

'The goddess that we serve'

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RESEARCH ARTICLE

‘The goddess that we serve’: projecting international community at the first serial chemistry conferences, 1893–1914

Geert Somsen

Maastricht University and Vrije Universiteit Amsterdam, the Netherlands

Corresponding author: Geert Somsen, Email: g.somsen@maastrichtuniversity.nl

Abstract

The emergence of conferences in the late nineteenth century significantly changed the ways in which the international scientific community functioned and experienced itself. In the early modern Republic of Letters, savants mainly related through print and correspondence, and apart from at local and later national levels, scholars rarely met. International conferences, by contrast, brought scientists together regularly, in the flesh and in great numbers. Their previously imagined community now became tangible. This paper examines how conferencing reshaped the collective of international scientists by zooming in on the massive meetings of the International Congress of Applied Chemistry, 1893–1914. Drawing on Emile Durkheim’s studies of religious gatherings it analyses the ritualization of routine conference practices, such as plenary ceremonies, toasts, ladies’ programmes and committee meetings. It looks at how roles were distributed as participants performed as hosts and guests, and in masculine and feminine and national and international identities. Importantly, it shows both how the sacralization of chemistry as a higher aim served to instil senses of dedication in order to organize labour and mitigate conflict, and how the self-perception of the international chemical community was based on contemporary understandings of parliament, democracy and representation.

The rise of conferencing in the late nineteenth century profoundly changed the ways in which the international scientific community functioned and experienced itself. Of course, such a community had been in existence since the early modern period, manifested as the Republic of Letters. But this was first and foremost a correspondence network of savants who would only occasionally meet each other. In the course of time, the number of local and national meetings increased, but *distant* scholars continued to connect mainly through the circulation of letters and print. They rarely gathered in the flesh, let alone en masse.

The Republic of Letters functioned in its own ways and there is substantial work on how it operated and perceived itself: the codes of conduct that governed epistolary exchanges, the networks that these forged, and the cosmopolitanism that pervaded its self-identification.¹ Much less attention has been given, by contrast, to the functioning

¹ Dena Goodman, *The Republic of Letters: A Cultural History of the French Enlightenment*, Ithaca, NY: Cornell University Press, 1994; Anne Goldgar, *Impolite Learning: Conduct and Community in the Republic of Letters, 1680–1750*, New Haven, CT: Yale University Press, 1995; Adrian Johns, “The ideal of scientific collaboration: the “man of science” and the

of international science after the rise of the conference: the changes that were brought about by face-to-face interaction, the impact of meeting by the thousands, and the effects on how scientists perceived their collective self and its *raison d'être*.² What studies do exist focus on the conference phenomenon *grosso modo*: e.g. the demography of participation and the emergence of conferencing capitals.³ But we still know very little about their internal structure and practices – about what *went on* at such international gatherings and how this reshaped the scientific community.⁴ For if conferences changed anything, it was that they made international science tangible. What used to be an *imagined* community was now materialized, right before participants' eyes.

In the following I analyse the social texture of scientific conferences, the forms of interaction developed in them, and their impact on the self-perception of the international scientific community. I focus on a series of chemistry conferences around 1900, examining some of their standard practices and gathering formats, such as parallel paper sessions, committee meetings, receptions and banquets, and ladies' programmes. Few of such activities were new – most were adopted from the national and local scientific meetings that pre-dated (and often still outnumbered) international gatherings. Conventions of scholarly interaction similarly drew on long traditions of previous small-scale encounters. Nor was international participation entirely novel – national gatherings such as those of the British Association for the Advancement of Science had included foreign attendants since their start around 1830.⁵ What was new in the explicitly 'international' conferences from the late nineteenth century onward was their self-conscious character as such. These meetings were *meant* to represent the world and manifest what contemporary observers called *l'internationalisme scientifique*.⁶

The characteristics of the community that embodied this internationalism cannot be derived from their formal arrangements, at least for the chemistry conferences under consideration. Membership criteria and rules of conduct were not yet stably codified;

diffusion of knowledge', in Hans Bots and Françoise Waquet (eds.), *Commercium Litterarium: Forms of Communication in the Republic of Letters*, Amsterdam: APA Holland University Press, 1994, pp. 3–22; Dirk van Miert, H. Hotson and T. Wallnig, 'What was the Republic of Letters?', in H. Hotson and T. Wallnig (eds.), *Reassembling the Republic of Letters in the Digital Age: Systems, Standards, Scholarship*, Göttingen: Göttingen University Press, 2019, pp. 23–40.

² The counterintuitive importance of face-to-face interaction in science was, paradoxically, first pointed out for early modern settings by Steven Shapin, who already then stretched its significance to our own times, going against both modernist exceptionalisms and formal understandings of science. See Steven Shapin, 'Epilogue: the way we live now', in Shapin, *A Social History of Truth: Civility and Science in Seventeenth-Century England*, Chicago: The University of Chicago Press, 1994, pp. 409–17. See also Shapin, 'Cordelia's love: credibility and the social studies of science', *Perspectives on Science* (1995) 3(3), pp. 255–75; and see the introduction to this special issue.

³ See e.g. Nico Randerad, 'Triggers of mobility: international congresses (1840–1914) and their visitors', *Jahrbuch für Europäische Geschichte* (2015) 16, pp. 63–82; David Aubin, 'Congress mania in Brussels, 1846–1856: soft power, transnational experts, and diplomatic practices', *Historical Studies in the Natural Sciences* (2020) 50 (4), pp. 340–63; Kenneth Bertrams, 'Caught-up by politics? The Solvay Councils on physics and the trials of neutrality', in Rebecka Lettevall, Geert Somsen and Sven Widmalm (eds.), *Neutrality in Twentieth-Century Europe: Intersections of Science, Culture, and Politics after the First World War*, New York: Routledge, 2012, pp. 140–58. A set of pathbreaking studies launched the subject three decades ago: Brigitte Schroeder-Gudehus (ed.), *Les congrès scientifiques internationaux*, special issue of *Relations Internationales* (1990) 62, pp. 111–211, more recently followed by Wolf Feuerhahn and Pascale Rabault-F Feuerhahn (eds.), *La fabrique internationale de la science*, special issue of *Revue germanique internationale* (2010) 12.

⁴ An exception, at least in the historical literature, is Cyrus C.M. Mody, 'Conferences and the emergence of nanoscience', in Barbara Harthorn and John Mohr (eds.), *The Social Life of Nanotechnology*, New York: Routledge, 2012, pp. 52–65.

⁵ Jack Morrell and Arnold Thackray, *Gentlemen of Science: Early Years of the British Association for the Advancement of Science*, New York: Clarendon, 1981; Roy MacLeod and Peter Collins (eds.), *The Parliament of Science: The British Association for the Advancement of Science, 1831–1981*, Northwood: Science Reviews, 1981.

⁶ P.H. Eijkman, *L'internationalisme scientifique (sciences pures et lettres)*, The Hague: Van Stockum et fils, 1911.

Table I. The full series of the International Congress of Applied Chemistry. Instalments were often referred to by their number in the series.

Number	Place	Year
founding meeting	Chicago	1893
1st	Brussels	1894
2nd	Paris	1896
3rd	Vienna	1898
4th	Paris	1900
5th	Berlin	1903
6th	Rome	1906
7th	London and Cambridge	1909
8th	Washington, DC and New York	1912
9th – planned but cancelled	St Petersburg	1915

permanent statutes would only be adopted gradually. But the community's structure and self-perception can be read off the routines and recurring practices that developed almost immediately. There was no central organization but there was a broad consensus on what could and should be expected in terms of roles and activities. In the following paper, I examine this common conference culture. My aim is not to trace its origins and further development, but rather to take a snapshot and establish how this particular international scientific community functioned and experienced itself.

The International Congress of Applied Chemistry

Chemistry has its own particularities (such as substantial industrial ties), but its conferencing chronology is more or less typical of most scientific disciplines. It started its first series of international gatherings in the 1890s, just after geology (see Mougey in this special issue) and not long before physics. Chemists sometimes claim to have pioneered the phenomenon with the famous Karlsruhe congress of 1860, but this was in fact a one-off meeting on a specific problem that was not repeated with any regularity.⁷ Occasional gatherings did continue, but the large serial meetings that would become standard in science only began after 1891, when the Association of Belgian Chemists proposed an international conference, an initiative that was to combine with one from Chicago, where chemists visiting the 1893 World's Fair called for an 'International Congress of Applied Chemistry' (ICAC).⁸ From 1894, this conference met bi- and later triannually, and, after 1919, was continued

⁷ Bernadette Bensaude-Vincent, 'Karlsruhe, septembre 1860: L'atome en congrès', in Schroeder-Gudehus, op. cit. (3), pp. 149–69.

⁸ D. Thorburn Burns and H. Deelstra, 'The origins and impact of the International Congresses of Applied Chemistry, 1894–1912', *Microchimica Acta* (2011) 172(3–4), pp. 277–83; Burns and Deelstra, 'Establishing a vital tradition: the series of International Congresses of Applied Chemistry, 1894–1912', *Chemistry International* (2011) 33(4), pp. 11–14; Brigitte van Tiggelen (ed.), *IUPAC 100: A Glance at the Union History*, special issue of *Chemistry International* (2019) 41(3); Roger W. Fennell, *History of IUPAC 1919–1987*, Oxford: Blackwell Science, 1994. The transition to large serial meetings was not abrupt, with, for example, an in-between type happening during the 1889 Paris World Exposition and the Karlsruhe model branching out to nomenclature. On the latter see Evan Hepler-Smith, "'Just as the structural formula does": names, diagrams, and the structure of organic chemistry at the 1892 Geneva Nomenclature Congress', *Ambix* (2015) 62(1), pp. 1–28.

(with alterations) in the congresses of the International Union for Pure and Applied Chemistry (IUPAC) that have lasted until today. My analysis will stop with the Great War, however, which not only obstructed conference travel, but also severely impacted the shape and self-perception of the international chemical community for years to come.

From the beginning the ICACs were massive meetings: for example, 4,100 chemists attended the seventh instalment, held in the UK in 1909. Plenary gatherings were combined with parallel sessions for subfields, committee meetings discussing standardizations (for units and constants, for example) and social functions, such as breakfasts, garden parties and excursions. Often the congresses were followed by longer trips to the organizing country's chemical industries and state institutions (such as the mint) that subscribing participants continued to take. Most of the activities were extensively reported, not only in the conference proceedings, published after every meeting in multiple volumes, but also in professional journals and the public press. I draw upon these sources, not just for factual information but also as written extensions of the conferences' performances. Especially official proceedings continued the outward self-presentation of the chemical community and often reproduced the conventions of what counted as proper and presentable interaction. Despite its name the ICAC's meetings were attended by both industrial and academic chemists, a custom that continued with IUPAC. In 1911, a separate series 'for academics only' began, but proved short-lived.⁹ It should be noted that throughout this period smaller meetings and conferences (for agricultural chemistry or pharmaceutical chemistry, for example) did continue, but I will concentrate here on the larger international meetings.

Celebrating the collective

One of the most striking features of the chemists' conference culture was their self-awareness as an international community. From the beginning, there was a strong sense that something new was going on, especially when compared to the experience of national or local meetings. The congress's international character was frequently stressed, and usually presented as the natural consequence of the essence of chemistry itself. At the opening address of the founding meeting of the series, president H.W. Wiley stated,

Chemistry is truly cosmopolitan. There is no one country that can claim it entirely, either by birth or adoption ... It is therefore entirely fit and proper that the chemists of all nations should now and then meet ...¹⁰

Similar expressions were repeated at subsequent conferences and would soon become a recurring trope. At the fourth ICAC in Paris in 1900, president of honour Marcellin Berthelot (himself incapacitated, so speaking through Henri Moissan) proclaimed that

science ... belongs neither to a private personality nor to a particular nation. It teaches us that all are citizens of the same country, that all the civilized people of the world are united. Science has no nationality. It is as well German, English, Italian, Russian, Japanese, as French. It is progressive among small nations as well as among large.¹¹

⁹ Brigitte van Tiggelen and Danielle Fauque, 'The formation of the International Association of Chemical Societies', *Chemistry International* (2012) 34(1), pp. 8–11.

¹⁰ Harvey W. Wiley, 'Address of welcome to the World's Chemical Congress', *Journal of the American Chemical Society* (1893) 15(6), pp. 301–5, 302.

¹¹ Henri Moissan and François Dupont, *IVe congrès international de chimie appliquée: Compte rendu in-extenso*, 5 vols., Paris: Association des Chimistes, 1902, vol. 1, p. 15. Quoted and translated in H.W. Wiley, 'Review: the

Remarks like this were made again and again, sometimes copying the lists of nations that could not monopolize the field almost verbatim.¹² The mantra became routine and in itself unremarkable. Yet its significance lay not so much in *what* was being said as in *where* it was said, on what occasions. Reflections on the universal nature of chemistry also occurred from time to time in textbooks and journals, but they were made much more frequently at conferences, especially during opening ceremonies, dinners and general receptions. These were plenary meetings attended by most conference delegates, and as such were appropriate moments to address what attendees had in common and what brought the various nationalities together. In this sense the remarks were welcoming gestures, acknowledging the international company so visibly present.

Explained as such, the expressions of internationalism may seem pedestrian, like casual pleasantries rather than profound statements. And perhaps that is what they were. But it is still vital to remember the importance of performances of community in collective gatherings. Significantly, at the very same time when international conference culture was taking shape, Emile Durkheim was analysing the function of mantras and rituals for the maintenance of group coherence. While focusing on religious practices, Durkheim insisted that his observations applied to other collectives (what he called 'societies') as well:

There can be no society that does not experience the need at regular intervals to maintain and strengthen the collective feelings and ideas that provide its coherence and its distinct individuality. This moral remaking can be achieved only through meetings, assemblies, and congregations in which the individuals, pressing close to one another, reaffirm in common their common sentiments.¹³

Such reaffirmation was achieved, Durkheim observed, by celebrating the community and sacralizing things it held in common – the deeds of the Messiah for Christians, the Decalogue for Jews and, we might add, universal chemistry for chemists. It is notable that the plenary speeches also often elevated the common pursuit to almost sacred levels. Chemistry was described as a higher cause, an object of devotion, 'the noble science to which we dedicate our lives'.¹⁴ 1903 Berlin congress president Otto Witt literally called it 'the goddess that we serve'.¹⁵ Following Durkheim, then, in worshipping such a sacred object, the chemical collective essentially revered itself. Chemistry was the collective (Witt added that in saluting the assembled, he saluted *la chimie entière*), and its ritual sacralization, typically in stately lecture halls, pressed upon the participants that they were members of something greater than themselves. They belonged to an international community that required their dedication.

The collective was also reaffirmed in a lighter way: through conference toasts. All of the ICACs featured toasts on several occasions, sometimes so many that their series needed to be managed by a designated 'toastmaster'.¹⁶ These were cheerful moments, surrounded by

Fourth International Congress of Applied Chemistry', *Journal of the American Chemical Society* (1901) 23(3), pp. 178–97, 180. All translations are mine unless otherwise indicated.

¹² See the other articles in this special issue for the ubiquity and longevity of this practice.

¹³ Emile Durkheim, *The Elementary Forms of Religious Life* (tr. Karen E. Fields), New York etc.: The Free Press, 1995 (first published 1912), p. 429.

¹⁴ William Ramsay at the inaugural meeting in London (speaking in four languages, this part in Italian). William Ramsay and William Macnab (eds.), *Seventh International Congress of Applied Chemistry: Organisation of the Congress. General Meetings*, London: Partridge and Cooper, 1910, p. 15.

¹⁵ *V. internationaler Kongress Angewandter Chemie: Bericht*, 4 vols., vol. 1, Berlin: Deutscher Verlag, 1904, p. 33.

¹⁶ The first ICAC already featured sequences with over a dozen toasts. Fr. Sachs, *Congrès international de chimie appliquée: Compte rendu*, Brussels: Gustav Deprez, 1894, pp. xli–xlii. Toastmasters were used in New York City in 1912 and in London in 1909, the latter equipped with a megaphone. Typically toasts followed short, lighthearted

humour, when toasters and toasted exchanged compliments and mutual appreciation. Toasts could have various objects, but glasses were invariably raised to the community and what brought it together. In 1900 over dessert, for example, Moissan 'proposed the health of the science of chemistry', while his respondent, Zurich professor Georg Lunge, drank 'to the solidarity of the nations united by science'.¹⁷ In 1912 at the Waldorf-Astoria, industrialist William Nichols even toasted the 'Eighth International Congress of Applied Chemistry' itself.¹⁸ Like internationalist pronouncements, toasts were speech acts that served to highlight the fundamental unity of the company present.

Hosts and guests

Besides group cohesion, toasts also signalled a role distribution within the international community, namely that between hosts and guests. Typically, the organizers thanked the foreign attendants for attending, after which one of them raised a glass in reciprocal gratitude. Often the hosting cities and countries were included in such expressions, usually via their representing burgomasters, ministers or even heads of state. Toasts were thus brought out to 'the French Republic', 'New York', 'the King of Great Britain and Ireland' and, to the tune of the Belgian national anthem, 'Sa Majesté le Roi', Leopold II.¹⁹ Habsburg Emperor Franz Josef received three hoorays and responded in a telegram.²⁰ State officials also partook physically in the conferences, such as in 1906, when King Victor Emmanuel and Queen Elena of Italy, surrounded by other dignitaries, arrived at the opening in a horse-drawn carriage between rows of international flags to sit down on a special podium under a royal crown.²¹ Mayors of Brussels, Paris, Vienna, Antwerp and New York personally welcomed the chemists in their city halls. US president Taft received them at the White House.

There was usually little evidence of genuine interest in chemical topics on the part of these notables. Taft treated his guests to a long lecture about his struggles with patent litigation, French finance minister Cochery thanked the attendants for 'the production of articles that can be taxed', and New York mayor William Jay Gaynor complained about 'the public press'.²² But talking chemistry was neither required nor expected of state officials, who, together with their venues, represented the hosting countries and symbolized the welcome extended to the foreign guests. The visitors were 'honoured' by these receptions, while the hosts expressed 'honour' in receiving the illustrious company. This economy of reverence reflected the way the congress series operated, with each instalment taking place in another country. The hosting task rotated among the leading nations, and paying tribute

speeches and chemistry-based jokes. At the closing banquet in 1900, Moissan told a fairy tale of a baby chemist (personifying the conference community) sent out into the world to make dyestuffs and medicines while keeping an eye on customs tariffs – followed by a toast to the congress itself and lively applause. 'Banquet (28 juillet)', in Moissan and Dupont, op. cit. (11), vol. 3, pp. 331–8, 333–4.

¹⁷ Wiley, op. cit. (11), pp. 193–4.

¹⁸ 'International Congress of Applied Chemistry', *Journal of Industrial and Engineering Chemistry* (1912) 4(10), pp. 706–19, 717.

¹⁹ H.W. Wiley, 'Second International Congress of Applied Chemistry', *Journal of the American Chemical Society* (1896) 18(10), pp. 923–40, 939 (the French Republic); 'International Congress of Applied Chemistry', op. cit. (18), p. 717 (New York and the king of Great Britain and Ireland); 'Le Banquet', Sachs, op. cit. (16), pp. xl–xlii, xli (Leopold II).

²⁰ C.E. Munroe, 'Third International Congress of Applied Chemistry', *Journal of the American Chemical Society* (1899) 21(1), pp. 73–102, 76–7.

²¹ 'VI Congresso internazionale di chimica applicata', *Gazzetta Ufficiale del Regno d'Italia*, 26 April 1906, pp. 1922–8, 1922.

²² 'International Congress of Applied Chemistry', op. cit. (18), pp. 710, 715; Cochery cited in Wiley, op. cit. (19), p. 938.

was thus done in the full expectation of mutuality. Reciprocity served distributive justice as well as the very continuity of the conference series.

Ladies and gentlemen

I will return to the national dimensions later. First, I want to point to another demographic feature of the international conference community: many male chemists brought their wives. These did not attend the chemistry sessions, but instead took part in a special 'ladies' programme' consisting of tourism and light entertainment such as boat rides, museum visits, concerts and afternoon teas. On a morning at the 1912 congress in New York, for example, they could choose between 'two automobile trips': '(1) Public Library, Tiffany's and the Metropolitan Tower; (2) Aquarium, Down-town Section, and the Stock Exchange. At noon the ladies ... visited Gimbel's Department Store; after this inspection a luncheon was served by Gimbel's in their Tea Room.'²³ The ladies' programmes were prepared by special committees consisting of the spouses of the hosting country's male organizers. But they did not run in isolation from the men's activities. At the shopping trip mentioned above, for instance, the women were supposed to be accompanied by 'their gentleman escorts', and many of the receptions, theatre visits and garden parties overlapped with the chemists' social programme.²⁴ Spouses were certainly expected to attend the most general gatherings, such as the reception at the Vienna Rathaus, in 1898, where Mayor Karl Lueger received the chemists 'and their ladies'.²⁵ At the 'Grand Banquet' of the 1912 New York meeting, 'Mrs. L.H. Baekeland, Chairman of the Women's Committee of the Congress' and wife of the famous plastics inventor, addressed the crowd herself.²⁶ But while mixed, there was a clear division of activities: those with a scientific component (paper sessions, committee meetings) were for men; social events were either for women or unisex.²⁷ The very few female chemists did participate in the scientific activities, but it is clear that the scheme was not designed for them – more on this below.

The significance of 'faculty wives' at conferences can be understood against the background of scientists' domestic arrangements. Gender studies of the lifestyles of early twentieth-century academics have pointed out typical role distributions, for example between the Swedish chemist Svante Arrhenius and his wife Maja Johansson.²⁸ While Svante played the part of the public man involved with leading a laboratory and communicating research with peers at home and abroad, Maja's task was to run the household (lab and domicile were integrated in one building) and provide a welcoming home for foreign visitors. She also accompanied him on research trips where this division of labour was more or less repeated. Thus the international network they built up involved the entire household, and Maja played an integral part in maintaining contacts, sending greetings and keeping abreast of the well-being of her and her husband's counterparts.²⁹

²³ 'International Congress of Applied Chemistry', op. cit. (18), p. 715.

²⁴ 'International Congress of Applied Chemistry', op. cit. (18), p. 715.

²⁵ Ferdinand G. Wiechmann, 'Third International Congress of Applied Chemistry, Vienna, 1898', *Science* (1898) 8 (194), pp. 360–2, 361.

²⁶ 'International Congress of Applied Chemistry', op. cit. (18), p. 715.

²⁷ In Berlin, 'housewives' also accompanied the chemists on factory excursions. See Otto N. Witt and Georg Pulvermacher, *V. internationaler Kongress für Angewandte Chemie: Bericht*, 4 vols., vol. 3, Berlin: Deutscher Verlag, 1904, p. 489.

²⁸ See e.g. Donica Belisle with Kiera Mitchell, 'Mary Quayle Innis: faculty wives' contributions and the making of academic celebrity', *Canadian Historical Review* (2018) 99(3), pp. 456–80; and Katherine Turk, "'The hand that rocks the cradle should rock the U. of C.': the faculty wife and the feminist era', *Journal of Women's History* (2014) 26(2), pp. 113–34.

²⁹ Staffan Bergwik, 'An assemblage of science and home: the gendered lifestyle of Svante Arrhenius and early twentieth-century physical chemistry', *Isis* (2014) 105(2), pp. 265–91.

We can see similar role distributions (and hence a continuation of earlier conventions) at international conferences. Wives were integrated in their husbands' participation and often identified with them, not only by the English custom of sharing their names ('Mrs. William James Evans') or the German convention of inclusion in their title ('Frau Professor Fischer'), but also by being referred to as chemists themselves; that is, as 'chemists of the gentler sex'.³⁰ This is not to say they received equal status, but rather that they were considered fellow members of the chemical community with a special role to play – contributing to the hospitality of the meeting. Wives were involved, for example, in welcoming the foreign guests, who were first picked up from train stations and harbours by junior staff members. In smaller meetings they often lodged them in their homes, and at the ICACs they received them at private 'lawn parties', teas and the like.³¹ Even when visiting, women were seen as part of the sociable setting that was supposed to delight the conference participants. In a report of a grand reception in Rome in 1906 they were mentioned in one breath with the other pleasures that served this purpose:

The splendour of the rooms of the Hotel Excelsior, the sumptuousness of the treatment, and the hosts' refined courtesy elicited the admiration and most cordially grateful expressions of the conference attendants who stuck around in the magnificent chambers past midnight.

Numerous ladies rendered the beautiful evening even more cheerful and florid.³²

Spouses were supposed to serve sociability and the ladies' programme was considered part of the conference's larger social programme, whose aim was to forge bonds of intimacy between otherwise dispersed attendants. Sally Wyatt and others have studied such work as 'affective labour', i.e. 'activities that create, sustain, and/or modify behaviors and judgments', especially in collaborative settings.³³ Traditionally, women have been disproportionately tasked with such interpersonal work, and international chemistry conferences prove no exception. The wives' role was to provide extra social adhesive: instrumental in the Durkheimian affirmation of collective experience noted above.

All the same, however, what built community on the one hand caused exclusion on the other. Actual working female chemists fit the distribution of roles badly. Were they considered 'ladies' or 'chemists of the gentler sex'? Were their husbands supposed to join the ladies' programme? There is no evidence that any ever did. Nor, unsurprisingly, was there space for same-sex partners or other relationships. Conferences reproduced the patriarchal structure of European bourgeois society and copied its gendered patterns into the international chemical community.

Love and labour

Gender was one category that framed the international community of conferencing chemists. Another register in which they expressed their relationships to one another was the

³⁰ Karl Lueger, quoted in Munroe, op. cit. (20), p. 92. The Brussels 1894 report spoke of 'des chimistes masculins et féminines'. Sachs, op. cit. (16), p. xliii.

³¹ See e.g. W.P. Jorissen, 'Réunion internationale de chimie à Utrecht', *Chemisch Weekblad* (1922) 19(40), pp. 418–25, 421, 425; 'International Congress of Applied Chemistry', op. cit. (18), p. 714.

³² 'VI Congresso internazionale di chimica applicata', op. cit. (21), p. 1925.

³³ Smiljana Antonijevic, Stefan Dormans and Sally Wyatt, 'Working in virtual knowledge: affective labor in scholarly collaboration', in Paul Wouters, Anne Beaulieu, Andrea Scharnhorst and Sally Wyatt (eds.) *Virtual Knowledge: Experimenting in the Humanities and the Social Sciences*, Cambridge, MA: MIT Press, 2013, pp. 57–88. For women as contributors 'to the social features of the Congress' see *Transactions and Organization: Eighth International Congress of Applied Chemistry*, Concord, NH: Rumford Press, [1912], p. 203. Other types of conference could carry very different conceptions of gender roles – see Kotsou in this special issue.

vocabulary of friendship. In opening ceremonies and plenary lectures – the same types of occasion where the international character of chemistry was pronounced – the ties between the conference participants were often phrased not as collegial bonds or professional associations, but in terms of friendship, fellowship and even brotherhood. In 1896 the American delegate C.A. Doremus thanked his French hosts for the ‘friendship ... with which we have been received’.³⁴ In 1900 Moissan surmised ‘that the most delightful as well as the most useful part of the congress was the meeting of old friends and the making of new ones’.³⁵ Already at the start of the series, initiator H.W. Wiley legitimated conferencing in similar terms: ‘the chemist must leave his desk and seek the acquaintance of his fellows. Every time you take a brother chemist by the hand you enlarge your life and extend your strength’.³⁶ Seven years later, Marcellin Berthelot advanced the rhetoric even further. After outlining the transnational bonds forged by chemistry, he added,

the true law of human interests is not a law of struggle and selfishness, but a law of love. This is how the science that brings us together today in this forum proclaims, as the final goal of its teachings, universal solidarity and fraternity! (Long applause.)³⁷

The trope of friendship between men of learning was an old one. Margaret Meredith has analysed the nature of its frequent proclamation among naturalists and natural philosophers in the eighteenth century, observing that the term had a special meaning in the polite codes of learned society. Friendship was not simply based on ‘liking each other’ but rooted in a shared love for the pursuit of knowledge. Scholars with a common interest in, for example, botany found friendship in the common, higher cause of the advancement of this field. Exchanges of scientific knowledge were thus deemed different from professional correspondence or business dealings, where mutual obligations were contractual. In science, sharing was considered voluntary, driven not by payment or contract, but by the shared love of one’s field of scholarship. In order to keep the exchange of knowledge going, therefore, naturalists needed to be regularly reminded of this common cause and their friendship in it: ‘The functioning of the republic of letters in inquiry depended upon such professed collectivity.’³⁸

Some of these understandings seem to recur in our turn-of-the-century conferences. The ‘friendship’ proclaimed there was also regarded as rooted in and driven by a common love of chemistry. All the pronouncements of international fraternity would have been vacuous without its supposed basis in this shared engagement. Chemistry was universal; it spurred cooperation across borders, and therefore it helped advance friendly international relations. Internationalism was not a political conviction but a consequence of dedication to science. We can see a reflection of this notion in the conferences’ social programmes, where much of the socializing itself revolved around topics of supposed common interest in chemistry. Sometimes these were *lieux de mémoire*, such as Pasteur’s former laboratories or a statue of Lavoisier.³⁹ More often, excursions took participants

³⁴ Wiley, op. cit. (19), p. 939.

³⁵ Quoted in Wiley, op. cit. (11), p. 191.

³⁶ Wiley, op. cit. (10), p. 303.

³⁷ ‘Discours de M. Marcellin Berthelot’, in Moissan and Dupont, op. cit. (11), vol. 1, pp. 4–15, 15.

³⁸ Margaret Meredith, ‘Friendship and knowledge: correspondence and communication in northern trans-Atlantic natural history, 1780–1815’, in Simon Schaffer, Lissa Roberts, Kapil Raj and James Delbourgo (eds.), *The Brokered World: Go-Betweens and Global Intelligence*, Sagamore Beach: Science History Publications, 2009, pp. 151–91, 160.

³⁹ ‘Hommage à Pasteur’, in Moissan and Dupont, op. cit. (11), vol. 1, p. 551, vol. 3, p. 345; ‘Inauguration de la statue de Lavoisier’, in Moissan and Dupont, op. cit. (11), vol. 3, pp. 346–60. See also Wiley, op. cit. (11), pp. 194–6.

to chemical industries, mines, mints and steel mills, strengthening their social bonds through the objects of their common pursuit.

Such resemblances to early modern notions may appear superficial. After all, the exchanges that Meredith discusses occurred between amateurs, savants who were under no contractual obligation: it would make sense, therefore, for their actions to be driven by moral appeal. The chemists discussed here, by contrast, were almost exclusively professionals who were paid to practise their field. What need would there be to remind them of their ‘common love’ and the higher cause of the pursuit of knowledge? Such questions, however, do not account for important segments of modern scientific work. Not all the chemists’ tasks were in fact remunerated, and most of the labour for the *international* functioning of the field was actually strictly voluntary. Free labour was needed in the preparation of conferences, in running them and, above all, in the business of the many committees that were occupied with the setting of international standards.⁴⁰ In chemistry, there were committees on atomic weights, nomenclature of organic and inorganic substances, formula notation, physico-chemical standards, measurement protocols and so on.⁴¹ They took up a large percentage of the non-plenary conference meetings, discussing norms and hammering out decisions. All this work was honorary – it might add to a chemist’s sense of duty or their professional reputation, but not to their salary. And hence, just as in the earlier period, it was necessary to make moral appeals to the higher causes that this labour served. The advancement of chemistry was not just one’s job; it was a common calling that required dedication and sacrifice to the community. The Durkheimian sacralization of the pursuit of chemistry also served this purpose, and it did so by continuing early modern traditions of framing scholarly interaction.

Conflict and resolutions

There was still another function served by the cultivation of bonds of friendship around the sacred cause of chemistry which is related to what was generally considered the core business of the ICACs. Roughly speaking, the chemistry conferences featured activities of five kinds: (1) the social programme; (2) plenary lectures; (3) the scientific sessions, consisting of (3a) paper presentations followed by (3b) discussions; and (4) standardization committee meetings. Of these the latter and the plenary lectures (2 and 4) were never much topic of debate. But two other types of activity received frequent scorn. Social programmes were a recurrent subject of scepticism, with many chemists (and outsiders) wondering whether they weren’t covert forms of tourism and entertainment, ‘occasions for excursions and banquets’.⁴² Such criticism never led to their abolishment, but does reveal that these activities were generally seen as secondary to the conferences’ true aims.

Another activity that was frequently criticized, perhaps more surprisingly, was that of the paper presentations. Not only were these regarded as often all too dull and somniferous; also they seemed not to require conferences. ‘Were the object of ... a congress only to listen to papers and addresses pertaining to the progress and development of our science’, W.H. Wiley pointed out in 1893, ‘it might well be asked whether such

⁴⁰ For further problematizations of the amateur–professional dichotomy see Adrian Desmond, ‘Redefining the X axis: “professionals,” “amateurs”, and the making of mid-Victorian biology – a progress report’, *Journal of the History of Biology* (2001) 34(1), pp. 3–50; and Paul Lucier, ‘The professional and the scientist in nineteenth-century America’, *Isis* (2009) 100(4), pp. 699–732. Thanks to Gustave Lester for his suggestion.

⁴¹ Committee meetings were regularly and extensively reported. The examples here are taken from Jean Gérard, ‘The Fourth International Congress of Chemistry: abstract of the minutes of the Cambridge meeting’, *Journal of Industrial and Engineering Chemistry* (1923) 15(10), pp. 1082–5.

⁴² Wiley, *op. cit.* (11), p. 180.

conventions are useful. The chemical journals of to-day fully cover the whole field of chemical activity ... the world over'.⁴³

After the Eighth International Congress of Applied Chemistry in New York City, in 1912, the secretary of its organizing committee, the American industrial chemist Bernhard C. Hesse, sounded the alarm about the contents of the paper presentations there, observing that

more than 90 per cent ... of all such material (however valuable per se it may be) is not fitted for nor adapted to discussion in a meeting ... [it could and] would have been written and published without the stimulus of such a Congress, in the publications now so plentifully provided all over the world.⁴⁴

Communicating results was fine, but why do it at a conference? '[T]he actual, crystallized work of these Congresses', Hesse went on, 'the real justification of for [their] existence', was what was subsumed above under items 3b and 4 above: the discussions after paper presentations and the work of the 'Commissions and Committees'.⁴⁵ In order to concentrate conferences on these specific tasks, a policy was adopted of pre-circulating papers. In New York and in the previous UK congress, manuscripts were handed in upon attendants' arrival and instantly printed and distributed, so that the paper sessions could skip the presentations and cut to the discussions at once.⁴⁶ The implementation of this policy proved problematic (many attendants failed to read the pre-circulated papers, others were annoyed by the publication pressure), but the clear intention had been to waste no time on what could be done outside the meetings.⁴⁷

What this shows is that the core conference business, according to many organizers, was discussion and resolution, debates about research and decisions about standardization. These were the only activities that required face-to-face interaction. They could not easily be done at a distance, on paper and through correspondence. Exchanging expert opinion and negotiating rules of nomenclature needed live conversation of people gathered in one space (cf. Bigg on presence in this special issue). Yet these very two core activities were at the same time sources of potential conflict. Chemical debates could easily lead to heated disagreement, especially in times when atomic theory was not yet fully settled and organic and physical chemists vied for supremacy. Negotiations of standards, in turn, almost per definition carried the risk of clashes, as some established practices needed to yield to others, and such capitulation might come at high cost. Units of mass or energy were often entangled with industrial interests or simply so engrained in local or national practices that changing them required major investments. Committees discussing such issues had to deal with heavy give and take.

Both central conference activities, then, carried the risk of enmity and strife. Disagreement lay at their heart.⁴⁸ And hence the consequences of these conflicts, especially on the losers' sides, needed to be bearable for all, and seen as a price to pay for a higher goal. It is in serving this need that we find another (perhaps less

⁴³ Wiley, op. cit. (11), pp. 178–9.

⁴⁴ Bernhard C. Hesse, 'The problem of International Congresses of Applied Chemistry', *Journal of Industrial and Engineering Chemistry* (1913) 5(4), pp. 321–8, 321.

⁴⁵ Hesse, op. cit. (44).

⁴⁶ Gérard, op. cit. (41). 'International Congress of Applied Chemistry', op. cit. (18), p. 713.

⁴⁷ See D. Holde, 'Impressions of the Eighth International Congress of Applied Chemistry in New York and of Certain Fields of Industry in the United States', *Journal of Industrial and Engineering Chemistry* (1914) 6(1), pp. 35–49, 37–8.

⁴⁸ This is not to say that each discussion was a zero-sum game of winners and losers; sometimes there were other ways out, such as appointing special committees or leaving final decisions to direct intergovernmental negotiations.

Durkheimian) function of expressions of internationalism and the common dedication to and love for chemistry. Seeing the advancement of knowledge and the international fraternity of chemists as sacred goals helped participants accept the conflict that came with debating and negotiating and the occasional pain that such contention inflicted on them. The intention was not to hide discord, but regularly to remind chemists of their ultimate higher aim, and of the sacrifices that their common enterprise sometimes asked them to make.

Internationality

So far, I have examined how the scientific internationalism professed at the chemistry conferences functioned. I will now turn to the particular shape it took. Internationalism is an extremely flexible concept that can capture widely varying understandings of world order, and so it makes sense to ask which of these informed the activities at the chemists' gatherings.⁴⁹ One immediately striking aspect is that the congresses worked as meetings of nations at least as much as of individuals. Despite early references to chemistry's cosmopolitanism, the conferences were predominantly inter-national. Expressions of nationhood were part and parcel of this practice, and often given free rein. There were special social functions, for example, for French chemists at Vienna, for Italians and Spanish-speakers each in New York, as well as, repeatedly, a so-called *Kommers* organized by the Verein Deutscher Chemiker: a jolly drinking gathering, featuring 'many salamanders and a "Bierspiel" full of typical German fun'.⁵⁰ On several occasions, orchestras played 'national airs', including 'Yankee Doodle' and 'Die Wacht am Rhein', to American and French dislike respectively.⁵¹ Nor was it unusual for attendants to wear national uniforms representing military or civic positions.⁵² If anything, chemistry brought nations together, but did not erase their differences.

The national basis was also built into the way the congress series operated. As noted above, each new instalment took place in another country, and hence the organizing burden and honour rotated among the nations. They often took great pride in the role, which could become something like a national project. As soon as it had been decided that the eighth congress was to be held in the US, American chemists were called up to help provide 'a very good showing':

the greatest success could be expected only ... if each and every chemist in the United States could be made to feel that he himself directly or indirectly, through his professional, business or educational affiliations, had a personal share of responsibility in the conduct and management of the Congress from its very start and to its very end ... it behooves every chemist in the United States actively and energetically to consider how and in what way he can best contribute to the success of this Congress ...⁵³

Yet the conference was not just the business of a country's chemists. Their governments were involved as well, first of all in issuing the invitations and nominating participants. For the second congress in 1896, the French Foreign Office approached 'all the principal'

⁴⁹ Glenda Sluga and Patricia Clavin, *Internationalisms: A Twentieth-Century History*, Cambridge: Cambridge University Press, 2017; Mark Mazower, *Governing the World: The History of an Idea*, New York: Penguin, 2012.

⁵⁰ 'International Congress of Applied Chemistry', op. cit. (18), pp. 714, 718. Cf. Holde, op. cit. (47), p. 37, for a positive review of the event. The 1903 meeting in Berlin also included a *Kommers*. See H.W. Wiley, 'Fifth International Congress of Applied Chemistry', *Science* (1903) 17(425), pp. 315–17, 316.

⁵¹ Americans were annoyed by the cliché, the French by the post-1870 German nationalism. Wiley, op. cit. (19), p. 938.

⁵² Wiley, op. cit. (11), p. 179.

⁵³ H.W. Wiley, 'Eighth International Congress of Applied Chemistry', *Journal of Industrial and Engineering Chemistry* (1910) 2(3), pp. 105–7, 105.

fellow states, asking them to send delegates to Paris, a procedure which was repeated thereafter.⁵⁴ Moreover, besides heads of state, ministers of specific departments were frequently involved, especially those of trade and industry, education and sometimes war. The reason for this was that national and commercial interests were often at stake, especially in the business of setting standards. In fact, the first conference of the series, in Brussels in 1894, had been organized under sponsorship of the Belgian and French sugar and brewing industries via the Belgian minister of agriculture, industry and public works, who became its honorary president, appointed by King Leopold.⁵⁵ The ‘general committee’ organizing the 1903 Berlin congress included the *Reichskanzler*; the presidents of the Imperial Health Department, Patent Office and Imperial Insurance Department; and almost all Prussian provincial ministers.⁵⁶ It was certainly not the case that such state involvement completely defined what went on at the meetings – many research discussions did not immediately touch upon trade interests and attendants were generally not hand-picked by their governments. But national interests formed an important background framing the international character of the conferences.

This circumstance also partly explains what is arguably the most drastic aspect of the congresses’ internationality: its circumscription. While purportedly ‘the chemists of the whole earth’ and ‘of all countries’ were gathering, in fact the vast majority came from Europe and the United States.⁵⁷ Latin America had a steady but small minority presence; most of the rest of the world was represented by colonial officials. This state of affairs reflected levels of economic development as well as the imperial order. ‘International’ was no egalitarian term, but rather mapped onto the hierarchies of the industrialized, or, in contemporary parlance, the ‘civilized’, world.

Parliaments of science

Chemists attending the ICACs saw themselves as representing both their field and their countries. These notions came together in the overall terminology that contemporaries applied to the conferences. As Anne Rasmussen has observed in an early study of the phenomenon, the word ‘congress’ used to refer not to the meetings but to the community of scientists in a particular field. They formed the ‘congress’ which met in successive ‘sittings’ – what we call conferences.⁵⁸ Moreover, participants were commonly called ‘members’ of the congress, or ‘delegates’. More than today, the meaning of ‘congress’ resembled that of ‘Congress’, as in the name of the American parliament. This was not a superficial analogy.⁵⁹ As we have seen, Bernard Hesse assumed that the chemistry conferences’ main aim was the issuing of resolutions after ample deliberation. ‘Members of Congress’ should debate chemical questions and problems of standardization, decide upon them, and publicly proclaim the resolutions they arrived at, much like a legislative body. The parliamentary parallel is even more visible in the organizational procedure adopted at the ICACs, which, for example for the 1903 Berlin conference, ran as follows. A ‘general committee’ chaired by the *Reichskanzler* invited foreign governments to send delegates. These

⁵⁴ E.g. in 1912 the American government did much the same. ‘International Congress of Applied Chemistry’, op. cit. (18), p. 706.

⁵⁵ Sachs, op. cit. (16), pp. iii–iv.

⁵⁶ Wiley, op. cit. (50), p. 315.

⁵⁷ Munroe, op. cit. (20), p. 92; Sachs, op. cit. (16), p. vi.

⁵⁸ Anne Rasmussen, ‘Jalons pour une histoire des congrès internationaux’, in Schroeder-Gudehus, op. cit. (3), pp. 115–33, 120.

⁵⁹ As Louise Miskell notes, the term ‘parliament’ had been adopted already in the 1830s for one of the first national conferencing organizations, the British Association for the Advancement of Science. Louise Miskell, *Meeting Places: Scientific Congresses and Urban Identity in Victorian Britain*, Farnham: Ashgate, 2013.

'congress members' were divided over twelve sections, one per branch of chemistry or industry. Each section took on questions 'of general and international importance', on which referees and co-referees were appointed, and which were discussed at the meeting. These deliberations, if conclusive, led to resolutions which were placed before the entire congress in its final session, and, after approval, publicized in the conference proceedings. In Berlin, most of these activities even took place in the chambers of the German Reichstag.⁶⁰

The notion of congresses as international parliaments was particularly significant in the field of chemistry. The ICACs sprang, to a large extent, from desires to internationalize product standards and regulate the food and drug business – the first two meetings were largely sponsored by the sugar and distillery industries.⁶¹ But the parliamentary image also appeared in more general, idealistic designs of forms of world government. In 1905, for example, the Dutch physician Pieter Eijkman presented a plan to establish a gigantic world capital on the outskirts of The Hague. This city would arise around the new Peace Palace (which housed the Permanent Court of Arbitration) and consist entirely of scientific institutions and an International Congress Hall. Here, scientists would regularly meet, discuss the issues of their field and decree solutions to public problems such as tuberculosis and labour organization, having been 'granted particular rights and powers [and] an official role in international government'.⁶² In 1913, the Norwegian American artist Hendrik Andersen designed an even more grandiose 'World Centre of Communication', including a 'Scientific Centre' boasting 'four Scientific Congress Buildings' with comparable purposes.⁶³ This legislative idealism was closely connected to the orientation of the peace movement of the time, with its focus on arbitration as a way to resolve international problems by expert decree. It was equally far removed from actual practice, as in both cases the enforcement of adopted resolutions largely remained an open question. The First World War finally killed the optimism surrounding arbitration at the same time as it smothered the parliamentary idealism around scientific conferences.⁶⁴ Geopolitical aspirations did not disappear, but they took new shapes, for example in the 'technical conferences' around 1945 and the Pugwash meetings and Nobel symposia of the 1960s and 1970s, discussed by Reinisch, Zaidi and Widmalm in this special issue.

Because of these changes the parliamentary aspect of conferences is much less recognizable today than are their other characteristics. Observers now are likely to be surprised by the hubris of chemists' perceptions of themselves as world legislators, a surprise that also stems from a fundamental difference between us and them in conceptions of representation. Before 1914, universal suffrage was only an ideal of the left, while most bourgeois Europeans (and scientists largely belonged to this group) believed in privileged voting rights. This privilege could be based on land ownership or tax bars (as in most European parliaments), on title (as in the British House of Lords and comparable bodies elsewhere) or on merit (as in representing one's nation in international sports or cultural

⁶⁰ Wiley, op. cit. (50), p. 316.

⁶¹ See Burns and Deelstra, op. cit. (8); and Christopher Hamlin, 'The city as a chemical system? The chemist as urban environmental professional in France and Britain, 1780–1880', *Journal of Urban History* (2007) 33(5), pp. 702–28. H.W. Wiley, at the US Department of Agriculture, led such a similar regulatory movement. See Deborah Blum, *The Poison Squad: One Chemist's Single-Minded Crusade for Food Safety at the Turn of the Twentieth Century*, New York: Penguin Press, 2018.

⁶² Eijkman quoted in Geert Somsen, 'Science, medicine and arbitration: Pieter Eijkman's world capital in The Hague', in Mary Kemperink and Leonieke Vermeer (eds.), *Utopianism and the Sciences, 1880–1930*, Leuven: Peeters Publishing, 2009, pp. 125–44, 140.

⁶³ Hendrik Christian Andersen with Ernest M. Hébrard, *Creation of a World Centre of Communication*, Paris: Philippe Renouard, 1913, p. 45.

⁶⁴ Mazower, op. cit. (49), Chapter 3. The notion that conferences should manifest public interests did live on – see Forster in this special issue for an example.

competitions). Election was not considered the only, or even the most legitimate, form of national representation. Even after 1918 many German physicists regarded themselves and other *Kulturträger* as worthy representatives of the nation – more so than elected politicians.⁶⁵ They carried these notions over from before the war, and similar understandings seem to have underpinned the parliamentary self-perception of the international chemical community. It was the chemists' accomplishments and their expertise that earned their conferences the status, if not of world legislatures, then at least of advisory bodies. As Moissan told attendants in 1900, 'The attention with which the various governments follow your Congress is a sure guarantee of the interest shown in you by the public authorities.'⁶⁶

Conclusion

International scientific communities assumed a completely new dynamic with the rise of the massive face-to-face encounters that were serial conferences. As we have seen for the case of the ICACs, the direct physical experience of what had previously been an imagined community created an intensified self-awareness and helped to reaffirm individuals' membership of the collective and to sacralize its common purpose: the pursuit of chemistry. The chemists' community was structured along lines of guests and hosts, masculinity and femininity, nationhood and internationality. Its internal ties were perceived in terms of friendship, rooted in a common dedication to a higher goal. This notion underpinned demands for unpaid labour and ameliorated the harmful consequences of debate and negotiation that lay at the heart of conference activities. All in all, the conference community saw itself as a world parliament, ruling over chemical issues and acting on the basis of expertise and merit.

In this article, I have identified these community features in the conference practices that became routine almost immediately after the series started. My aim was not to trace their origins, but to analyse the new international conference culture that established itself at the ICACs. And yet this cultural interpretation led almost inevitably to a political analysis of the chemical community. Routines and rituals not only stressed the collective and its importance, but also structured it in terms of roles and hierarchies. They reflected its sacralized aims as well as the distribution of power within the community. Moreover, the conference culture functioned within a framework provided by the leading nation states, their economic interests and their geopolitical relations. The texture of 'universal chemistry' hinged on this international order. At the same time, the conferencing chemists assumed a more or less autonomous part in this framework. Their task was not merely to serve their respective countries, but to lay down chemical rules of play for the interactions between them. They not only were governed, but also aspired to govern themselves. The ICACs, it could be said, formed an international polity whose relative and precarious autonomy was grafted upon the late belle époque's bourgeois culture and imperial world order.

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⁶⁵ Paul Forman, 'Scientific internationalism and the Weimar physicists: the ideology and its manipulation in Germany after World War I', *Isis* (1973) 64(2), pp. 151–80, 152, 170–1.

⁶⁶ Moissan and Dupont, op. cit. (11), vol. 1, p. 2.

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