Österreichische Biophysikalische Gesellschaft

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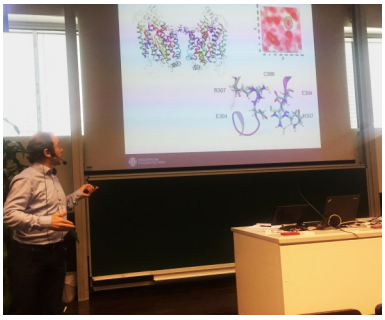
BIOPHYSICS AUSTRIA

EBSA/Jahrestagung
Getting ready for the Biophysics Austria Annual Meeting 2.0

by Thomas Stockner

The annual meeting of our society is certainly our most important get-to-gether. This year we will meet in the Campus of the University of Vienna. The meeting is organized once again together with the Austrian Association of Molecular Life Sciences and Biotechnology (ÖGMBT), continuing a successful series of joined meetings. It has become a tradition. Having said this, I could close this Editorial and leave for the summer break. But wait! New developments are on the horizon, as we are introducing a few major remakes to our annual meeting: Traditionally, our annual meeting was organized with the Biophysics session embedded into the joint meeting of ÖGMBT and Biophysics Austria. This was and is a very successful setting, because it comes with important added value: the Biophysicist interested in tackling biological problems have their annual meeting together with the Molecular Biologists and Biochemists, which work on those biological systems. A well established win-win situation. The success can be best grasped by looking at the number of attendees in the Biophysics session, which every year has ranged way above the number of our society members attending the meeting. Though very successful, these advantages came with a burden. The area of interest as well as activities of Biophysics Austria members are much broader than the typical scope of such a focused session. It therefore implies that not all our society members could be sufficiently attracted the annual meeting by the too focused topics . Biophysics Austria Annual Meeting 2.0 is now intended to remedy this suboptimal setting, because I am convinced that we as a society need be able to create a program which is of interest for every member in our society. Therefore, the Annual Meeting needs to have a much broader scope. Consequently, we introduced a couple of innovations: i) the Biophysics session in the joint meeting is transformed into a Satellite of the meeting, which gives us much more independence for the selection of session topics as well as timelines; Essentially, we will be able to freely adjust the organization to our needs. ii) The introduction of a new session plan, which is intended to cover in the best possible way the areas of interest of all our members: The core-topics are now defined as: Membrane Biophysics, Signaling, Biophysical Methods and Structural Biology. This topics are expected to cover the research interest of a wide range of members. Adjustments should follow until everyone feels represented, and than remain as a constant. The aim of this exercise is to create a point of reference for all society members, thereby making our annual get-to-gether a true family meeting. iii) Starting with this year, a single day Biophysics Austria ticket is introduced, which allows for attending our Annual Meeting without the need paying for the entire length of the joint ÖGMBT and Biophysics Austria meeting, as required in the past. I hope that this redesign will find broad resonance, while further suggestions are very much welcome.



Thomas Stockner
Medical University of Vienna

In this issue

The big event on the horizon.

Biophysics Austria is member of the European Biophysical Societies' Association (EBSA), which comes with a number of benefits for Biophysics Austria members. The next biannual EBSA Society Meetings, the 12th EBSA congress, will be held in Madrid on 20-24 of July, 2019. Please save the date on your calendar. Would be great if many of us could find there way to this attractive meeting. But I would like to present you a special teaser for an event, which is way more important for our society: The 13th EBSA congress will be hosted by Biophysics Austria in Vienna in 2021, and chaired by Elena Pohl. She will than also serve as president for EBSA. Please to join me in congratulating her and the application committee for winning the bit. We will keep you updated in this Newsletter on exiting developments.

A Biophysicist's Portrait: Georg Pabst

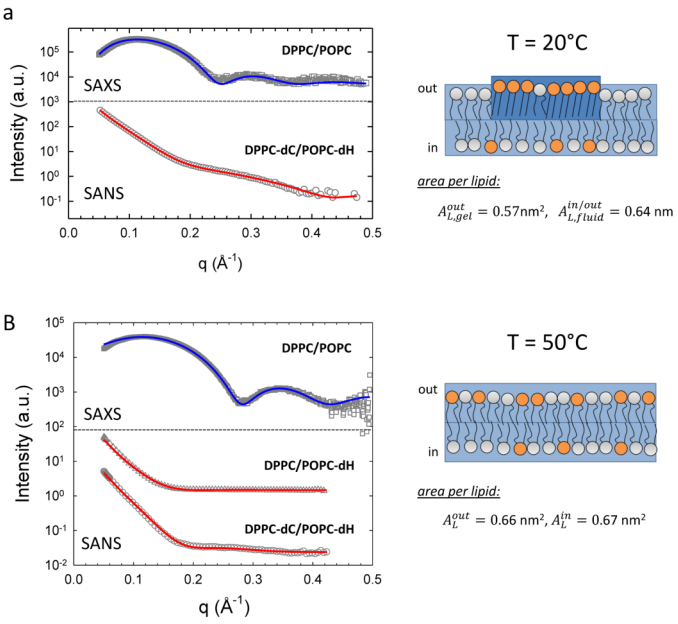
Karl Franzens University Graz

by Gerhard Schütz

Fact sheet:

- Born 24. 11. 1970 in Salzburg
- 2000: PhD in Physics TU Graz
- 2000 – 2001: Post doctoral researcher at the National Research Council, Canadian Neutron Source, Chalk River
- 2007: Habilitation in Applied Physics TU Graz
- 2002 – 2012: Research Scientist, Institute of Biophysics and Nanosystems Research, Austrian Academy of Sciences, Graz
- 2012 – 2014: Assistant Professor at the Karl Franzens University Graz
- Since 2014: Associate Professor at the Karl Franzens University Graz

"Mir ist dann eingefallen, dass …" describes one of the key experiences in science. It's hard to translate to English language. "I have an idea" doesn't really capture the stochastic process of being struck by an insight. It needs preparation, though. You can't just sit at your computer, typing your latest manuscript or grant proposal. The "Einfall" (inspiration) requires suitable environment, and the appropriate mood. Quite often, it happens when relaxing after a conference, a hearing, or – as in case of Georg Pabst – at the end of an exhaustive poster session. "I strolled around at the 2015 EBSA meeting in Dresden, tired of the many posters I've seen, and gazed out into the distance." A figure on one of the posters caught his attention. "Ah, diffraction data, that may be interesting, I'll have a look". There was a student, who used E. coli as active swimmers to modulate interactions of colloidal particles. "I was not so much interested in the colloidal physics, but in the fact that one can do diffraction experiments on live cells!" The "Einfall" was there, and after a preliminary experiment and some discussions with colleagues, a grant proposal was submitted and funded. "We've just started with this project: we will be able to see for the first time, how antimicrobial peptides act on a bacterial membrane with milliseconds time resolution!" This is what most of us know Georg Pabst for: a membrane biophysicist, with a deep understanding on how lipids and proteins feel in a bilayer. But let's start from the beginning. Georg Pabst grew up in Zell am See as an Otolaryngologist's son. "In school I was not so much interested in molecular cell biology, however: there were too many complicated terms. I liked quantum physics and astronomy." So Georg decided to study technical physics, and he moved to TU Graz. "I always wanted to go to Graz. Compared to Karl Franzens University, the TU Graz appeared more attractive, because it offered the clear perspective for easily finding a job in industry later on. He graduated with a work on the trajectories of charged particles in a time of flight mass spectrometer. "Then I wanted to do something new." Again, an "Einfall" came, in this case as a job offer for a PhD position in the group of Peter Laggner at the Institute of Biophysics and Nanosystems Research of the Austrian Academy of Sciences in Graz. "In fact, I didn't have high expectations for my application, since the job offer was already expired by a year or so.



Leaflet specific structure of DPPC/POPC asymmetric bilayers above and below the melting temperature of DPPC via a joint analysis of small angle X-ray and neutron scattering (SAXS/SANS) data. At low temperatures (a) DPPC-rich gel-like domains in the outer leaflet have a significantly larger area per lipid than in symmetric DPPC bilayers due to a coupling to the inner fluid POPC-rich leaflet. The gel-like domains melt upon raising temperature to 50 °C, which leads to an equilibration of lipid areas in both leaflets (b). Figure taken from F.A. Heberle and G. Pabst, Biophys. Rev. 9: 353 (2017).

Georg Pabst
Karl Franzens University Graz

And I didn't understand too much of the text on the advertisement." What he understood, though, were two words: synchrotron and Trieste. "I liked the idea of working on a huge machine. And I also liked the idea of working in Trieste." Together with Michael Rappolt, he studied temperature-induced non-equilibrium states in multilamellar lipid vesicles. "Compared to equilibrium we indeed found substantially smaller bilayer repeat distances , when applying temperature jumps with an infrared laser. Peter Laggner was excited." It took them, however, quite some time to understand the reason for this effect. And Georg had to develop a new method for the analysis of small angle X-ray scattering data. "We needed to disentangle bilayer thickness and bilayer separation from noisy scattering data." Applying this method to their data yielded disappointing results: "There was no new structural intermediate of the lipid bilayer, just an ultrafast thinning of the interstitial water layer". Still, the publication of the new method became Georg's best cited paper and it caught the attention of John Katsaras, a well-known membrane biophysicist, then at the Chalk River laboratories in Ontario, Canada. Supported by a Schrödinger stipendium from the FWF, Georg went for a postdoctoral stay to Canada to work on peptide-membrane interactions. "When I arrived with my family in Canada, there was ice rain, and the next day we had one meter of snow. I knew that I wouldn't stay for long there." After a year, he returned to Austria, full of enthusiasm and motivation. Again, he joined the group of Peter Laggner, "but I had to learn a lot when setting up my own group." Georg was interested then in the mechanism behind the function of anesthetics. "That was, except for a paper in JACS together with Thomas Stockner, rather unsuccessful with respect to getting funded. Things changed, when I switched fields and began with studying membrane domains and asymmetric bilayers". He and his group have been determining, how lipids pack in the different leaflets and domains and how that couples to membrane protein function. Since then, Georg became increasingly recognized by the community: in 2016 he has started as editorial board member of the Biophysical Journal, and from 2010-2013 he was Biophysics Austria president. In the last few years, the retirement of Peter Laggner and restructuring of the Austrian Academy of Sciences led to Georg's move to the Karl-Franzens University Graz, where he became associate professor at the Institute of Molecular Biosciences. "For me, this was a very good solution of a difficult situation. Particularly, the improved contacts to biologists now bring a lot of new interesting research questions. In fact, this is how I would define biophysics: trying to find physics in biology".
I could start here a second story, portraying Georg Pabst the musician. "I had bands since school time, it got more intense from my student times on." Georg sings, plays guitar, and is the song-writer in MurBeat, a band playing, what he calls, "Mundart Funk and Rock" i.e. with lyrics in Austrian dialect. With some luck, you can hear them on the local radio: "Two of our songs are regularly played on Radio Steiermark. And in three weeks, we are back to the studio." We wish him and us a successful recording session, and a lot of "gute Einfälle"!

Young Biophysicists in the Spotlight - Karin Kornmüller

Medical University of Graz; Gottfried Schatz Research Center for Cell Signaling, Metabolism and Aging; Biophysics; Nanomedicine Group

by Rainer Schindl

Whenever you meet Karin you are welcomed with a big smile and you are instantly infected with her enthusiasm and positive mood. Not only that she is blessed with an optimistic and lively character - I am impressed that Karin manages to publish a top 10 research article as a first author every year. When I asked her how to combine such successful research output with such a well-balanced attitude, she attributed this to the creative and inspiring atmosphere and people around her.
Karin is researcher at the Medical University of Graz in the nanomedicine laboratory of Assoc. Prof. Dr. Ruth Prassl. One particular strength of Ruth's research team is her talent to establish and maintain long lasting and fruitful collaborations. Whether it is within the newly established Gottfried Schatz Research Center, or connecting institutes from all three Graz universities, or in national and international teams – Karin is engaged in many interdisciplinary research projects. The idea of interdisciplinarity is visible throughout Karin's scientific education. "Well, I was fascinated by so many things, I couldn't pinpoint it to classical physics, biology, or medicine." Karin explains. That's why she decided to study molecular biology, followed by a masters in biochemistry and molecular biomedicine, and a PhD in biophysics. When asked, she considers herself a trained structural biologist with a strong background in biochemistry, who uses the exciting toolkit of biophysicists, but always within the frame of medical relevance and applicability.

Karin Kornmüller
Medical University of Graz

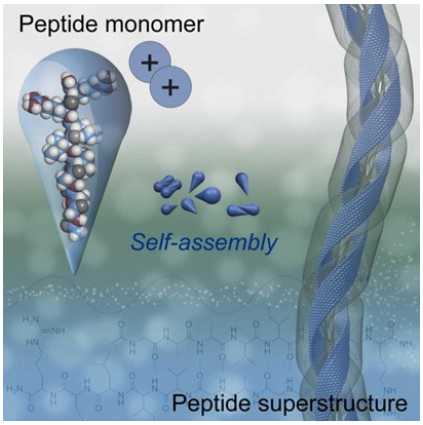
When Karin started in Ruth's lab, one of the research tasks was the crystallization of a tricky protein. This protein kept researchers around the globe busy for decades. At that time, Karin was keen to tackle this research topic with a totally new approach. She was inspired by a visit by the distinguished expert from the MIT, who proposed designer peptides as alternative to conventional detergents in protein crystallography. Indeed, when Karin tested their potential, some of these designer peptides performed quite well as detergents, however, even more astonishing were their self-assembling properties. as novel biomaterials for future medical applications.

Karin immediately was captivated by the beauty of structures which these peptides spontaneously form in solution. Remarkably, these initially monomeric peptides attach to each other to form highly ordered supramolecular structures with an astonishing level of perfection. Self-assembled peptide superstructures have size ranges from a few nanometers to submicrometers. Very simple in their design and composed of only naturally occurring amino-acids, the peptides promise a huge potential. These include delivery systems for targeted drug- or gene-delivery and 3D scaffolds for tissue-engineering. Many of the peptides form tubular or spherical structures, but Karin has a particular intuition for finding unique architectures.

At the Biophysical Society Meeting in San Francisco, Karin presented new, spectacular data that was promptly rewarded with the internationally recognized Student Research Achievement Award. Investigating a novel peptide, all the scattering curves from Synchrotron small angle X-ray scattering measurements promised something unexpected. Months of meticulous fitting function development and structure refinement, crosschecking with electron-microscopy and spectroscopy techniques, resulted in the discovery of the first self-assembled supramolecular peptide double helix. The real beauty of the double helix was revealed when Karin got cryo-EM pictures that perfectly fitted to her proposed model structure.

Since designer peptides can adopt only a rather limited number of basic architectures (vesicles, tubes, fibers, helical ribbons, flat sheets and a donut structure have been found in the past few years), the discovery of this new morphology was highly exciting. Karin's good sense for designing peptides that self-assemble into unique architectures led also to the discovery of only rarely observed peptide lamellae, which strikingly mimic lipid membranes.

Only recently she received the ESG Nano Prize 2018, an advancement award of the Erwin Schrödinger Society to support talented young scientists, for her research on lamellar peptide structures. A major goal of Karin is to combine her curiosity driven research with practical medical applications. With respect to applying peptides as novel materials, a large focus of her research is the investigation of peptide interactions with artificial and biological membranes. In the future she aims to expand this approach, in order to answer fundamental questions: what happens at different hierarchical levels, when peptide nanomaterials are interfaced with biological materials? What happens at the membrane level? What happens at cell level, and what happens at the tissue level? Every question by itself is an ambitious challenge, but Karin is a dedicated optimist, so she always sets her goals high.



Above a certain concentration peptides spontaneously self-assemble into highly ordered supramolecular structures. These structures are the basis for the development of novel nanomaterials for medical applications.

Imprint:

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Up-Coming Events

by Birgit Plochberger

ÖGMBT/BA

As in previous years, the joint annual meeting of the "Österreichische Gesellschaft für Molekulare Biowissenschaften und Biotechnologie" und Biophysics Austria will take place in the middle of September. This year there is a small but subtle difference. Even before the actual beginning of the annual conference, the Biophysics Austria organizes its own workshop day. Specifically, the Biophysics Austria will already start with the lectures on the 17th of September at 09:50. The respective three sessions will be held on the topics Structure and Simulations, Biophysical Methods and Membranes and Signaling. We are very pleased to welcome Prof. Dr. Christine Ziegler as Plenary Speaker. In this regard there was and still is the possibility to register for only this single conference day and thus pay a lower conference fee. The common day dominated by biophysics will be concluded with wine and beer during the poster session. Biophysics Austria invites all members to the joint General Assembly after lunch with coffee and cake. We look forward to seeing you!

Biophysical Society Meeting / Balitmore

For all biophysical enthusiasts, the annual Biophysical Society Meeting takes place in early March in Baltimore. As every year, Biophysics Austria is pleased to welcome all members and future members at the Biophysics Austrian mixer. Here are the most important datelines: call for annual meeting topics is the 20th of September 2018, annual meeting abstract submission is set to the 1st October 2018 and the early registration deadline ends with the January 28, 2019. The Biophysical Society supports biophysicists at all career levels and honors their scientific achievements through its travel, bridging, and poster awards – for more details visit the homepage: http://www.biophysics.org/2019meeting/awards-competitions.