swiss physical society

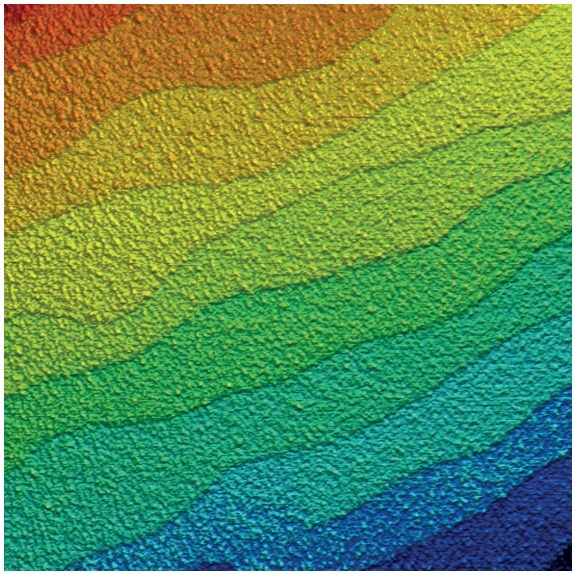
Nr. 57
März 2019

SPG MITTEILUNGEN
COMMUNICATIONS DE LA SSP

AUSZUG - EXTRAIT

Physicists in Industry (8)

"Surfing the Nanoscale with Dr. Nikola Pascher"



Topography showing atomic steps of strontium titanate imaged with a Nanosurf FlexAFM (image size: 1.1 µm).
Read on p. 47 an interview with Nanosurf's Head of R&D, Nikola Pascher.

Physicists in Industry (8)

In our series *Physicists in Industry* we regularly inform about the activities of, well, physicists in industry, but also what they recommend to students when those are looking for a job after completing their studies. In addition to research activities in large-scale industries like IBM, many graduates join or even set up start-up companies based on their innovative ideas. The lack of business experience can be compensated e.g. by special mentor programs of *Innosuisse*, the Swiss Innovation Agency. But physicists should also move more and more to SME that are already established on the market but need innovation, especially when considering the increasing complexity of arising technologies (see *SPG Mitteilungen* Nr. 56 on p. 44). All these points were addressed at our last year's annual meeting at EPFL in the special session *Physics beyond University*, organised by the SPS section "Physics in Industry", which attracted many listeners (dito, page 11).

One of the speakers was Nikola Pascher, who gave a very enthusiastic talk for students about her exciting work at Nanosurf. *Andreas Fuhrer*, SPS section head, interviewed her after the meeting.

"Surfing the Nanoscale with Dr. Nikola Pascher"

Nikola, you are head of R&D at Nanosurf, a company developing scanning probe instruments ... (see box).

Nanosurf has already visited Mars. Where do YOU want to go with Nanosurf technology?
Nanosurf is currently in a really interesting transition phase. The company started as a supplier of instrumentation for teaching and managed to establish a leading position in this very specialized market. Growth is limited in that niche, so expansion into different areas becomes necessary. Currently we are increasing the performance of our instruments to access a high-end market. This is extremely exciting. My personal goal is to make this happen together with our R&D team.

Nanotechnology emerged from scientific research of physicists investigating structures at the length scale of a few atoms.
From your perspective, building tools for nanoscale characterization, are your main clients still in physics or has nanotechnology become even more important for other fields?
Nanotechnology is very broad. It covers material science and physics, but it is also getting bigger and bigger in life sciences. These research fields are extremely interesting and relevant for our daily life. New areas are emerging fast. For instrumentation, this is important as these fields of research impose entirely new demands on scientific instruments. While samples in physics are usually made of metals, semiconductors, etc., samples in life sciences consist of biological tissue. They are often alive. We have to be creative in how we measure such samples without seriously damaging them. We put a lot of thought into how to create the greatest benefit for the researcher with our instruments.

Innovations are central to your business. Is it more the push from new nanotech research results or the pull from different markets that drives the development of scanning probe technology tools?
It is both. I would say for us it is rather the push from the nanotech researchers. Our customers are mostly scientists at universities who want our instruments to contribute to hot topics in research. Our instruments need to empower them to do this.

What is your vision/wish for the future in your role as head of R&D at Nanosurf?
I really love to work with instruments that have a great performance, solve my problems, are easy to handle and beautiful to look at. Sometimes the instruments even inspire me to discover things I have never thought about before. My vision is that we develop great and inspiring high-end products with breath-taking performance to make amazing science possible.

What are the key hurdles when turning a working "lab demonstration" into a real product?
When I started at Nanosurf, I was surprised of how perfect an instrument has to be in order to be accepted on the market. When setting up an experiment in a university lab, it

About Nanosurf:
Nanosurf, founded in 1997, is a Swiss-based provider of scanning probe microscopes. Our products are developed and produced in our headquarters in Liestal by our dedicated team of experienced engineers and physicists, and sold worldwide. Our product range includes the most compact AFM and STM instruments on the market, state-of-the-art research in atomic force microscope systems, and customized and comprehensive next-level solutions. Our customers in research, industry and teaching value the innovative approach, modularity, and ease of use of our solutions.

About Nikola:
Nikola's career path started at the University of Augsburg in Germany, where she studied Physics. After graduation, she moved to ETH Zürich for her PhD and a subsequent postdoc project at IBM Research. Her work triggered a passion for scanning probe microscopy and precise scientific instrumentation. After a period of working as a senior research scientist at Nanosurf, she is now heading the Research and Development department of this company.

is usually a single person or a very small group of people who operate it. Under these circumstances the main goal is to obtain scientific results quickly. To make the instrument easy and efficient to operate is usually secondary. When a prototype is supposed to become a product, everything from mechanics and electronics to software has to be perfect, polished and working together nicely. The time it takes to fine-tune all processes tends to be underestimated.

How important is the local research landscape in Switzerland for a technology company like Nanosurf? (location (Liestal), employees, education, funding, technology providers, ...)

Nanosurf would never be where it is now if it was not for our great university partnerships. All R&D of Nanosurf is located in Liestal. From there it is very easy to maintain excellent connections to the University of Basel, ETH Zürich and EPFL in Lausanne. Our collaborators are usually active in scanning probe microscopy or in the development of instrumentation. As a small company, it is almost impossible to maintain lab-space and find time to do great experiments that lead to publishable results. First experiments with our instruments are usually carried out together with our collaborators in a university lab. On top of that, with their scientific publications these collaborators help us advertise our products and their capabilities. We collaborate with several groups that are active in development of instrumentation or nanotechnology research. We profit greatly from their ideas and innovations. Switzerland has very useful funding schemes for companies close to university research. Nanosurf always has a number of running Innosuisse projects and is grateful for this kind of support.

Do you still use physics every day?

Absolutely. Compared to my work at the university my use of physics is now a lot broader. When doing a PhD or a postdoc the goal is usually to focus on a specific topic or problem. In my position as Head of R&D it is necessary to understand all the topics covered by nanotechnology, ranging from material science to biology. The trend in atomic force microscopy goes towards instruments operating close to their physical limits. To do this, a thorough understanding of the underlying physical principles is necessary: How to build up the mechanics of the instrument for optimal performance? What can be accomplished with optics? How can things be miniaturized and optimized for reliability and cost? What is possible with electronics and software? I find this playground, that connects physics to different disciplines of science and engineering extremely inspiring and I learn new things every day.

What did you dream to become as a kid? Did that dream come true? Was the path you took a direct line or more a bumpy road?

I think the path never was a direct line, but all the experiences I made were necessary for me to develop to who I am today. Even when I was a kid, I realized that developing a dream and living it is not an easy task. The world around us changes rapidly and our life is a constant process of learning. In this process the perspective on the future is bound to change continuously. So, I think even though it is important to be focused and to try to make a personal dream come true, it is also important to adapt the dream when the circumstances and underlying assumptions change. Not looking left and right from a precise goal might lead to a lot of missed opportunities.

For myself I would say, that I never had a dream like “I want to become the head of R&D at a nanotechnology company” but rather had ideas of what I would like to be on a different level. I knew for sure that my goal in life would be to do things I find inspiring, to enjoy what I am doing and to meet and work with interesting people. To do cutting-edge science and engineering fulfills all of these criteria. So, for the present I would say that my dream has come true. As for the future, I am curious of where it will take me.

You are one of the rare examples of a woman in a leading technical position. What, in your opinion, could be done to improve the gender balance?

This is a difficult topic. I think that the routes of this gender imbalance are buried deep in our thinking, our education and our society. Men and women often behave differently in given situations. These ways of behavior might trigger different impressions with decision makers. I don’t think this is usually a process which comes from bad intentions, but rather from an unconscious bias.

Like with many challenges in our society, I think that education is the key. While studying physics or engineering learning is usually focused completely on the technical part. Yet the development of good social and behavioral skills might benefit from training also. These topics would be immensely helpful in everyday professional life.

We should raise an awareness for unconscious bias in our society and start to reduce it. Schools and universities could offer courses to train both men and women on these behavioral topics. Apart from learning we also need to change our procedures and processes to remove gender bias, like e.g. the selection process for important positions.

Were there points in your life at which you believe the path you chose (that was decided for you) would have been different if you had been a man?

When I try to think of the points in my life when I made serious decisions, I have the impression that there were plenty of aspects that were more important than gender. I decided to study physics, because I loved this science and felt my talent lay in this area. I decided to do my PhD at ETH because I liked the topic, the people and the place. And so on. Of course, sometimes, I, as a woman in physics, was treated in a special way (“Good morning gentlemen, good morning Ms. Pascher”), and it was not always easy to laugh about this. Yet I don’t think that this has ever influenced my decisions.

Any recommendations to female students? What should they do to find an exciting job in physics?

Don’t let other people tell you what your role is and always question your - and other people’s assumptions. Enjoy what you are doing and work with a lot of enthusiasm. If you don’t manage to be enthusiastic for what you are doing, it might be time for a change. Be open-minded and look for new challenges.