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Main topic

Perspectives on contemporary leadership

Editorial

Leadership for the future

- Female leadership in science: A topic worth discussing
- Leadership in transformation: Values as a compass in uncertain times
- Tackling the problem of “forever chemicals” with boron doped diamond electrodes
- Wasting light to reveal structural heterogeneity in biomolecular films

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Zum Titelbild:
Leadership in science is a journey as varied and demanding as the research that drives it. Especially in physical chemistry and related fields, stepping into responsibility means navigating new expectations: from guiding young researchers to shaping ideas and directions in a team. Good leadership can be learned, developed, and strengthened, whether one is a postdoc, a new group leader, or an experienced scientist taking the next step. In this issue of the Bunsen-Magazin, we explore what leadership looks like in academia and industry, how scientists grow into it, and which paths can lead there.
Cover image: Noah Al-Shamery.

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Leadership for the future

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European societies are currently facing a multitude of existential challenges from social division and the rise of extreme forces over the decline of established industries to climate change and the first glimpses of its potentially disastrous consequences. To overcome these challenges, rapid and far-reaching social, technological, and environmental shifts will be inevitable. With these ongoing transitions, the demands on leaders are also changing and expanding. Leaders today must navigate evolving priorities, including diversity, equity, and inclusion (DEI) and the pressing need for meaningful climate action. To realize these challenging demands, leadership – and especially effective leadership – is a central skill to master, and current and future leaders need to be prepared for the tasks ahead. In this issue of the Bunsen magazine, we present perspectives on contemporary leadership by experts aiming to support established and early-career researchers to further develop their leadership skills.

On the topic of leadership skills, Steve Price provides an introduction on which skills are essential for effective leadership and how these skills can be developed. He also discusses what motivates leaders to take their leadership position and shoulder the additional work and responsibility. While needless to say, the ability of being a good leader is independent of gender, leadership positions in science and technology have traditionally been (and often still are) mainly occupied by men. In her article, Prof. Katharina Kohse-Höinghaus discusses the importance of women in leadership roles and reflects on the past, present and future of female leadership especially in the German academic sector. Further expanding on leadership in science, Gabriele Gebhardt contemplates whether good leadership is even necessary for research organizations to succeed, and if so, how leadership skills can be trained. Dr. Ramona Thalinger and Dr. Kirill Monakhov share their advice on the broad topic of good/effective mentorship from different approaches.

From an industry perspective, Dr. Hanno Brümmer argues that especially in times of uncertainty, values can serve as a guiding framework for effective leadership. Values are not merely aspirational ideals; they constitute the foundation for public confidence in research and industry and the structural basis for resilient scientific communities. Leadership during periods of change means navigating others through complexity while remaining anchored to these core principles.

The academic ecosystem, which is responsible for allowing new ideas to thrive and pushing forward the limits of human knowledge, is fundamentally shaped by effective leadership. In the German academic system, the establishment of the junior professorship in 2002 represented a fundamental reorientation. By providing early-career independence in research and teaching, alongside clearer pathways to permanent appointments. In an experience report, Jun.-Prof. Jan Meisner offers his perspective on becoming a permanent professor via a junior professorship.

To complete this issue, we present excellent and innovative research from early career researchers. Dr. Joshua Tully provides insights into his work on solving the problem of so-called "forever chemicals" with electrochemistry, while Dr. Alexander Fellows shows how the structural inhomogeneity of biomolecular films can be revealed with sum frequency generation microscopy. We also introduce the research of the four finalists of the Agnes-Pockels-PhD Award 2025. All four finalists will give a talk at the Bunsen-Tagung 2026 in Dresden, where the award winner will be chosen. To further center perspectives around physical chemistry and tie them to the larger climate concerns, we asked Prof. Gregor Jung, Ass. Prof. Alexander Genest, and Prof. Günther Rupprechter how physical chemistry can contribute to solving the world's growing demand for green energy.

Additionally, we present the yPC report 2025 summarizing the main activities and achievements of the young Physical Chemists in 2025. With Prof. Maria Wächtler and Dr. Ulrich Ott, we discuss the benefits of taking an active or leadership position in the Bunsen society.

So, does leadership in science matter? Now more than ever. Can it be developed? Through incremental steps. We must approach leadership with the same rigor we bring to our scientific work: through intentional steps that define us both as scientists and as human beings.

Dr. Tobias Dickbreder, Noah Al-Shamery, Abha Valavalkar,
Dr. Christian Wiebeler, Dr. Tarek Al Said
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Steven Price

Leadership skills: A quick what, when, where, how and why

I confess an initial concern, as a humble mechanical engineer, that my contribution to this esteemed journal and its learned audience, might not be of sufficiently high academic standard. With a deep breath, I resolved to, if not master my fear, then at least *project the confidence* that I could provide two pages of thought-provoking copy. I'll only know if I've achieved that when it's complete and I'll have to manage my fears and *work in this uncertainty* until then.

In a career of over 40 years I've worked with more than 1500 leaders in the chemical industry and related sectors. Since 2003, at the European Institute for Industrial Leadership (EIIL) I've helped more than 2000 young leaders to develop their own leadership skills, mostly by *interviewing* and *observing* others. So, I've observed, and practiced, a variety of leadership skills (including projecting confidence and making decisions in uncertainty), and I've seen how young talented graduates have grown and developed their leadership skills right up to board level. Most of these leaders began to develop and exhibit their leadership skills whilst at university, though rarely, and only fairly recently, as part of their university studies.

It is important to first have a common understanding of what a skill is in this context before demonstrating how, at the risk of upsetting the Profs reading this, one can be developed 'at university but not in university'. For us, a skill can be defined as "an ability that can be developed and used deliberately and at the right moment to cause a desired effect." Employers recruit from candidates who already show, or show the *self-improvement orientation* to grow, the skills their organisation needs. Academic or "hard" skills are relatively easy to judge through degrees, institutions, curricula, and grades. Take 'playing the violin': we can distinguish beginners from experts, and even without hearing someone play, we can infer their capability from evidence such as concert experience, audience size, paid performances, or certificates from recognised assessors. With this information, we feel confident about their ability to perform in our orchestra. Other abilities – *time management, cultural awareness, communication, effective influencing* – are often labelled "soft skills," a term that can wrongly suggest vagueness, innate talent, or something less important. In reality, these personal capabilities enable people to work *effectively with others (teamwork)* to achieve meaningful results. They are neither simple nor universal, and those who can use them reliably, even under pressure, uncertainty, or time constraints, are more likely to progress to leadership positions. Soft skills are valuable and transferable but can be complex, involving multiple components that are difficult to measure. Just as a violinist refines bowing, fingering, tone, tempo, and expression, and then brings them together fluently, soft skills are made of parts that can be practised separately and combined when needed. With the right approach, these so-called "soft" skills – like musical technique – can be learned, developed, and applied with confidence. Pre-pandemic, I wrote an article for the Future of Universities Thoughtbook [1]. In it I noted that universities, at least whilst they remain physical places to learn, collect together large numbers of students, often away from home for the first time, often with time on their hands between studies. Student societies such as the young Physical Chemists (yPC) and the European Young Chemists' Network (EYCN), and other organisations run by students, provide a great way for students to spend their free time. The benefits for many come simply from the activities of the society; the themed discussions, events (even parties) they 'consume' as a member. But for those who provide the organisation behind these activities, they begin to develop useful 'soft' skills, and many of the leaders I've had the privilege to know cut their leadership teeth in such student organisations.

Regular meetings on society business provide opportunities for observation and *review* of *effective meeting skills*. Why is it that some meetings held by some people are more effective than those held by others? What do they do differently? What should I try to do next time I get the opportunity? Why are some of our events more successful than others? Who did what to make successes happen? What can I do next time to make my event successful? Those who move on to elected office get to handle issues like budgets, resource planning, training, strategy of the association, handing over to the new board, liaising with national and international boards of the association. All provide experiences which require the exercise of skills much sought after by employers but rarely recognised as such by students.

Some students breeze through these experiences by simply emulating others, seeking 'how should I?' guidance to get results they can be personally proud of. Others begin to become interested in the skills themselves – how come I can do this, but they do not do it? How did we manage to reach that conclusion from all those different perspectives at the beginning? By observing and reviewing, identifying and repeating practices which worked, and avoiding things which didn't, can help those interested to develop their skills over time.

One outstanding student I knew managed to organise a successful conference of over 400 students from 16 national representations, with opening ceremony, closing ceremony, two days of workshops and two more of cultural visits, a parallel annual general meeting of the international association representatives, evening entertainment and transport and accommodation for all with a team of vol-

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unteers, without any career advancement, or bonus to incentivise or sanction. Using only the 'soft' skills learned through her student association experiences; with simply the power of *personal persuasion*, *briefing tasks effectively* to show people what needed to be done, and *managing stakeholders* or *prioritising resources* to help remove obstacles to them doing it, this student achieved a success of which the communications department of any major multinational would be proud. I was so hugely impressed that I hired her!

The EIIL has partnered with student organisations since 2006 and since this strategic hire in 2021, has brought five scientific and technical student organisations, including EYCN, together with six EIIL member companies, in a consortium known as the Future Leaders Dialogue. The initiative's four annual surveys and highly interactive conferences to date (a fifth is launched early December) have attempted to narrow the gap between student and employers perspectives on what makes a company's career offer attractive, and which skills are most required by industrial employers. One common issue observed was the lack of appreciation by employers, and recognition by students of the skills they'd developed whilst undertaking their student society activities. 'SOELSAF', not an IKEA product but the working acronym for the Student Organisations and Employers Leadership Skills Assessment Framework, is a spin-out project to address this. The initiative has developed a common skills development framework which will enable self-assessment, and peer-validation of skills acquired, and more importantly will help provide a common language and examples with which job seeking students can describe their Student Organisation experiences, and the skills they've used in these.

So can we expect to see more future chemical industry leaders amongst the readership of this journal? We worked together with some of them when we jointly hosted with EYCN a conference 'Leadership in a Time of Crises – The Future of the European Chemical Industry'. We heard from industry leaders, and discussed with both students and industry young professionals, how the industry is planning to navigate its way through a distinctly un-level playing field of high energy prices, complex and inconsistently applied legislation, tariffs and trade wars, and Chinese overcapacity. We heard how the industry must transform, be more innovative, circular and less fossil-dependent and that it needs investment, protection and a big 'buy European' campaign to become resilient.

What we didn't hear was that it also needed to take responsibility for the talent pool, and to continue to attract the best talent, and its future leaders, against the pull of competing sectors. We heard

Fig. 1: Leadership in a Time of Crises – The future of the European Chemical Industry: The banner of the conference organized jointly by EIIL and EYCN. One of the key points discussed during the conference: "POSNOTPOP" – "Be part of the solution, not part of the problem!" Copyright: EIIL.

concern that leadership in a career in the chemical industry might only be *leading your team* to meet austerity budgets. That having to *motivate a team* to do more with less for the pride of having done a good job isn't really so attractive. That becoming better than your competitor for the next promotion, so that you can exchange a fraction more salary for a quantum leap worsening of work-life balance is losing its appeal for an incumbent millennial generation choosing not to apply for vacant higher management positions.

So what does make, at least some of us, do it? In sport, in music, it's easy to benchmark yourself against competitors, improve your skills against an observed standard and compete for the rewards at the top of the game: trophies and medals, gold discs, sell out stadiums. In our chemical industry our superstar leaders get the reward of making planet-changing choices. If, as I do, we believe the biggest, most worthwhile challenge on the planet is to improve our standard of living whilst reversing the man-made effects of climate change, then we need the best leaders on the planet to join, and to lead a chemical industry to tackle that challenge. And for those young chemists seeking to put in the hard work, first in their student societies and then throughout their career, to develop their 'soft' leadership skills, this is the reward which awaits you. Nailed it!

References

[1] Todd Davey, Arno Meerman, Balzhan Orazbayeva, Max Riedel, Victoria Galán-Muros, Carolin Plewa, Natascha Eckert, The Future of Universities Thoughtbook: 40 Perspectives on How Engaged and Entrepreneurial Universities Will Drive Growth and Shape Our Knowledge-Driven Future Until 2040, *University Industry Innovation Network* 2018. (https://next.rmit.edu.au/wp-content/uploads/2020/06/FUT_-Global-Edition.pdf)

Steven Price

In a career of over 40 years Steve Price has worked in the chemical industry and related sectors. Initially as an maintenance engineer on fertilizer and amines plants, then project manager building acrylics plants around Asia, then working his way up to European Board level in a division of a major multinational chemical company. Since 2003, has been Director and one of 8 coaches in the European Institute for Industrial Leadership (EIIL), a non-profit association of industrial companies in the chemicals, energy and related sectors, where he has helped develop member's leadership skills at all levels from graduate right to board level. Steve is passionately interested in the development of leadership skills, and for those interested has mentioned eighteen leadership skills, or components of skills, in this article. How many of these have you mastered?

Katharina Kohse-Höinghaus

Female leadership in science: A topic worth discussing

This article does not attempt to provide a general assessment of the situation of women in leadership positions. The focus here is on female leadership in the natural sciences and technical disciplines, especially in academia and in the German context. It conveys impressions from a personal perspective.

When asked about leading women in science, an obvious answer is to name exceptional female researchers such as Marie Skłodowska-Curie, who was awarded the Nobel Prize in Physics in 1903 and in Chemistry in 1911 for her groundbreaking discoveries in the field of radioactivity. A look at the Nobel Prizes [1] underlines the relative rarity of female recipients. In total, 67 female laureates have been honored in the approximately 120 years from 1901 to 2025, but most of them in the categories of Peace (20 awardees), Literature (18), and Physiology and Medicine (14). Exceptional achievements by 5 women among 229 laureates were recognized with the Nobel Prize in Physics, as well as of 8 female recipients among 198 awardees in Chemistry. There is also a significant time gap after the first awards to women, with increasing attention to female scientists mainly in the past decade.

In Germany, the Gottfried Wilhelm Leibniz Prize is considered the highest research award. In the four decades since its introduction, it has been awarded to 455 scientists, including Christiane Nüsslein-Volhard in 1986 as the first woman and Sigrid Peyerimhoff in 1989 as the first female chemist [2]. After only a few female researchers were honored in the early years, the list now includes 78 women. About 15 female laureates have received this prestigious award for their work in chemistry and physics, including biochemistry and biophysics. The situation is similar with other important awards or elections to prestigious societies and academies – recognition for outstanding work by female researchers is often only quite recent. One can read about or speculate on the reasons and study historical and current biographies [3–8]. For example, the first female Fellows of the Royal Society were only recognized from 1945 onwards, although their election had been possible since 1922 [3, 4].

Leadership positions in academic organizations offer further insight into the status of female representation. To name just a few, the German Chemical Society (GDCh), the German Physical Society (DPG), the Society of Natural Scientists and Physicians (GDNÄ), and the Bunsen Society for Physical Chemistry (DBG), founded 1867, 1845, 1822, and 1894, respectively, appointed their first female presidents in 2007 (DBG, GDNÄ) and in 2012 (GDCh, DPG). The first female presidents of the German Science and Humanities Council (WR) and the German Research Foundation (DFG) took office in 2017 and 2020, respectively. Some major scientific organizations in Germany, the Max Planck Society, the Helmholtz Association, the Fraunhofer Society, and the Alexander von Humboldt Foundation, have been represented by male presidents to date, while the first female president of the Leibniz Association took office in 2022. Female scientists are increasingly being elected as university presidents and rectors, and the representation of women in the leadership teams of scientific organizations and universities is now well established at the vice-presidential level.

Historical developments and traditional roles have contributed to the relatively recent emergence of women in leadership positions in science. Nevertheless, young women pursuing education and a career in the sciences and technology today still face challenges regarding guidance, encouragement, and the need for role models. My own path in science with about 50 years in an academic environment is described in my autobiography in the series “Lives in Chemistry” [8]. The young girl in Fig. 1, who attended a girls’ school and came from a non-academic background, initially found little support for her desire to become a scientist, and in the first 20 years of my professional development, I had to overcome quite a few difficulties.

Fig. 1: Critical reflections on my future, 1965.

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The participation of women in leadership roles in science can be viewed from both a personal and a structural perspective. Expectations placed on leaders in scientific organizations and institutions should encompass more than just professional achievements and expertise in the scientific domain. Respect for members and partners of the respective institution at all levels, as well as the willingness and ability to create an open, inclusive, fair, and participatory environment, should be indispensable. Vision, strength, and creativity in leading the institution, planning and defining criteria for its strategic development, and establishing transparent processes and structures are factors that contribute to a favorable climate for scientific personal and institutional growth. Tolerance, reliability, honesty – the wish list for responsible leadership is long.

Regarding the involvement of young researchers, an inclusive culture is desirable, in which one can introduce new concepts and topics even in an early career phase, learn from mistakes, and receive constructive feedback. Communication is essential, for setting targets and standards, and jointly achieving common goals. This is especially needed for advancing the potential of female leadership in science. Future female leaders do not just fall from the sky, but should be identified, encouraged, and promoted at an early stage. Female role models and appropriate guidance are key for a positive development. But what should one bring as a young woman for a career and as a future leader in science and technology? Motivation, tenacity, resilience – but above all, a positive self-concept. Support helps, as does the feeling of not being alone in a given situation. Of course, the family issue is a topic that must be considered with one's partner, personal surroundings, and the employing organization, especially for female career development. There may be more support than anticipated – asking questions and making respective requests can help to find or establish suitable measures and structures.

From my role as a mentor, speaker, and co-organizer of workshops for women in science, it is revealing to see that many of the same questions are asked in quite different settings. One of the recent events of the international network "Women in Combustion" that I founded almost 20 years ago, took place in Nanjing, China. Although the spirit was great, as seen in Fig. 2, many concerns were raised during the discussions, including fierce competition for attractive positions, long and inflexible work hours, and the continuing scarcity of childcare facilities near the campus. Even though there would be no group meetings in presence at 11 p.m. here, similar topics as in China were addressed at meetings in several universities in Germany and international online meetings focusing on women's careers in science. Discussions with female researchers of different career stages and international experiences led to recurring subjects such as remaining lack of support for independent research, concerns about hierarchical structures, limited availability of long-term positions in the academic system, and the need for diversity- and family-friendly environments. Such questions often covered a broad spectrum from the more general to the practical. Examples included finding leads into and support for exploring new research fields, finding strength and resilience in difficult situations, and maintaining authenticity as a female researcher in male-dominated surroundings. Above all, it is often unclear where to find the right office in large organizations that would care about such matters.

Fig. 2: Women in Combustion Workshop, Nanjing, China, 2025. Photo©: Kun Jin.

I wish to encourage all young and experienced female researchers and colleagues to pursue their path with curiosity and ambition, and to support others who may need their advice and mentorship. I also appeal to those who shape the academic workplace to actively engage with female researchers to critically review potentially inefficient or adverse structures and habits, and to keep learning about and encouraging diverse career perspectives. Clear prospects for female scientists are necessary to promote their engagement as leaders in scientific institutions and organizations.

References

[1] https://www.nobelprize.org.

[2] https://www.dfg.de/resource/blob/169450/download-gwl-preis-uebersicht-leibniz-preistraeger-innen.pdf.

[3] Stella Butler, *Breaking the Glass Ceiling of Science. The First Eleven Women to Become Fellows of the Royal Society 1945-54.* The History Press, Cheltenham, UK, 2025.

[4] https://royalsociety.org/blog/2025/06/great-barriers/.

[5] Lives in Chemistry, https://l-i-c.org.

[6] Ansgar Schanbacher, *Menschen und Ideen. Die Gesellschaft Deutscher Naturforscher und Ärzte 1822–2016.* Wallstein Verlag, Göttingen, 2016.

[7] Sigrid Peyerimhoff, *Ein Leben für die Quantenchemie.* GNT Publishing GmbH, Berlin, 2025.

[8] Katharina Kohse-Höinghaus, *Burning for Science – A Woman in a Technical Field.* GNT Publishing GmbH, Berlin, 2025.

Prof. Dr. Katharina Kohse-Höinghaus

Katharina Kohse-Höinghaus studied chemistry in Bochum with a doctorate in 1978 and performed her habilitation in Stuttgart in 1992. She developed advanced techniques to study reactive species in high-temperature systems. As a professor of physical chemistry in Bielefeld from 1994, she established an international hub for combustion research as well as one of the first school labs in science. Prof. Kohse has been honored with numerous awards, academy memberships, and honorary professorships. She has served in many scientific organizations and as the first female president of the Bunsen Society in 2007-2008.

Gabriele Gebhardt

The quality of leadership in science – does it really matter? And if so, can it be trained?

The quality of leadership in scientific research organisations has been taken for granted for an amazingly long time even after leadership had been identified as a key success factor for the performance level and sometimes even survival of organisations. This might be because a scientific organisation as a corporation of the public sector can hardly fail once it has been established and delivers relevant results – as a difference to private corporations which find themselves in a market-driven environment. Additionally, scientists are supposed to be strongly self-motivated and driven by passion for their work. A high identification and spirit of purpose will compensate for many aspects in the working environment that count as hygiene factors and might not always be fulfilled in a satisfactory way such as the contract situation, the payment or relations with relevant interaction partners. With a labour market that provides new personnel resources quickly, even a high fluctuation of talents within research groups might help to diminish the effect of unfavourable internal factors such as poor leadership.

The moment, competition among organisations might challenge its level of performance or even survival, the attention will be drawn to further internal aspects of its constitution. Here, leadership and management might make a difference. Currently, we observe a struggle for talents in many research areas around the world. A more tense situation on the labour market will turn the recruitment of candidates and the employee retention into a permanent challenge. This is why the quality of leadership and management requires a greater attention even for scientific research organisations.

In our consultancy team, we have had the opportunity and pleasure to design various training and development programs for young leaders in science for several customers in the public scientific research field in Germany. Our customer portfolio encompasses institutions within the Helmholtz-Association such as the German Aerospace Centre, the German Centre for Cancer Research, the Research Centre Jülich, the Helmholtz-Zentrum Berlin as well as institutes within the Max-Planck-Gesellschaft and the Fraunhofer Gesellschaft. Our approach is to identify the key requirements to a position such as a group lead or main project lead in a postdoctoral situation and define the relevant curriculum with our customers. Based on the requirement profile, we design training-workshops which we conduct as in-presence-trainings. For the design of the program, we make the difference between leadership and management skills. The focus is in general on leadership competencies which include all types of shaping direct interactions with other persons and stakeholders in a 360-degree perspective. If needed, we include managerial skills such as project management capabilities or strategic planning into the curriculum. As managerial competencies are often part of a broader organisational framework, they are partly covered by additional internal training which does not only address the specific target group of new leaders in science.

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As a highly appreciated good practice, the workshops consist of two-day-physical training that is driven by a strong link between brief theoretical backgrounds, the participants' own reflection of experience and immediate practical applications. The participants receive direct, personal feedback on their impact on others in various simulations, role plays and exercises related to the working field such as bilateral conversations on problem-solving, delegation, personnel development and group situations. The programs consist of three to six modules depending on the range of requirements and responsibilities of the positions to cover. We work with a stable group of max. twelve participants throughout the program so that the level of trust and openness to reflect on own development potentials is quickly fostered and participants open to receiving and providing positive as well as critical feedback with their peers and the trainer. As a side effect, the exchange and work in a stable group supports the networking beyond the training experience and creates additional value for the organisation.

The fundamental challenge in leadership to which we want to respond is: How can a leader have a positive impact on stimulating relevant observable behaviour of other persons so that the goals of the organisation and the specific endeavour will be attained? How can a leader in specific situations even have an influence on modifying other persons' attitudes or beliefs so that a higher level of commitment will enable an even higher level of contribution? Here we refer to the concepts of transactional and transformational leadership. One of the basic requirements when collaborating with others is how to be aware of the impact that our communication and interaction have on our counterpart and whether there might be un-intended and even non-constructive effects of our actions. Raising self-perception and the readiness for receiving feedback are core competencies that we train during the modules as well as a broad variety of communication skills to enable constructive, solution and future oriented as well as appreciative interactions. The systematic approach for the design of the training modules is based on the concept of the theory of social systems developed by Niklas Luhmann and further transferred to the theory of organisations by Fritz Simon and others. This is why we move in our training modules from the understanding of less complex social systems in bilateral interaction to the analysis of more complex systems of groups which are in place the moment three persons get together. With the third person entering the scene there is an observer as part of the social system by which the dynamic changes immediately. We are intuitively aware of it when we feel that providing critical feedback to an individual in a group might not be very promising for stimulating a change in behaviour in a sustainable way without damaging the relationship.

A much-valued approach in our programs consists of a three-module-concept: Module 1 is focused on clarifying the role understanding of and the role change to a leadership position, on expectation management between role taking and role making and on shaping bilateral communication situations in a constructive and appreciative way. Bilateral communication situations cover a broad range from problem-solving to delegation to providing feedback to counselling and consulting with interaction partners in a 360-degree perspective: the team members, peers, external parties and own superiors. In module 2 we move to actively influencing group situations so that the group interaction really creates synergies. This module includes team development as well as meeting management and conflict resolution. For module 3 we take into consideration the individual constitution as a leadership personality in terms of self and time management and fostering individual resilience so that we can prevent a permanent over-load from happening. Based on our customers' feedback and the experiences with sustainability in behaviour-oriented learning processes we conduct the training as in-presence-training. The intensity of feedback-processes during the training cannot be met by online training. At the same time, being able to share the learning experience during the workshops presupposes a certain level of trust among the participants – and trust can only be built in physical interactions.

In our team we are very grateful that we can contribute to shaping the scientific working environment as a place of high-quality communication even beyond the force-less force of the better argument.

Further readings

[1] Bernhard M. Bass, Bruce J. Avolio, Developing potential across a full range of leadership TM: cases on transactional and transformational leadership, *Lawrence Erlbaum Associates 2001.*

[2] Bernhard M. Bass, Ronald E. Riggio, Transformational Leadership, *Psychology Press* 2005.

[3] Bruce J. Avolio, Full range leadership development, *SAGE Publications 2010.*

Gabriele Gebhardt M.A.

Gabriele Gebhardt studied philosophy, social sciences and roman languages at the universities of Bochum, Tours and Barcelona. After a collaboration within a research project of the DFG for the edition of the work of Wilhelm Dilthey at the Ruhr-University Bochum she further developed empirical research in organisation theory within her postgraduate studies of labour sciences at the Ruhr-University. In 1999, she co-founded an organisation consultancy which she has been leading as CEO of Gebhardt.Organisationsberatung since 2022. Together with her team they have a strong focus on collaborating with scientific research institutions and public administration on the federal, provincial and municipal level.

How to PhD: Being a good mentee/mentor

During their studies, most PhD students experience mentorship from both the mentee and mentor perspectives. First and foremost, PhD students are mentees of their PhD supervisor, who guides their research and professional development, and, thus, has a decisive impact on the success of a PhD. On the other hand, PhD students are often teaching bachelor's or master's students, acting as (short-term) mentors during their first practical research experiences. Since mentoring is such an integral part of a PhD, we asked Dr. Ramona Thalinger and Dr. Kirill Monakhov for perspectives and advice on mentoring.

The yPC Editorial Team

Ramona Thalinger

The power of mentorship: Shaping careers and confidence

Mentoring is more than sharing expertise – it is leadership in action. In academia and industry, mentors are often the invisible catalysts behind successful careers. They provide orientation, confidence, and perspective in moments of uncertainty. From my own journey, I know, without the right people at the right time, many doors would have remained closed.

My Story – Why mentoring matters

I am the first generation in my family to attend university. If not for a professor who encouraged me to pursue a PhD, I might never have considered it. Later, during my PhD, another professor suggested I teach tutorials – an offer I initially declined because I didn't feel ready. That encouragement changed my trajectory. When I transitioned into industry, mentors became even more critical. I had more than one:

- The Catalyst – the person who gave me confidence when I doubted myself.
- My Role Model – a strategic thinker who taught me collaborative work styles and big-picture thinking.
- The 'Me in 7 Years' Mentor – someone with a similar background who helped me navigate everyday challenges.

And as I grew more experienced, I realized the impact I could make as a mentor myself: helping women in male-dominated environments fight imposter syndrome, stay sharp during tough times, and even negotiate a raise.

What makes a good mentor?

There is no universal formula – it depends on the mentee and the context. But some principles are timeless:

- Trust and confidentiality: A strong foundation is essential.
- Empathy: Both emotional and cognitive – understand the person and their challenges.
- Honesty: No sugarcoating; clarity builds credibility.
- Time and commitment: Mentoring is an investment.
- Flexibility: Admit when you don't have the answer and connect the mentee to someone who does.

A mentor doesn't need to know everything. In fact, having multiple mentors for different perspectives is often the best approach.

How to build an effective relationship

Mentoring is a two-way street. The mentee also has responsibilities:

- Come prepared and respect the mentor's time.
- Define your goals clearly.
- Be open to feedback and different viewpoints.

Mentors rarely approach mentees proactively – so courage matters. Sometimes it starts with a simple question: 'Could you give me advice on this?' Formal programs help, but informal relationships often grow organically.

Practical Tips

Five Do's for mentors:
1. Listen actively and build trust.
2. Suggest, don't dictate.
3. Share networks and opportunities.
4. Communicate honestly and clearly.
5. Stay flexible and open.

Five Do's for mentees:
1. Set clear objectives.
2. Accept feedback gracefully.
3. Respect time.
4. Embrace diverse perspectives.
5. Take initiative.

Out of the box: Can AI help?

While nothing replaces human empathy and experience, AI can support mentoring in surprising ways: from preparing for

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meetings with curated resources to simulating negotiation scenarios. Think of it as a 'micro-mentor' for specific tasks – not a substitute, but a complement.

Closing thoughts

A good mentor can change a career – and sometimes a life. Mentoring is not a one-way street; both sides learn and grow. So take the initiative, invest in relationships, and remember: leadership starts with helping others succeed.

Dr. Ramona Thalinger

Ramona Thalinger earned her PhD in physical chemistry at the University of Innsbruck (2016), researching Ni/Rh-perovskites for catalytic reactions such as methane reforming and methanation. After eight years in industry focusing on material and surface analysis, PVD technologies, and innovation, and being passionate about leadership and mentoring, she recently began an MBA at Mannheim Business School.

Kirill Monakhov

How to be a good mentor? How to have an effective mentor-mentee relationship?

When I was first asked to answer the question 'How to be a good mentor', my instinctive reaction was: Treat your mentee as you would like to be treated if you were in their position. Yet, not all mentor-mentee relationships are "healthy"; I have seen many examples to the contrary. The topic is rather complex and highly individual. Well, to be honest, it would be easier for me to explain how to generate a crosstalk between stimulus-responsive polyoxometalates (POMs) than to answer this question! But let's try. Below, I summarize in one flow what I'm thinking about, while sitting in a bakery after my lecture on POMs.

1. Genuine interest and time investment
A mentor must have a true interest in working with the mentee and helping the mentee advance in their career. This means investing time, listening carefully to their needs, challenges, and aspirations, and offering guidance tailored to their individual situation.

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2. Curiosity and mutual learning
I genuinely enjoy learning from people, whether they are students or professors, working in my field or outside it. Exploring another person's way of thinking can be as fascinating as studying POM properties. Mentorship should be a two-way exchange, where both parties expand their perspectives.

3. Shared success
It is a great honor, when a mentee succeeds in their career. Knowing that my advice or experience may have contributed, even slightly, is deeply rewarding. The mentor's satisfaction should come from the mentee's growth, not from exercising authority.

4. Engagement from both sides
The mentee must also be willing to be mentored, i.e., to engage in open dialogue about life, science, and challenges. Mentorship is not a one-directional transfer of wisdom; it's a relationship based on mutual respect and trust.

Ultimately, these questions touch the psychology of both parties – their egos, attitudes, and capacity for empathy. To build an effective mentor-mentee relationship, both sides should have a clear vision of what they expect, agree on how often they will meet, and simply take the time to talk. Equally important is mutual respect for each other's limited time.

There is no universal recipe. But if I were to summarize my message in five words to both parties, it would be:

Be respectful, curious, and authentic.

With these qualities, the relationship will evolve naturally – not forced, but genuine.

Dr. Kirill Monakhov

Kirill Monakhov is head of the Switchable Molecularly Functionalized Surfaces Group at the Leibniz Institute of Surface Engineering (IOM). Prior to his appointment in Leipzig in 2018, he was leader of an Emmy Noether junior research group at the RWTH Aachen University and a postdoc at the University of Strasbourg. He holds a PhD in chemistry from the Heidelberg University (2010). In 2025 he was awarded a visiting professorship by the Institute of Advanced Study at the University of Warwick. His work focuses on vanadium-containing POMs for bio-inspired alternative computing and sensing.

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Hanno Brümmer

Leadership in transformation: Values as a compass in uncertain times

Leadership in a world of change

In an age where the only constant is change itself, our understanding of leadership is also shifting. Climate change, digitalization, geopolitical tensions, and social upheaval present companies and organizations with complex challenges. The outdated notion of leadership as "command and control" has reached its limits, if not before.

This reality is particularly evident in supply chain management. Today's supply chains are subject to constant change – due to technological innovations, geopolitical shifts, or changing customer behavior. In my work as Head of Supply Chain & Logistics EMLA at Covestro, I see every day how crucial it is to maintain a balance between long-term thinking and short-term action in this environment. "Change" is therefore much more than just a buzzword: it describes the key skill that managers need in this environment – understanding complex processes, making agile decisions, and communicating change transparently. Change management, including clear and credible communication at all levels – both internally and externally – thus becomes a decisive factor for success.

However, change cannot be managed through processes and structures alone – it requires orientation, trust, shared values, and a clear common vision. The more dynamic the world becomes, the less leadership can be secured through fixed structures. Orientation does not come from control, but from inner clarity – from values that guide actions and decisions. Values are the compass when the map is incomplete. A vision must provide meaning and direction. An idea of where the shared journey should lead. Values provide stability, vision provides direction: both form the core of modern leadership.

Especially in times when there are no clear answers, these factors become a crucial tool for responsible leadership. Values help to make difficult decisions when conflicting goals arise – for example, between efficiency and sustainability, or short-term success and long-term responsibility. Values do not replace analysis, but they do provide direction. A lived vision, in turn, connects people across different perspectives and creates a common goal that everyone can orient themselves toward.

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Living values – not just proclaiming them

Values are not just a mission statement on the wall, but part of everyday practice. They become visible in the way decisions are made, conflicts are resolved, and people are treated. This is especially true when pressure and uncertainty increase. Values give managers and employees a sense of security. They create a common point of reference when conditions change.

A good example of this is our "We Are 1" culture at Covestro. It forms the foundation of our daily actions and is based on four core principles: acting responsibly, striving for improvement, winning together, and showing leadership. It promotes collaboration across departments, countries, and hierarchical boundaries. This culture thrives on open communication, mutual trust, and shared responsibility. When teams find solutions independently or show initiative in difficult situations, leadership emerges at all levels.

But values are not created by words, but by behavior. They are not imposed, but grow through joint action and the way we communicate, give feedback, and respond to mistakes. A culture based on trust, openness, and a willingness to learn empowers people to take responsibility and show leadership in the best sense of the word.

Leadership is not given – it emerges.

Leadership does not begin with a title, but with an attitude. It manifests itself when people take responsibility – even without a formal mandate.

In my leadership roles, it has always been important to me to be directly involved with employees and to listen to their feedback. For example, as an operations manager, I personally explained urgent efficiency measures to all production shifts on site and worked with them to implement them. Even today, I still hold monthly question-and-answer sessions for all employees in my department.

True leadership is based on values, not hierarchy—on trust instead of control. People follow personalities whose actions are credible and value-based. Those who live by their values and pursue a clear vision lay the foundation for the leader they will become tomorrow.

Dr. Hanno Brümmer

Hanno Brümmer is Executive Vice President for Supply Chain & Logistics for Europe, Middle East, Africa and Latin America at Covestro. Educated as PhD chemist he started at Bayer in 1996. In his career he previously held positions of increasing responsibilities in Innovation as well as Production & Technology including assignments in several locations in Germany and in the USA. He holds the chair of the Industrial Advisory Board of the European Institute of Industrial Leadership (EIIL) in Brussels, is Board Member of the Logistics & Transportation Committee of the German Industry Association (BDI) and member of the Advisory Board for the Federal Association of Logistics (BVL).

That's yPC!

"I am looking forward to realizing joint projects within the yPC Team and to connecting with young physical chemists."

Christian Wiebeler is a habilitation candidate at the Institute of Physics, University of Augsburg. His research focuses on molecular dynamics simulations and computational spectroscopy of molecular systems.

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Paths to professorship: Junior professorship

There are currently three main paths towards qualifying for a permanent professorship in physical chemistry within the German academic system. The traditional path is the *habilitation*, in which researchers deepen their scientific profile over several years by working in a research group. This is often combined with teaching and supervisory responsibilities to ultimately demonstrate their suitability for a professorship by acquiring the *venia legendi* (the formal authorization to teach at the professorial level). A second path is via an *independent junior research group,* for example through programmes such as Emmy Noether from the DFG or ERC Starting Grants. In this case, early-career scientists assume full responsibility for their own research programme, budget, and team to build a track record of scientific leadership. The third path is the *junior professorship*, which represents an early step into a professorial role. It also involves full responsibility for leading a research group and is typically combined with a clear evaluation framework and a tenure track.

With the series **"Paths to professorship"**, we aim to showcase personal experiences along these three paths. In this first instalment, Jan Meisner from Heinrich Heine University Düsseldorf shares his experiences and reflections from pursuing a junior professorship. In future articles, we are planning to show perspectives on the traditional habilitation and junior research group paths. If you qualified for professorship through one of these paths and are interested in sharing your perspective, get in contact with us via ypc@go.bunsen.de.

The yPC Editorial Team

Jan Meisner

Experience report

For a long time, academic careers in Germany were slow and unpredictable. Many colleagues only became full professors in their mid-40s, and the traditional route via habilitation often meant years of dependence on a senior professor. To make careers more attractive and to stop the "brain drain" of talented young scientists, Germany introduced the junior professorship in 2002, roughly comparable to an assistant professorship in the U.S. academic system. The idea was simple: give promising young researchers independence in research and teaching much earlier and create a clearer, more transparent path towards a permanent professorship.

Formally, a junior professorship is a six-year, temporary W1 position, often structured as "3+3 years" with a mid-term evaluation in between. Unlike the habilitation, you first pass through a regular appointment procedure involving a committee: you apply, are evaluated, give talks and survive the interview, very similar to applying for a permanent professorship. In the end, you receive an offer as a full member of the faculty. All in all, this is quite what most people striving for an academic position dream about during their postdoc years: a lab of their own with a (limited) budget, own courses, and the right to independently supervise doctoral students.

However, this independence is both exciting and intimidating. On paper, the teaching load is relatively light with four to five hours per week (compared to eight to nine hours per week for a permanent professorship). This is meant to give junior professors time to establish their own research group and scientific profile. In practice, designing new lectures from scratch, navigating university regulations, and taking care of administration still consume a considerable amount of time. At the same time, you are expected to establish your own research group, acquire third-party funding, publish regularly, and become visible in your community. Once the first grants are successful, the group can grow quite rapidly, which in turn increases the time needed to supervise PhD students and postdocs even more. Since I enjoy teaching and discussing scientific findings with my students and postdocs, it is also very rewarding to observe their development. One of the aspects I value most is seeing them grow into independent scientists, for example when they drive projects on their own, obtain fellowships, or receive awards.

The price for the early independence of the junior professorship is, by definition, a probationary phase. At the beginning, you negotiate a performance agreement that specifies what is expected in research, teaching, and academic service. This document matters as it will be used to judge whether continuation is "deserved". Oftentimes, the mid-term evaluation after three years is the first big hurdle. However, if the mid-term evaluation is passed, it often is regarded as formally equivalent to a habilitation, making you appointable as a W2 or W3 professor at other universities. In the tenure-track variant of the junior professorship, this logic is taken one step further. Here, a second, final evaluation after six years decides whether you will be promoted directly to a permanent professorship at the same university. This makes careers significantly more predictable. You know which criteria you will be evaluated against, and you have a concrete timeline. In my own case, having a clearly defined tenure track has been both reassuring and motivating, structuring my planning for research projects, grant applications, and group development.

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Reality, of course, can be more complicated. Many junior professors experience a gap between the legal independence of the role and the resources they actually have. Starting a group with only a small basic budget can be tough and many junior professors spend the first months writing grant proposals to be able to finance their students. Without successful funding, “independence” quickly becomes purely theoretical. The six-year time window is also challenging on a personal level, as it often coincides with the phase of life in which many people would like to start or grow a family. The pressure to perform high-quality science, constant evaluations, and uncertainty about the future do not always fit well with that.

The junior professorship began as a bold experiment in German academia, but despite the challenges described above, I am convinced that it is one of the most promising pathways to a professorship in Germany, particularly in fields such as physical and theoretical chemistry. It combines early independence and genuine university status with a structured evaluation process and, ideally, a transparent tenure track. Compared to leading an independent junior research group outside the formal faculty structure, the junior professorship offers a stronger position within the university including the right to participate in committees, departments, and teaching. For me personally, it is an intensive, sometimes exhausting, but ultimately very rewarding journey toward academic independence.

Jun.-Prof. Dr. Jan Meisner

Jan Meisner graduated in chemistry at the University of Stuttgart, where he also obtained his PhD in 2017 under the supervision of Johannes Kästner. During this time, he had research stays at the Universities of Warwick, Heidelberg, and Groningen and at Imperial College, London. His PhD was recognized with the Young Scientist Award from the division “Computers in Chemistry” of the GDCh for an exceptional thesis in computational chemistry and the Wilhelm-Ostwald-Award from Deutsche Bunsen-Gesellschaft for outstanding interdisciplinary theses. After a postdoctoral position in the group of Todd Martinez at Stanford University from 2018 to 2021, supported by a DFG Research Fellowship, he took a position as Juniorprofessor (Assistant Professor) at Heinrich Heine University, Düsseldorf in 2021.

Joshua Tully

Tackling the problem of “forever chemicals” with boron doped diamond electrodes

Forever chemicals

Per- and poly-fluoroalkyl substance (PFAS) contamination is widely regarded as one of the most pressing environmental challenges of our time. PFAS is a class of over 5,000 fluorinated molecules, [1] which have been used extensively due to their non-stick, water repellent, and heat-resistant nature. This extensive use in consumer products, industrial processes and firefighting foams has led to significant environmental contamination, which has been mapped extensively in Europe by the Forever Pollution Project (https://foreverpollution.eu/map/). Whilst local hotspots can been seen around airports, landfill, and manufacturing sites, the connected nature of Earth’s water systems leads to detectable levels of PFAS in animals, air and soil, even in remote locations such as Antarctica, [2] the Galápagos Islands, [3] and the Amazon Rainforest [4]. These chemicals are bioaccumulative in nature, and no natural degradation pathway exists, [5, 6] leading to the name “forever chemicals.” The prevalence of these compounds in natural water systems combined with an appreciation of their serious health impacts, [7] has led to public outcry, and ultimately legislation to limit the amount, which is permitted in drinking water. The US has a limit of 4 ng/L for five PFAS (including PFOA and PFOS), [8] the EU has a collective 100 ng/L limit for 20 specific PFAS, [9] and the UK introduced a collective limit of 100 ng/L for 48 specific PFAS [10]. Due to these limits there is a wealth of on-going research looking into separation, preconcentration, and destruction technologies for PFAS, in the hope of developing a treatment chain capable of removing these from drinking water and importantly, destroying them.

PFAS compounds typically consist of a functional headgroup (typically a carboxylic acid or sulfonate group) attached to the end of a fluorinated carbon chain (Figure 1). The most common way to divide PFAS compounds is by the length of the carbon chain length. There are three categories; long-chain PFAS have six or more carbon atoms in their chain, short chain PFAS has four to six, and ultra-short chain PFAS have less than four. Some PFAS compounds (such as 6:2 FTS) may have a section of carbon chain which is hydrogenated rather than fluorinated. The length of the chain makes a huge difference to the efficacy of adsorption, separation, and destruction technologies, with long-chains being easier to remove and destroy the parent compound. However, short-chain PFAS are just as harmful as their long-chain analogues, requiring the development of effective treatment methodologies for all chain lengths.

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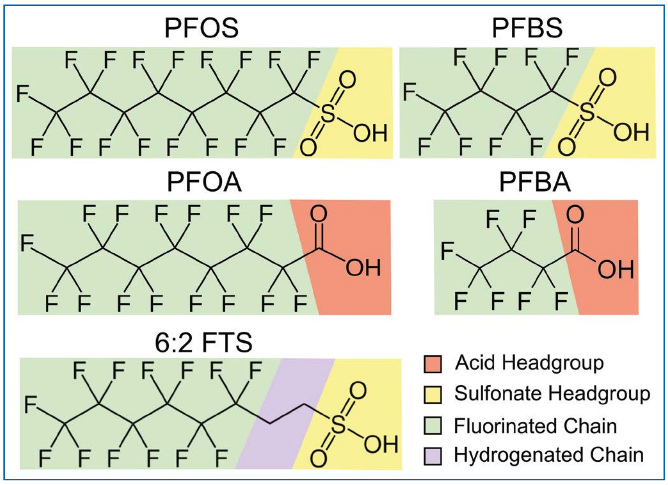

Fig. 1: The structures of common PFAS compounds including PFOS (Perfluorooctane Sulfonate), PFOA (Perfluorooctanoic Acid), PFBS (Perfluorobutane Sulfonic Acid), PFBA (Perfluorobutanoic Acid), and 6:2 FTS (6:2-Fluorotelomersulfonic Acid). Carboxylic acid headgroups are highlighted in red, sulfonate headgroups in yellow, fluorinated chains in green, and hydrogenated chains in purple.

Electrochemical advanced oxidation

One promising method for the destruction of PFAS is electrochemical advanced oxidation (EAO), where molecules can be activated by a direct electron transfer to/from the electrodes or attacked by oxidative species generated on the electrode surface. Electrochemistry is easily scalable, and can work directly with PFAS in water systems, making it an ideal technology for PFAS destruction. However, the electrode material must be carefully chosen to ensure it can survive the current densities required to oxidise the PFAS and generate useful reactive species from oxidation of the water and electrolyte. Materials such as heavy-metal oxides, and magneli-phase titanium sub-oxides have been used but Boron Doped Diamond (BDD) is typically considered the most promising electrode material for PFAS destruction, with commercial systems available.

Boron doped diamond

For several decades synthetic diamond has been grown for a variety of technological applications such as high-power electronics, optical windows and quantum-optical devices. If boron is added into the growth chamber the insulating structure of diamond can be made semiconducting, and with enough boron, eventually metallic [12, 13]. This provides an electrode which retains all of un-doped diamonds best in class properties, such as chemical stability and hardness whilst being conductive enough for electrochemical applications [13]. In the context of EAO these electrodes are thought to be able to produce free hydroxyl radicals; [14] an extremely oxidising species considered to be critical in PFAS destruction, whilst remaining stable enough for continuous operation [15].

Our work

The difference between the PFAS concentrations found in natural water sources, and the limits, which will be imposed for drinking water, motivated us to begin looking at electrochemical destruction of PFAS, to provide solutions for this pressing problem. We chose to start our work using freestanding BDD, a material which the Macpherson group is very familiar with having used it for a variety of applications including heavy metal detection, pH sensing, catalyst supports, and electrosynthesis.

The next challenge is how to monitor PFAS destruction? Researchers most commonly use liquid chromatography and tandem mass spectrometry approaches to quantify the concentration of the starting PFAS species throughout the experiment. While this approach is excellent at tracking this initial molecule, it considers the PFAS “destroyed” as soon as one chemical bond is broken (due to the molecule no longer having the target m/z). While this method can provide kinetic information on the first stage of PFAS breakdown, a major concern is ensuring that compounds are broken down entirely, so as not to create shorter chain PFAS which are harder to destroy and thought to be more harmful. Complete breakdown of a PFAS compound is defined as when all C-F bonds in the molecule are broken (defluorination), leaving no fluorinated organic molecules behind. Because of this the extent of the PFAS breakdown can be monitored by measuring the concentration of released fluoride. In our work we use an electrochemical approach known as a Fluoride Ion Selective Electrode (F^- ISE), this is a rapid, low cost, and accurate way of measuring fluoride and provides us (in combination with LC-MS methods) a fuller picture of the PFAS breakdown observed.

With these methodologies we can test all aspects of PFAS breakdown including cell design and operation, starting PFAS concentration, and different electrolytes, providing insights that would not have been possible with only a single approach. In our initial work, [11] conducted in collaboration with Dr Madeleine Bussemaker (University of Surrey, UK) we looked at two common short-chain PFAS species PFBA and PFBS (Figure 2). These were chosen as they are often seen as a breakdown product from longer chain analogues, and because the literature had reached no consensus on if it was even possible to breakdown these short chain species with electrochemical approaches. This work demonstrated that it was not only possible to breakdown PFBA and PFBS with BDD electrodes, but that defluorination rates of ~100% were possible under some conditions, and > 60% seen in all experiments suggesting that many of the C-F bonds are broken during these experiments. This is promising, as high defluorination values for these species suggest that this technology will be widely applicable to PFAS as a whole. The combined approach also revealed that while PFBS breaks down quicker than PFBA at higher concentrations the defluorination efficiency is worse, suggesting the breakdown intermediates are more stable than for PFBA, providing an initial insight into potential breakdown routes.

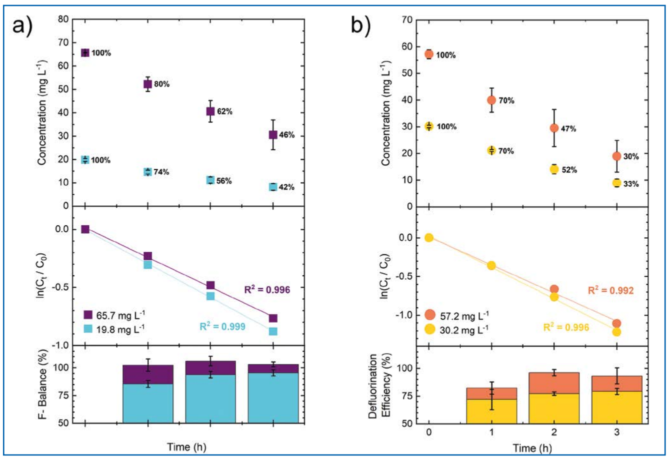

Fig. 2: a) (top) Concentration–time data for PFBA removal at 65.7 mg L^{-1} (purple squares) and 19.8 mg L^{-1} (blue squares) in saturated potassium sulfate solution. (middle) First order kinetic plots for the degradation. (bottom) Bar chart showing the defluorination efficiency (mass balance) in % for each time point, reproduced from Amerio-Cox *et. al.* [11] b) (top) Degradation concentration– time data for PFBS starting at 57.2 mg L^{-1} (orange circles) and 30.2 mg L^{-1} ppm (yellow circles) in saturated K_2SO_4 solution. (middle) First order kinetic plot of the degradation. (bottom) Bar chart showing the defluorination efficiency (mass balance) in % for each time point reproduced from Amerio-Cox *et. al.* [11].

We have also been working with our local water authority, looking at how these electrochemical systems scale and how PFAS can be treated in abstracted water so that it meets the UKs requirements for drinking water. Our future work in this area will include improving cell design, testing environmentally relevant concentrations in realistic matrices, and fundamental work looking at the breakdown products from different PFAS compounds under different conditions.

References

[1] E. L. Schymanski, J. Zhang, P. A. Thiessen, P. Chirsir, T. Kondic and E. E. Bolton, Per- and Polyfluoroalkyl Substances (PFAS) in PubChem: 7 Million and Growing, *Environ Sci Technol*, 2023, **57**, 16918–16928.

[2] A. R. Reindl, L. Wolska, J. Pawłowski, K. Hoszek-Mandera, M. Bełdowska, K. Fudala, R. J. Bialik and A. Panasiuk, Pygoscelis penguins as indicators of perfluoroalkyl substances pollution and global health risks - case study from King George Island (Western Antarctic), *Environ Res*, 2025, **285**, 122475.

[3] Q. Mehdi, L. E. Blackman, G. A. Lewbart, J. P. Muñoz-Pérez, D. Alarcón-Ruales, D. Páez-Rosas, J. Aufmuth and J. A. Bowden, Exploring the distribution of per- and polyfluoroalkyl substances (PFAS) in surface water and wildlife from the Galápagos Islands, *Reg Stud Mar Sci*, 2025, **90**, 104438.

[4] I. Kourtchev, B. G. Sebben, S. Brill, C. G. G. Barbosa, B. Weber, R. R. Ferreira, F. A. F. D'Oliveira, C. Q. Dias-Junior, O. A. M. Popoola, J. Williams, C. Pöhlker and R. H. M. Godoi, Occurrence of a “forever chemical” in the atmosphere above pristine Amazon Forest, *Science of The Total Environment*, 2024, **944**, 173918.

[5] L. Ahrens, Polyfluoroalkyl compounds in the aquatic environment: a review of their occurrence and fate, *Journal of Environmental Monitoring*, 2011, **13**, 20–31.

[6] M. G. Evich, M. J. B. Davis, J. P. McCord, B. Acrey, J. A. Awkerman, D. R. U. Knappe, A. B. Lindstrom, T. F. Speth, C. Tebes-Stevens, M. J. Strynar, Z. Wang, E. J. Weber, W. M. Henderson and J. W. Washington, Per- and polyfluoroalkyl substances in the environment, *Science* (1979), DOI:10.1126/SCIENCE.ABG9065/ASSET/2F72E-F5A-FF70-4629-901D-8541B8A14E3D/ASSETS/IMAGES/LARGE/SCIENCE.ABG9065-FA.JPG.

[7] M. N. Ehsan, M. Riza, M. N. Pervez, M. M. O. Khyum, Y. Liang and V. Naddeo, Environmental and health impacts of PFAS: Sources, distribution and sustainable management in North Carolina (USA), *Science of The Total Environment*, 2023, **878**, 163123.

[8] Per- and Polyfluoroalkyl Substances (PFAS) | US EPA, https://www.epa.gov/sdwa/and-polyfluoroalkyl-substances-pfas, (accessed 18 November 2025).

[9] Per- and polyfluoroalkyl substances (PFAS) - ECHA, https://echa.europa.eu/hot-topics/perfluoroalkyl-chemicals-pfas, (accessed 18 November 2025).

[10] PFAS and Forever Chemicals - Drinking Water Inspectorate, https://www.dwi.gov.uk/pfas-and-forever-chemicals/, (accessed 18 November 2025).

[11] M. Amerio-Cox, J. J. Tully, F. Tang, A. Dettlaff, J. V. Macpherson, T. Mollart, T. Sidnell, S. Mathias, P. Sears and M. J. Bussemaker, Investigation of Short Chain PFAS Degradation Efficiency Using Free-Standing Boron Doped Diamond Electrodes at High Current Density in a Flow Cell, *ACS Electrochemistry*, DOI:10.1021/ACSELECTROCHEM.5C00121.

[12] X. Blase, E. Bustarret, C. Chapelier, T. Klein and C. Marcenat, Superconducting group-IV semiconductors, *Nat Mater*, 2009, **8**, 375–382.

[13] J. V. Macpherson, A practical guide to using boron doped diamond in electrochemical research, *Physical Chemistry Chemical Physics*, 2015, **17**, 2935–2949.

[14] N. Vatistas, Electrocatalytic Properties of BDD Anodes: Its Loosely Adsorbed Hydroxyl Radicals, *International Journal of Electrochemistry*, 2012, **2012**, 1–7.

[15] J. J. Tully, D. Houghton, B. G. Breeze, T. P. Mollart and J. V. Macpherson, Quantitative Measurement Technique for Anodic Corrosion of BDD Advanced Oxidation Electrodes, *ACS Measurement Science Au*, 2024, **4**, 267–276.

Dr. Joshua Tully

Joshua Tully is an Assistant Professor of Chemistry, working in the Warwick Electrochemistry and Interfaces Group at the University of Warwick, UK. He received his PhD in Chemistry with a thesis titled “Engineered Diamond Devices for Next Generation Applications” in 2022. Josh’s research interests span electrochemistry and materials science, and his research interests include 3D printing, low-cost sensors, citizen science, diamond processing, electrosynthesis, and environmental remediation.

1. What inspired you to pursue an academic career and when did you know that is what you wanted to do?

While it is perhaps cliché, I have always enjoyed research, I love making things, solving problems (technical or otherwise), trying to understand complex concepts and conveying my work to a wide audience. The freedom afforded by an academic career to work on whatever topics or problems you find interesting, whether fundamental or applied in nature is to my mind, unparalleled in any other research environment. I think this became clear to me during my PhD, which led directly to my decision to stay in academia once this was completed. Working on projects which may provide solutions to some of the myriad of challenges facing humanity, as well as to meeting and working with amazing people from all around the world is also a unique privilege.

2. How did you come up with your research topic?

I had briefly encountered PFAS when working on boron doped diamond corrosion in electrochemical advanced oxidation systems during my PhD, which means I had enough knowledge to capitalise on an encounter with someone from a local water company, who expressed that they were looking for technologies for PFAS destruction as part of a pilot plant. Other projects I work on have been ideated in a number of ways, many through discussions at conferences, some through connecting two seemingly unrelated things from different projects, and even a few from non-scientific activities like driving or watching TV! Research has a creative component, so taking time to engage in creative activities you enjoy can directly help you when looking for new ideas and solutions.

3. How have you developed your leadership skills throughout your career?

To try and develop myself as a leader and supervisor I have undertaken some courses on management and supervision offered by Warwick. These were really helpful in equipping me with tools and resources to handle these new responsibilities, and I would encourage everyone to undertake similar training if it is offered. Beyond that I try to be approachable and solicit feedback from those I am working with as to what things they like or would change.

4. Which challenges did you face when starting your research group/starting to supervise students?

The biggest challenge I have faced when starting my research group (which is still a work in progress) is acquiring independent funding. I have applied to several early career fellowships and have not been successful in securing any yet. While this can be demotivating, colleagues have highlighted that this is (unfortunately) an unavoidable part of the life of an academic, and I will keep trying in the future. I have been fortunate to work with a really excellent group of students, and other than the training and approaches mentioned in the previous question have had no real challenges when starting to supervise students.

Alexander Fellows

Wasting light to reveal structural heterogeneity in biomolecular films

Biomolecular interfaces are incredibly widespread in nature, representing the thin boundaries where a diverse mixture of important chemical and biological processes occur, ranging from transport mechanisms to highly specific physiological signalling events. The functional behaviour of these interfaces is finely controlled by their molecular-level structures and dynamics, with crucial details including parameters such as the density and composition, as well as the complex orientational distribution of their constituents, their molecular conformations, and intermolecular connectivity. Importantly, many biological interfaces consist of highly specific and unique molecular assemblies, with this specificity and non-bulk-like structure controlling their functionality. An important example of this is the cell plasma membrane where the constituent molecules self-assemble into complex structural phases surrounded by anisotropic solvation networks [1, 2].

One common feature of biomolecular interfaces is their prevalence for substantial heterogeneity, extending from the molecular level up to the micro- and even macro-scale. In lipid membranes, for example, the constituent molecules often phase-separate and form so-called ‘lipid rafts’ that are crucial in specific signalling processes [3, 4]. Equally, the conformational properties of amino acid residues within membrane proteins critically control their secondary structures which, along with their membrane surroundings and solvation shell, also impact their overall 3D folding (tertiary) structure that defines their precise functionality. Clearly, to gain insight into the macroscopic characteristics of such molecular interfaces, one must understand this rich plethora of structural information down to the molecular level.

Over the past century, a multitude of techniques have been developed that can probe different aspects of the molecular structure and properties. These range from X-ray and Neutron diffraction methods that can yield information on the molecular-level structure within thin molecular films [5–7] to atomic force microscopy (AFM) that can probe their heterogeneous phase structures [8, 9]. Equally, nuclear magnetic resonance (NMR) spectroscopy has been instrumental in determining the conformational structure of proteins, which has even led to the development of tools such as AlphaFold that are defining the ‘AI era’ of science [10]. However, two of the most influential techniques for studying biological assemblies are cryo-electron microscopy (cryo-EM) and fluorescence imaging. Both methods can achieve exceptionally high spatial resolution, and due to its high quantum yield, fluorescence can be recorded with acquisition times that enable the study of millisecond-to-second dynamical processes [11–13].

While all these methods have their distinct advantages, one class of techniques that stand out in terms of their general ability to elucidate structural information are vibrational spectroscopies [14]. Even the FTIR machines that are now found in practically every chemistry lab can give you vast swathes of information on the molecular constituents and their intermolecular environments, all in a completely tag- and contact-free approach under a wide range of environmental conditions. These concepts can then be extended to more advanced techniques such as tip-based methods like tip-enhanced Raman / IR spectroscopy [15–17] or photothermal AFM-IR [18, 19] that circumvent the micron-scale resolution limit, achieving nanoscale characterisation. The main complication of ‘traditional’ vibrational spectroscopy, however, is its insensitivity to interfacial structure, with the spectra being generally overwhelmed by the vastly more numerous bulk molecules. Furthermore, these methods are also generally insensitive to certain aspects of the molecular structure, particularly the specific packing arrangements, conformations, or degree of orientational order, all of which are important factors controlling interfacial properties such as its mechanical behaviour (e.g. membrane tension), permeability, or specific binding recognition. A technique which is sensitive to this information, in addition to the other structural details generally available from traditional methods, is sum-frequency generation (SFG) spectroscopy.

Sum-frequency generation (SFG) spectroscopy and imaging

In SFG, a vibrationally resonant IR excitation is combined with an off-resonant visible interaction to upconvert the vibrational coherence and produce an output at the sum of the two input frequencies (see Figure 1a) – hence the name *sum-frequency generation* [20]. The important aspects of SFG, however, come from this specific two-photon frequency mixing that makes it a second-order nonlinear optical process. Because of this, SFG is governed by the second-order electric susceptibility, $\chi^{(2)}$, which is a rank-3 tensor and displays unique symmetry properties – the most important of which is its sign-dependence on the absolute molecular orientation [21–23]. This means any isotropic environments yield completely cancelling responses. In other words, SFG is only sensitive to structural anisotropy, which is why it is often labelled as a ‘surface-specific’ technique due to the inherent anisotropy created at these boundaries.

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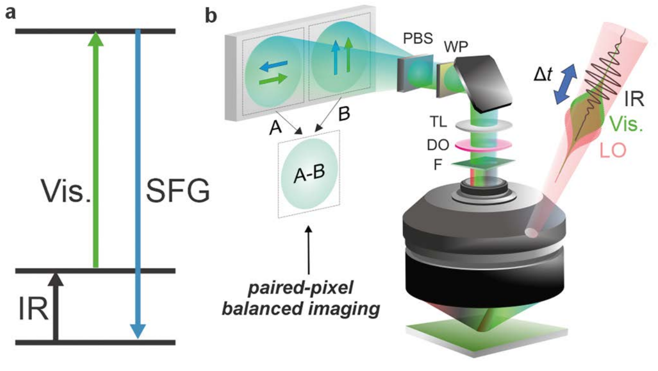

Fig. 1: Sum-frequency generation (SFG) microscopy. a) Energy level diagram showing the SFG wave-mixing process. b) Schematic of our widefield phase-resolved SFG microscope, showing the collinear beam geometry (IR, visible and local oscillator (LO)) and balanced imaging concept. F – filter, DO – delay optics, TL – tube lens, WP – waveplate, PBS – polarizing beamsplitter.

With this sensitivity to anisotropic structure, SFG can go beyond the sort of compositional and intermolecular environment analysis of traditional vibrational spectroscopy methods and yield insights into conformational structure and the orientational distribution, all with interfacial selectivity. The main complication is that, as a second-order process, the output signals are exceptionally small, especially given that they generally only source from a few molecules. This necessitates the use of high-power pulsed lasers and incredibly sensitive detection schemes. Even so, SFG spectroscopy has proven time and time again to be a powerful method in surface science and the analysis of thin molecular films [24–30].

Due to the substantially higher sensitivity constraints associated with spreading the output signal over a CCD array (or much-increased acquisition time in a confocal scanning regime), SFG has mostly been restricted to spatially averaged spectroscopy applications. Clearly, however, the ever-present heterogeneity at interfaces, particularly in biomolecular films and membranes, screams for imaging. Through recent advances using a newly devised microscope geometry (Figure 1b) and paired-pixel balanced imaging detection system [31], however, we demonstrated that hyperspectral phase-resolved SFG imaging can be performed with sub-monolayer sensitivity [32]. By examining two-component lipid monolayers as simplistic models for cell membranes (Figure 2a and b), SFG images clearly resolved the phase-separated domain structure (see Figure 2c).

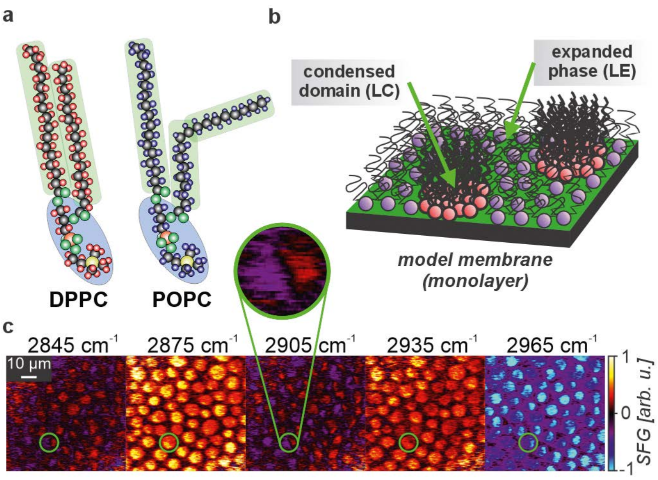

Fig. 2: SFG imaging of phospholipid monolayers. a) Molecular structure of the two lipids used: 1,2-dipalmitoyl-sn-glycero-3-phosphocholine (DPPC) and (perdeuterated) d_{82}-1-palmitoyl-2-oleoyl-sn-glycero-3-phosphocholine (POPC). b) Schematic of phase-separated model membrane. c) hyperspectral phase-resolved SFG images of the mixed monolayer, showing the C-H resonances from DPPC. Inset highlights the split nature of condensed domains at certain frequencies. Figure adapted from ref. [32]. Copyright © 2024 The Authors.

Signs of long-range packing order

On a more detailed inspection of the hyperspectral images shown in Figure 2c, we noticed that, while the roughly circular condensed lipid domains light up with either all-positive or all-negative signals in most frequency planes, others show a pronounced ‘split’ character (e.g. left-negative, right-positive). This observation of a change in sign of the SFG response is indicative of a pronounced in-plane ordering of the lipid molecules. The rationale for this is simple: The self-assembled nature of these lipid films ensures all molecules align with their hydrophobic tails pointing ‘up’ towards air, thus generating a well-known out-of-plane structure. Given that the sign of the phase-resolved SFG response is determined by the absolute orientation of the molecule, as indicated above, the out-of-plane structure must yield the same sign SFG responses. By contrast, if the molecules have a net in-plane direction (i.e., are not isotropically distributed in-plane within a pixel), then they can also contribute an in-plane SFG signal where the sign now depends on the absolute in-plane direction. This observation therefore suggests that the ~200,000 molecules that are being spatially averaged in each pixel have a pronounced in-plane packing direction, and that this direction changes across the condensed domains.

To confirm this, we ran analogous SFG measurements in which we ‘flipped’ the polarization of the incident and detected light from ‘P’, where it probes both in-plane and out-of-plane structure, to ‘S’, where the electric fields are solely in-plane. These measurements, shown in Figure 3a, clearly confirm the presence of significant in-plane signals (and thus a large degree of in-plane ordering) as well as their split +/- character. While such findings are interesting in terms of highlighting the complexity of the molecular structure in these systems, they nevertheless provoke more questions and present a challenge in terms of how such in-plane and out-of-plane SFG signals can be separated to decipher the full 3D structure of the lipids.

Azimuthal scanning fourier analysis

Our approach to overcome this challenge was to develop and implement an azimuthal-scanning regime whereby hyperspectral SFG images were recorded as a function of the sample rotation angle about its surface normal (see Figure 3b) [32–34]. This rotation clearly modulates any in-plane (XY) contributions while leaving the out-of-plane (Z) axis unaltered. While the simplicity of this description is suitable for linear spectroscopy, as a nonlinear optical technique, things aren’t quite so simple for SFG. The second-order susceptibility has components of the form ABC, where A, B, and C, can be any of X, Y, or Z. In other words, it cannot be described in terms of projections in the same way as a vector. Nevertheless, rotation of the sample about the Z-axis still modulates its different components in distinct ways. If using 'P'-polarized light, one probes all components of $\chi^{(2)}$ with any combination of 'X' and 'Z', i.e. XXX, XXZ, XZX, ZXX, XZZ, ZXZ, ZZX, and ZZZ. With the collinear beam geometry employed in our system (see Figure 1b), four of these contributions cancel with each other, leaving only XXX, XXZ, ZZX, and ZZZ. By rotating the sample with an angle Φ, any 'X' contribution transforms like cos Φ, while 'Z' is left unchanged. This means the XXX component transforms as $\cos^3 \Phi$, XXZ as $\cos^2 \Phi$, ZZX and cos Φ, and ZZZ as 1. The resulting SFG response thus has a nontrivial functional form with changing Φ, highly depending on the relative amplitudes of the four contributing susceptibility components. However, simply by taking a Fourier transform of the response, transforming it into the rotational / azimuthal frequency space (see Figure 3), the different contributions become more easily separable, yielding frequency components from 0-3.

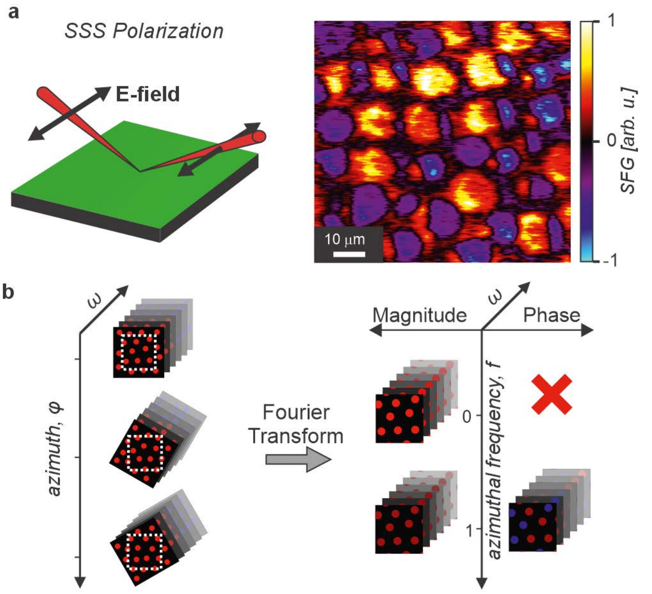

Fig. 3: In-Plane signals and azimuthal scanning. a) Schematic showing the in-plane electric field in the 'S'-polarization as well as an SFG image taken in the SSS polarization combination. b) Schematic of the azimuthal scanning procedure and subsequent Fourier analysis (only showing the 0- and 1st-fold azimuthal frequencies for simplicity). Figure adapted from ref. [32] and [33]. Copyright © 2024 The Authors.

It turns out that, in this azimuthal frequency description, the different frequency contributions contain distinct information on the molecular structure. The 0-frequency contribution is essentially the response as if the sample possessed in-plane isotropy, yielding information on the molecular tilt angle with respect to the surface normal and its conformation. By contrast, the 1st-fold frequency contribution is uniquely sensitive to the in-plane directionality, meaning images of this aspect of the packing structure can be directly extracted. Beyond this, the 2nd- and 3rd-fold frequencies can reveal more subtle information on the in-plane orientational distribution.

With this analysis concept in hand, its application to the model lipid monolayer systems described above have revealed new details about the molecular structure in their phase-separated domains. Specifically, we have estimated the molecular tilt angle to be within ~8° of normal [33] and, as shown in the 1st-fold direction maps in Figure 4a, have characterised the in-plane packing structure, which exhibits a pronounced spiral pattern, with the spiralling direction being a manifestation of the molecular chirality of the lipids [32]. Furthermore, given that the phospholipids possess two tails per molecule, analysis of the higher order rotational frequencies allowed us to uncover the separation angle between these two tails, finding them to be oriented in vastly different directions, along with the width of the molecular orientational distribution within each pixel (e.g., see Figure 4b).

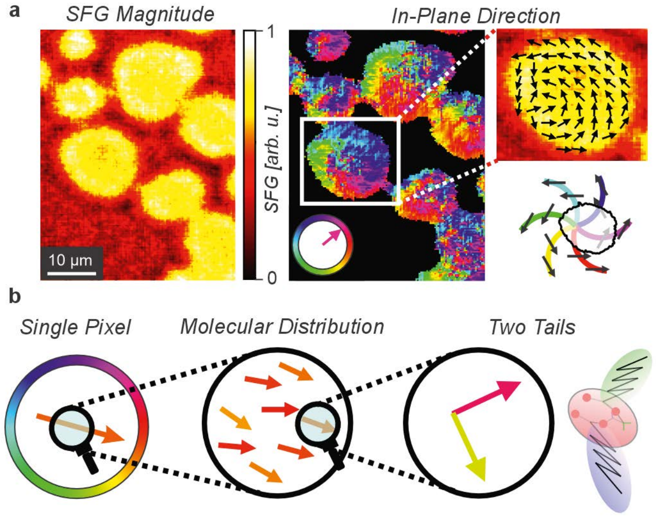

Fig. 4: Structure of condensed lipid domains. a) Images of the SFG magnitude and in-plane molecular orientation (direction) extracted from the 1st-fold rotational phase. b) Schematic showing the deduced orientational distribution of lipid tails groups, starting from the 'net' direction observed in an individual pixel, followed by its distribution of molecular orientations, and finally the splitting of each molecular contribution into those from its two tail-groups. Figure adapted from ref. [32]. Copyright © 2024 The Authors.

Looking forward

With the development of this SFG microscope, as well as the associated measurement and analysis methodology, we now have a method capable of diving deep into the complex structural hierarchy within molecular films. The above proof-of-concept measurements on mixed phospholipid monolayers, as simplistic models for cell membranes, demonstrate how SFG is incredibly sensitive to a vast range of structural information, where targeted measurement and analysis procedures can extract parameters such as the molecular conformation and specific packing structure, as well as the distribution of molecular orientations.

Going forward, we aim to continue in our development of this technique, striving to find new and better ways of extracting more from the obtained data, with the additional goal to substantially improve acquisition times for studying the dynamical processes occurring in these types of systems, e.g. the molecular self-assembly process, phase-separation behaviour, and formation of the specific packing structures within the condensed domains. Beyond this technique development, we hope to show that SFG imaging can become an established method for investigating biological systems by moving beyond the simplistic cases used in our proof-of-concept measurements to both more realistic models and even live cells. This two-pronged strategy thus combines the benefits of the bottom-up approach in understanding the fundamental principles with the application to real systems with all their associated complexity.

References

[1] G. M. Cooper, "The Cell: A Molecular Approach" (Sinauer Associates, Sunderland (MA), ed. 2, 2000).

[2] W. Stillwell, *An Introduction to Biological Membranes: From Bilayers to Rafts* (Academic Press, London, UK, 2013).

[3] K. Simons, E. Ikonen, Functional Rafts in Cell Membranes. *Nature*, 1997, **387**, 569–572.

[4] D. Lingwood, K. Simons, Lipid Rafts As a Membrane-Organizing Principle. *Science (1979)*, 2010, **327**, 46–50.

[5] M. Seul, P. Eisenberger, H. M. McConnell, X-Ray Diffraction by Phospholipid Monolayers on Single-Crystal Silicon Substrates. *Proceedings of the National Academy of Sciences*, 1983, **80**, 5795–5797.

[6] K. Kjaer, J. Als-Nielsen, C. A. Helm, L. A. Laxhuber, H. Möhwald, Ordering in Lipid Monolayers Studied by Synchrotron X-Ray Diffraction and Fluorescence Microscopy. *Phys Rev Lett*, 1987, **58**, 2224–2227.

[7] D. Vaknin, K. Kjaer, J. Als-Nielsen, M. Lösche, Structural Properties of Phosphatidylcholine in a Monolayer at the Air/Water Interface: Neutron Reflection Study and Reexamination of X-Ray Reflection Measurements. *Biophys J*, 1991, **59**, 1325–1332.

[8] A. Alessandrini, P. Facci, Phase Transitions in Supported Lipid Bilayers Studied by AFM. *Soft Matter*, 2014, **10**, 7145–7164.

[9] P. E. Milhiet, M. C. Giocondi, C. Le Grimellec, AFM Imaging of Lipid Domains in Model Membranes. *ScientificWorldJournal*, 2003, **3**, 59–74.

[10] J. Jumper, R. Evans, A. Pritzel, T. Green, M. Figurnov, O. Ronneberger, K. Tunyasuvunakool, R. Bates, A. Žídek, A. Potapenko, A. Bridgland, C. Meyer, S. A. A. Kohl, A. J. Ballard, A. Cowie, B. Romera-Paredes, S. Nikolov, R. Jain, J. Adler, T. Back, S. Petersen, D. Reiman, E. Clancy, M. Zielinski, M. Steinegger, M. Pacholska, T. Berghammer, S. Bodenstein, D. Silver, O. Vinyals, A. W. Senior, K. Kavukcuoglu, P. Kohli, D. Hassabis, Highly Accurate Protein Structure Prediction with AlphaFold. *Nature*, 2021, **596**, 583–589.

[11] S. W. Hell, Far-Field Optical Nanoscopy. *Science (1979)*, 2007, **316**, 1153–1158.

[12] B. Huang, M. Bates, X. Zhuang, Super-Resolution Fluorescence Microscopy. *Annu Rev Biochem*, 2009, **78**, 993–1016.

[13] M. Adrian, J. Dubochet, J. Lepault, A. W. McDowall, Cryo-Electron Microscopy of Viruses. *Nature*, 1984, **308**, 32–36.

[14] H. Fabian, W. Mäntele, "Handbook of Vibrational Spectroscopy" (Wiley, Hoboken, 2006), pp. 2999–3454.

[15] Z. Zhang, S. Sheng, R. Wang, M. Sun, Tip-Enhanced Raman Spectroscopy. *Anal Chem*, 2016, **88**, 9328–9346.

[16] I. Amenabar, S. Poly, W. Nuansing, E. H. Hubrich, A. A. Govyadinov, F. Huth, R. Krutokhvostov, L. Zhang, M. Knez, J. Heberle, A. M. Bittner, R. Hillenbrand, Structural Analysis and Mapping of Individual Protein Complexes by Infrared Nanospectroscopy. *Nat Commun*, 2013, **4**, 2890.

[17] S. Berweger, D. M. Nguyen, E. A. Muller, H. A. Bechtel, T. T. Perkins, M. B. Raschke, Nano-Chemical Infrared Imaging of Membrane Proteins in Lipid Bilayers. *J Am Chem Soc*, 2013, **135**, 18292–18295.

[18] A. Dazzi, C. B. Prater, Q. Hu, D. B. Chase, J. F. Rabolt, C. Marcott, AFM-IR: Combining Atomic Force Microscopy and Infrared Spectroscopy for Nanoscale Chemical Characterization. *Appl Spectrosc*, 2012, **66**, 1365–1384.

[19] A. Dazzi, C. B. Prater, AFM-IR: Technology and Applications in Nanoscale Infrared Spectroscopy and Chemical Imaging. *Chem Rev*, 2017, **117**, 5146–5173.

[20] Y. R. Shen, *Fundamentals of Sum-Frequency Spectroscopy* (Cambridge University Press, Cambridge, 2016)*Cambridge Molecular Science*.

[21] Y. R. Shen, Basic Theory of Surface Sum-Frequency Generation. *Journal of Physical Chemistry C*, 2012, **116**, 15505–15509.

[22] A. Morita, *Theory of Sum Frequency Generation Spectroscopy* (Springer, Singapore, 2018).

[23] A. G. Lambert, P. B. Davies, D. J. Neivandt, Implementing the Theory of Sum Frequency Generation Vibrational Spectroscopy: A Tutorial Review. *Appl Spectrosc Rev*, 2005, **40**, 103–145.

[24] Y. R. Shen, Phase-Sensitive Sum-Frequency Spectroscopy. *Annu Rev Phys Chem*, 2013, **64**, 129–150.

[25] K. B. Eisenthal, Liquid Interfaces Probed by Second-Harmonic and Sum-Frequency Spectroscopy. *Chem Rev*, 1996, **96**, 1343–1360.

[26] Y. R. Shen, V. Ostroverkhov, Sum-Frequency Vibrational Spectroscopy on Water Interfaces: Polar Orientation of Water Molecules at Interfaces. *Chem Rev*, 2006, **106**, 1140–1154.

[27] S. Hosseinpour, S. J. Roeters, M. Bonn, W. Peukert, S. Woutersen, T. Weidner, Structure and Dynamics of Interfacial Peptides and Proteins from Vibrational Sum-Frequency Generation Spectroscopy. *Chem Rev*, 2020, **120**, 3420–3465.

[28] H.-F. Wang, L. Velarde, W. Gan, L. Fu, Quantitative Sum-Frequency Generation Vibrational Spectroscopy of Molecular Surfaces and Interfaces: Lineshape, Polarization, and Orientation. *Annu Rev Phys Chem*, 2015, **66**, 189–216.

[29] S. Nihonyanagi, J. A. Mondal, S. Yamaguchi, T. Tahara, Structure and Dynamics of Interfacial Water Studied by Heterodyne-Detected Vibrational Sum-Frequency Generation. *Annu Rev Phys Chem*, 2013, **64**, 579–603.

[30] E. C. Y. Yan, L. Fu, Z. Wang, W. Liu, Biological Macromolecules at Interfaces Probed by Chiral Vibrational Sum Frequency Generation Spectroscopy. *Chem Rev*, 2014, **114**, 8471–8498.

[31] T. Khan, B. John, R. Niemann, A. Paarmann, M. Wolf, M. Thämer, Compact Oblique-Incidence Nonlinear Widefield Microscopy with Paired-Pixel Balanced Imaging. *Opt Express*, 2023, **31**, 28792–28804.

[32] A. P. Fellows, B. John, M. Wolf, M. Thämer, Spiral Packing and Chiral Selectivity in Model Membranes Probed by Phase-Resolved Sum-Frequency Generation Microscopy. *Nat Commun*, 2024, **15**, 3161.

[33] A. P. Fellows, B. John, M. Wolf, M. Thämer, Extracting the Heterogeneous 3D Structure of Molecular Films Using Higher Dimensional SFG Microscopy. *J Phys Chem Lett*, 2024, **15**, 10849–10857.

[34] B. John, S. Kaur, M. Wolf, M. Thämer, A. P. Fellows, Using Phase-Resolved Vibrational Sum-Frequency Imaging to Probe the Impact of Head-Group Functionality on Hierarchical Domain Structure in Lipid Membranes. *Faraday Discuss*, 2025, **259**, 366–383.

What inspired you to pursue an academic career and when did you know that is what you wanted to do?

While I was drawn to science from a very young age, by the time I was applying for university I was still unsure which discipline I wanted to pursue, generally leaning towards Physics or Mathematics. This is what I particularly liked about the Natural Sciences course at the University of Cambridge – being able to get a taste for four distinct subjects at university level in the first year. In hindsight, this course was absolutely the right decision for me as it let me discover my passion for chemistry. However, despite thoroughly enjoying the bachelor's course, and even staying on for the Part III integrated master's, by the time of graduation I still wasn't sure about an academic career, primarily due to its known and frequently regurgitated stigmas. Nevertheless, I opted to stay for a PhD at Cambridge to sample the academic life... which is precisely when it clicked. For me, it was the intellectual freedom to investigate something completely new that becomes immediately present once you transition from undergraduate to graduate studies. This has really empowered my love for science and now there is absolutely no looking back...

How did you come up with your research topic?

During my PhD work, I was fortunate enough to have the accessibility and almost sole use of multiple different vibrational spectroscopy techniques, which allowed me to really get a feel for their unique characteristics and advantages for studying different aspects of the sample structure. At the same time, I also got the chance to investigate quite a wide range of different sample systems, spanning monolayer films, biomimetic materials, and even whole cells. This experience, along with inspiration from recent advancements in the field, sparked my interest in nonlinear optical techniques due to the incredibly rich structural information that is contained within their signals, leading me into my postdoc at the Fritz-Haber-Institute in a technique development group. Since starting my own group, I have brought in aspects from both my PhD and postdoctoral time, following a technique development route in nonlinear imaging, but particularly also focussing on multi-modal characterisation approaches and the investigation of complex biomolecular systems.

How have you developed your leadership skills throughout your career?

I believe one of the most effective methods for developing leadership skills is simply to talk to others and immerse yourself in different environments. There is a vast wealth of experience out there, with the majority of professors being more than happy to give advice and share their knowledge. Equally, I found that interacting with different people from different social and cultural backgrounds really highlights the diversity across the academic landscape and how different people approach various research settings, particularly at different stages of their careers. Beyond this, I have made use of the range of different training courses offered at the University of Cambridge, as well as discussion workshops arranged at the Fritz-Haber-Institute. These initiatives are incredibly effective methods for developing a whole range of different areas of professionalism beyond research.

Which challenges did you face when starting your research group?

Starting a research group certainly presents new challenges beyond the usual ones felt by researchers across all career stages. From my own experience, particularly being quite a young PI, I would say one of the main obstacles I have had to, and still, face is developing my own profile as an independent researcher such that I can penetrate the existing field and make myself known. This is becoming ever more difficult as more and more research is being done across the world, but has a crucial impact not only on instigating collaborations and getting invites to conferences, but also on critical factors like the success rates of paper submissions or grant applications as others become aware and confident in your abilities and the quality of your scientific work.

Dr. Alexander Fellows

Alex Fellows read natural sciences at the University of Cambridge, UK, where he also stayed for his PhD studying the structure of biomolecular films using advanced spectroscopy. For this work he received best thesis prizes from both his department and the Royal Society of Chemistry. After a brief postdoc following his PhD submission in 2022, he moved to the Fritz-Haber-Institute, Berlin, first as a postdoc, and then being promoted to group leader in 2025. His Nonlinear Chemical Imaging group now focusses on developing new nonlinear microscopy tools to study biomolecular structure and assembly.

Finalists of the Agnes-Pockels-PhD award 2026

The Agnes-Pockels-PhD award recognizes an outstanding PhD in physical chemistry and 2026 is the 7th time it will be awarded by the German Bunsen Society. The jury has the selected the four finalists – Noah Al-Shamery from the University of Warwick and Nanyang Technological University Singapore, Freya Berggötz from the Deutsches Elektronen-Synchrotron DESY, Pavel Khavlyuk who completed his PhD at Dresden University of Technology, and Adam Šrut from Technical University of Darmstadt. All four finalists will present their work in the Agnes-Pockels session at the Bunsen-Tagung 2026 in Dresden, where the award winner will be chosen. We are excited to introduce the four finalists and their research.

The yPC Editorial Team

Noah Al-Shamery

Confinement-guided nanoscale electropolymerization of melanin with scanning electrochemical cell microscopy (SECCM)

Confinement at the micro- and nanoscale provides powerful means to control chemical reactivity and material properties. Melanin-based poly indolequinones, noted for broadband absorption, radical character, and redox activity, offer exciting opportunities for electrochemical and optical nanodevices, but precise nanoscale integration has been a longstanding challenge. [1] In this work, we exploit the meniscus confinement of scanning electrochemical cell microscopy (SECCM) to direct melanin electropolymerization with high spatial resolution. Within the confined droplet, dihydroxyindole-melanin undergoes localized, layer-by-layer growth under inert conditions. The restricted geometry not only enables nanoscale patterning but also regulates nucleation and conductivity, with morphology tuned by potential, dwell time, and electrolyte composition. Resulting nanostructures, characterized by SEM/EDX and interference-reflection microscopy, exhibit reproducible dimensions and purity. Beyond fabrication, these architectures provide a platform for investigating how confinement and interfacial environments govern charge transport and light-matter interactions, including structural color effects linked to confined light-matter interactions at the nanoscale. [2] This work positions SECCM as a confinement-driven nanofabrication method, demonstrating how confined electrochemical environments can be harnessed both to design functional organic nanostructures and to probe generic confinement effects central to materials science.

References

[1] J. V. Paulin, A. P. Coleone, A. Batagin-Neto, G. Burwell, P. Meredith, C. F. O. Graeff and A. B. Mostert, *J. Mater. Chem. C* 2021, **9**, 8345-8358.

[2] K. McKelvey, M. A. O'Connell and P. R. Unwin, *Chem. Commun.* 2013, **29**, 2986-2988.

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Noah Al-Shamery

Noah Al-Shamery is a final-year Joint PhD candidate at Nanyang Technological University Singapore and the University of Warwick, where he investigates nature-inspired electrochemical materials for energy storage and sensing applications. His interdisciplinary work builds on a strong background in surface science from his time at the University of Bonn; complemented by active contributions to the German Bunsen Society's young Physical Chemists, where he has helped restructure the network and substantially grow its membership as co-chair. Since 2025, he serves as chair of the European Young Chemists' Network (EYCN) representing ~45,000 early career researchers across over 20 European member societies.

Freya Berggötz

Chiral control of gas-phase molecules using microwave pulses

Over the past decade, microwave three-wave mixing (M3WM) has emerged as a novel technique for investigating chiral molecules in the gas phase. This approach provides a robust method for distinguishing the enantiomers of a chiral molecule and determining the enantiomeric excess. Beyond such analytical applications, the use of tailored microwave pulses allows us to control and manipulate chirality at the molecular level. Here, I present an overview of recent developments in the area of microwave three-wave mixing and its extension to enantiomer-

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selective population transfer. The latter is an important step towards enantiomer separation – first in energy, and finally in space. On the one hand, we demonstrate the application of M3WM to a more complex class of molecules, that is, nitrogen-containing compounds, which exhibit hyperfine structure in their rotational spectra due to nuclear quadrupole coupling. On the other hand, we present an excitation scheme that targets the main limitations of enantiomer-selective population transfer and significantly enhances population enrichment in the rotational level of interest, using microwave pulses alone.

Freya Berggötz

Freya E. L. Berggötz obtained her bachelor's degree in physics at the University of Hamburg, Germany, where she developed a setup for focusing extreme-ultraviolet laser pulses generated by a high-harmonic source. Changing the field of research – and with it the frequency range – she later joined Prof. Melanie Schnell's group at the Deutsches Elektronen-Synchrotron DESY for her master's thesis and subsequently as a PhD student. Freya is exploring tailored microwave pulse schemes for differentiating and controlling chiral molecules, as well as investigating the conformational landscapes and internal dynamics of different molecular systems using broadband microwave spectroscopy.

Pavel Khavlyuk

Advancement in metal aerogels: From porous thin films to two-dimensional materials

The development and systematic study of new nano- and microsystems are complex yet rewarding tasks shaping the future of many technological and industrial sectors. Metal aerogels (Figure 1), a class of nanomaterials built of nanostructured metals, attract significant scientific interest which is driven by their unique properties: electrical conductivity, catalytic activity, plasmonic properties, and a porous network with a large surface area. Despite significant advancements, challenges remain in designing and manipulating the composition and morphology of metal aerogels for high-performance applications. Understanding the formation mechanisms and the relationship between morphology and properties is crucial for further development and potential new applications. Additionally, reducing production costs and simplifying characterization methods are crucial for advancing the industrialization of metal aerogels.

Therefore, the main goal of this work was to bridge these gaps by tuning the synthetic parameters that control the morphology, and thus the properties, of thin, porous networks, and by expanding the range of their compositions. The present work focuses on three main tasks: (i) establishing a detailed methodology to characterize structural features of ultrathin films; (ii) expanding the range of metals used in two-dimensional (2D) aerogels beyond gold by developing a universal synthesis route; and (iii) investigating how gelation parameters affect the mechanical and electrical properties of 2D networks, using 2D gold aerogels as a model. This understanding will transition 2D and spray-coated aerogels from being intriguing subjects for fundamental research to potentially viable materials for various applications, including catalysis, sensing, and soft neural implants.

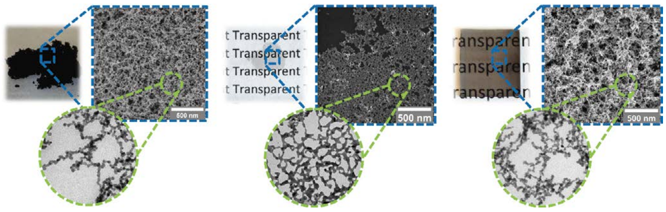

Fig. 1: Appearance and structural differences and similarities between three-dimensional metal aerogels (left), two-dimensional metal aerogels (middle), and spray-coated metal aerogels (right).

Dr. Pavel Khavlyuk

Pavel Khavlyuk received his Ph.D. in Chemistry at the Dresden University of Technology under the supervision of Prof. Alexander Eychmüller in February 2025. Since then, he has been conducting postdoctoral research with Prof. Kristina Tschulik, supported by the Walter Benjamin Programme at the Ruhr University Bochum, focusing on the properties of nanomaterials as catalysts for electrochemical reactions. He has co-authored over 25 peer-reviewed publications. His scientific interests focus on the synthesis and design of nanomaterials for optical and electrochemical applications.

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Adam Šrut

First principles treatment of electron transfer in mixed-valent systems

Mixed-valent compounds are actively researched because of their potential applications in molecular electronics and because they provide a playground for studying electron transfer (ET). In my research, I uncovered the exact nuclear movement that leads to the ET event in mixed-valent compounds. The main goal was to recover the conceptual Marcus–Hush model of the electron transfer from *ab initio* calculations. To this end, it was necessary to find a way to quantitatively specify a nuclear coordinate that leads to ET (the x-axis of the model). Using a thermally populated ensemble of molecular geometries, we gained access to alterations of the electronic structure by vibrational motion. We could then exploit the properties of the Marcus–Hush model in a fitting procedure that uses the vibrational modes as a basis. For the first time, we were able to determine the exact motion that leads to the electron transfer event. With this knowledge, we were able to uncover new, unexpected phenomena in ET. Foremost, heavy-atom tunnelling plays an important role in ET in small dinitroradical anions. We further showed that a geometry-dependent electronic coupling is a natural consequence of the superexchange coupling mechanism. Hence, for mixed-valent systems with redox centers interacting via a bridging unit (like the famous Creutz–Taube ion), it is necessary to extend the Marcus–Hush model by a second dimension that alters the electronic coupling.

The idea of identifying a nuclear coordinate responsible for a change in electronic structure is also transferable to other areas, for example, coherent motions during excited state dynamics or proton-coupled electron transfer.

Dr. Adam Šrut

Adam Šrut studied chemistry at the University of Chemistry and Technology in Prague. After that, he pursued his PhD at the Technical University of Darmstadt with Prof. Vera Krewald. Currently, Adam continues his research in this group as a postdoc.

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Agnes Pockels (1862-1935)

Photo: Unknown author, Agnes Pockels ca 1892, marked in the public domain, details on Wikimedia Commons

Agnes Pockels was a self-taught woman who learned from her brother's books and studied the surface tension of liquids while washing dishes. The British scientist Lord Rayleigh helped Agnes Pockels to break through. After all, she was allowed to do research at the Technical University of Braunschweig.

Agnes Luise Pockels was born on February 14, 1862 in Venice as the daughter of Alwine and Theodor Pockels, an Austrian professional officer. Her brother Fritz was born three years later in Vincenza. The malaria, which was rampant in the region at the time, did not spare the Pockels family either and ultimately led to the father's early retirement.

In 1871 the family moved to Braunschweig, where Pockels attended the municipal secondary school for girls. The young woman gave up studying to look after her ailing parents. Nevertheless, with the help of the physics textbooks of her brother, who later became a physics professor, she autodidactically developed into a scientist and made significant observations on the surface tension of liquids - almost while washing dishes on a daily basis. To investigate the phenomenon, she invented the slide chute, which is still used today, in 1882, which the American researcher Irving Langmuir (1881-1957) developed into the Langmuir-Pockels film balance. Langmuir received the Nobel Prize in 1932 - some of his findings were based on Pockel's experiments.

Pockels made an important contribution to the elucidation of interface phenomena. As a scientific outsider she feared that German journals would reject her publication, in 1891 she turned to the English physicist and later Nobel Prize winner John William Strutt (1842-1919), known as Lord Rayleigh. A lively correspondence developed and finally Pockel's work was published in the journal "Nature" with Rayleigh's recommendation. Pockels also made this known in Braunschweig. From then on she was allowed to work at the physical institute of the Technical University of Braunschweig and was also invited to scientific lectures. On January 27, 1932, Pockels was the first and to this day only woman to receive an honorary doctorate from the Technical University of Braunschweig for her groundbreaking research on surface chemistry - an extraordinary honor for an autodidact.

Agnes Pockels died on November 21, 1935 at the age of 73 in Braunschweig. Since 1993, the Technical University of Braunschweig, as the university is called today, has awarded the Agnes Pockels Medal to people who have made outstanding contributions to promoting women in research and teaching.

Authors: Prof. Dr. Eberhard Ehlers, Prof. Dr. Heribert Offermanns

Literary source: https://en.gdch.de/publications/biographies-of-women-chemists/agnes-pockels.html

yPC asked! How can physical chemistry solve the world's energy problems?

One of the pressing questions of our time is how we can satisfy the ever-increasing energy consumption of our society and economy, while simultaneously transitioning from the established fossil-fuels to new, clean energy sources. Clearly, significant effort from all parts of society (and especially technological fields) will be crucial to realize this energy transition, so we asked three established researchers on their perspective – "How can physical chemistry solve the world's energy problems?"

The yPC Editorial Team

Gregor Jung

There is enough green energy provided by the sun for mankind, be it directly as sunlight, be it indirectly e.g. as hydrodynamic power. Especially obvious as task is therefore the optimization of the first process in solar cells, like in the generation of tandem solar cells, e.g. by exploiting quantum effects in semiconductors or the development of new materials like lead-free and stable perovskites. In the same way, singlet fission materials may help to overcome the Shockley-Queisser limit of conventional solar cells. Whether other semiconductor materials may replace silicon with its fully developed technology behind – I doubt it, although I appreciate the photochemical solar cells from a scientific point of view. I might be wrong.

The other current issue is the storage of energy, and we may distinguish two forms: the direct storage of electricity in batteries, and electrochemists as part of the physical chemistry family may develop new batteries, e.g., on the basis of earth-abundant sodium instead of widely used lithium which is, so far, mined under ecologically questionable conditions; physicochemists, however, may help to optimize the extraction of lithium from other sources. On the other hand, cheap large scale batteries, consisting of other abundant materials, are becoming affordable and help to solve the energy storage problem where weight or energy density is not an issue.

When we think in terms of chemical energy as second important form of storable energy, then there is still a lot to do: hydrogen evolution where not enough high-voltage transmission infrastructure is available (like in foreign countries) is a scientific challenge, and photochemical approaches of water splitting, maybe by means of biotechnology to exploit what natural evolution provided, are certainly worth being investigated. This is especially true if we can overcome the limitations of rare metals as catalytically active species. Other, more convenient storage molecules like ammonia, methane etc. may rely on catalysts of any kind which are or will be developed by physicochemists.

However, physicochemists may look for other unconventional energy storage forms like the production of ring systems under strain like a quadricyclane as prototypical high energy molecule. I am especially excited about upconversion materials and molecules where redox-active species are produced with which inert bonds like the carbon-fluorine bond can be broken. Here, physicochemists in conjunction with inorganic chemists can develop appropriate compounds which are inspired by the joint action of photosynthetic systems I and II. An important side aspect of this kind of research is that we may get rid of forever chemicals. These developments can contribute to a smaller extent to solve the energy problems, but other challenges beyond the energy demand, e.g. removal or at least a closed loop of production and consumption of CO_2, are absolutely essential as well. Physicochemists are challenged!

At the end, we can ask whether physicochemists can also support somehow the reduction of energy consumption. Light-emitting devices instead of light bulbs are an impressive example at the one hand, although rebound effects, at least partially, counteract all achievements. Can we produce house walls where the bricks cool it in summer and heat it in winter, as zeolites do in a dish washer? Can physicochemists introduce new materials in quantum computation with which the exponentially growing energy needs for AI can be mastered? However, that's far beyond my expertise.

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Prof. Dr. Gregor Jung

Gregor Jung studied chemistry at the Ludwig Maximilian University of Munich. He wrote his diploma thesis at the Max Planck institute for quantum optics, before starting his PhD studies in physical chemistry with A. Zumbusch and Ch. Bräuchle at Ludwig Maximilian University in 1997. In 2002 and 2003, Gregor Jung worked as a postdoc in the group of G. R. Fleming at the University of California, Berkeley. Afterwards, he moved back to Germany as a tenure track junior professor for biophysical chemistry at Saarland University in 2004. Since 2010 Gregor Jung is professor for biophysical chemistry at Saarland University.

Alexander Genest, Günther Rupprechter

Physical chemistry for the energy quest

Beautiful machines that were supposed to deliver work from thin air were designed by great minds, think of Leonardo da Vinci or James Watt. It was one of the groundbreaking successes of physical chemistry to provide a rationalization for the failure of realizing such *perpetua mobilia*. The advent of steam engines intensified the need for an understanding of how to improve them. Ultimately it was the efficient use of the heat input, that would render some designs more successful than others. Gaining more work from the same amount of required energy, that is efficiency, delivered a taste of free energy.

The ever-increasing desire for abundant and cheap energy constitutes a challenging issue in modern societies, where the amount of energy used translates into the cost of living and products. The sun provides ample energy to earth, for example harvested by solar and wind parks, which is nowadays cost competitive, yet an intermittent source of energy, not fully compatible with a 24/7 lifestyle. Therefore, modern physical chemistry aims at utilizing sustainable energy sources and at flexible storage in various chemical energy vectors. Also, light can be directly employed to drive chemical reactions that form products of higher energy in uphill processes. This may even create sustainable fuels from the unpopular CO_2 molecule, facilitating an urgently needed closed energy cycle (provided direct air capture works as well). A similar driving force for demanding reactions is electricity for electrosynthesis, electrocatalysis and electrified processes. Clearly, high energy materials are crucial in batteries as well. These diverse applications represent a new central research topic in physical chemistry within the quest for ample green and affordable energy to power society. Most likely, finally there will be a mix of technologies tailored to societal specific energy needs, as a "one fits all" solution is never ideal. For sure, physical chemistry will remain an indispensable cornerstone of modern university curricula to enable future researchers in their quest for sustainable green energy solutions.

Prof. Dr. Günther Rupprechter

Günther Rupprechter received his Ph.D. from the University of Innsbruck. Following postdoctoral research at UC Berkeley and FHI Berlin, in 2005 he became full Professor in Surface and Interface Chemistry at TU Wien. He is a member of the Austrian Academy of Sciences and Fellow of the European Academy of Sciences.

Ass. Prof. Dr. Alexander Genest

Alexander Genest received his Ph.D. from TU München. After his time as postdoctoral fellow at the Institute of High Performance Computing at A*STAR in Singapore he received a tenure track position at TU Wien end of 2024 to model catalytic reactions at surfaces with kinetics in mind.

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Noah Al-Shamery, Abha Valavalkar, Tobias Dickbreder, Christian Wiebeler, Tarek Al Said, yPC Team

yPC Report 2025

2025 has been another excellent and inspiring year for the young Physical Chemists (yPC)! With new faces in our core team, expanded collaborations across Europe, fresh event formats at the Bunsen-Tagung, and continued success in communication and outreach, we are proud to look back on what we accomplished together. Here are this year's highlights!

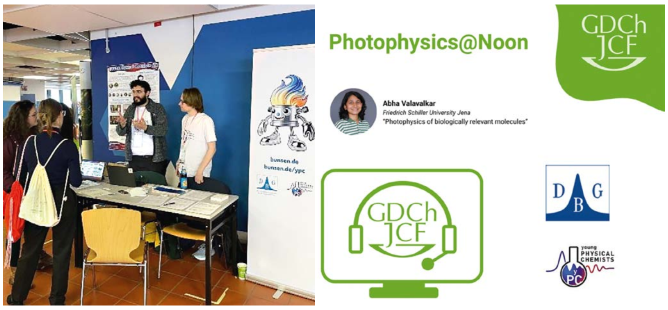
Growing the team

Our core team keeps expanding, and now includes ten active members dedicated to shaping the future of early-career physical chemists. This year, we warmly welcomed Christian Wiebeler and Tarek Al Said! yPC is currently co-chaired by Noah Al-Shamery and Abha Valavalkar. Abha was elected during the January general assembly. To make joining even easier, we now have a yPC Interest Group chat, accessible through the QR code below, where interested members can stay up to date and get involved. We always encourage early-career researchers to reach out, connect with us, and consider contributing to the yPC community.

KarriereRadio & Other ongoing initiatives

Our podcast yPC KarriereRadio, hosted by Carolin Müller and Christina Tonauer, continues to be a central element of our outreach. In 2025, we released three new episodes, including our most recent episode with Cristiane Brox and Vanessa Vethacke, publishers at Springer Nature, discussing how to go from physical chemistry in the lab to scientific publishing. Also in the works is a fascinating collaboration with the Deutsche Gesellschaft für Elektronenmikroskopie (DGE) on electron microscopy, an exciting expansion into interdisciplinary conversations. Furthermore, Abha organized an industry visit to Jenoptik (Jena), which was well attended. If you are interested in these activities, you can stay up to date through our yPC mailing list, available via subscription on our website (bunsen.de/ypc).

Beyond the podcast, we strengthened collaborations with student and early-career groups: Florian Schneider and Noah Al-Shamery represented yPC at the Junge Chemie Forum JCF Spring Symposium, Noah shared yPC-opportunities at the Swiss Snow Symposium 2025 of the young Swiss Chemical Society (youngSCS), and Abha presented yPC and her research in an invited talk at the JCF Photophysics@Noon Lunchtalk session. More joint activities with networks such as the AGyouLeaP of the German Physical Society are already being planned for the coming year!



Left: Florian Schneider and Noah Al-Shamery at the DBG/yPC-Booth at JCF FJS 2025 (©: yPC). Right: Photophysics@Noon Seminar with Abha Valavalkar (©: JCF).

Bunsen-Tagung 2025: New formats, new momentum

The Bunsen-Tagung in Leipzig showcased some of our most interactive and well-attended events to date. We introduced a completely new World Café–style session, where participants engaged in rotating small-group discussions with industry professionals. This format was met with enthusiastic feedback and we hope to expand on it moving forward.

Additional highlights included: A "How to PhD?" discussion session with Prof. Ralf Ludwig and Jun.-Prof. Jannika Lauth, offering honest insights into the doctoral journey, and a workshop on effective scientific communication by Patrick Koy (MLP). We also proudly organized the Agnes Pockels PhD Award Session, congratulating Marius Gerlach, the 2025 award recipient, for his outstanding presentation and contributions to physical chemistry. A vibrant networking evening at the student club Destille provided a relaxed environment for building new connections in Leipzig.

Impressions from the "World Café" discussion at Bunsen-Tagung 2025 (©: yPC).

Our team is already planning an exciting program for Bunsen-Tagung 2026, so stay tuned!

Expanding international connections

2025 significantly strengthened yPC's visibility across Europe.

A major milestone this year was Noah's election as Chair of the European Young Chemists' Network (EYCN) for 2025–2027, representing the interests of around 45,000 early-career chemists across more than 20 societies.

Our current EYCN delegates: Tobias Dickbreder, Christina Tonauer, Simon Sprengel, and Noah Al-Shamery, ensure that yPC's voice is heard on an international stage. Lukas Magenheim (Junge Chemie GÖCh) was invited to the Bunsen-Tagung 2025, further strengthening our Austrian network and symbolizing our commitment to sustained cross-border collaboration. These networks form the backbone of future joint initiatives, mobility programs, and shared events.

From left to right: Lukas Magenheim (Junge Chemie GÖCH), Norman Labedzki (btS e.V.), Noah Al-Shamery (yPC) (©: Elisabeth Kapatsina/DBG), and Burny at the EYCN Delegate Assembly 2025 in Prague (©: Noah Al-Shamery/yPC).

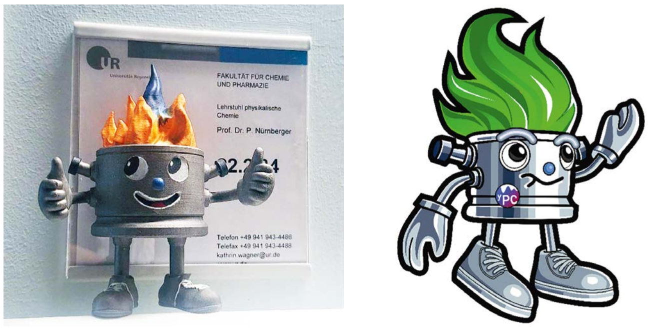
Social media & science communication

Our social media channels, managed brilliantly by Florian Schneider, now focused on LinkedIn and Instagram, continue to grow, with: 431 followers on LinkedIn and 198 followers on Instagram. We use these platforms to share news about our events, podcast episodes, and opportunities for early-career researchers.

In addition to our recurring yPC corner in the Bunsen-Magazin, several yPC members took on larger editorial roles this year: Noah Al-Shamery, Tobias Dickbreder, and Florian Schneider served as guest editors of the 03/2025 issue on Scanning Probe Microscopy, contributing their expertise to the broader DBG community.

Burny goes 3D!

Our beloved mascot Burny continues to evolve! This year, Burny was transformed into a 3D-printable model, and has already made appearances in labs across Germany. Members interested in printing their own Burny can request the files by emailing ypc@go.bunsen.de. A special thank-you goes to Prof. Patrick Nürnberger (University of Regensburg), one of the first to bring 3D Burny to life!



Left: Our 3D-printed Burny on top of the physical chemistry mailbox at the University of Regensburg (©: Patrick Nürnberger). Right: Burny can have many colors depending on the salt being burnt! (©: Noah Al-Shamery)

We need YOU at yPC!

As our activities continue to grow and diversify, we are always excited to welcome new members into the yPC core team. Whether you are passionate about organizing events, communicating science, designing graphics and outreach materials, contributing to the Bunsen-Magazin, developing new ideas for supporting early-career researchers, or representing the community at national and international meetings, there is always a meaningful way to get involved. Each contribution, large or small, helps shape the future of young Physical Chemists within the DBG.

If you feel inspired by our work or have ideas of your own that you would like to bring into the community, we would be delighted to hear from you. You can join our Interest Group Chat, connect with us on social media, or simply reach out via email at ypc@go.bunsen.de. We look forward to meeting new members, hearing fresh perspectives, and continuing to build a vibrant and supportive network together.

This has been your yPC Team: signing off for 2025!

yPC asked! What is the tangible value of being a DBG member?

During the last Bunsen-Tagung, some of the yPC members served at the booth of the Bunsen Society talking to prospective new members about joining our society. A reoccurring theme in these conversations revolved around the benefits of being a member. We answered these questions from our personal perspectives, but of course the reasons for being a DBG member will differ. In this article, we asked two long time members, Maria Wächtler and Ulrich Ott, about their motivation for and the benefits of being a DBG member.

The yPC Editorial Team

Maria Wächtler

What was the tangible value of being a yPC/DBG member/chair?

Already during my time as a PhD student in the field of physical chemistry, the Bunsen-Tagung was a fixed point in the year, although (maybe I shouldn't admit this here) I joined DBG as member at a much later point. This was in 2018, when I met Jannika Lauth and Klaus Boldt at Bunsen-Tagung in Hannover. At that time, both were already active in the newly founded yPC. They were looking for new members, especially active ones for developing attractive formats for young researchers within DBG and organizing activities. As a young scientist on the way to establish my own research profile, this seemed to me a good opportunity to make contacts, meet interesting people, and to be actively involved to shape the scientific community, in which I wanted to become a part of. Hence, I joined DBG and got active in yPC, also as yPC spokesperson for a while.

A special challenge I experienced during my time as an active member of the yPC was the COVID pandemic. In the yPC team, we suddenly had to think beyond the established formats, like the yPC Forum, workshops during the Bunsen-Tagung or the industry visits organized by yPC. This was when our online format yPC meets industry came to life with regular online sessions and invited guests giving insights into their paths after their PhD. To organize the sessions was one thing, but to be suddenly the person leading the online event, interviewing the guests *etc*. was something new for me. I would have never thought I could do this, but I actually enjoyed it a lot. I am very happy that the next yPC generation developed this format further by setting up the PodCast yPC-Karriereradio. During my active time in yPC and besides exploring the area beyond my comfort zone, I had the possibility to make valuable contacts. I benefited a lot from the exchange with researchers at a similar stage in career, facing similar challenges, facing the same struggles. Also, I had the opportunity to talk to and learn from experienced researchers, I otherwise maybe would never have had the opportunity to talk to.

Looking back, I can only encourage all young researchers to use the platform DBG and yPC offers you. Join the events at Bunsen-Tagung and especially the formats of yPC, build your network and learn how careers as a chemist can look like in industry, in academia or in completely unexpected fields. And get involved. You can help to develop the formats you would like to have to support your path on becoming a successful physical chemist.

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Prof. Dr. Maria Wächtler

Maria Wächtler studied chemistry and received her PhD in 2013 from Friedrich Schiller University in Jena. After a postdoctoral period at Leibniz Institute of Photonic Technology Jena (Leibniz-IPHT), she was appointed head of the work group Ultrafast Spectroscopy in 2015 and since 2020 she was head of the work group Quantum Confined Nanostructures in the department Functional Interfaces at Leibniz-IPHT. In 2022 she became Professor for Physical Chemistry at RPTU Kaiserslautern-Landau. In early 2025, she and her group moved to Kiel University. She is spokesperson of the research focus Kiel Nano, Surface and Interface Science (KiNSIS). Her research focuses on the investigation of function determining interactions and light-driven processes by (time-resolved) spectroscopy in photoactive hybrid materials.

Ulrich Ott

Some opening remarks:

I decided to get engaged with the Deutsche Bunsen-Gesellschaft (DBG) with the aspiration to bring value to the association by supporting its activities rather than looking for tangible benefits for myself. Coming from the chemical industry as a senior manager, I was curious to experience the DNA of a scientific organization and its activities.

What was the benefit of being part of DBG as treasurer and board member?

With my physicochemical background and my business experience it was quite inspiring to get exposed to the scientific community and to widen my networking to different stakeholders. In addition, managing the financials of the dependent foundations of DBG has been an interesting experience for me. As to the benefits for DBG I am convinced that somebody with industry business acumen can add a lot of value to an association like DBG, as this is complementary to its scientific focus and competence. My main attention at DBG has been on the support in strategic topics, operational effectiveness and management of financials.

What is your favorite memory from the Bunsen-Tagung (BT)?

With the BT being the main event of DBG, I was always impressed how many young physical chemists attend every year, being very motivated to exchange scientific knowledge and having a good time as well. And I am pleased that yPC is using the event as a platform to motivate young scientists to become more interested in our association. We very much need the young generation engaged in DBG in order to continue as a strong and well respected partner in the chemical science community!

How has being the treasurer helped in your own career?

As I was already at a quite late stage in my professional career when I took over this duty, it was more like bringing my business experience to the table than supporting my career. Yet I appreciated the opportunity to learn about the main topics and challenges in the physical chemistry arena. I strongly believe that a junior manager could learn about organizational and finance matters, when taking on the treasurer's duties in an entity with rather limited scope and complexity.

What is the one advice you would give to young physical chemists starting their own career?

With a sound and honest reflection of your own skills, inclinations and expertise you should be open for the new and unknown, for challenges and changes, always accompanied with a positive attitude.

Dr. Ulrich Ott

Ulrich Ott has served as the treasurer of DBG since 2015.

Dr. Ulrich Ott
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Zurück zum Inhaltsverzeichnis

Geburtstage im Februar 2026

Marcus Bäumer, Prof. Dr.

Thomas Daniel, Dr.

David Lebender, Dr.

Markus H. Hölzle, Prof. Dr.

Michael Fechtelkord, PD Dr.

Rolf Hempelmann, Prof. Dr.

Helmut Schacke, Dr.

Geburtstage im März 2026

Thomas Sottmann, PD Dr.

Andreas Stierle, Prof. Dr.

Andreas Förster, Dr.

Andreas Dreizler, Prof. Dr.

Hans Ebeling, Dr.

Hellmut Eckert, Prof. Dr.

Hans-Joachim Freund, Prof. Dr.

Jens Frahm, Prof. Dr.

Peter Schuster, Prof. Dr.

Das Bunsen-Magazin dokumentiert Geburtstage der DBG-Mitglieder in Fünfjahresschritten – beginnend mit dem 60. Geburtstag. Mitglieder, die keine Veröffentlichung ihres Geburtstags wünschen, teilen dies bitte der DBG-Geschäftsstelle mit: geschaeftsstelle@bunsen.de.

Neuanmeldungen zur Mitgliedschaft

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Dr. Valentin Hermann
Dr. Steffen J. Sahl
Prof. Dr. Peter Jomo Walla
Dr. Jan Wilhelm

Verstorben

Prof. Dr. Martin Klessinger
Prof. Dr. Marius Lewerenz

Veranstaltungen

Deutsche Bunsen-Gesellschaft

Bunsen-Kolloquium
Spectroscopy of Complex Solvents: From Clusters to Solvation Science
16. Januar 2026, Rostock
www.bk2026.uni-rostock.de

Bunsen-Tagung 2026
Properties and Processes under Confinement
30. März-01. April 2026, Dresden
www.bunsentagung.de

Bunsen-Tagung 2027
Light-Driven Reactions at Nanocale Materials
05.-07.04.2027, Potsdam

Weitere Veranstaltungen

Wilhelm-Jost-Gedächtnisvorlesung 2025
The Marvels of Thermodynamics: Or When Iron Man Meets Captain Planetary Boundary
13.01.2026, Darmstadt
14.01.2026, Hannover
15.01.2026, Göttingen
www.bunsen.de/veranstaltungskalender

ECC10 - EuChemS 2026
12.-16.07.2026, Antwerp
www.euchems2026.eu/

GDCh Electrochemistry 2026
22.-25.09.2026, Bayreuth
www.gdch.de/electrochemistry2026

Weitere interessante Veranstaltungen finden Sie im www,bunsen.de/veranstaltungskalender

Ausschreibungen

Klung-Wilhelmy-Wissenschafts-Preis
Einsendeschluss: 31. Januar 2026
www.klung-wilhelmy-wissenschafts-preis.de

Verschiedenes

WissKom-Kolleg: bis zum 28.01.2026 bewerben

Damit wissenschaftliche Erkenntnisse, Forschungsvorhaben und komplexe Inhalte innerhalb und außerhalb der Wissenschaft kompetent, zugänglich und nachhaltig kommuniziert werden können, bedarf es einer versierten und verantwortungsbewussten Wissenschaftskommunikation. Nur so sind Gespräche auf Augenhöhe und eine aufgeklärte Debatte in breiten Kreisen der Gesellschaft möglich. Die Alfred Toepfer Stiftung F.V.S. und die Claussen-Simon-Stiftung bieten Kommunikator:innen mit dem WissKomm-Kolleg ein Akademieprogramm, das neben der Vermittlung von Kompetenzen vor allem die Reflexion der eigenen Rolle im Spannungsfeld von Öffentlichkeit, Politik und Wissenschaft, den Erfahrungsaustausch und die Vernetzung in den Mittelpunkt rückt.
Infos zum Kolleg und zum Bewerbungsverfahren: https://wisskomm-kolleg.de/

Neues DPG-Buch „Physik: Erkenntnisse und Perspektiven"

Die Publikation „Physik: Erkenntnisse und Perspektiven" vereint Beiträge von über 200 Physiker:innen aus unterschiedlichsten Fachgebieten. Sie gibt einen umfassenden Einblick in die facettenreiche Welt der Physik – von der Erforschung der kleinsten Teilchen bis zu den Weiten des Universums. Ein zentrales Anliegen des Buches ist es, die Rolle der Physik in der Gesellschaft zu reflektieren. Es wird aufgezeigt, wer Physik betreibt und wie sich Physiker:innen ihrer Verantwortung für die gesellschaftlichen Auswirkungen ihrer Forschung stellen.
Buchbestellung/Download:
www.dpg-physik.de/veroeffentlichungen/publikationen/broschueren-buecher/physik-erkenntnisse-und-perspektiven

BUNSEN-TAGUNG 2026

125th Annual Conference of the German Bunsen Society for Physical Chemistry

Properties and Processes under Confinement

March 30-April 01, 2026 | TU Dresden

***y*PC-Workshop**
- How to Publish with Impact
- Career Workshop

Monday, March 30, 15:30 (registration required)

Science Dinner
Enjoy an evening in the company of your colleagues and friends.
Monday, March 30, 19:00 (registration required)

yPC Networking Evening
for early career researchers
Tuesday, March 31, 19:00, (registration required)

Tour of Dresden's historic town center
Tuesday, March 31, 19:00, (registration required)

DBG MEMBERSHIP

Personal members of DBG receive a **reduction on the registration fees**. Enrolled students have the opportunity of a **complimentary DBG membership**. Further information is available on bunsen.de/wir-ueber-uns/mitgliedschaft/

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www.bunsentagung.de

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Deutsche Bunsen-Gesellschaft
für physikalische Chemie

Einladung zur Mitgliederversammlung der

Deutschen Bunsen-Gesellschaft für physikalische Chemie e.V. (DBG)

Gemäß § 10 der DBG-Satzung berufen wir hiermit die Mitgliederversammlung 2026

unserer Gesellschaft für

Montag, 30. März 2026, 13.30 Uhr

nach Dresden ein.

Die Mitgliederversammlung findet statt in der Technischen Universität Dresden, Raum 403,

HSZ Hörsaalzentrum, Bergstr. 64, 01069 Dresden.

Tagesordnung

1. Bericht des Vorstandes über das abgelaufene Geschäftsjahr
2. Feststellung der Jahresrechnung, Bericht des Schatzmeisters über den Jahresabschluss und über das laufende Geschäftsjahr
3. Entgegennahme und Genehmigung des Berichts der Rechnungsprüfer:innen
4. Entlastung des Vorstandes und der Geschäftsführung
5. Vornahme der erforderlichen Wahlen
6. Festsetzung des Jahresbeitrages
7. Beschlussfassung über Ort und Zeit der nächsten Hauptversammlungen (Bunsen-Tagungen)
8. Beschlussfassung über eingegangene Anträge
9. Verschiedenes

Diese Einladung richtet sich nur an Mitglieder der DBG. Anträge aus der Mitgliedschaft (TOP 8) müssen gemäß §10 Abs. 4 der DBG-Satzung einschließlich einer kurzen Begründung mindestens vier Wochen vor der Mitgliederversammlung, d.h. spätestens am 2. März 2026, dem Ersten Vorsitzenden vorliegen. Anträge sind fristgerecht mit entsprechender Begründung an den Ersten Vorsitzenden, geschaeftsstelle@bunsen.de, zu senden.

Prof. Dr. Robert Franke
Erster Vorsitzender der DBG 2025-2026

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☐ ANTRAG AUF MITGLIEDSCHAFT ☐ ÄNDERUNGSMITTEILUNG Mitgliedsnummer: ___________________

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