

CELL SCIENTISTS TO WATCH

Cell scientist to watch – Christian Münch

Christian Münch studied biochemistry at the University of Tübingen and the Max Planck Institutes in Martinsried and Tübingen, Germany. For his PhD, he joined the group of Anne Bertolotti at the MRC Laboratory of Molecular Biology, Cambridge, UK, to work on protein aggregation and prion-like processes in neurodegenerative diseases. Then, he moved to Harvard Medical School, Boston, USA, to carry out postdoctoral work in Wade Harper's lab, where he studied cellular protein quality control and the mitochondrial unfolded protein response. Christian established his independent research group in 2016 at the Institute of Biochemistry II, Goethe University Frankfurt, funded by an European Research Council (ERC) starting grant and Emmy Noether grant. His lab studies cellular stress responses to mitochondrial protein misfolding, infection and disease, as well as developing proteomics methods.

What inspired you to get into science and study protein quality control?

I have always been very curious and, as a kid, tried to get my hands on all kinds of books to educate myself and figure out how things worked. Then in high school, I really got interested in biochemistry – largely due to having great teachers. Later, I was very fortunate to spend a year at the Max Planck institute in Munich as part of my undergraduate education, where I did several lab rotations. Inspiring people like Ulrich Hartl, Stefan Jentsch and Walter Neupert got me hooked on the topic of protein quality control and I've never let go; there are just so many interesting aspects to study!

Could you tell us about the main theme your lab is working on?

We're focusing on different stress conditions in which protein quality control doesn't work properly anymore, including after protein misfolding, infection or neurodegeneration. So, on a broader level, we are trying to understand the commonalities and differences in the ways cells respond to stress and understand the molecular details. We also develop new methods for quantitative proteomics, but actually this is never our main goal; rather, we usually want to answer a biological question and when we don't find a good enough method, we try to create one – and most often turn to proteomics.

What is the most attractive part of using systems biology approaches, such as proteomics, to answer your research questions?

I think it's being able to understand the context of a cellular process, which is often quite complex, and then figure out molecular mechanisms from there. For example, you can take a condition such as a SARS-CoV-2 infection, where you have no idea of what is going on in the cell, but with approaches such as quantitative proteomics, you can find important factors or pathways and start working out what is actually happening. For me, the important aspect of systems biology is to combine different layers of data, including molecular information.

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Was it straightforward for you to start working on COVID-19 when the pandemic started?

Yes, this kind of happened naturally. We had developed a new proteomics method to look at translation with a high time resolution, and thought it would be fascinating to apply it to highly dynamic processes. So, we had already started a number of collaborations to study cells that are infected with different viruses, as there was very little knowledge about what happens to protein translation after infection. And then SARS-CoV-2 arrived in Frankfurt – not surprisingly among the first places in Europe due to its huge airport. So, we very quickly shifted our existing collaboration with the Medical Virology group here in Frankfurt towards coronavirus research. It was quite a hectic period – taking care of two young kids at home during lockdown and at the same time trying to spend every possible minute generating and analysing datasets that could be a foundation for advising which drugs to use in the clinics. We submitted our first SARS-CoV-2 paper within 3 weeks of the virus arriving in Frankfurt – those were really crazy times! However, it was worth it and we were quite proud to have been able to contribute towards dealing with the pandemic.

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In what other ways was the experience of studying a virus causing a global health crisis different compared to your previous work?

One of the things we were not used to was interacting with various companies that asked whether they could build their clinical programs



The Münch lab taking advantage of a short COVID reprieve for a lab outing in Frankfurt.

on our data. Another new aspect for us was the interest from the press and discussing our work with the public. We also made a strong commitment to making the data immediately available through public preprint servers and depositories to help other groups in their efforts.

Let's go back to the time when you started your lab. What do you feel were the main challenges of becoming a group leader and how are those challenges different now?

One of the challenges was that I still felt like a postdoc. I was very well trained in how to do the experimental side of science, but not in many other aspects that are required for leading a group. I basically had to learn a lot of things on the job, including the administrative parts. Today, one of my biggest challenges is to not get distracted from doing science by all sorts of other things I get asked to do. Although I can now also influence decisions that enable good science at a much higher level, but at the end of the day I want to be able to tackle my own research questions.

Tell us about the PROteostasis Group of European New InvEstigators (PROGENIE) and the main motivation behind launching this network

It started with some of us new PIs coming together at conferences and realizing that it would be really useful to have a forum to meet and network, find collaborators and maybe even apply together for a grant. This was inspired by a similar network called Junior European *Drosophila* Investigators (JEDI) and we thought we could try something similar for people working in the proteostasis field. I think it's been very useful, especially in COVID-19 times when it helped us to connect online while we were shut away in our offices. For us at PROGENIE, training the next generation of scientists has also been important, and that's why we've been organizing the Susan Lindquist School on Proteostasis for students

and postdocs. We did this online last year and it was one of the few conferences that actually really worked in a virtual format; the group was relatively small and there was plenty of time for questions and discussion – so the feedback from the speakers and attendees was that they finally got back a little bit the feeling of participating at a conference.

What is your approach to mentoring and establishing a good lab culture?

As every person is different, I don't think there can be one mentoring style that fits all. So, what's very important to me is creating an open environment where everyone feels welcome and at ease to speak out, criticize, take criticism, challenge ideas and also to fail. This is what really nurtures new ideas and new directions. Also, I think we've benefited a lot from having people with diverse scientific and cultural backgrounds, from standard biochemistry or cell biology through clinical medicine to bioinformatics – it's very useful to have many different perspectives.

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I imagine that many groups want to collaborate with you. What is in your view the key to establishing productive collaborations?

I think the most important part is good communication. Even if it's a small and straightforward collaboration where we do proteomics on a couple of samples, we need to make sure that the experimental setup is fine and what our collaborators want to get out of the experiment is properly discussed. But to make full use of proper scientific collaborations, I think you also need to get to know each other – both on the science side, to see what you can actually do together, and on the personal side, to find out how you can work together most effectively and productively.

Is there a piece of advice that you found helpful in your career?

I don't think I have a very specific one, but what I've learned is that it's important to appreciate just being able to be there and do science as our job. It can be challenging and competitive, but at the same time there is also an open community spirit that welcomes young people, which I think is really empowering.

Finally, what is something people might not know about you?

I read very different things, listen to all sorts of different music and, to the great amusement of my lab, watch very different kinds of TV shows! There, my curiosity might get the better of me sometimes. I also used to play a lot of music and do different sports, but these activities have taken a bit of a backseat – I spend most of my time outside the lab with my family.

Christian Münch was interviewed by Máté Pálffy, Features & Reviews Editor at Journal of Cell Science. This piece has been edited and condensed with approval from the interviewee.