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Chemistry

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The 9th Young Faculty Meeting – The Crossroad for Sharing Ideas Across the Alps

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June 8, 2016 is a day to remember for the rising group leaders based in Switzerland, who reunited this year at the Young Faculty Meeting (YFM) in Bern to share their excitement and talk about science at the turning points of their academic careers. The «Platform Chemistry» of the Swiss Academy of Sciences (SCNAT) annually welcomes young faculties, including Ambizione Fellows, Maîtres Assistants, Habilitands, and SNSF Professors, to get together at the YFM and exchange ideas, visions, and experience as independent researchers. This year's round table was organized jointly by **Lucas Montero de Espinosa** (Adolphe Merkle Institute, Fribourg), **Michal Juriček** (University of Basel), and **Leo Merz** (SCNAT) and generously supported by the member companies of KGF (Kontaktgruppe für Forschungsfragen): BASF, F. Hoffmann-La Roche, Novartis, and Syngenta.

The 9th edition of the meeting took place at a new cozy venue, 'Haus der Universität', in a friendly atmosphere that whirled around the stimulating discussions. The one-day program included five scientific talks by young faculty members and three lectures by senior guests, who enlightened and entertained the audience during the morning and afternoon sessions. Throughout the day, the speakers offered a panoramic view from the 'top of the Alps' over the diverse chemistry landscape in Switzerland, with a fresh breeze of innovative ideas and a broad spectrum of topics. A feature taken up from the earlier YF Meetings was a moderated panel discussion with the three guest speakers combined with an apéro, which endorsed dynamic dialogues that were continued on the way to the trains.

The entrée talk of the morning session was served by **Edmondo Benetti** (ETH Zurich) who gave an overview of bio-inspired, tissue-reactive graft-copolymers developed by him and his students for cartilage repair during the early stages of osteoarthritis. Their graft-copolymers are capable of assembling selectively on the degraded cartilage, resurfacing it, and restoring the lubricating properties of the native tissue. They comprise a backbone coupled to brush-forming side chains, which provide biopassivity and lubricity, and to tissue-reactive groups for anchoring onto the damaged cartilage. Edmondo showed that optimization of the graft-copolymer architecture allowed a uniform passivation of the degraded cartilage surface, which reestablished and in some cases improved the lubricating properties of the natural cartilage. Due to these distinctive properties, as well as their high biocompatibility and stability under physiological conditions, cartilage-reactive graft-copolymers emerge as promising injectable formulations to slow down the progression of cartilage degradation in the early stages of osteoarthritis.



Edmondo M. Benetti

In the second talk of the morning session, **Laura Rodríguez-Lorenzo** (Adolphe Merkle Institute, Fribourg) presented her investigations on how the cellular uptake of polymer-coated nanoparticles can be influenced upon surface functionalization with fluorescent probes, which is a widespread method to determine the fate of nanoparticles in the cellular matrix. To tackle this challenge, Laura proposed an elegant approach involving a comparison of the cell uptake of two differently functionalized gold nanoparticles. In the first case, the fluorescent markers were directly attached to the polymer-coated nanoparticle's surface, and in the second case, the fluorescent markers were shielded in between two polymer layers. Very interestingly, Laura's results showed that the presence of certain surface fluorophores had



Laura Rodríguez-Lorenzo

a stronger impact on the cell uptake process than other factors such as the polymer charge or structure, which were generally accepted to play a predominant role.



Jay Siegel

After a short coffee break, **Jay Siegel** (Tianjin University, China) took the participants on a magical mystery tour across three continents. In his personal tribute to *peripateticism and peripetia* in (scholarly) life, Jay unveiled the unexpected turns of events that brought him in his early days from California to Europe, from Europe back to California and back to Europe again, and finally to China to head off on his latest adventure. In the spirit of the Peripatetic philosophy, he uncovered the circumstances that made him move between the continents and illuminated how taking up a challenge that is miles away and outside your comfort zone opens up unforeseen horizons of opportunities. As a scientist driven by passion and curiosity, he advertised picking up these challenges and following your own ideas. Among the many destinations of Jay, his move to China is without doubt the most adventurous one. But as he says, the opportunity to create a

world-class fundamental drug research center at the Tianjin University was an irresistible proposition.

In the last talk of the morning session, **Christof Sparr** (University of Basel) brought the audience into the realm of synthetic methodology, where he and his team develop unique molecular transformations for making biaryls, important components of natural drugs and commercial ligands for catalysis. To overcome limitations of the traditional cross-coupling approaches, Christof's strategy relies on elegant *de novo* constructions of an aromatic ring. During his lecture, Christof introduced the concepts of stereoselective aldol condensation for making configurationally stable 1,1'-binaphthyls and oligo-1,2-naphthylenes with high enantioselectivities and group tolerance, which was recently extended to the enantioselective synthesis of axially chiral aromatic amides. Equally impressive is his direct transformation of esters to arenes by using 1,5-bifunctional organomagnesium reagents, an efficient tool for the construction of linear arrays of aromatic rings in just a few steps, including hydrocarbons that display limited stability and solubility, such as pentacene.



Christof Sparr



Discussions continued through the lunch break.



Edith Joseph

After the lunch break, **Edith Joseph** (University of Neuchâtel) opened the afternoon session by highlighting the potential of microorganisms as environmentally friendly agents for cultural heritage preservation. Microbial chemical mechanisms are exploited aiming to consolidate, clean, stabilize, or even protect cultural items. The activities of her group address various degradation processes taking place on outdoor monuments and archaeological objects. In particular on metallic artifacts, investigations on surface functionalization are carried out to prevent the formation of corrosion patinas. Among other examples, Edith showed a specific strain of fungal species that produces a copper oxalate biopatina on copper-based alloys. In addition to its high environmental stability, this protective layer does not alter the visual aspect of the objects. Interestingly enough, Edith's team has also exploited the ability of bacteria to form reduced iron biominerals that are successfully used to stabilize iron corrosion. Finally, Edith presented bacteria able to oxidize sulfur to sulfates that could be employed to remediate the presence of iron sulfides in waterlogged wood and allow its preservation for future generations.



Eliav Haskal

The second guest speaker **Eliav Haskal** (NCCR for Bio-Inspired Materials, Fribourg) delivered a stimulating talk on the importance of innovation and collaboration with industry in today's academic life. As a person with both academic and industry experience, Eliav shared his view on the expectations of both sides when searching for and establishing a collaboration, and introduced the concept of *Responsible Partnering* as an initiative to improve the effectiveness of collaborative research and knowledge transfer between the academic and industry sectors. While he claimed that a clever collaboration with industry will not impact the freedom, it is important to negotiate well. In this sense, he also cautioned to start small, especially with partners one did not collaborate with before. He also stressed the great opportunities behind such collaborations in terms of access to equipment as well as resources and funding, technology transfer, or the chance to face societal challenges, and underlined the fact that the majority of R&D expenditures in Switzerland are currently associated to the domain of health care, in which the (bio) chemical sciences do certainly play a central role.



Fabien Cougnon

During the third afternoon talk, **Fabien Cougnon** (University of Geneva) introduced the fascinating world of molecular links and knots and the various chemistries and dynamic interactions used in their synthesis. Although catenanes, the most prominent examples of molecular links formed by mechanically interlocked cyclic structures, have been known for more than five decades, the preparation of more complex links and knots remains an enormous challenge. While the synthesis of these topologically complex architectures typically relies on metal templation, the work of Fabien revolves around the use of hydrophobic effects as the driving force, an approach discovered by serendipity, which allowed him to synthesize catenanes as well as trefoil knots, a Solomon link, and a figure-of-eight knot. As highlighted by Fabien, similar architectures are found in the structure of certain proteins. The ability to synthesize such knotted assemblies would therefore enable a better understanding of structure–property relationships in these natural macromolecules.

The afternoon session was closed with a talk by **Karl-Heinz Ernst** (Empa, University of Zürich), who shared his invaluable experience as a panel member of the European Research Council Consolidator Grants (ERC-CoG). Throughout his presentation, he discussed some of the do's and don'ts when preparing the proposal and defending it in the advanced stages of the evaluation



Karl-Heinz Ernst

process. In his words, writing a successful ERC-CoG application requires a fine balance between craziness and feasibility where excellence is the key. The proposed science should thus push a specific field beyond the state of the art, but should also stand over solid grounds. He also pointed out Switzerland's high success rate, and encouraged the audience to seek advice at any of the Euresearch offices throughout the country, which can provide guidance and mentoring for the preparation of a successful ERC-CoG proposal.

A moderated panel discussion combined with the final apéro served as a perfect closure of the meeting. During this one-hour discourse, *Karl-Heinz Ernst*, *Eliav Haskal*, and *Jay Siegel* orchestrated a vivid exchange of ideas with the participants on various topics. Recommendations such as adding entrepreneurship to your CV, using the first postdoc position to organize independent funding, or topics like the importance of mobility in today's science, the past and future of our scientific system, or the cultural factor in the approach to innovation in science were discussed.

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