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How to cite

HOOGENDOORN, Sascha, WINSSINGER, Nicolas, MATILE, Stefan. SCS Spring Meeting 2022 on Biosupramolecular Chemistry. In: Chimia : Frontiers in Ultrafast Spectroscopy and Dynamics. University of Geneva. [s.l.] : [s.n.], 2022. p. 604–606. doi: 10.2533/chimia.2022.604

This publication URL: https://archive-ouverte.unige.ch/unige:161794
Publication DOI: 10.2533/chimia.2022.604

doi:10.2533/chimia.2022.604 Chimia 76 (2022) 604–606

Conference Report

SCS Spring Meeting 2022 on Biosupramolecular Chemistry

Sascha Hoogendoorn, Nicolas Winssinger, Stefan Matile*

*Correspondence: Prof. Stefan Matile, Department of Organic Chemistry, University of Geneva, 30 Quai Ernest-Ansermet, CH-1211 Geneva, Switzerland

The Spring Meeting is the oldest, most traditional meeting of the Swiss Chemical Society. The society itself was founded in 1901 by Alfred Werner (University of Zurich), the first president, Otto Billeter (University of Neuchâtel), Eugen Bamberger (ETHZ) and Amé Pictet (University of Geneva), our four founding fathers. Already in 1904, Otto Billeter, the second president, launched the Spring Meeting, dedicated to *important scientific developments*, with one timely theme developed within one day by the very best worldwide. Since then, many key decisions were made at this occasion. At the spring meeting 1917, for instance, Swiss chemists decided that they needed their independent journal to publish and founded *Helvetica Chimica Acta*. Living again in a period where we better think twice how to publish and whom to support financially, the new editors of *Helvetica Chimica Acta*, Eva Hevia (University of Berne) and Jerome Waser (EPFL), were encouraged with applause for their efforts to bring the journal of the Swiss Chemical Society back to the very top, where it used to be and where it belongs. Also, during the opening ceremony of the Spring Meeting 2022, Christian Bochet (University of Fribourg) was welcomed with applause as the new president of the Swiss Chemical Society.

The Spring Meeting 2022 is not the 118th Spring Meeting, not all took place. The last Spring Meeting that was cancelled was 2020 because of the pandemic, 2021 was online. More than 180 registered participants were thus thrilled to meet on a sunny spring day in the wild west of Switzerland, finally back live to exchange during the informal breaks and the more formal events accompanying the Spring Meeting (Figure 1).

The scientific part of the Spring Meeting was opened by ***Chris Hunter*** from the University of Cambridge (Figure 2). He took us on the scientific journey of his group to unexplored chemical space, which gives vast opportunities for the discovery of new architectures that encode function. Inspired by nature's DNA, he discussed several synthetic systems that contain H-bonding recognition elements outside of the backbone that drive dynamic duplex formation.[1] Moreover, kinetically-inert covalent base-pairing enables replication of the template, showing how evolving structures provide enhanced functionality.[2,3]

In her invigorating lecture, ***Helma Wennemers*** from ETH Zurich convinced the audience that they should care about collagen.[4–6] She showed how collagen model peptides can be chemically modified to introduce novel functionalities, for example hyperstability of the triple helix through lipidation. She concluded with exciting new work that combines a collagen peptide with a LOX activity sensor to probe and visualize areas of extensive collagen remodeling, both *in vivo* and *in situ*.

Andreas Herrmann from Firmenich, Geneva, and recipient of the KGF-SCS Industrial Science Award in 2016, presented advances in pro-fragrances based on supramolecular systems in order to control the release of the volatiles.[7–9] The systems are leveraged on the reversible imine conjugates that form micellar structures and respond to changes of pH, concentration.

The morning session was completed by the traditional lecture of the winner of the Werner prize, awarded annually by the Swiss Chemical Society to a national raising star. ***Fabian von Rohr***, on the move from the University of Zurich to the University of Geneva, introduced quantum materials that were created by a combination of chemical and physical design principles, from phase selective FeS_2[10] to polytypism in layered dichalcogenides[11] and the renaissance of black phosphorus, β-GeSe solids, and superconductivity.[12]

Hanadi Sleiman from McGill University in Montreal, Canada, opened the afternoon session.[13–15] As a leader in DNA nanotechnology and the biological properties of DNA-based assemblies, the audience was indulged on two fronts, approaches to shift the equilibrium and dynamics of assemblies with small artificial nucleobases and novel vectors for nucleic acid therapeutics.

Wilhelm Huck from Radboud University in the Netherlands presented his research in the area of complex chemical systems,[16-18] starting with networks leveraged on enzymatic reactions to design oscillators and culminating with the formose reaction under oscillating input. A unifying theme throughout this work is to emulate the functional behavior observed in living systems, understand the resilience to perturbations and capitalize on the information processing capabilities of the system.

Dean Toste from UC Berkeley teamed up with his colleagues Ken Raymond and Robert Bergman to pioneer biosupramolecu-

Fig. 1. The joy to meet again in person at the Spring Meeting 2022 in Geneva, after a break of two years due to the pandemic.

Fig. 2. The speakers of the Spring Meeting of the Swiss Chemical Society: Chris Hunter, Helma Wennemers, Andreas Herrmann, Fabian von Rohr (top), Hanadi Sleiman, Wilhelm Huck, Dean Toste and Don Hilvert (bottom, left to right).

lar catalysis.[19] When three like that join forces, something very special should happen. Catalysis within the Raymond capsules indeed turned out to be intriguing. Dominated by desolvation and ion pairing, stabilizing cationic transition states, supported also by OH-π and possibly cation-π interactions with the π-basic aromatic planes of the cage, unusual reactivity becomes possible. The most charismatic reactions from nature with these characteristics are terpene cyclizations. They are shown to occur efficiently within the supramolecular catalysts, affording limonene and related monoterpenes with up to 97% chemoselectivity controlled by conditions within the capsule.[20] Expansion to the aza-Prins-type cyclizations affords the respective cyclic amines with similarly unique chemoselectivity. Exemplified by Darzens condensation,[21] enantioselectivity within the capsule is realized by an intriguing remote control from stereogenic centers on the surface of the capsule.

A lecture at the spring meeting of the Swiss Chemical Society was considered as ideal to thank ***Don Hilvert*** on the occasion of his retirement for his invaluable contributions to the community since his arrival in Zurich October 1, 1997. The audience agreed with spontaneous applause. Rather than the biocatalysis theme he cherished throughout his career,[22] Don Hilvert continued on the capsule theme of the preceding talk instead.[23,24] However, the Hilvert capsules were big, growing bigger and bigger throughout the talk, and for each round of laboratory evolution a 3D-printed model came out of the pocket to make the audience physically feel the progress. Starting with lumazine synthase, the recapitulation of virus biogenesis in the lab evolved this nonviral protein into spherical virus like nucleocapsids with diameters up to 33 nm, loaded with functional RNA.

Taken together, the first live meeting since a long time for most participants made the Spring Meeting 2022 an experience that will be remembered. The closing remarks highlighted that it is the quality of all lectures that accounts for the success of the meeting. We are most grateful to all who made this meeting possible, particularly David Spichiger, Céline Wittwer, Sarah Schmitz, Sonia Candolfi and Céline Caria, and deeply appreciate the generosity of the University of Geneva and the NCCR Chemical Biology as lead sponsors, and the NCCR Molecular Systems Engineering, the NCCR Bio-Inspired Materials, and the Chemical Society of Geneva, the Swiss Academy of Science, Firmenich, Novartis, Roche, Anton Paar, Bruker, GMP, Cordouan, IG Instruments, Magritek, Shimadzu, Chemistry Europe, Helvetica, Thieme and the Swiss NSF.

Received: May 3, 2022

[1] A. E. Stross, G. Iadevaia, C. A. Hunter, *Chem. Sci.* **2016**, *7*, 5686, https://doi.org/10.1039/C6SC01884J.
[2] D. Núñez-Villanueva, C. A. Hunter, *Org. Biomol. Chem.* **2019**, *17*, 9660, https://doi.org/10.1039/C9OB02336D.
[3] M. Ciaccia, D. Núñez-Villanueva, C. A. Hunter, *J. Am. Chem. Soc.* **2019**, *141*, 10862, https://doi.org/10.1021/jacs.9b04973.
[4] M. R. Aronoff, P. Hiebert, N. B. Hentzen, S. Werner, H. Wennemers, *Nat. Chem. Biol.* **2021**, *17*, 865, https://doi.org/10.1038/s41589-021-00830-6.
[5] J. Egli, C. Esposito, M. Müri, S. Riniker, H. Wennemers, *J. Am. Chem. Soc.* **2021**, *143*, 5937, https://doi.org/10.1021/jacs.1c01512.
[6] C. Foletti, N. Trapp, S. Loosli, B. Lewandowski, H. Wennemers, *Helv. Chim. Acta* **2019**, *102*, e1900052, https://doi.org/10.1002/hlca.201900052.
[7] A. Herrmann, *Chem. Eur. J.* **2012**, *18*, 8568, https://doi.org/10.1002/chem.201200668.
[8] E. Lutz, E. Moulin, V. Tchakalova, D. Benczdi, A. Herrmann, N. Giuseppone, *Chem. Eur. J.* **2021**, *27*, 13457, https://doi.org/10.1002/chem.202102049.
[9] V. Tchakalova, E. Lutz, S. Lamboley, E. Moulin, D. Benczdi, N. Giuseppone, A. Herrmann, *Chem. Eur. J.* **2021**, *27*, 13468, https://doi.org/10.1002/chem.202102051.
[10] K. Ma, R. Lefèvre, Q. Li, J. Lago, O. Blacque, W. Yang, F. O. von Rohr, *Chem. Sci.* **2021**, *12*, 13870, https://doi.org/10.1039/D1SC03026D.
[11] C. Witteveen, K. Górnicka, J. Chang, M. Månsson, T. Klimczuk, F. O. von Rohr, *Dalton Trans.* **2021**, *50*, 3216, https://doi.org/10.1039/D0DT03636F.
[12] F. O. von Rohr, H. Ji, F. A. Cevallos, T. Gao, N. P. Ong, R. J. Cava, *J. Am. Chem. Soc.* **2017**, *139*, 2771, https://doi.org/10.1021/jacs.6b12828.
[13] C. M. Platnich, A. A. Hariri, H. F. Sleiman, G. Cosa, *Acc. Chem. Res.* **2019**, *52*, 3199, https://doi.org/10.1021/acs.accounts.9b00424.
[14] C. Lachance-Brais, C. D. Hennecker, A. Alenaizan, X. Luo, V. Toader, M. Taing, C. D. Sherrill, A. K. Mittermaier, H. F. Sleiman, *J. Am. Chem. Soc.* **2021**, *143*, 19824, https://doi.org/10.1021/jacs.1c08972.
[15] H. H. Fakih, A. Katolik, E. Malek-Adamian, J. J. Fakhoury, S. Kaviani, M. J. Damha, H. F. Sleiman, *Chem. Sci.* **2021**, *12*, 2993, https://doi.org/10.1039/D0SC06645A.
[16] A. A. Pogodaev, T. T. Lap, W. T. S. Huck, *ChemSysChem* **2021**, *3*, e2000033, https://doi.org/10.1002/syst.202000033.
[17] A. A. Pogodaev, C. L. F. Regueiro, M. Jakstaite, M. J. Hollander, W. T. S. Huck, *Angew. Chem. Int. Ed.* **2019**, *58*, 14539, https://doi.org/10.1002/anie.201907995.

[18] M. Teders, A. A. Pogodaev, G. Bojanov, W. T. S. Huck, *J. Am. Chem. Soc.* **2021**, *143*, 5709, https://doi.org/10.1021/jacs.0c12956.
[19] C. J. Brown, F. D. Toste, R. G. Bergman, K. N. Raymond, *Chem. Rev.* **2015**, *115*, 3012, https://doi.org/10.1021/cr4001226.
[20] W. M. Hart-Cooper, K. N. Clary, F. D. Toste, R. G. Bergman, K. N. Raymond, *J. Am. Chem. Soc.* **2012**, *134*, 17873, https://doi.org/10.1021/ja308254k.
[21] S. M. Bierschenk, R. G. Bergman, K. N. Raymond, F. D. Toste, *J. Am. Chem. Soc.* **2020**, *142*, 733, https://doi.org/10.1021/jacs.9b13177.
[22] C. Zeymer, D. Hilvert, *Annu. Rev. Biochem.* **2018**, *87*, 131, https://doi.org/10.1146/annurev-biochem-062917-012034.
[23] K. Root, R. Frey, D. Hilvert, R. Zenobi, *Helv. Chim. Acta* **2017**, *100*, e1700166, https://doi.org/10.1002/hlca.201700166.
[24] S. Tetter, N. Terasaka, A. Steinauer, R. J. Bingham, S. Clark, A. J. P. Scott, N. Patel, M. Leibundgut, E. Wroblewski, N. Ban, P. G. Stockley, R. Twarock, D. Hilvert, *Science* **2021**, *372*, 1220, https://doi.org/10.1126/science.abg2822.