

PROFILE

Cytoskeleton Spotlight: Michaela Horger

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1 | 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?

For as long as I can remember, I have been a deeply curious and strong-willed individual with an affinity for intellectual play. In my education, I explored many paths that let me engage with problem-solving and creative thinking, including contemporary dance, but science resonated with me most strongly and offered the rich intellectual playground that I was seeking in a career path. I am currently pursuing a PhD in the laboratory of Dr. Danielle Grotjahn at Scripps Research, where I investigate an

intersection of cytoskeletal and mitochondrial biology with no shortage of exciting questions to explore.

For me, the most interesting moments along my research path have been those in which the data completely turns my understanding of a system on its head. I study an elusive family of cytoskeletal proteins called septins which exhibit incredibly complex behavior. Septins have the ability to humble researchers with even the most elegant hypotheses, and I have been humbled by them many times. The moment when the fog clears and a new understanding emerges after spending long hours with unexpected data is unforgettable. It's moments like these that drive my passion for science and keep me coming back to the bench.

2 | Is There Any Misconception or Common Misunderstanding About Cytoskeleton Biology That You Would Like to Clarify?

When those outside of the field are asked to think about the cytoskeleton, I think it's common for the cytoskeleton to be reduced to a rigid body passively supporting cell shape or serving as the cellular highway for transport around the cell. Although this understanding can be useful on first introduction to cell biology, it ignores my favorite parts about the cytoskeleton, like how it senses and responds to cell states. The cytoskeleton is a highly dynamic and interconnected network of polymers that responds to both chemical cues, such as ion concentrations and nucleotide availability, as well as geometric cues, like spatial confinement and membrane curvature. This responsiveness allows the cytoskeleton to sense and adapt to the cell's state in real time, while simultaneously integrating these cues into the cellular architecture. It is this dual function as both a sensor and a generator of cell state that I personally find most intriguing about the cytoskeleton and that I think tends to be forgotten by a wider audience.

3 | How Do You Think Advancements in Technology Have Influenced the Progress of Cytoskeletal Research in Recent Years?

In my (somewhat biased) view, the increased commercial accessibility of powerful microscopes and high-performance dyes has really reshaped how we investigate the cytoskeleton. Structures and dynamics that were once too small and too fast to reliably image can now be studied more widely thanks to the increased prevalence of microscopes with high spatial and temporal resolution in microscopy cores. In my own research, I rely heavily on super-resolution microscopes in our microscopy core, which allow me to connect my lab's broader research focus on mitochondrial ultrastructure with my specific questions on interactions between mitochondria and the septin cytoskeleton.

4 | Tell Us Something Interesting About Yourself That Wouldn't Be in Your CV

Before fully dedicating myself to my scientific career, I spent many hours a day into my early twenties training as a dancer. Many of my scientific philosophies and strategies were born in the studio, on Marley floors, working through similarly complex problems. Dance, like science, is an iterative process requiring dedication, attention to detail, and creative thinking. During this time, I had the privilege of working with Royal Flux Dance Company under the artistic direction of Jaci Royal. Jaci and I shared an appetite for experimentation and risk taking: she had ambitious artistic visions and I was a determined problem solver willing to try almost anything to bring her visions to life. The incredible output of this creative dynamic instilled in me a confidence in measured risk taking that has carried over into my approach in the lab, helping me tackle challenging experiments and explore unconventional hypotheses.

5 | It's 5:01 p.m. on a Friday. What Are You Doing?

If it's 5:01 p.m., you'd likely find me on a microscope. I save the evening hours, when microscope booking is half-priced, for experimentation that is not strictly project-related: How far can I push this dye? Are these imaging probes compatible? Do we have any use for this cool new acquisition setting? If you're my PI and you're reading this, it's all essential, very important work!