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Conference Report

Young Faculty Meeting 2025

Chemistry in a Complex World: Navigating Interdisciplinarity

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The Swiss Academy of Sciences (SCNAT) set up the Young Faculty Meeting (YFM) to bring young PIs in chemistry together to network and exchange ideas on specific topics. This year's YFM, 13th-14th February, was organised by the authors and Alexandria Deliz Liang (University of Zurich). The chosen topic was '*How to navigate interdisciplinarity as a young PI*'. Unfortunately, this was not the only challenge to navigate: several speakers, as well as one of the organisers had to cancel their participation on short notice due to the flu. However, three participants were happy to spontaneously step up and give an impromptu talk about their research. Thus, the meeting ended up having a very nice spectrum of fields in chemistry and beyond. The challenge to reach the Griesalp in the winter was solved as planned: the seminar hotel could be reached by means of a large snowmobile.

After the round of introductions, ***Patricia Dankers*** (Eindhoven University of Technology) opened the conference with her keynote lecture on '*Supramolecular Biomaterials: From Scientific Curiosity to Application – A Personal Journey*'. The presentation provided insights into her research journey and the translational potential of supramolecular biomaterials in regenerative medicine.[1] Beyond her fascinating research, Patricia Dankers reflected on the value of mentorship, interdisciplinary collaboration, and maintaining a balance between scientific depth and broader impact, highlighting the need for passion, adaptability, and strong interpersonal connections in academic research. Whether you are creating a start-up or leading an academic research group, people matter the most.

The session concluded with an engaging discussion, addressing topics such as grant writing strategies, balancing student mentorship with independent exploration, building effective interdisciplinary teams, and communicating research to the public. Patricia Dankers emphasized that while scientific progress relies on technical expertise, success in academia is also shaped by collaboration, and a willingness to embrace new challenges.

In her presentation entitled '*How Old is Red?*', ***Laura Hendriks*** (Haute école d'ingénierie et d'architecture Fribourg) discussed her scientific methods for the dating of works of art. In particular, she presented an analytical method for studying red anthraquinone-based pigments in paintings using a combination of chromatographic methods and radiocarbon dating. The combined use of these techniques makes it possible to determine the century of production of the painting (with some approximation).[2] The talk also emphasized the challenges in creating effective communication with her interlocutors, who very often do not have a scientific/chemical background, and the need to build trust along these exchanges. Her talk was followed by a vivid discussion on how valuable artwork can be made available for analysis using the presented analytical methods. The discussions continued through the long afternoon break, which was also used for a short hike in the fresh snow or a dip in the hot tub.

After dinner of the first day, ***Kathrin Altwegg*** (University of Bern) took the participants on an interdisciplinary journey across space and time with her contribution: '*Comets, from Material of Dead Stars to Life*'. During her talk, she gave the eagerly listening crowd fascinating insights into the ROSETTA mission, which was concerned with the chase of the comet 67P/Churyumov-Gerasimenko across our solar system.[3] During said mission, Kathrin Altwegg was responsible for the ROSINA, a miniaturized mass spectrometer, which was tasked with sniffing out the comet's zoo of odors. Having worked for the largest part of her academic life (ROSETTA was a 40-year-long project!) on space research as well as due to her role as the first director of the competence center '*Center for Space and Habitability*' (CSH), Kathrin Altwegg was destined to talk about her point of view on interdisciplinarity. In fact, within the now established CSH, experts from science to philosophy and theology come together driven by their interest in the search for extra-terrestrial life and more. The ensuing discussions carried on long into the night (Figs. 1 and 2).

Fig. 1. The YFM is all about networking in an informal setting.

Fig. 2. Fireside chat on various topics, which was launched by Leo Merz.

The second day was opened by ***Michelle Frei*** (ETH Zurich) with '*Chemigenetic Tools for Live-cell Fluorescence Microscopy*', in which she outlined her group's work on preparing chemi-

cal tools for cellular imaging. These chemical tools are purpose-designed fluorescent rhodamine molecules whose chemical design is key for their penetration through the cell membrane. Through genetic modification, the exact placement in the cell can be pre-defined, allowing highly selective marking of individual cell organelles. By combining different wavelengths and fluorescence lifetimes within a single experiment, this method enables fluorescence lifetime multiplexing to visualize and investigate multiple cell functions simultaneously.[4]

Jutta Toscano (University of Basel) took the audience on another journey to space with her talk '*Manoeuvring Chemical Reactions, One Degree of Freedom at a Time*'. In her research, astrochemist Jutta Toscano, aims at precisely controlling the state of her chemical reactants using a combination of electric and magnetic fields to guide molecules in vacuum as well as lasers to shed light on how increasingly complex carbon-containing molecules, molecular ions and fragments undergo chemical reactions in interstellar space – a topic the 'ambient', earth-bound chemists had to wrap their heads around.[5]

Peter Štacko (University of Zurich) discussed his synthetic approaches for the preparation of prodrugs activatable *in situ* by irradiation with near-infrared (NIR) light, a process called photo-uncaging. In his presentation '*Light in a Heartbeat*', Peter Štacko visualized how red/NIR radiation can be advantageous because it can penetrate deeply into the human body, thus falling within the so-called phototherapeutic window. This phenomenon was demonstrated when the speaker asked the audience to place their fingers on the lit flashlight of their cell phones to see the light penetrate their skin. Developing new chemical reactions, Peter Štacko demonstrated the synthesis of purpose-designed cyanine dyes and their role as photocages for drug delivery and photoinduced release.[6]

Later, ***Stefan Vučković*** (University of Fribourg) continued the young faculty session with his talk entitled '*Density Functional Development in the AI Age*'. In his presentation, he discussed theoretical approaches aimed at transforming density functional theory (DFT) into a truly predictive tool in contrast to current DFT, which is often 'only' used to support experimental claims. "*Today, DFT is responsible for about one third of the total load of the capacity of available supercomputers*", clarified the speaker. In the following, Stefan Vučković presented various examples, including studies on bond stretching as well as efforts to develop a holistic treatment of van der Waals and ionic interactions. These approaches have achieved high accuracy without increasing the computational costs. With error bars of about 1 kcal/mol, DFT can be used as a truly predictive tool.[7]

In his contribution '*Responsive Organometallics*', ***Máté Bezdek*** (ETH Zurich) presented the research of his group on redox systems and chemical sensing, highlighting innovations in redox flow batteries and environmental monitoring technologies. The work of his group explores organic solvent-based redox systems that enable high cell voltages and tuneable electronic materials, potentially offering new opportunities for energy storage applications. In parallel, their advances in chemical sensors enable oxygen detection for environmental health monitoring by integrating photoirradiation and resistance-based sensing. Máté Bezdek's presentation underscored the need for interdisciplinary approaches in developing scalable, high-performance materials for both energy and sensor applications.[8]

After the lunch break, the two young PIs from industry, ***Claudio Bomio-Confaglia*** and ***Solène Miaskiewicz*** (both from Novartis), presented their point of view in their joint contribution '*The Interdisciplinary World of Medicinal Chemistry*'. The two speakers presented the development pathway of the KRAS-G12C inhibitor JDQ442, starting from computational chemistry, *via* a broad screening for hit finding as well as lead optimization, complemented by process chemistry and *in vivo* experiments, all the way to clinical trials and translational medicine. Their presentation showcased differences as well as similarities between industrial and academic research, thus expanding the view on interdisciplinarity in research.

Inland water research and preservation is at the heart of the mission of Eawag. Thus, it does not come as a surprise, that ***David Janssen*** (Eawag) and his team are part of said institution. Some of his group's research on the redox state of Lake Zug was consequently addressed in his talk, entitled '*The Maintenance of Intermediate Redox States in Lake Zug*'. As explained therein, his approach relies on the depth profiling of chemical species associated with metallic Fe and Mn, as well as the concentration of H_2S. In particular, in the case of Mn species, David Janssen uses a portable photospectrometer and a Cd^{2+}-porphyrin that readily forms complexes with Mn^{2+} and Mn^{3+} ions after ion exchange. The newly formed Mn-porphyrin complexes have distinct optical characteristics, which readily enables their quantification.[9]

All good things finally come to an end. This year's Young Faculty Meeting was wrapped up by ***Chan Cao*** (University of Geneva) and her talk '*Biological Nanopores for Single-molecule Analysis*'. Chan Cao presented her work on biological nanopores for single-molecule analysis, more specifically, α-hemolysin embedded in the lipid bilayer. This particular channel or nanopore can then be used for the sensing of differently sized, denatured proteins and reading out their amino acid sequence by letting these pass through the nanopores.[10]

Soon after, all participants were brought back to the lower lands – once more by snowmobile (Fig. 3). Although being located somewhat remotely, the participants of this year's Young Faculty Meeting unanimously agreed that all of them are looking forward to returning to the wintery Griesalp in 2026.

Fig. 3. The participants of the YFM 2025 before parting ways.

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[1] L. Rijns, M. G. T. A. Rutten, A. F. Vrehen, A. A. Aldana, M. B. Baker, P. Y. W. Dankers, *Nanoscale* **2024**, *16*, 16290, https://doi.org/10.1039/D4NR02088J.
[2] L. Hendriks, T. Blattmann, N. Haghipour, C. Portmann, *CHIMIA* **2023**, *77*, 792, https://doi.org/10.2533/chimia.2023.79.
[3] N. Hänni, K. Altwegg, M. Combi, S. A. Fuselier, J. De Keyser, N. F. W. Ligterink, M. Rubin, S. F. Wampfler, *Astrophys. J.* **2024**, *976*, 74, https://doi.org/10.3847/1538-4357/ad8565.
[4] M. S. Frei, B. Koch, J. Hiblot, K. Johnsson, *ACS Chem. Biol*. **2022**, *17*, 1321, https://doi.org/10.1021/acschembio.2c00041.
[5] J. Toscano, *CHIMIA* **2024**, *78*, 40, https://doi.org/10.2533/chimia.2024.40.
[6] M. Russo, H. Janeková, D. Meier, M. General, P. Štacko, *J. Am. Chem. Soc*. **2024**, *146*, 8417, https://doi.org/10.1021/jacs.3c14197.
[7] T. Gould, B. Chan, S. G. Dale, S. Vuckovic, *Chem. Sci.* **2024**, *15*, 11122, https://doi.org/10.1039/D4SC02358G.
[8] L. Wettstein, J. Specht, V. Kesselring, L. Sieben, Y. Pan, D. Käch, D. Baster, F. Krumeich, M. El Kazzi, M. J. Bezdek, *Adv. Sci.* **2024**, *11*, 2470265, https://doi.org/10.1002/advs.202470265.
[9] D. J. Janssen, A. Damanik, N. Tournier, J. Tolu, L. Winkel, S. Y. Cahyarini, H. Vogel, *Limnol. Oceanogr*. **2024**, *69*, 2775, https://doi.org/10.1002/lno.12687.
[10] C. Cao, P. Magalhães, L. F. Krapp, J. F. Bada Juarez, S. F. Mayer, V. Rukes, A. Chiki, H. A. Lashuel, M. Dal Peraro, *ACS Nano* **2023**, *18*, 1504, https://doi.org/10.1021/acsnano.3c08623.