Österreichische Biophysikalische Gesellschaft

BIOPHYSICS NEWS

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BIOPHYSICS AUSTRIA

Minutes from the 2016 Biophysics Austria Meeting in Graz and an outlook on the upcoming 2017 events

by Klaus Groschner

As in previous years, our 2016 Biophysics Austria Meeting was held as a Satellite of the Annual ÖGMBT Meeting, this time hosted in Graz. The already traditional teaming up with Austria´s Association of Molecular Life Sciences and Biotechnology has meanwhile proven an efficient, economic and scientifically profitable way to organize our Society´s main annual get-together. Admittedly, when considering participant numbers, our annual Satellite at the ÖGMBT Meeting is seriously challenged by the meanwhile well-established annual Biophysics Austria Mixer at the US Biophysical Society Meeting (see below announcement of this event in New Orleans 2017). Nevertheless, the national Meeting remains the main event and is of pivotal importance for our Society as it represents the only direct hub for communication between Austria´s Biophysicists, providing a platform for scientific exchange as well as for academic and political affairs. The 2016 Satellite program was organized and chaired by Peter Pohl (Johannes Kepler University Linz) and included an invited talk by Andreas Horner (Johannes Kepler University Linz), who elaborated on the role of "H-bond formation in water permeability of narrow channels". Notably, platform presentations, selected from Abstract submissions were significantly upgraded this year by extending the presentation time to 20 min. A big success! It was a very lively and vibrant session that benefitted significantly from the crossover of participants between sessions independent of Society membership or research field. This mutual benefit of being well integrated in to the ÖGMBT program was also evident at the poster presentations and in a session that followed the Biophysics Austria Satellite, devoted to the topic of "Single molecules and Biomembranes". Understanding the function of Biomembranes is a central issue in Biophysics and also a traditional strong focus of biomedical science activities in Graz. More than two decades ago, the first local life science program grant (SFB Biomembranes) was funded with a focus on this very topic. This program exerted a strong impact on Graz´s research landscape, which is still visible today. The heritage in Biomembranes research is noticeable in an emerging local network initiative formed the main Universities in Graz, termed BioTechMed program, and in the activities of the Nikon Center of Excellence for Superresolution Microscopy, headed by Wolfgang Graier (Medical University of Graz) and Sepp Kohlwein (Karl-Franzens-Universität, University of Graz). More information on this research center is provided in a short report in this Newsletter. For the 2016 ÖGMBT Meeting, Sepp Kohlwein organized a session on "Single molecules and Biomembranes", which was an exciting mix of reports on novel bioimaging technologies and experimental strategies for deciphering membrane functions at the molecular level.

Andreas Horner, Peter Pohl, Johannes Kepler University Linz

Dirk Trauner, Ludwig-Maximilians-Universität München

In this issue

As one of the international guest speakers, Dirk Trauner from LMU presented novel photopharmacological tools and approaches to analyse lipid signaling and metabolism.
The preparations for our next Satellite Meeting, which will take place in Innsbruck in September 2017 have already started and we will keep you updated with all information on the meeting.

Save the date: The Biophysics Austria Satellite 2017 will take place on Wednesday September 27th in Innsbruck, with Nieng Yan (School of Medicine at Tsinghua University, Beijing, China) as a plenary speaker on "Structure of the voltage-gated calcium channel".

Be part of it: Biophysics Austria Mixer, Sunday February 12th, 2017 at the Biophysics Meeting 2017 in New Orleans. This event will provide an opportunity to meet your FWF Biophysics representative Ruth Prassl (see also portrait below) who will be available for information and discussions.

A Biophysicist's Portrait Ruth Prassl, Medical University of Graz

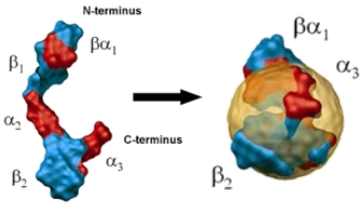
by Gerhard Schütz

Ruth Prassl, Medical University of Graz

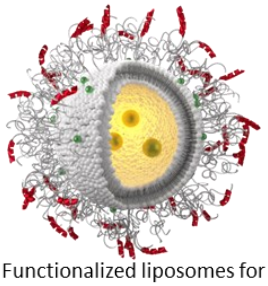
Fact sheet:

- Born on April 26th 1959 in Klagenfurt, Carinthia
- 1986: Dissertation (Dr.phil.) at Karl-Franzens University Graz
- 1987 – 1990: Post doctoral researcher at Joanneum Research Graz
- 1991 – 2012 Researcher at Institute of Biophysics and Nanosystems Research (IBN) of the Austrian Academy of Sciences in Graz
- 1999: Venia Docendi (Habilitation) in Physical Chemistry at the Karl-Franzens University Graz
- 2013: Associate Professor at the Medical University of Graz

"In fact, I wanted to study medicine. But my dad said, there are so many physicians around, you'll never find a job then" and Ruth Prassl's father should know, as he was a pharmacist. That was in 1977. Ruth grew up in Klagenfurt, went there to the Realgymnasium and did her Matura, but for the next step a move was inevitable: in the seventies, there was no University in Klagenfurt. So Ruth decided to study chemistry at Karl-Franzens University Graz. KFU Graz had almost no biochemistry then, so Ruth's connection to the live sciences came later after in several steps.
The first step was her PhD work, were she investigated by rheology the viscoelastic properties of synovial fluids. Under the supervision of Josef Schurz, she was interested in finding natural substitutes of synovial fluids. After her dissertation in 1986, Ruth got into contact with Peter Laggner, who became a key person and mentor for her remaining career. Peter has seen an article on how to detect forest decline by ESR spectroscopy. He grasped the idea and Ruth investigated the vitality of spruce needles for the next three years working at Joanneum Research.
The project dissipated, and Ruth focused her life on family: her first child was born, and research became less important. Until a phone call from Peter Laggner reached her: "The Kostner-SFB got funded!" A window of opportunity opened up, and Ruth took the chance and started her second PostDoc, again with Peter, but now on a project which laid the basis for a lifelong interest: The detailed analysis of low density lipoproteins (LDL). The endeavor was heroic: Ruth and Peter wanted to crystallize LDL, in order to obtain high-resolution x-ray structures.
Indeed, Ruth was successful in getting crystals from distinct highly homogeneous LDL subfractions.
She spent a lot of time at Synchrotron radiation sources, however, the diffraction power of the LDL crystals was poor, and only low resolution diffraction data could be recorded. While struggling with LDL crystallization, Ruth focused more on the structural features of LDL in solution with special emphasis on the core lipid transition and oxidative modifications of LDL. As G. Kostner asked Ruth, whether she would be interested to work on β1-Glycoprotein-1, termed apo H, it was the great opportunity to work on her first own research project. Ruth and her team succeeded in solving the crystal structure of apoH, to study the flexibility of apo H in solution reflected in the small angle X-ray scattering (SAXS) model and to investigate protein lipid binding properties. Ruth continued with X-ray and neutron studies on protein structures in solution and her group reported the first low resolution model of the LDL-protein – apoB100, coming back to LDL. Currently, LDL structure is investigated under high pressure.
Those studies have already been performed at the Institute of Biophysics and Nanosystems Research (IBN) of the Austrian Academy of Sciences in Graz, which was headed by Peter Laggner. "There was this enormous knowledge about lipids and membranes!" It was an inspiring and focused environment, one of the hot spots in biomembrane research in Europe. Ruth truly enjoyed that time, a second child was born, a daughter, while her career progressed.
Now she was within the framework of the Austrian Nanoinitative, which was – at least in the beginning – jointly financed by the FWF and the FFG. Her project was on the development of liposomes for targeted drug delivery and imaging. Again, the players were lipids/proteins/peptides, but now as tools for real health applications.
It seemed as if the stage was set for successful continuation: the biological tools were there, the medical questions were hot, the techniques were well established, and the scientific environment at the IBN was excellent. But then – in 2012 – Peter Laggner retired as Institute director, and the Austrian Academy of Sciences decided to transfer the research groups to the Graz Universities.



Low resolution structure of apoB100 mapped on LDL



Functionalized liposomes for targeted drug delivery and imaging

The PIs of IBN found new home, and since 2013, Ruth Prassl is Associate Professor at the Medical University of Graz. It appears like a perfect fit to continue with her research and network activities in the field of nanomedicine, now at the Institute of Biophysics, headed by Klaus Groschner. In 2014, Ruth Prassl also became a member of the FWF board, where she is responsible for theoretical medicine and biophysics. "I learn a lot there, particularly about the spectrum of excellent research which is done in Austria". Especially, she highlights the very positive atmosphere at FWF, both in the administrative sections and the board. "It's a lot of work, but it's fun!"

Finally, I asked Ruth how she managed to combine family and a scientific career. "There was my mother in law." Ruth's husband was running a small company at home, so it was not as difficult to have the kids at home in the afternoon. "Nowadays it's a little bit easier. More and more man help with childcare. But what is more important is the flexibility we have in our job. It's often accepted that parents, in case of emergency, take their kids to the office. "Isn't it, Felix? Good bye, Felix"
And Felix, about three years old, gets picked up by his dad and leaves the PhD office.

Young Biophysicists in the Spotlight

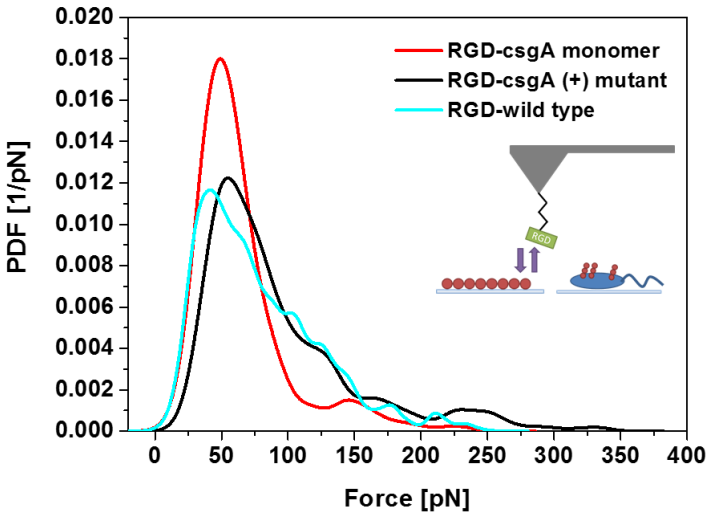
by Thomas Stockner

Following our tradition, in this column we present a young colleague, each time from a different field of biophysics. In this issue I would like to introduce Yoo Jin Oh from the Institute of Biophysics at the Johannes Kepler University Linz. Yoo Jin Oh has a solid background in physics, graduated in Condensed Matter Physics from the department of Physics at the college of Natural Sciences of the Ewha Womans University in Seoul, South Korea. Her method of choice is Atomic Force Microscopy (AFM). "It is the combination of solid physics measurements with important biological questions, which attracted my attention". In the focus of her studies are µm small bacteria and their strategies to adhere to solid surfaces and cell membranes as well as their capability to form biofilms. Future applications in medicine and industrial setting can already now be envisioned, while still exploring their fundamental properties.

Yoo Jin Oh, Institute of Biophysics, Johannes Kepler University Linz

Yoo Jin Oh is a young scientist on the doorstep to becoming fully independent. Her instrument of choice is an Atomic Force Microscope, which she applies to biomaterials. After graduation, she joined the lab of Peter Hinterdorfer at the Johannes Kepler University Linz on a Marie-Sklodowska Curie fellowship. Currently she is supported by an APART fellowship. It became clear from my interview with Yoo Jin Oh that continuity is a central theme in her scientific carrier. She uses AFM since here graduation. In the focus of her research are bacteria and the biofilms they create. It was her, who introduced the topic to the Hinterdorfer lab. She said that the interest in bacteria arouse when she was a PhD candidate in physics, driven by curiosity and a strong interest into microbiology, bacteria, small structures, and the interaction forces, which these small organism can develop. "There is still a large playground, many things remain unknown". She can attach a single living bacterium to the tiny tip the AFM microscope; once attached, allow them to bind to surfaces and measure the adhesive forces. She answered to my naive question, how she would know that the bacterium is still alive, with: "I can see it wiggling in the readout of the AFM microscope, while attached to the microscope". Fascinating!!!
Yoo Jin Oh will soon make a big leap forward towards independence. Continuity, combined with a burning curiosity into the pathogenic interactions of bacterial interaction with their host will remain on her side as the leading theme. A glimpse on the CV of Yoo Jin Oh revealed an impressive list of publications.

Yoo Jin Oh, Johannes Kepler University Linz



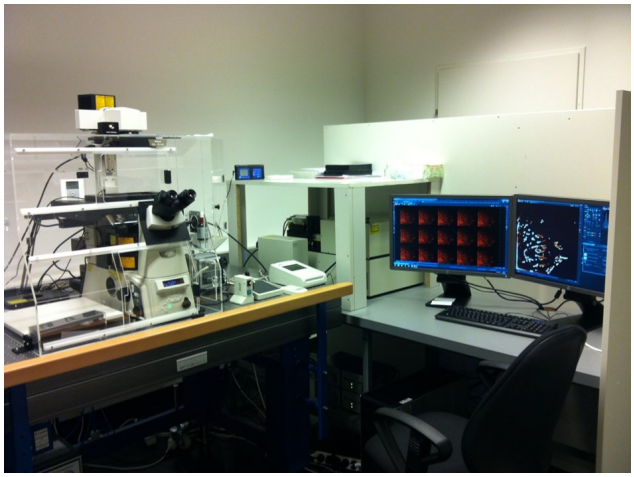
A typical dataset from AFM measurements: these data show the interaction forces between the core interacting region (RGD) of fibronectin and the bacterial using AFM. The interaction forces show distributions, from which stoichiometry and forces can be extracted. The monomeric curli (red curve), which cannot form the essential larger structures, clearly differs from the wild type bacteria and curli overexpressing bacteria.

It was hard to find the highlight; I would like to point your attention to a recent article she published in the Scientific Reports of the Nature journals (DOI: 10.1038/srep33909). She reports on enteric bacteria that develop fiber structures with which they adhere to the cell membranes of their hosts and which promote the formation of biofilms. Despite a wealth of knowledge, the exact mechanism of binding to the cell membrane remained unclear. A clever combination of AFM measurements, mutations of the bacterial anchoring protein curli and the attachment point on the cell surface (which is fibronectin) allowed her to reveal not only the number of interacting proteins, but also the exact region on fibronectin important for the interaction. A route to an industrial or clinical application can easily be envisioned, given the impact of bacteria on human health and the challenges provide by biofilms in industrial settings.

Nikon Center of Excellence in Graz for Superresolution Microscopy: Cells and Organelles

by Roland Malli

Academic researchers and company staff rarely talk with each other, while exactly the exchange of information between user and producer can boost cutting edge developments. Nikon is aware of this situation and started to partner with research institution in order to exchange knowledge and develop optimized imaging solution for specific research areas. In June 2015 Nikon Instruments Europe opened a new Center of Excellence at the Medical University and the Karl -Franzens University in Graz. The Nikon Center of Excellence in Graz is a center for superresolution microscopy focusing on cells and organelles. Prof. Wolfgang F. Graier, head of the Institute of Molecular Biology and Biochemistry at the Medical University, and Prof. Sepp Kohlwein from the University of Graz lead this center, which is also supported by the Austrian Ministry for Science, Research and Economy (bmwfw) and BioTechMed (https://biotechmedgraz.at/en/). The center is equipped with state-of-the-art N-SIM and N -STORM Super Resolution systems and an A1Rsi Confocal System with remarkable imaging speed. Currently, researchers are using the fancy systems to investigate protein trafficking within cellular organelles during tumorigenesis. Importantly, Nikon continuously collects feedback from the researchers. This communication is essential for further technological improvements that in turn will help the researcher to further penetrate into unknown micro- and nano-worlds of living systems.



The N-SIM of the Nikon Center of Excellence in Graz is used in the Graier Malli lab to investigate the dynamics of endoplasmic reticulum to mitochondria contacts in living cancer cells.

Imprint:

Österreichische Biophysikalische Gesellschaft
c/o Institut für Biophysik,
Medizinische Universität Graz
Harrachgasse 21/4, 8010 Graz

Web: http://www.medunigraz.at/biophysik/
Tel: +43-316-380-4135
Email: biophysik@medunigraz.at

Upcoming Events

- XIX. Annual Linz Winter Workshop on biological single-molecule research, nano-medicine, and bio-nanotechnology – February 3-6, 2017 (Linz, Austria)
- Biophysical Society, 61st Annual Meeting – February, 11-15, 2017 (New Orleans, Louisiana, USA)
- EMBO Conference, Towards novel therapies: Emerging insights from structural and molecular biology – March, 6-8, 2017 (Groningen, The Netherlands)
- Biophysics Week – March 6-10, 2017 http://www.biophysics.org/BiophysicsWeek/tabid/6657/Default.aspx