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CELL SCIENTISTS TO WATCH

Cell scientist to watch – Melina Schuh

Melina Schuh received her diploma degree in biochemistry from the University of Bayreuth, Germany, where she completed her Diploma thesis with Stefan Heidmann and Christian Lehner. She went on to do her PhD with Jan Ellenberg at the European Molecular Biology Laboratory in Heidelberg, Germany. In 2009, after a bridging postdoc with Jan, Melina started her own group at the MRC Laboratory of Molecular Biology in Cambridge, UK. Since January 2016, she is a Director at the Max Planck Institute for Biophysical Chemistry in Göttingen, Germany, and will establish a new department focussing on meiosis. She is an EMBO Young Investigator and a recipient of the 2014 Lister Institute Research Prize, the 2014 Biochemical Society Early Career Award and the 2015 John Kendrew Young Scientist Award. Her lab is studying meiosis in mammalian oocytes, including human oocytes.

Melina Schuh (©EMBL, M. Schupp)

What motivated you to become a scientist?

To some degree I became a scientist by chance. I had many different interests in school, and I was struggling to decide whether I wanted to become a journalist, an architect or a scientist. My friends and family encouraged me to study biochemistry because they thought that it suited me most. But I don't think I knew at that stage what it would be like to work as a scientist. Studying biochemistry was a very good choice, though, and I never had any regrets. I loved the way science was taught at university.

In your PhD you developed methods for studying meiosis in mouse oocytes. What problems did you have to overcome, how did you devise your system?

There were very few high-resolution studies of mouse oocytes when I started my PhD in Jan Ellenberg's lab at EMBL in Heidelberg. Jan's lab had worked with starfish oocytes but had no experience with mammalian oocytes. I wanted to develop a system that would allow us to image meiosis in oocytes at high resolution by using a confocal microscope. This was not trivial because oocytes normally develop inside the body and they are very sensitive cells. I had to find out how to culture the oocytes outside the body on a confocal microscope, how much light they could tolerate, and how to label and follow structures – like the chromosomes – over the entire course of meiosis, which takes more than 12 h. Much of it was learning by doing, but I also got very valuable advice from various people around me.

You continue to work on meiosis in mouse oocytes. What are the particular questions that your group is currently trying to answer?

Our main aim is to understand how defects at the interface between chromosomes and the cytoskeleton lead to aneuploid eggs and pregnancy loss in mammals. We have also recently started to study meiosis and chromosome segregation directly in live human oocytes, which has not been possible before. This is a new direction of research in my lab that I am very excited about, as it should allow us to investigate why human eggs are so likely to be aneuploid.

What parts of the cytoskeleton are you specifically looking at?

We have evidence that, in human oocytes, the way that the spindle assembles is different from how it assembles in mitotic cells. Spindle assembly takes more than half a day in human oocytes. In mitosis, it takes just 30 minutes. So the question is: why are human oocytes so slow in assembling a spindle? Oocytes from many species assemble the spindle without centrosomes. Instead, they use acentriolar microtubule organising centres (aMTOCs), which functionally replace the centrosomes. We could not find these aMTOCs in human oocytes. We discovered that human oocytes assemble the spindle by a mechanism that is chromosome-dependent and mediated by the small GTPase Ran. The spindles need to be extensively reorganized while the chromosomes become aligned in the spindle centre. This could be one of the reasons why spindle assembly takes so long. These are, at least to our knowledge, the first studies of chromosome segregation in live human oocytes.

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At the time this interview was conducted, Melina Schuh was a group leader at the Medical Research Council – Laboratory of Molecular Biology in Cambridge, UK. She is now a Director at the Max Planck Institute for Biophysical Chemistry in Göttingen, Germany. She investigates meiosis in mammalian oocytes.

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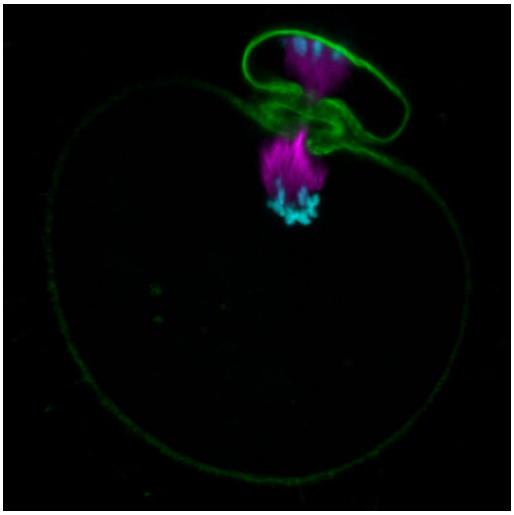

Fig. 2. Mouse oocyte during polar body extrusion. Chromosomes are shown in cyan, actin in green, microtubules in magenta. (©MRC Laboratory of Molecular Biology, M. Pasternak and M. Schuh).

Have we been looking at an incomplete system when studying meiosis in mouse oocytes?

Mouse oocytes still resemble human oocytes in many aspects. We will need to study human oocytes in much more detail to evaluate how closely they resemble mouse oocytes.

How did your collaborations influence your research? Do you have any advice on collaborating?

It is helpful to collaborate with scientists that you enjoy interacting with and where the communication is working well. Which is crucial to a successful collaboration.

Everyone makes mistakes. How do you deal with them in the lab?

It is unavoidable that you make mistakes at some point in your career. And you should, of course, try to learn from your mistakes. But it is equally important that you don't get hung up on these mistakes. You need to accept that you cannot be perfect. Try to always remind yourself of all the things that are working, the things you are doing well and to simply enjoy the science.

What advice on how to establish a successful academic career would you give?

I would recommend that you try to do something new and exciting, even if it is difficult. Be creative, ambitious and fearless in your approaches. Do not think that something cannot be done just because nobody has done it yet. It is good if you try to develop something new, because this helps you to stand out from the crowd, become known for what you are doing, advance your career and get tenure.

What do you think about the feasibility of being both a good parent and a good scientist?

I think this is a challenge for many parents. Pregnancy, maternity or paternity leave, the many sleepless nights that come with a baby, and the time involved in looking after children will all have an impact on your productivity. There is not much that can be done about this. It does help to have excellent day care, ideally subsidised by institutes. It is also important that line managers and institutions in general are understanding that there will be a transient period of time when progress is going to be a bit slower. Having this support will help you to stay focussed on your work and to get through this busy time with confidence.

You left your home country, Germany, to start your own research group here in Cambridge. Do you think of returning to Germany one day?

I have been offered a great position at the Max Planck Institute for Biophysical Chemistry in Göttingen. I very much enjoy working at the LMB, but my husband is still working in Germany while I am in the UK with two kids. Moving back to Germany will allow us to live together as a family while doing research at a fantastic institute – it couldn't be better.

Video interview

An additional, short video interview with Melina Schuh is also available, and can be viewed directly here: http://jcs.biologists.org/lookup/suppl/doi:10.1242/jcs.182717/-/DC1 or on the JCS Interviews page: http://jcs.biologists.org/content/interviews.

Melina Schuh was interviewed by Anna Bobrowska, Editorial Intern at Journal of Cell Science. This piece has been edited and condensed with approval from the interviewee.