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FIRST PERSON

# First person – Sharol Schmidt

First Person is a series of interviews with the first authors of a selection of papers published in Journal of Cell Science, helping early-career researchers promote themselves alongside their papers. Sharol Schmidt is first author on 'Identification and characterization of the land-plant-specific microtubule nucleation factor MACET4', published in JCS. Sharol is a PhD candidate in the lab of Andrei Smertenko, Institute of Biological Chemistry, Washington State University, WA, investigating the evolution of plant cell division and the mechanisms behind plant cell shaping.

Sharol Schmidt

**How would you explain the main findings of your paper in lay terms?**

Contrary to their animal counterparts, plant cells are immobile owing to the rigid cell walls, and thus their position in the plant body is permanently fixed. Hence, plant development depends on the position of partitions between daughter cells or cell plates during cytokinesis. Both orientation and construction of the cell plate is determined by microtubules. We study regulation of microtubule behavior in the plant-specific cytokinetic microtubule structure, the phragmoplast. The phragmoplast builds the cell plate by expanding from the cell center toward the parental cell wall. During phragmoplast expansion, microtubules depolymerize once cell plate synthesis is being initiated. Intriguingly, the phragmoplast morphologically resembles the animal cell cytokinetic structure, the midbody. Both structures use the same microtubule regulators. However, unlike the dynamic phragmoplast, the midbody is structurally very stable. So the question is, which proteins determine the unique properties of the phragmoplast? Our work characterizes the land-plant-specific microtubule-associated protein MACET4, which contributes to regulation of phragmoplast size. This is just the first step that will help to understand how the phragmoplast expands.

**Were there any specific challenges associated with this project? If so, how did you overcome them?**

MACET4 has no conserved domains and at the beginning of the project we had no idea what the activities of MACET4 were going to be. It was a completely unknown protein. We really had to start this project from scratch. Once we saw phragmoplast localization of MACET4–GFP and increased microtubule polymers in co-sedimentation assays, we started to get an idea about potential functions of MACET4. We designed our early experiments around a central hypothesis: if MACET4 increases turbidity in a microtubule solution, then it is polymerizing microtubules and we should see long microtubules in the presence of MACET4. We polymerized fluorescently labeled tubulin with recombinant MACET4 and we saw asters and short microtubules. This really threw us. How could MACET4 contribute to polymerization and aster formation, but restrict microtubule elongation? We recorded *in vitro* microtubule dynamics and saw a reduction in rescue with MACET4 and the control kymographs tended to have longer microtubules. This actually made sense because phragmoplast microtubules are short and constantly changing from states of depolymerization to polymerization. That was when the pieces of the puzzle started coming together.

**When doing the research, did you have a particular result or 'eureka' moment that has stuck with you?**

My favorite 'eureka' moment was when I was checking seedlings, which were, hopefully, expressing MACET4–GFP under the control of the *MACET4* native promoter in the knockout mutant background. I was searching for tiny green phragmoplasts in root tips with the confocal microscope. I was worried there would be not be a detectable GFP signal meaning many months wasted for producing the line. One cell contained a green blob, so I set up recording time-lapse and left the room for about 10 minutes. When I returned, it was clear that the blob was turning into an expanding phragmoplast. For the next 45 minutes, my heart was racing as the MACET4—GFP-labeled phragmoplast gracefully expanded across the cell.

**Why did you choose Journal of Cell Science for your paper?**

Journal of Cell Science focuses on publishing papers that address fundamental cell biology questions. Although the protein we are characterizing is specific to land plants, all eukaryotes have microtubules. We wanted our findings to be known to cell biologists working in different model systems.

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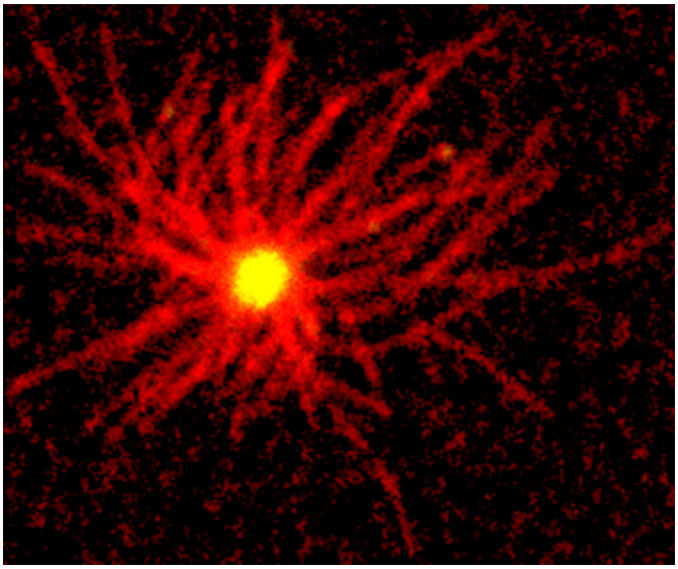

***In vitro* reconstitution of microtubule nucleation centers.**

**Have you had any significant mentors who have helped you beyond supervision in the lab? How was their guidance special?**

Previous work environments have really implanted some skills that I think are beneficial to bench work. I started working in a kitchen when I was 15 and I continued that job through most of my undergrad. There is a lot happening all at once in a kitchen. Each task must be prioritized, addressed quickly and requires teamwork. I really think the environment of 'move with purpose' and 'keep a clean work station' and 'open communication' helped me get through some complicated lab procedures. Especially for those *in vitro* microtubule dynamics assays that need tubulin on ice and the buffers that have 20 reagents that need to be made fresh every time. Not to mention, everything in the lab has a timer and I am certainly conditioned to manage multiple timers at once.

**What motivated you to pursue a career in science, and what have been the most interesting moments on the path that led you to where you are now?**

My original plan was to get an education that would help with our small family farm and also to give back to my community. I started in general biology and planned to get a 4-year degree with an emphasis in horticulture. The more I learned about subcellular life, the more I wanted to continue my career in molecular plant science. I enjoy bench work, but I also enjoy sharing my knowledge and love for science with others. Somewhere along the way, I realized that my real passion is to 'demystify' science to make it all-inclusive. It wasn't a particular moment; I started realizing that many people from my community, which is heavily based on agriculture, had great misconceptions about science. I feel some mistrust of the scientific community right now among the general public and I think that re-establishing the trust is vital.

## "If the equipment is working, you ought to stay until the experiment is done. Don't come back and try tomorrow."

**Who are your role models in science? Why?**

My first chemistry professor in undergrad really got me into science. Paul Buckley introduced me to my first long-term experiments, which took up more than one or two lab classes. He also let us work with the analytical equipment and spend time getting to know the software. He taught us how to repair the instruments and standardize them too. He was an incredible teacher that had enthusiasm for his job and he made science fun. Typing lab reports never felt like work, rather a piece of art we should be proud of. He also gave me the best advice I have ever had in science, "If the equipment is working, you ought to stay until the experiment is done. Don't come back and try tomorrow."

**What's next for you?**

I would also like to use my knowledge and experience to encourage continuing education in STEM subjects among the members of my community, get engaged into youth development programs as well as provide public education about plant science in general and its role in agriculture.

**Tell us something interesting about yourself that wouldn't be on your CV**

I am obsessed with landscaping and re-landscaping my backyard garden. When I am not studying plants in the lab, I am at home playing with my hobby plants. People always come to me with their gardening questions and I love being the go-to friend with plant knowledge and hands-on experience. I intend for my garden to be a haven for birds and bees. It is incredible to watch a pair of wrens build a nest in a gourd that I grew, hanging from a tree that I started from seed.

**Reference**

**Schmidt, S. and Smertenko, A.** (2019). Identification and characterization of the land-plant-specific microtubule nucleation factor MACET4. *J. Cell Sci.* **132**, jcs232819. doi:10.1242/jcs.232819