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## Biophysicist in Profile

### Peter Hinterdorfer

“Peter is one of the real ‘gentlemen’ of science—all science, all collaboration and not one hint of arrogance,” says *Stuart Lindsay* about *Peter Hinterdorfer*, Associate Professor at the Johannes Kepler University, Institute for Biophysics, in Linz, Austria. Lindsay collaborates internationally with Hinterdorfer from his position as Edward and Nadine Carson Professor of Physics and Chemistry at the Center for Single Molecule Biophysics, Biodesign Institute in Tempe, Arizona.

Lindsay continues, “He was trained in an integrative mix of physics, chemistry and biophysical chemistry that served as an example to me. I have been struggling to catch up ever since meeting him and, thus, realizing the power of putting these disciplines together.”

Hinterdorfer’s mixing of disciplines came in part from changing preferences and directions as he advanced through his studies. In high school, he first wanted to study mathematics and later decided that physics might be a better profession. As he began college, he leaned toward theoretical physics.

At that time, Austria had a two-stage higher education system: a master’s degree after a minimum of ten semesters, and a Phd. After two or three years of undergraduate study in a program saturated with mathematics and sciences, students had to specialize in a particular discipline. Biophysics had just become a possible field of study at Linz when it came time for Hinterdorfer to choose his specialty. He had strong interest in both physics and biology, and he thought this new field would be a good fit for him.

He met his “first and probably most important” scientific mentor in the person of *Hansgeorg Schindler*, his thesis supervisor for both his master’s and PhD programs. Schindler, who founded the Institute for Biophysics, introduced him to fluorescence correlation spectroscopy. “We used a special home-built setup—not built by me - that had not only time correlation, but also had spatial correlation.”

Hinterdorfer did his postdoc in the lab of *Lukas Tamm* at the University of Virginia, where Tamm still serves as Harrison Professor in the Department of Molecular Physiology and Biological Physics. “Peter was my first postdoc after I moved my lab from Switzerland to Virginia,” says Tamm. “He had golden hands in the lab. He was the first to measure fusion mediated by influenza hemagglutinin by TIRF microscopy in supported bilayers. This was no easy task, as it required a combination of superb biochemistry with skills setting up a prism-based TIRF microscope and collecting data before the advent of super-sensitive and fast CCD cameras that we now are all used to.”

Hinterdorfer, in turn, enjoyed “a lot of scientific freedom, progress, and a more international community” in Tamm’s lab. The 14-month postdoc experience confirmed his decision to pursue biophysics. He returned to Austria in 1993, taking with him a lifelong friendship with Tamm and other important connections that opened the way to international collaborations.

Back at JKU in Linz, he started as a university assistant and worked his way up to associate professor by 2001. Along the way, Hinterdorfer switched from fluorescence microscopy to atomic force microscopy. He became increasingly independent and started his own group. The group gradually increased and now includes about 25 people —approximately one-third postdocs, one-third PhD candidates, and one-third undergraduate students—working in a lab that now has about ten atomic force microscopes.

In the early days of his lab, he found single-molecule force spectroscopy work highly challenging, because it required a lot of chemistry. JKU colleague *Herman Gruber* became his chemistry expert and one of the major players in designing force microscopy tips to make them into sensors. They have continued to collaborate on many projects, though Gruber has his own group.

Hinterdorfer's most important scientific breakthrough, and the one for which he is best known, was the development of the TREC (Topography and RECOgnition) imaging technique. Utilizing the high-resolution imaging capacity of AFM, TREC enables detection of incidents of single-molecule binding. The resulting 'recognition' image localizes receptor molecules at a resolution accurate to one nanometer. Patented, the microscope is now marketed as PicoTREC™.

"This is just a start for medical sensing and detecting diseases on a molecular level," says Hinterdorfer. It should make possible personalizing medicine by investigating cells of individual patients to determine the most promising approach to treatment. Instead of system diagnosis, diagnosis would be based on cell structure and cell function."

Hinterdorfer's scientific expertise is just one of the reasons that *Ferry Kienberger*, Hinterdorfer's first PhD student, considers him "the most influential person in my career." Currently working for Austrian division of Agilent Technologies, Inc. in the Electronic Measurement Group, Kienberger says, "Peter excels in mastering his research group and simultane-

ously keeping the individuality high. He brings synergy through combining scientific merits, networking and social outlets, soft skills, and lab management. It's exactly how these individual elements are combined, weighted and brought to the daily research lab that makes Peter so successful."

*Martina Rangl*, a talented PhD student currently working with Hinterdorfer, says that Hinterdorfer is "as solid as a rock" as a group leader. "Nothing shakes him. It can be urgent, problematic, or acute. He stays calm, positive, approachable, and communicative." The team sees "the boss" as a friend.

Hinterdorfer recently edited the Springer *Handbook of Single-Molecule Biophysics*. He also organizes the annual Linz Winter Workshop with 250 attendees from all over the world, accompanied by the Linz Winter School, which includes hands-on sessions for 50 beginners and young people. Hinterdorfer advises young scientists, "Interest and enthusiasm for science should be your most important driving force, regardless of the importance of whatever patenting, industrializing, or commercializing you do. Love what you do!"

One of the ways to continue loving it, he says, is to switch it off from time to time and not think about science for a while. He escapes from science through cultural events, get-togethers with family and friends, sports (such as his weekly soccer game) or music; like many in Austria, he hails from a musical family.

Hinterdorfer looks to Biophysical Society annual meetings for getting an overview of future trends in the field. He also notes that "most of the articles which inspire me for future research come from the *Biophysical Journal*."



Hinterdorfer (fifth from right) and his best friends participating in a cycling tour in Styria (south-Austrian county bordering Slovenia).