



Prof. Mario Albrecht

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Microbiomes, Neuroplasticity and a Go-Between



The cooperation BioTechMed Graz is combining and expanding the scientific know-how and technical infrastructure of the three big universities in Graz. Three new professorships have already been taken up. Here, the appointees give a first insight into their work. An interview by Franz Zuckriegel.

botenstoff: BioTechMed Graz has been in the news recently with the appointment of

Prof. Moissl-Eichinger (center)

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time for an interview in this busy phase. And I'd like to begin with Prof. Schöpf, can you describe your first impressions?

Veronika Schöpf: Well, I just started work at my institute at the University of Graz a couple of weeks ago and of course I'm busy getting to know my new surroundings. As a professor of neuroimaging I am working on imaging of the brain. Previous-

ly, a simple map of the brain with structures and functions was enough; that isn't true any more. For example, to develop useful imaging biomarkers, we need to link the structure and function of the brain to other pieces of information – such as genetic or therapy-related data.

My goal is to bring this technology to the next level and make it scientifically practicable. What I find especially interesting are questions about neuroplasticity: What happens in the brain and how does it change when specific kinds of information are no longer present, for example when a sense is lost? For investigating questions like this I'm sure we will discover capabilities in Graz that people haven't noticed yet.

b: Do you already have definite ideas?
Schöpf: It's really too early for that; we'll have to get to know each other better first ...

b: Prof. Moissl-Eichinger, your subject is 'interactive microbiome research'. How is your settling-in phase going?

Christine Moissl-Eichinger: I've been here for exactly four weeks longer than Prof. Schöpf, so I'm at much the same stage. I'm also enjoying getting dug into my new job. The subject of microorganisms is my life and actually microorganisms shape all of our lives. For example, did you know we have more than a kilogram of pure microbial matter in our gut? You can imagine how important that is – how the microorganisms transform nutrients, what metabolic reactions are happening there that we don't

understand at all yet. Microbiome research is about understanding these processes better. It's not just about the gut, it also applies to the skin. A human individual has more microbes living on them than there are people in the world. And these microbes are a key to our wellbeing.

My background is in classical microbiology; I have also worked in environmental microbiology, and then I got into a very exciting area which has to do with the cleanliness of spacecraft. The cleanroom analysis we did for that work took us back to the human microbiome, because the microorganisms in these cleanroom environments are a picture of what the humans bring in. We discovered microbes on the skin that you can't detect with the classical medical diagnostic techniques. Here we have to develop new techniques and find new approaches for new questions. In this area I have brought several big research projects with me. One project chosen by the European Space Agency has to do with the international space station: There we are looking at how the microbiome inside the station has changed over the years. Another project has to do with the microbiome on the skin, and we have some more astrobiology work to do besides the space station. Just now I'm busy talking to many colleagues in Graz who are doing research on the microbiome.

b: Is the popular-science explanation that the microbiome defines the person as individual – as the genome really true? Or is the microbiome more complex and more variable?

Moissl-Eichinger: The microbiome is enormously complex, and we still have the chicken-and-egg question. Does the body become sick and then this is reflected in the state of the microbiome, or is a problem with the microbiome the cause of the disease? How does the body interact with the microbiome? And to what extent can I control my microbiome by eating sensibly or by doing physical exercise? There is still a lot of basic research to do on these issues.

b: And now Prof. Albrecht, how has your time in Graz been so far?

Mario Albrecht: I've been in Graz since March now, and I think that bioinformatics as a subject is really a kind of go-between that connects the life sciences, medicine, biological sciences and informatics and IT. In the context of BioTechMed the focus is on analysis of the large volumes of data that are generated by modern instruments with high-throughput processes. It's not possible to analyze these amounts of data manually, so we have to use informatics methods. We are working on the development and application of specialized bioinformatics methods.

It's relatively easy to continue research in this area in Graz, because this work has a long tradition here. Right now we are working on both basic and applied projects, for example in developing special prediction methods. To support better understanding of data we are also interested in visualization, both in two and three dimensions. And we can represent knowledge as a network, for example a network between molecules and proteins that shows their interdependencies and interactions.

b: Have you already been in touch with the Know-Center?

Albrecht: We have already been in touch, and the Know-Center is also developing software for the life sciences. Yes, I think there are some interesting possibilities for cooperation when it comes to tool development and knowledge visualization.

b: Are you open to specific requests from industry?

Albrecht: Of course we are.

Schöpf: Of course financial support in shared projects is always welcome, for degree or doctoral projects or even bigger research projects.

Moissl-Eichinger: From my point of view it's important to increase the awareness of the relevance of microbiome research for industry, so in that sense contacts from industry are very welcome. And then – and I know my colleagues agree with me on this – we have to strengthen the interactive elements of BioTechMed in teaching, which would include a shared series of lectures.

b: Many thanks for the interview!

Prof. Veronika Schöpf

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BioTechMed: The New Professorships

The call to take up the chair for interactive microbiome research went to Christine Moissl-Eichinger (center of photo at top). The German scientist (38) will make the study of microorganisms in a variety of contexts in the human body the center of her work.

The new chair in bioinformatics at TU Graz, which is supported for three years by the Government of Styria, has been taken up by Mario Albrecht (top left). The 39-year-old will focus his efforts on the field of 'big data'. He will find ways to filter the most important results out of the flood of biomedical data and to reveal hidden functional interactions.

Veronika Schöpf (top right) has taken up the professorship of neuroimaging at the University of Graz. Brain research using functional and structural MRT imaging is currently a highly successful area of research in Graz.

A fourth professorship in the cooperation BioTechMed with potential for significant future developments in biopharmacy will be located at TU Graz. The position should be filled by the beginning of 2015.

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