. 287), and it was only in July that Picard, Darboux's successor, writing to Schuster and Hale, returned to the subject. In the meantime, Hale had written to Schuster and Picard with a proposal for co-operation.

His idea was to found an international organization after the war, one composed of new bodies called national research councils (NRCs), on the model of the National Research Council (NRC) in Washington, created in 1916. The aims of this NRC embraced pure and applied research in science, and they were considered relevant to peacetime as well (Blaauw 1994 pp. 21-22).

Now, things moved quickly. Through the summer, discussions continued in informal correspondence between Picard, Schuster, and Hale. In August 1917, Schuster suggested a preliminary conference to agree on a common position. Difficulties of travel made it impossible for the Americans to come to such a meeting in London. So the French and British met alone at Burlington House in December, and there they laid the first plans for an interallied conference in the following year (Royal Society 1945 pp. 277-280).

3. *The Accademia dei Lincei joined the team*

At the beginning of the new year, however, a diplomatic incident risked upsetting the consensus. In January 1918, the British Ambassador in Rome informed the Royal Society that Rodolfo Lanciani from the Accademia dei Lincei had learnt about the project. Why had Italy not been informed and invited (Royal Society 1945 p. 286)¹? There was now no alternative but to make the Franco-British initiative an interallied affair.

In February, a special British committee was appointed. This *Committee on International Scientific Organizations* (CISO) was asked to present a report (Royal Society 1945 p. 287). It was also agreed that the Japanese and Belgians should be invited to attend the forthcoming interallied meeting (Royal Society 1945 p. 294).

In April, the CISO reported on the situation before and during the war (Royal Society 1945 pp. 297-302). It presented an overview of organizations and conventions, divided in two parts. The first part concerned the specialized groups in which, before the war, friendly personal relations had been the mainstay. The second part concerned the scientific section of the International Association of Academies (IAA). It was this section that would raise particular problems after the war. Throughout the discussions, it was a priority for the Allied nations to determine their policy with regard to the Central Powers. The CISO report, presented at the

¹ The IAA was founded as an initiative of several German academies in 1899. Composed of two sections: humanities and science, its membership included 19 academies from 14 countries, on the eve of the war, see (Greenaway 1996 pp. 10, 253). In fact, Lanciani was to be involved in a postwar review of the IAA's humanities section.

Royal Society in April, was sent to the academies concerned, with the proposal that they should meet in London in the following October.

4. *Hale's proposals and the French Statement*

The discussions continued over the next few months, during which time documents from Hale and Picard were added to the CISO report. Hale submitted two printed memoranda to both Schuster and Picard: the first was a text setting out the regulations of the American National Research Council. These regulations were clearly intended as a model for other countries to use in establishing their own National Research Councils (NRCs) under the overall control of their various national academies; the second was a *Suggestion* for the constitution of an International Organization for Science and Research that would bring together the NRCs of all countries.

On 30 September 1918, at a special meeting of the Académie des sciences in Paris, the academicians approved a set of resolutions that were sent to the CISO, ready for the London Conference. The two main resolutions were: first, that the enemy states should be excluded from all the international associations and secondly, that new conventions should be approved as soon as circumstances allowed, with a view to establishing other new associations (Baillaud, 1918).

Although «enemy states» was a gentle way of making the point, in reality German scientists were particularly targeted. The Central Powers included not only the German Empire but also the Austro-Hungarian Empire, Bulgaria, and the Ottoman Empire.

5. *The London Interallied Conference and its resolutions 9-11 October 1918*

At this point the first interallied conference, in London, brought together the representatives of Belgium, Brazil, France, Great Britain, Italy, Japan, Serbia and United States. From 9 to 11 October 33 delegates laid the foundations of the future international organization. The CISO report, the French statement and Hale's printed memoranda were among the documents discussed. The resulting decisions drew heavily on the French statement, though some also drew on Hale's proposals for an international organization made up of the representatives of what were variously called national research committees or councils (Académie des sciences 1918 pp. 566-570).

A Committee of Enquiry was constituted with delegates appointed by the national academies of the Allied nations. Its job was to prepare a general plan for the new international associations. On 11 October, at the end of the Conference, it was decided to move immediately to the creation of two special committees (astronomy and geophysics) (Baillaud 1918). It was also agreed that the next Interallied Conference would be held in Paris at the end of November. Chemistry, however, was not discussed at this conference.

6. *The Paris Interallied Conference 26-29 November 1918*

Between the London and Paris conferences, the armistice was signed. The event modified perceptions of the project. In Paris, in successive sessions, the delegates (46 delegates, 10 nations) discussed the structure of the future international organization for science and its associated associations². They also took the decisive step of transforming the Committee of Enquiry into the International Research Council (IRC). It remained now to discuss the statutes that had been drawn up by the Committee for astronomy since the London Conference. The discussions of the proposed statutes continued over several more sessions, article by article. The articles were considered first as the basis of the IRC statutes and secondly as a model for the other future associations (Fauque *et al.* 2020 b). Questions of principle provoked lengthy debates. At the end, an Executive Committee (EC) was elected; it was composed of five members from the five «founder» nations³ (Académie des sciences 1918 pp. 933-941). Among the five, there was no chemist.

The task of the EC was to centralize all proposals, so as to avoid a dispersion of resources or possible duplication of effort. Just after the closing session, in a special meeting, the astronomers and the geodesists approved the definitive regulations for their respective Unions (astronomy and geophysics) (Académie des sciences 1918 pp. 939-940; Fauque *et al.* 2020b).

It was during this second session that a Committee for international cooperation in chemistry, subsequently referred to as the Committee for Chemistry, was set up. It was composed of the six chemists present at the conference: Albin Haller as president (F), Percy Frankland (GB), Charles Moureu (F), Raffaello Nasini (It), Arthur Amos Noyes (US) and Joji Sakurai (Japan) (Fauque 2011 p. 124).

As president of the Committee, Haller proposed two resolutions: 1. To dissolve the IACS and create a new association limited to the interallied societies, though with the possibility that in due course approved neutral nations too might join; 2. To return the funds to Ernest Solvay, the sponsor of the International Association of Chemical Societies (IACS).

II. THE CASE OF CHEMISTRY

1. *A. Haller and the IACS*

The IACS was created at the instigation of Albin Haller in 1911 following a meeting in Paris attended by the presidents of the three great European chemical societies, Auguste Béhal (Société chimique de France), Wilhelm Ostwald (Deutsche

² Belgium, Brazil, France, Great Britain, Italy, Japan, Poland, Romania, Serbia, United States.

³ EC members: É. Picard, mathematician (F, president); three vice-presidents: G.E. Hale, astronomer (US), G. Lecointe, astronomer (B), V. Volterra, mathematician and physicist (I); A. Schuster, physicist (GB) (secretary). Japan, one of the victors, was not considered here as a «founder», because, it was not involved in the preliminary discussions at the London Conference.

Chemische Geselstallschaft) and William Ramsay (Chemical Society of London). By 1914, 14 chemical societies, devoted primarily to pure chemistry, had joined the IACS (Fauque 2011; Van Tiggelen *et al.* 2012, p. 9). They established a programme focussed on a number of questions that required an urgent answer, notably on standardization in bibliography and publishing, nomenclature, atomic weights, and physical constants.

In 1913 Haller went back to Solvay, someone he had known personally for thirty years. Solvay agreed to help the new organization though on condition that its permanent secretary worked from the future Institut de chimie Solvay in Brussels and its meetings were held every other year in Brussels. He also generously endowed the Association for 29 years.

On the eve of the war, Haller was president of the IACS. The conflict, though, prevented the association from functioning, so that in 1919, it was ironically as president that he had to propose the dissolution of the very association that he had founded seven years before. At the beginning of 1919, Haller wrote to Solvay to explain the situation (IACS 1919). He asked whether it would be possible to keep the funds should an interallied association along similar lines to the IACS now be created. Solvay agreed, though once again with conditions that privileged the link with Belgium: the association's headquarters, including the permanent secretariat would have to be in Brussels, and one in every two or three congresses must be held there. Funds transferred from the dissolved association would further strengthen the links with the Institut de chimie Solvay. It appeared a promising start for the future international association, with its membership of chemical societies. With the new project in mind, Haller wrote to all the 14 societies belonging to the IACS.

2. National Groups for an Interallied Confederation

At the same time, a second and quite different project for chemistry was emerging. The initiative came from two societies of industrial chemistry: the Society of Chemical Industry in Britain (BSCI) and the France's Société de chimie industrielle (FSCI) (Fauque 2011 & 2019). Since the summer of 1918, these two societies had been laying plans for continuing the cooperation they had begun during the war in the time of peace.

The BSCI, established in 1881 and the much younger FSCI, created in 1917 in Paris, were chaired by two long-standing close friends, both prominent in the chemical industry: Henry Louis, president of the BSCI, and Paul Kestner, president of the FSCI. In November 1918, in London, on the occasion of a reception in honour of Kestner, they discussed a plan for an interallied federation to oversee questions of documentation, patents, and standardization of analytical methods, as well as urgent questions relating to number of commercial exchanges. The idea of an interallied

organization for chemistry had by now been reinforced by the decisions emerging from the Interallied Academies Conference in London some weeks before.

Taking up Hale's idea, it was decided at the BSCI meeting that France and Britain would each create a national group. The first to be established was the British *Federal Council for pure and applied chemistry* (FCPAC). The plan for the FCPAC, chaired by William Pope (a future president of the BSCI), was presented to the Council of the Royal Society in January (Royal Society 1945 p. 368). The French *Fédération nationale des associations de chimie* (FNAC), chaired by Moureu, followed soon afterwards. Each group was made up – on an equal basis – of chemical societies and societies concerned with industrial matters.

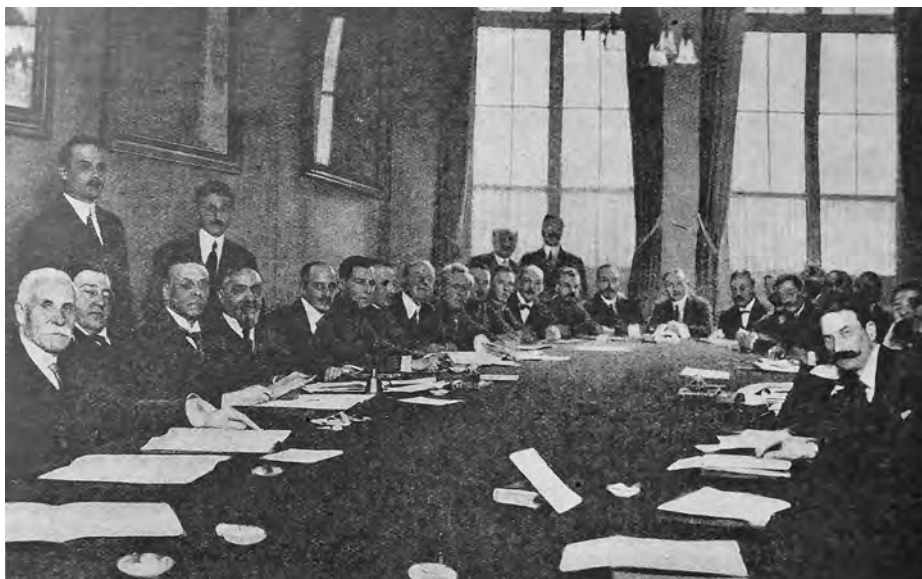
The FNAC appointed a provisional Committee to prepare statutes for the future interallied body. And in April, the FSCI decided to issue a return invitation to the BSCI. On this occasion it offered to hold an interallied conference of chemistry during the FSCI meeting. The aim was clearly to establish an interallied Confederation of chemistry, in accordance with the resolutions of the Interallied Conference of the Scientific Academies in London in 1918 (Fauque 2011).

3. *The Paris Interallied Conference for chemistry (14-15 April 1919)*

So, it was that in April 1919 the first two national groups came to be established. With their own national groups not yet established, it was the American, Belgian and Italian chemical societies that sent representatives to the conference. The result was a conference attended by 43 chemists from the five so-called «founder» countries (21 from France, 9 from USA, 6 each from Great Britain and Italy, and 1 from Belgium), as well as a small number of individuals (Gérard 1919 pp. 560-561). They voted to create an Interallied Confederation of Pure and Applied Chemistry. The delegates also approved a number of resolutions, made proposals, and formulated the draft statutes that I call version 1. They were inspired by the statutes of the International Astronomical Union, agreed in the previous November in Paris.

The aims were to promote better procedures for documentation, and if possible, to create an interallied periodical for bibliography that would be independent of the German equivalents. Also on the agenda were international standards governing format and abstracts, action on international patents, and analytical methods, as well as the familiar subjects of nomenclature and atomic weights. In fact, the new body essentially adopted the main objectives of the IACS, though with an extension to chemistry in its industrial and commercial aspects.

Members of the Confederation's Council were to be appointed, two from each country, one for pure chemistry, one for applied or industrial chemistry (Gérard 1919 p. 563). The headquarters would be in Paris, in the building that housed the FSCI. Moureu was re-elected as president. And the Secretary General (SG) was



First Interallied Conference for Chemistry, held at the Hôtel du Comité des Forges, Paris, on 14 April 1919. Sitting from the left: P. Kestner, H. Louis (?), W. Pope, Ch. Moureu. Standing on the far left is J. Gérard. (Reprint from *Chimie & Industrie*, 2/5, Mai 1919, p. 501).

Jean Gérard, who was also SG of the French national Federation and SG of the FSCI. It is hard to avoid the impression of a French coup!

In all this, what became of Haller's plan? At the Paris Conference, he failed in his hopes for a resurrection of the IACS. He still thought, however, that at the next IRC Conference in Brussels, attitudes towards his plan might change (Gérard 1919 p. 556).

After the Paris meeting, the first statutes were reworked by the French (V2), and sent to the IRC Executive Committee for examination at its Paris meeting in May. It is important to bear in mind that there was no chemist in the IRC Executive Committee. Yet the IRC was being asked to consider two chemistry-related projects. One was Haller's, based on the renewal of the IACS. The other was the work of chemists with a broader spectrum of interests embracing both pure and applied chemistry. The champions of the latter project, with its headquarters in Paris, were members of national committees or other national bodies for chemistry. The IRC Executive Committee declared that it hoped that these two projects would be merged into one at a special meeting on chemistry to be held in London in July before being presented to the IRC meeting in Brussels, soon afterwards (Schuster 1920 p. 76).

4. *The London Interallied Conference for chemistry (16-18 July 1919)*

Once again, the British SCI planned to hold a parallel interallied conference of chemistry during its meeting in London on 16-18 July (Fauque 2011 pp. 128-129; Gérard 1919). In London things proceeded formally enough. At the plenary session, the SG Jean Gérard presented a report on the April meeting along with some additional resolutions wholly in accord with the IRC's principles. A committee of five members, chaired by William Pope, examined this version 2 of the statutes and proposed several modifications. At the subsequent plenary session, a version, further revised (V3), was discussed before a vote for yet another, fourth version. The American Edward W. Washburn had suggested that the name should be changed from *Confederation* to *Union*, but this proposal was rejected.

In London, on 18 July, the International Confederation of Pure and Applied Chemistry was formally established. The question now was how to incorporate the new body in the framework of the other international organizations, associated with the IRC, that had emerged from the conferences of the interallied academies in 1918. With this project in hand, a delegation chaired by Moureu went to Brussels.

5. *The «Birth» of IUPAC at the Constitutive Assembly of the IRC, Brussels, 18-28 July 1919*

Before the project could be considered by the IRC's Executive Committee, it had first to be submitted to the IRC Committee for chemistry (Fauque 2011 pp. 129-130). On 22 July, a meeting between the Committee and the delegation from London specially appointed to present the proposal was held in a room of the Belgian Académie des sciences. Those present also included members of the IACS Bureau and chemists present in Brussels as their countries' delegates to the IRC conference.

Haller chaired the session. After a brief reminder of the history of the IACS, he presented the two resolutions on which the IACS's adhering societies had voted. Of 14 societies contacted, 11 had responded. Of these, 7 agreed to the two proposals (dissolution, followed by a new association without the Central Powers, and the return of the funds to the sponsor). Since seven answers represented the majority of the votes cast, it followed that the IACS had to be dissolved and the funds returned to Solvay. The assembly endorsed the dissolution. Then, as chair of the session, Haller presented the new organisation as proposed at the Paris conference in April. It was now, as he put it, for the chemists present at the meeting to found an interallied organization consistent with the wishes of the International Committee for chemistry while also (as he hoped) taking account of the decisions taken by the chemical societies of the old IACS.

At this point, Haller declined to become president of this Confederation and gave the floor to Moureu (Fauque 2011 p. 129). While Haller invoked his age, other possible reasons are evident. Though Haller and Moureu were members of

the interallied committee for chemistry (two from France out of a total of six), they represented two different generations. Haller (70') was an elderly academic chemist. Moureu (56'), also an academic chemist, was younger; closer to J. Gérard (29') and P. Kestner (55'), he shared the same political ideas and with them made up the powerful trio that saw through the foundation of IUPAC (Fauque 2011). After a brief report on the new body, Moureu underlined the fundamental difference between the IACS and the Confederation: in the IACS, a country was represented by one or more independent societies, in the Confederation, a country would be represented by a federation of all the country's national societies.

They then examined the statutes (V4), and a new commission was appointed to study them; at the next session, still chaired by Haller, its report (V5) was discussed again, and the title *Union* definitively replaced *Confederation*. On the 23 July, yet another version of the statutes (V6) was discussed and approved, and the official name became *Union internationale de chimie pure et appliquée* (UICPA)⁴. In conclusion, Haller confirmed that in the interests of continuity with the IACS, it would be helpful for the new Union to respect the decisions that the Association had had made in its meetings before the war.

On 24 July, the final project (V6) was presented to the IRC Executive Committee. Schuster, the IRC secretary, remarked that it would be necessary to omit the names of all the founder countries in the first article, because Japan, now an important member, was not included; the list of five founders was duly removed in the definitive version 7. On 24 July, too, the IRC Executive Committee approved the union's request for membership of the Council. At the closing session of the general assembly (28 July), the creation of the new unions was approved unanimously, and all the statutes passed without a public reading (Schuster 1920 pp. 7-8). Some days later, writing to Solvay, Haller noted that he had worked hard to persuade colleagues to accept his proposals, but that he had failed (IACS 1919). No funds from Solvay were ever sent to the young IUPAC.

In addition to Moureu as president and J. Gérard as secretary general, the first Bureau of IUPAC was composed of four vice presidents: Georges Chavanne (B), William Pope (GB), Leopoldo Parodi-Delfino (It.), Charles Parsons (USA). J. Sakurai was to be elected vice-president several years later.

6. *The Italian presence*

Raffaello Nasini was present in Paris in 1918, as a member of the International Committee for chemistry, and as a delegate in Brussels. E. Paternò attended the Paris Conference in April; however, he arrived late and was present for only part of it, and he was not in London or Brussels. The industrialist Pirelli, a delegate of the

⁴ While French, the language of diplomacy, was the official language of IUPAC, English was admitted equally for all IUPAC purposes.

Società di chimica industriale di Milano, who attended the London and Brussels conferences in 1919, in place of L. Parodi-Delfino of the Società di chimica industriale di Torino, was a substantial presence. So too was Ostilio Severini, director of the Società per la Cianamide, who attended the conferences in Paris in April and London in July, and participated actively in the discussions.

III. CONCLUSION

The foundation of IUPAC had nothing to do with the scientific academies of France and Great Britain. It emerged virtually unchanged from the Confederation that had been created in April in Paris. Much work remained to be done, and Italy offered to host the first international conference of chemistry in 1920. At that Conference (Rome, June 1920), IUPAC was to confirm its more distant heritage by incorporating the programme of the IACS in its aims. This is a legacy to which IUPAC still lays claim.

It was in Rome that the French representative Léon Lindet, in the name of the former organizing Committee of the pre-war International Congresses of Applied Chemistry, asked IUPAC to take over responsibility for future congresses (UICPA 1920 p. 80). This was agreed and the regulations for congresses of pure and applied chemistry were written, not into the statutes but into the rules of IUPAC as prepared by J. Gérard, and discussed and approved in Rome (UICPA 1920 pp. 65-68). It was agreed that congresses would be independent but that they would take place at the same time as the annual general assembly of IUPAC, which henceforth took the name of *Conférence internationale de la chimie* (UICPA 1920 pp. 59, 65).

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