

maintain the public's confidence and fulfill its role in advancing the common good.

1. (Mahaffy 2008, *Pure Appl. Chem.*, Vol. 80, No. 1, pp. 161–174, 2008, <https://doi.org/10.1351/pac200880010161>, or <https://iupac.org/project/2004-047-1-050/> )

### Science Under Siege: Confronting the Hydra's Many Heads

by David Winkler, La Trobe University, Monash University, University of Nottingham

Science is facing a multifaceted and intensifying assault, likened by Professor David Winkler to a Hydra—each challenge spawning new threats even as others are addressed. While attacks on science are nothing new, today's wave is unprecedented in scale and complexity, fueled by political polarization, digital disruption, and growing public skepticism.

The internet has democratized access to scientific research but also enabled the rise of predatory journals and conferences, diluting the impact of legitimate science. The explosion of AI-generated content—often built on flawed, biased, or insufficient data—has further strained the credibility of scientific outputs. Peer reviewers, overwhelmed by a flood of low-quality submissions, are stretched thin, making it easier for unvetted studies to slip through.

A reproducibility crisis also looms large. A 2016 *Nature* survey found that over 70 % of researchers across disciplines failed to replicate others' results—and more than half failed to reproduce their own. Confirmation bias, underpowered studies, and a rush to publish are compounding the issue. Pre-registration of experiments and new models of continuous online review may help reverse this trend.

Ethical oversight remains uneven. While some organizations like the American Chemical Society and Royal Society of Chemistry enforce formal codes of ethics, many universities still fail to mandate coursework on scientific integrity and bias. Winkler highlights the urgent need for a global chemical ethics framework, especially given the powerful—and potentially dangerous—applications of chemistry and biology.

Finally, anti-science rhetoric, particularly in the U.S., has been amplified by social media influencers and uncredentialed commentators. The erosion of expert voices, visible during the COVID-19 pandemic, underscores the need for renewed advocacy. The path forward may include more grassroots efforts—like the March for Science—and a renewed global commitment

to uphold the integrity, transparency, and public value of scientific inquiry.

<https://iupac.org/event/wclm-2025-trust-in-science-and-the-right-to-science/>

### Sustainable Practices for Promoting Diversity in Chemistry

by Siu Yee New and Mei-Hung Chiu

The issue of gender has been highlighted as one of the United Nations' Sustainable Development Goals. To further raise public and policymakers' awareness, the IUPAC World Chemistry Congress 2025, held in Kuala Lumpur, Malaysia, organized an SDG5 (Gender Equality) symposium. The event brought together participants and experts to exchange ideas and share actions aimed at reducing gender disparity, while promoting inclusion, diversity, and equality.

The SDG5 symposium convened a vibrant and diverse group of scientists, educators, and leaders to explore how chemistry can serve as a catalyst for gender equality and inclusive innovation. Titled "*Sustainable Practices for Promoting Diversity in Chemistry*," the session attracted strong participation and featured dynamic, engaging Q&A discussions that encouraged open dialogue and knowledge exchange.

### Rethinking Leadership and Redefining Success

Speakers emphasized that advancing gender equality in chemistry demands systemic change—reimagining who leads, who participates, and how success is defined. Josephine Tsang (Chemical Institute of Canada) called for a transformation in scientific culture through inclusive leadership and allyship, urging institutions to amplify underrepresented voices and build equitable frameworks that support resilience in the sciences. Javier García-Martínez (University of Alicante) introduced IUPAC's initiative to establish *Guiding Principles for Responsible Chemistry* [1], grounded in ethics, diversity, and inclusion. He stressed that chemistry must align with societal goals and embed equity across research, education, and public engagement.

### Mentorship and Visibility: Building Inclusive Communities

The symposium highlighted the importance of mentorship and visibility in supporting women and



From left, Nurul Huda (Universiti Kebangsaan, Malaysia; SDG5 Symposium organizing committee), Zuriati Zakaria (Institut Kimia, Malaysia), Mei-Hung Chiu (National Taiwan National University), and Siu Yee New (University of Nottingham, Malaysia)

underrepresented groups in STEM. Chao-Ping Hsu (Academia Sinica, Taiwan) shared three impactful initiatives: the Women in Science & Technology (WiST) Convention, the NSTC Career and Gender Equality Workshop, and a Mentor-Mentee program launched by the Taiwan Chemical Society—all aimed at strengthening professional networks, fostering thematic discussions, and supporting junior chemists.

Keynote speaker Frances Separovic (University of Melbourne) discussed Australia's Women in STEM Decadal Plan and the *STEM Women Global* directory, which enhances visibility and career progression. She also introduced a mentoring program launched in 2024 that connects early-career researchers from low-income countries with experienced mentors worldwide.

### Inclusive Education and Equitable Access

Education emerged as a central theme, with calls to develop inclusive curricula and accessible learning environments. Mustafa Sözbilir (Atatürk University, Türkiye) presented inclusive strategies for blind and low-vision (BLV) students, including adapted lab activities and 3D-printed materials. His work demonstrated how simple, cost-effective modifications can enhance learning and motivation for visually impaired students.

Ghada Bassioni (SEU Egypt) emphasized the role of inclusive education strategies in promoting gender equality. She advocated for chemistry curricula that feature diverse role models and for workshops focused on leadership and communication skills tailored to women in chemistry. She also emphasized the importance of internships and hands-on research opportunities for female students.

### Chemistry for Climate and Community

The intersection of sustainability and gender equity was compellingly illustrated by Rozzeta Dolah (Universiti Teknologi Malaysia), who introduced the metaphorical shift from a “Periodic Table” to an “Equal Table.” Her work on MIZU Paint and ZetaTech™ nano-carbon coatings demonstrated how green chemistry innovations can address environmental challenges while empowering women scientists and entrepreneurs.

### Global Perspectives, Shared Challenges

Jane Catherine Ngila (University of Johannesburg) provided insights into the African context, outlining how digital divides and systemic barriers deepen gender gaps in STEM. She highlighted policy frameworks and success stories from the continent that showcase how inclusive science, technology, and innovation (STI) ecosystems can contribute to multiple SDGs.

Tracey Peter and collaborators (University of Manitoba, with partners in Sweden and Germany) presented cross-national research on how workplace incivility and perceptions of inequity contribute to emotional exhaustion and attrition among women in STEM.



From left Supawan Tantayanon (Thailand, newly elected member of the IUPAC Executive Board), Sieng Huy (Cambodge), Zuriati Zakaria (Malaysia), Ale Palermo (UK, member of the IUPAC Science Board)



Attendees of the “Sustainable Practices for Promoting Diversity in Chemistry” event at IUPAC2025

Their findings underscore the urgent need for supportive workplace cultures and institutional reforms.

### A Call to Action

The symposium concluded with a collective commitment to embed ethics, equity, and inclusion into the core of chemical research, education, and leadership. The engaging Q&A session reflected the enthusiasm and urgency among participants to collaborate across borders and disciplines. Chemistry, as the speakers affirmed, must not only solve technical problems but also contribute to a more just and sustainable world.

These efforts build on IUPAC’s long-standing commitment to equity, reflected in initiatives such as the Global Women’s Breakfast [2], the Gender Gap in Chemistry project [3], and the Distinguished Women in Chemistry Award [4]. By linking the symposium outcomes to these global initiatives, the chemistry community strengthens its collective efforts to embed diversity, equity, and inclusion into the heart of scientific progress.

### References

1. IUPAC Guiding Principles of Responsible Chemistry <https://iupac.org/responsible-chemistry/> (viewed 18 Aug 2025)
2. IUPAC Global Women’s Breakfast <https://iupac.org/gwb/>
3. IUPAC project The Gender Gap in Chemistry – Building on the ISC Gender Gap Project <https://iupac.org/project/2020-016-3-020/>
4. IUPAC Distinguished Women in Chemistry or Chemical Engineering

<https://iupac.org/what-we-do/awards/iupac-distinguished-women/>

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## Green Chemistry for a Sustainable Future

by Aleksander Antonov

As part of the IUPAC 2025 World Chemistry Congress in Kuala Lumpur, PhosAgro, UNESCO and IUPAC hosted an international symposium titled “Green Chemistry: Experience and Opportunities for Cooperation for a Sustainable Future.” The event brought together leading scientists along with representatives of industry, government agencies and international organizations. The results of the Green Chemistry for Life grant programme were presented during the symposium. Over eight rounds, the jury has reviewed more than 1,000 scientific works, and grants have been awarded to 55 young scientists from 33 countries in Asia, Africa, the Middle East, Europe, North America and Latin America.

UNESCO Assistant Director-General for Natural Sciences, Lidia Brito, said: “Our PhosAgro–UNESCO–IUPAC partnership, through the Green Chemistry for Life programme, supports young scientists from all