AFR GRANT SCHEME – AIDES À LA FORMATION-RECHERCHE

RESEARCH HIGHLIGHT

DR MARTINE PHILIPP

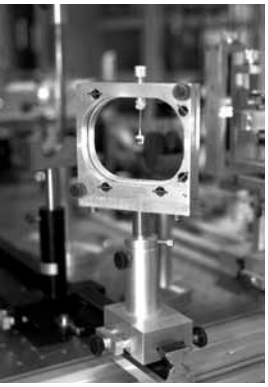
PARTICIPATION AT THE 60TH LINDAU NOBEL LAUREATE MEETINGS

In June 2010, the city of Lindau in Bavaria will host the 60th annual Meeting of Nobel Laureates in chemistry, physics and medicine/physiology, a congregation of some of the world's most brilliant scientific minds. Every year, this event provides international young "Best Talents" with the unique chance to meet Nobel Prize Laureates in an informal setting. The Lindau meeting is not only a globally recognized forum for the exchange of knowledge between generations, but also gives young researchers an excellent opportunity to establish new contacts in the scientific world and gather ideas for up-and-coming projects.

To be allowed partaking is an honour, the selection process is tough: globally, an initial 12-15,000 hopeful candidates are nominated every year. Out of these, the Lindau Council selects 700 that are invited to the meeting, based on their curriculum vitae and on recommendations from renowned scientists. Dr Martine Philipp, one of two Luxembourgish researchers that will attend the meeting in 2010, and currently a research assistant at the University of Luxembourg, can be rightfully proud to be one of this year's participants. Truthfully, her academic history is as impressive as it is unusual: after two years at University, she held a tri-national (Luxembourgish, French and German) pre-degree in Physics, three years later she received a German Diploma as a Physicist combined with a French DEA (*Diplôme d'Etudes Approfondies*) in Material Sciences. Both degrees were awarded with the best possible grade achieved; for her graduation project (under the direction of Prof. Dr Dr h.c. Jan-Kristian Krüger) she did not only achieve the dream mark of 1.0, she was also presented with a prize of excellence for being one of the three best graduates of her year.

But how does one get a Luxembourgish, German and French degree in such a short time? The Saar-Lor-Lux degree programme (SLLS) is the secret: this course, founded in early 2000 and supported by the Franco-German University, allows students to undertake one degree in three different countries. As such, Philipp spent her two first years in Luxembourg, and then moved on to Saarbrücken, Nancy and back to Saarbrücken for the consecutive three years. Besides the obvious advantage of gaining a multi-national diploma, Philipp claims the course has other benefits too: "First of all, you get to work with experts in a variety of fields. The University of Saarbrücken specialises in material sciences, whereas Nancy consecrates itself to plasma science. In addition to the scientific aspect per se, the programme requires a certain amount of flexibility, a bonus in my view. Furthermore, getting to know the different study systems in different countries had a strong appeal to me."

After graduating, Philipp returned to Luxembourg to work on her FNR-funded PhD thesis: Non-equilibrium phenomena, structural formation and influences of interfaces in network-forming systems as seen from the optical and acoustic viewpoint. Once again under the direction of Krüger, she was studying the mechanical properties of 2-component glues, adhesives that are made of two chemical substances, a resin on one side and a hardener on the other. Mixed together, the two substances undergo a chemical reaction and polymerise. The technique makes the combination of materials such as plastic and metal feasible, a feat that was nearly impossible before the invention of strong glues. "Nowadays, cars or planes are held together mainly with glue," explains Philipp. "Adhesives have two clear advantages to welding for example: firstly, welded materials tend to rust relatively quickly at the welding junction, secondly, using glue is cheaper." According to her, the average car today contains about 30 kg of adhesive. Although this sounds like a lot, gluing actually reduces the weight of the final product, making it more environmentally friendly, in a way.



"Biocompatible glues are certainly an important and interesting area of future research," says Philipp. They are already in use for medical procedures such as liver or spleen operations and are tested in bone repair too. But the fundamental questions Philipp has been studying during her thesis still require more work as well. The polymerisation process of the two components is not straightforward; the fact that nanoparticles are added (amongst others) to the substances to acquire different properties such as strength or impact resistance makes it even more complex, because the chemical reaction tends to change around these. Such structural heterogeneities can impart positive properties, but might also be a reason for disintegration of the glue. In her search for understanding, Philipp certainly made one very important finding: the two chemical components in her glue did not only mix by diffusion, as has been assumed so far, but also through convection. Put simply, this means the process is faster, but also even more complex and harder to understand than previously thought.

After Philipp's doctoral promotion in November 2009, the physics group of the University of Luxembourg have started analyzing more complex glues. Could the further elucidation of the polymerisation process become the postgraduate's future occupation? "Having undertaken my PhD in Luxembourg means that by 2011, I will have to continue research in a different country for at least a year, and leave the projects I am currently working on," Philipp says. Industrial research would be a possible choice, but since she has her sights rather fixed on fundamental science, a postdoctoral research position would be the better option. "I could see myself moving to the UK or the United States, in order to brush up on my language skills as well as doing research," she ponders. Another interesting project has caught her attention: "The research unit in Luxembourg has close contacts to the Max-Planck-Institute in Düsseldorf. One of their projects is the study of the mechanical properties of lobster shells, a material that is very lightweight yet extremely resistant. Biophysics would definitely be an interesting branch to work in." Talking to colleagues from around the world will certainly help her to make a choice. "For me, the timing of the Lindau Nobel Council is definitely perfect!"