



Chemistry at the Crossroads: Enabling Solutions for a Changing World

by Javier García Martínez

Chemistry stands at a challenging crossroads. We are being asked to decarbonise sprawling value chains, build true circularity, build resilient supply chains, navigate through funding and regulatory whiplash, and rebuild public trust, all at once. And yet, we are a creative community that continues to turn constraints into inventions, such as cleaner processes and fuels, greener solvents, and abundant alternatives for scarce elements.

In the process, the chemistry community does more than solve problems: it creates wealth and quality jobs, improves our health and quality of life, and builds the resilience that a sustainable future demands. This transformative power of chemistry is illustrated each year by the IUPAC Top Ten Emerging Technologies in Chemistry, which showcases how bold ideas and scientific ingenuity can redefine what is possible. But innovation alone is not enough; equally important are data standards, trusted recommendations, and a common language that enable breakthroughs to be safely and reliably scaled across laboratories, industries, and borders; and it is precisely here that IUPAC proves to be essential.

Our recent General Assembly in Kuala Lumpur marked a pivotal moment for IUPAC, as our community came together to make the organization more impactful and effective in addressing today's challenges. Perhaps the moment when this spirit was most visible was the Town Hall meeting, which was held to provide an update on the restructuring of our scientific organization, and that was the result of months of careful analysis and design by the Science Board in close collaboration with dedicated colleagues. The meeting outlined the rationale and options considered and, more importantly, sparked a thoughtful and constructive discussion about the Union's future scientific priorities and the structures needed to support them. The openness and pragmatism in the room were exactly what this moment required, and the feedback shared will inform the next stage of

the design process. Similarly, the World Chemistry Leadership Meeting, entitled 'Trust in Science and the Right to Science', provided an opportunity to reflect on critical issues facing the scientific community. (see more details p 50) The discussions were candid and practical, addressing some of the most critical issues of our time: how to strengthen research integrity, how to open data responsibly, how to communicate clearly with the public and policymakers, and how to ensure that the tools we develop are accessible to all.

Equally powerful was the Presidents' Forum, where leaders of chemical societies from around the world shared activities, resources, and information, allowing us to move forward as one community. Launched in 2023, this initiative is gaining momentum and quickly becoming an integral part of IUPAC's activities.

An important outcome of our meeting in Kuala Lumpur was the admission of Guatemala, Estonia, Singapore, and Peru to the IUPAC family. These new members bring fresh energy and perspectives from Latin America, Europe, and Asia, reinforcing the truly global nature of IUPAC and the momentum that carries us forward. Together, these initiatives, from restructuring to expanding membership, reflect one unifying vision: an IUPAC that is more agile, inclusive, and impactful, prepared to lead chemistry into its next century of service to science and society.

Among the many memorable moments of the World Chemistry Congress, one stood out as especially meaningful: the launch of the **IUPAC Guiding Principles of Responsible Chemistry**. These Principles are already emerging as a foundational document and, even more importantly, as an invitation to reflect on what it truly means to be a chemist today. Green chemistry remains essential; we must reduce our impact on the environment, but it is not enough. Practicing chemistry responsibly also involves embracing safety, diversity, reproducibility, and fair access to data in everything we do. Too often, we focus only on what chemistry *can* do; it is high time to talk about what chemists *should* do. From the beginning of my Presidency, this initiative has been a personal priority that has been masterfully brought to life by a dedicated group of colleagues, chaired by Mark Cesa and Mary Garson. This represents one of the earliest and most significant achievements of our Committee on Ethics, Diversity, Equity, and Inclusion (CEDEI), which, though established only a few years ago, is already making a real difference within our community. Because this initiative is so fundamental and so close to my heart, seeing it take root fills me with pride and hope in the future of the discipline.



Inorganic Chemistry Division meeting in Seattle, Washington, on 13rd August 2006, hosted by Barbara and Randy Coplen. Back row (L to R): Anthony West (Div. II President), Leonard Interrante (Secretary), Tyler Coplen, Luis Oro, Markku Leskelä, John Corish, Alan Chadwick, Kazuyuki Tatsumi (Div. II Vice President and IUPAC President 2012-13) & Norman Holden. Front row (L to R): Sheena West, Tipping Ding, Susan Rosenblatt, Gerd Rosenblatt, Javier García-Martínez (IUPAC President 2022-23), Vita Interrante, Mrs. Chadwick & Mrs. Tatsumi.

Our recent World Chemistry Congress and General Assembly in Kuala Lumpur are yet another powerful reminder of what our community can achieve when we come together. This is why I want to extend my heartfelt congratulations to Datuk ChM Dr. Soon Ting Kueh and his team at the Malaysian Institute of Chemistry for delivering such an exceptional event. The program, attention to details, and warm hospitality left a lasting impression on all of us. No sooner had we returned from Malaysia than the International Advisory Board for the next World Chemistry Congress and General Assembly convened its first meeting, a clear sign of the momentum and commitment that are driving our community forward. I cordially invite you to join us in Montréal, Canada, 8-16 July, 2027, for what I am sure will be another memorable gathering showcasing the best of chemistry.

Next year will mark my twenty years of service to IUPAC. I started as an Associate Member of the Inorganic Chemistry Division (Div II), a Division I have called home for many years. In that time, IUPAC has become an integral part of who I am. The colleagues and friends I have met here have not only inspired me, but also broadened my perspective on how chemistry can help build a better future for all. Through IUPAC, I have learned to think more globally, to listen more openly, and to recognize the true power of chemistry. This community has profoundly influenced how I view my role as a chemist and how I envision the future of our field. It is no exaggeration to say that IUPAC has shaped both my career and the scientist I have become, and for that, I will always be deeply grateful. Now, as my official role at IUPAC comes to an end, I feel a mix of sadness and gratitude, but also a deep

sense of pride in what we have achieved together. I cannot list everyone I would like to thank, but I must acknowledge my fellow Officers, Qi-Feng, Chris, Ehud, Mary, Richard, Zoltan and Wolfram, and I wish Christine and Derek every success. My heartfelt thanks also go to Tammy, Enid, and Fabienne, whose tireless work makes an enormous difference every single day. Much of what they do happens behind the scenes, yet it is essential to IUPAC's success and to the strong sense of community that so many of us value. Perhaps the most important lesson of my IUPAC journey is the extraordinary power of volunteers. It is astonishing how much we accomplish with limited resources and a small staff. That speaks volumes about the dedication of our volunteers and about the strength of our brand, which attracts people from around the World eager to contribute through our Divisions and Committees, our projects, and our conferences. Above all, it affirms that at IUPAC, there is truly a place for everyone.

Serving IUPAC for the past six unforgettable years as Vice President, President, and now Past President has been one of the greatest privileges of my life. Together with many colleagues, I have worked to advance the Union's mission—reshaping its governance to make it more agile, aligning its structure with the evolving trends of chemistry, strengthening our efforts on digital standards, empowering early-career scientists, promoting diversity, and expanding our reach through global initiatives. Yet what I carry with me most are the people: the brilliant minds, generous mentors, and passionate colleagues who reminded me, time and again, that chemistry is ultimately about people and the impact we create together. I have gained far more than I have given, and for that I will always be

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profoundly grateful. Thank you for your trust, your support, and your unwavering commitment to advancing chemistry for the benefit of all. My official role may be coming to an end shortly, but the journey does not stop here. I remain more committed than ever to building connections and working alongside all of you to shape a vibrant, sustainable future for chemistry.

On that note, in my last Column in the April–June 2024 issue, I wrote that integrating the International Younger Chemists Network (IYCN) into the IUPAC structure was one of the most obvious, indeed, inexorable opportunities for our organization. Just a year later, we can already see it happening. Their presence in Kuala Lumpur was felt everywhere: in the many impactful activities they organised at the World Chemistry Congress, in their active participation in our General Assembly, and in the energy they brought to conversations throughout the week. I would also like to highlight the Global Conversation on Sustainability that they organize every year on 25 September 25, and invite you all to participate. It was a pleasure to welcome the Young Observers to the General Assembly. Their enthusiasm and commitment remind us that the strength of IUPAC lies in attracting and empowering the next generation, ensuring that our Union continues to grow in relevance and impact.

Looking ahead, IUPAC's ongoing efforts to have all our output in digital form and to develop international digital standards, an initiative known as "Digital IUPAC", are not merely optional; they are essential to ensuring that our standards remain relevant and effective in a data-driven world. That means ensuring all chemical information is machine-readable, interoperable, and reusable from the outset, so they flow seamlessly between laboratories, publishers, databases, and regulators. Our Committee on Publications and Cheminformatics Data Standards has been building exactly this foundation, curating and advancing digital standards such as InChI, ThermoML, and JCAMP-DX, and our partnership with CODATA has accelerated the work through the WorldFAIR Chemistry case study. Together, we have produced practical guidance like the open FAIR Chemistry "Cookbook" and associated training, and we are now extending that momentum via WorldFAIR+, which focuses on cross-domain interoperability. Embedding the FAIR principles in IUPAC projects and recommendations, so that data and metadata are findable, accessible, interoperable, and reusable by people and machines, will keep IUPAC at the centre of how chemistry is discovered, validated, taught, regulated, and communicated in the years ahead.



IUPAC100 celebration in Paris at the IUPAC World Chemistry Congress after the return of the Global Breakfast in 2019. From left: Juris Meija, Christine Dunne, Nnanake Offiong, Javier García Martínez, Supawan Tantayanon, Hooi Ling Lee, Mary Garson, and Laura McConnell

The global activities we launched during our centenary continue to strengthen IUPAC's image as an inclusive and welcoming community. The Global Women's Breakfast has grown into one of the largest and most visible initiatives of its kind, with more than 2,500 events organized so far, reaching over 120,000 attendees across more than 100 countries. Thanks to the leadership of Laura McConnell and Mary Garson and a dedicated network of volunteers from around the world, it is not only opening doors but also building a true global community of scientists and professionals committed to advancing diversity, equity, and inclusion in science. The Top Ten Emerging Technologies in Chemistry has become a widely anticipated annual publication. By showcasing breakthrough ideas with real potential for societal impact, it celebrates the ingenuity of our community and demonstrates how chemistry provides practical solutions to our most pressing challenges. The Periodic Table Challenge has exceeded all expectations in terms of global reach and participation. Hundreds of thousands of students, teachers, and curious minds from over 160 countries have engaged with this joyful activity, turning a symbol of our discipline into a vibrant entry point for learning and discovery. The more recent project to promote chemistry entrepreneurship is already making a significant impact. Through a series of webinars, this initiative has engaged chemists and entrepreneurs alike, creating a platform for sharing knowledge and insights on transforming scientific innovations into successful ventures. The project is now entering a new stage, focusing on providing actionable guidance and fostering collaboration among diverse



The 90th anniversary celebration of the founding of the Spanish National Institute of Physics and Chemistry at, now the “Blas Cabrera” Institute of Chemistry of the Spanish National Research Council (CSIC) in Madrid, Spain, on October 18, 2022, with the presentation of the IUPAC Periodic Table and some significant elements of Spain’s participation in IUPAC in the 1930s.

sectors. Together, these initiatives highlight IUPAC’s ability not only to serve the scientific community but also to inspire society at large, strengthening our role as a truly global and inclusive Union.

Since 2019, IUPAC has undergone a transformation to become more agile and focused on delivering impact. We shifted from meetings of a very large Bureau, often dominated by administrative tasks, to more regular and purposeful meetings of the Executive and Science Board. This restructuring has allowed us to create the time and focus necessary to think and act strategically. While restructuring often brings uncertainty, adapting our structure to meet the evolving needs and opportunities of contemporary chemistry is not just timely; it is critical for ensuring our continued relevance. As part of this evolution, we have intensified our efforts to engage more effectively with external stakeholders, governments, industries, and international organizations. Earlier this year, IUPAC played a pivotal role in drafting the Muscat Declaration on Global Science, a key policy document emerging from the Global Knowledge Dialogue in Oman during the International Science Council meeting. At the same time, we secured a generous \$1 million donation from Raymond Soong, founder of LITEON, to establish the IUPAC-Soong Prize, an annual award celebrating breakthroughs in sustainable chemistry. While these accomplishments mark significant progress, more work is needed to deepen our relationships with international organizations and the chemical industry. Strengthening these connections is essential to amplifying our influence and impact in shaping global science and sustainability efforts.

There are many challenges ahead, yet chemistry has so much to offer, and IUPAC is uniquely positioned to ensure that its full potential is achieved. For this reason, I invite every member of our community, scientists, educators, policymakers, and industry partners, to take an active role. By contributing expertise, sharing perspectives, and working with IUPAC to harness the transformative power of chemistry. Only by working together can we transform challenges into opportunities and ensure that chemistry continues to deliver solutions for society and the planet. Through our standards and recommendations, our projects and publications, our education and outreach, and our ability to connect scientists across borders, we provide the global chemistry community with the tools and platform for discovery and innovation to thrive. In doing so, we are helping chemistry deliver solutions for the benefit of humankind and the world. This is more than our mission; it is our responsibility. Few callings are as urgent or as inspiring as joining together to shape a more sustainable and hopeful future through chemistry. 🌍

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