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RIGI WORKSHOP 2013

'Thinking Big in a Small World: Creativity in the Molecular Sciences'

Marc Creus and Stefan Willitsch, Department of Chemistry, University of Basel, CH-4056 Basel

The top of a Swiss mountain in January is an unusual place to hold a workshop; however, the fourth Rigi Workshop took place from January 20th-22nd successfully at the inspiring location of the top of mount Rigi.

This three-day event brought together a selected group of 41 young scientists, who expressed an interest in bridging or integrating different fields of knowledge with a focus on creativity in the molecular sciences.

The ambitious aims of this event included: i) to reach beyond one's own research, ii) to learn to understand the creative processes behind scientific discoveries; iii) to be inspired by the examples of leading scientists; iv) to dare to think creatively and v) to ask BIGGER questions.

After some opening remarks by *Pia Stieger*, representing SCNAT, *Stefan Willitsch* set the tone of the meeting with a presentation inspired by Erwin Schrödinger's 'annus mirabilis' of 1926. Schrödinger's own unusual scientific career and his broad scientific and philosophical interests set an outstanding example for how a single brilliant mind managed to fertilize disciplines as diverse as theoretical physics and molecular biology.

Marc Creus presented a case-study of a famously creative biologist: Charles Darwin. Despite Darwin's early failures both as a medic and as a theologian, he managed to combine his knowledge of economy (*i.e.* Malthus), geology as well as his remarkable powers of observation of Nature to postulate a theory that revolutionized our understanding of biology. Darwin's creative insight, born of many years of hard work and a disparate mix of knowledge, eventually led to the practical applications of molecular biology and biotechnology that we enjoy today. Two key messages arose: i) an interest in different fields and years of hard work can help creativity and ii) you really cannot tell the end from the beginning...

Jay Siegel then presented the first scientific lecture on 'Aromatic Architectures: Design and Synthesis'. His enthusiastic presentation combined elegantly theoretical aspects, such as very simple concepts about knots and topology, with practical observations, such as the insight that technology and – particularly in chemistry – the availability of compounds and reagents in large amounts are a driver for innovation, *i.e.* it can be particularly helpful if the compound one is working on is available at the kilogram scale. Jay Siegel's firework-presentation managed to include everything from a (controversial) objection to the use of Darwin and Schrödinger to illustrate how modern research effectively works, to a practical and anthropocentric demonstration of how an organometallic moiety dances around a molecule to induce dynamic stereochemistry – by dancing in front of the audience. Jay Siegel's second talk, on 'Passion, Pride and Purpose in Curiosity-Driven Research', included an exposure of

the importance of loving what you do as a premise to carry out good work, as well as some thought-provoking observations on 'freedom' in scientific thinking: quite paradoxically the enjoyment of freedom, although crucial for creativity, is inherently full of risks and consequently shunned by many who prefer to follow more comfortable and secure career paths...

Tim Hunt, Nobel Prize laureate in Physiology or Medicine in 2001 for discovering protein molecules that control the division of cells, gave an entertaining and illuminating talk delivered with characteristic humbleness and humour, beginning with his daughter's apparently naïve question: "why does light go through a window and not through a wall"? (the answer, as for many questions in the molecular sciences, apparently lies with an understanding of Schrödinger). Tim Hunt's topic, 'Creative Science', was laden with personal anecdotes and strong opinion on how science should be funded and pursued. In a critic of unnecessarily bureaucratic and 'milestone'-guided science, he quoted the late Max Perutz: "Discoveries cannot be planned; they pop-up, like Puck, in unexpected places". A heated discussion then followed on whether sufficient emphasis is put on pursuing science for no purpose other than the pursuit of knowledge itself, *i.e.* science that asks "I wonder why this happens or how that works?" – rather than research that follows narrow guidelines toward practical goals, which is arguably more engineering than science. Tim Hunt's second talk 'How to win a Nobel Prize', whilst understandably failing to provide sure-way recipes toward the goal promised in the title, did provide some very entertaining and inspiring insights on the presenter's own scientific career. We learned that seminal aspects for his own Nobel Prize-winning work included choosing important questions that can be addressed with simple experimental models; gaining inspiration from other gifted scientists and mentors and not despairing when his lab burned down (!), but rather taking this event as an opportunity for redirecting his own work from a fresh perspective.

In his presentation 'Parallel Domains – Arts, Science and Nature', *Daniel Schümperli* pointed out some usually ignored aspects of scientific endeavour, such as the pleasing aesthetic beauty of a simple explanation, as well as the importance of appreciating and identifying with your subject of study in a 'Zen-like' fashion. He also observed that the famous philosophies of science ignore the fact that a scientist spends most of the time not postulating or falsifying hypothesis, but rather much more mundanely simply "trying to get things to work". This comment was received with unanimous agreement and was appreciated in particular by the students. Perhaps "getting things to work" – so important for the creation of new knowledge – should receive much more attention both by thesis supervisors and philosophers?

Helmut Schwarz explored the beauty of molecules further using as an example C60 – fullerene. He described the compound's discovery, naming and structure, as well as the famous session in the British House of Lords where this remarkable molecule was discussed in detail, worthy of an operetta by Gilbert & Sullivan. More seriously, during this talk entitled 'The Magic of Molecular Soccer', he illustrated how an apparently simple and purely curiosity-driven question, namely "can one encage the most innocent of gases, helium, inside C60?" provided an important test-system for fundamental understanding of the energetic barriers of chemical events. A second presentation 'Methane:



Concepts rather than Recipes’ underlined how very difficult apparently very simple reactions are and how much there is to learn even from the simplest of organic compounds, for example transforming methane into methanol.

All students also had the opportunity to present their own science simply, succinctly and concisely to this very heterogeneous audience in just 2 minutes. The poster sessions turned out to be very popular. In some cases, informal discussion was intense, aided perhaps by accompanying drinks. Discussions lasted in some cases well into the night...and contrasted with the beverage, which tended to be rather shorter lived! The two winners of the Poster Presentations were **Pascal Eberle** and **Susanna Hempel**. Gratifyingly, the guest speakers agreed that the standard of posters as a whole were above average and the enthusiasm with which students debated science during breaks and meals was very remarkable.

Interactive discussions and debates were also fostered in the brainstorming sessions, in which students and guests speakers were asked to present important and challenging questions in the molecular sciences and how these could begin to be addressed. In turn, each group of students was asked to suggest how they could contribute to address others’ ‘grand challenges’. Everyone agreed that this was a very difficult exercise, forcing participants to reach beyond their own scientific topic and engage in wider issues; to make connections between different and apparently distant scientific disciplines and to communicate outside one’s usual zone of comfort. The ideas presented – including how to improve drug-targeting, increased understanding of the brain and solving the energy problems of the world – and most particularly the process of brainstorming and idea-generation itself were also discussed at length.

Even coffee breaks were busy with debate as well as a with a coffee-program that included a painting exhibition inspired by science by participant **René Oetterli**; a demonstration of an interactive molecule visualization projector by **Tobias Schmidt**

and a practical guide on 3D printing your favourite molecule by **Joachim Schnabl**. The HUGO trio provided further evening entertainment by transposing biological data – such as DNA or protein sequences – into music. After the first stunning and rather experimental musical piece a puzzled silence followed, at which point Tim Hunt asked aloud “should we not applaud?”; after a few seconds of further hesitation, the audience obliged with enthusiasm. The aesthetics, motivation, methods and significance of the music provided topics of conversation after the concert.

Finally, a short but intense couple of hours were available for winter sports and contemplation of the outstanding scenery.

This interactive event explored scientific thinking and connections in the molecular sciences. Some of the talks highlighted aspects of the origin of creativity in scientific research, often inspired by beauty in the arts and Nature. Many of the participants were also inspired by the enthusiasm, breadth of knowledge and presentation skills of speakers and students alike.

This annual Rigi-Workshop is organised by the Platform Biology of the Swiss Academy of Sciences (SCNAT) in order to promote interdisciplinary and interactive science by graduate students in Switzerland. The event was co-organised by Dr. Marc Creus and Prof. Stefan Willitsch, at the University of Basel.

The organizers would like to express special thanks to all speakers and participants, as well as the sponsors and supporters of this event, including the SCNAT and especially Mira Portmann; the Swiss Chemical Society; Swiss Society for Biochemistry; SNI; KGF and the Cogito Foundation.

A WARM WELCOME TO OUR NEW MEMBERS!

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