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CELL SCIENTISTS TO WATCH

Cell scientist to watch – Stefanie Redemann

Stefanie Redemann studied Biology at Darmstadt Technical University, followed by a Master's at EMBL in Heidelberg, Germany. She then pursued a PhD in the labs of Tony Hyman and Jonathon Howard at the Max Planck Institute of Cell Biology and Genetics in Dresden, where she investigated the role of the actomyosin cortex in force generation and spindle positioning. After obtaining her doctorate degree in 2009, she joined the lab of Thomas Müller-Reichert at the Medical Theoretical Center in Dresden to work on reconstructing the mitotic spindle using electron tomography. Stefanie started her independent research group in 2018 at the University of Virginia School of Medicine, where she is using interdisciplinary approaches to study spindle assembly and chromosome segregation in both mitosis and meiosis.

Stefanie Redemann

Did you always want to become a scientist?

No, actually. In school, even though I thought that physics is very interesting, I wasn't really good at it. Since I didn't know what I wanted to do after finishing school, I went for vocational training and applied to become a travel agent, a speech therapist and a lab technician – seemingly quite random things! I then actually ended up completing a three-year training programme with the company Merck, but I had a hard time imagining being a technician for the next 40 years or so. Luckily, I had a very nice boss who encouraged me to go to university. So, that's what I did and then everything else just followed.

You've been interested in interdisciplinary approaches from early on, combining cell biology and biophysics. Could you tell us a bit more about that?

I was at EMBL in Heidelberg for my Master's degree and then at MPI-CBG in Dresden for my PhD, and both are really interdisciplinary institutes. I often interacted with physicists and computational researchers, which was great because people from different areas bring a lot of new perspectives. In the end, this deepens your understanding of biology – sometimes when you think you might have understood how a cell biological process works and take it to a physicist, they'll tell you that it actually doesn't make sense when considering the laws of physics. In addition, bringing in people from the outside can also be very inspiring.

What questions are your lab trying to answer just now?

The big picture is trying to understand how microtubules, motor proteins and chromosomes come together to make a spindle that segregates chromosomes the same way every time. We are now looking at the central spindle and how it can generate forces to push the chromosomes apart. We've also started investigating what I call the structural diversity of chromosomes: if you look at chromosomes, they're all very different in size and the position of kinetochores can differ, too. It is known that there is a bias in chromosome missegregation, so we're trying to see if and how the structural diversity of chromosomes affects that. We also have some things that are still developing, such as looking at organelles in mitosis, which is quite new for me.

Could you tell us some of the key insights your work has revealed about spindles in mitosis and meiosis from your use of tomography?

I think we've had quite a few new insights, because by using electron microscopy (EM) tomography we can look at spindles at a resolution that hasn't been achieved before. For example, in contrast to the textbook view, we've found that, in mitosis, the kinetochore microtubules are not actually connected to the centrosome, which has consequences for segregation. In meiosis, spindles are tiny and therefore hard to see with light microscopy; using our tomography data and building some models, we learned a lot about microtubule dynamics, nucleation and growth. One of our recent findings has been that microtubule turnover is the major driver of spindle reorganization.

What were the main challenges you faced when becoming a group leader?

I really underestimated the administrative part and everything that is associated with grant writing or hiring and mentoring people. Then there is the teaching aspect and figuring out how to design your lectures, as there is no fixed curriculum. So, in the beginning you're constantly doing things you've never been trained in before – I guess a PhD qualifies you for figuring out stuff, but it's still pretty stressful. When I started, I did take a one-week lab management course organized by EMBO, which was very useful. Also, when I joined Thomas's lab for my postdoc, he was just starting up his group, so I saw what it means to begin with an empty room without people, and I could also learn from the challenges, experiences and

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Stefanie with her family on a visit to New York.

some 'mistakes' he made – of course later on you still always make your own mistakes!

Are you still doing experiments yourself?

I actually do a lot of the EM preparation, sectioning, imaging and image analysis, as those are more flexible; if I were to run a proper wet-lab experiment over several days, that would be very difficult because there are so many interruptions. But I often do collaborative projects, as I still probably have the most experience in the lab when it comes to dealing with samples that are not from *C. elegans*. Actually, as we speak, I just got some *Sciara* flies I want to look at, as I find it fascinating how they segregate chromosomes with monopolar spindles and selectively throw out the paternal chromosomes. So, this is kind of a pet project of mine – you know, when people in your lab show you data, that's really exciting, but it still feels very different because you have not been the one tinkering around to discover something. Sitting in your office the whole day can also sometimes feel isolating, so it's quite nice to go into the lab, see what your people are up to and do some of your own experiments.

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Your research combines imaging with theoretical modelling. Is it difficult to build an interdisciplinary team of researchers as a new PI?

It's hard, and I think for us this has mostly worked through collaboration. If I were to hire, for example, a computational biologist, can I really train that person well enough? It's also more difficult for junior PIs to hire good postdocs with a different background, because they often might want to join more established labs.

In general, what's your approach to starting collaborations?

I genuinely love collaborating and am really open to it. If I see something that I think is cool, I often write to the person and, so far, most people I've approached have been interested in working together. Also, since tomography is something not everyone can do, people often come to me with all sorts of project ideas I know nothing about, so that keeps it very interesting!

What kind of mentor are you trying to be, and what kind of lab environment or scientific atmosphere do you seek to establish?

Often what influences you are the things that you like – so for me this is a supervisor who is hands off, because if I'm being micromanaged, I get really stressed and also slow at doing things. Of course, you need to realize that everyone is different, and there are also a lot of people who need tight supervision, so it's my job to find out what works best for each lab member. In terms of lab environment, I think it's important that people always feel they are supported and in a safe space. When I was in Dresden, I liked that, as a lab, we did lots of things together and formed a real community, and I would like to have this for my own lab as well. I'd also mention that MPI-CBG is a pretty unique place; when I was there, I felt that I knew everyone in the building and people were extremely interactive. There are things like the architecture of the building with large communal spaces, or not being allowed to have your own coffee machine that kind of make you meet and talk to people all the time. This is a good thing as it opens the door to a lot of potential collaborations. With my lab, we did have lunch together every day (before COVID), which is great because people mostly talk about what they do outside of work, so you really get to know them.

You're on the Women in Cell Biology committee of ASCB. What activities are you involved in, and what do you get out of being part of such a group?

The task of the Women in Cell Biology (WICB) is to promote equity, diversity and inclusion in cell biology. We provide career development and leadership opportunities. We organize panel sessions at the annual ASCB meeting, but also throughout the year. At last year's conference, we discussed about mentoring and toxic mentor relationships, and this year we're planning a panel on gender diversity. It is actually the 50th anniversary of WICB this year and we are organizing a number of events during the upcoming ASCB meeting to celebrate this. It's really nice to be a part of such a community – we actually have male members as well. I think it's important when you are a new PI to build a strong network of people who are supportive and you can connect with – even when it's just talking about how terrible you feel about not getting a grant.

"Work on a unique question or learn a new technique that will distinguish you from others".

You mentioned the importance of a support network. Is there any other advice you would give to someone who would like to become an independent group leader?

I think the most important thing is to find your niche. Work on a unique question or learn a new technique that will distinguish you from others. In Dresden, I had the opportunity to learn EM

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tomography during my postdoc, but joining Thomas's lab was also a personal decision. I was pregnant at the time and my partner was doing his postdoc in Dresden, so it did not make sense for us to leave the city then. That's why I decided to do a short postdoc – which turned out to be much longer than planned. Many people told me that if I stayed in the same city for my postdoc, that would be the end of my academic career, but in the end it all worked out. So, there is not a single way to succeed and become a group leader!

Finally, what might people be surprised to find out about you?

I have three kids who are six, nine and eleven years old, so that keeps me super busy. I also like to do lots of DIY stuff, for example, building a tree house or all sorts of home reorganization activities. I also like knitting and crocheting, but next to the kids and work, there's never enough time for that!

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