

CELL SCIENTISTS TO WATCH

Cell scientist to watch – Celeste Nelson

Celeste earned her first degrees in Biology and Chemical Engineering in 1998 at MIT. From there she moved to the Johns Hopkins University School of Medicine to pursue her PhD in Biomedical Engineering in Christopher Chen's laboratory. Before starting her own group at Princeton University in 2007, Celeste worked as a postdoctoral fellow in Mina Bissell's group in the Life Sciences Division at Lawrence Berkeley National Laboratory. Celeste's work has been recognised with multiple awards, including a Burroughs Wellcome Fund Career Award at the Scientific Interface, a Packard Foundation Fellowship, a Sloan Fellowship, the MIT Technology Review TR35 (Young Innovators under 35), the Allan P. Colburn Award from the American Institute of Chemical Engineers (AIChE) and the Dreyfus Teacher-Scholar Award. Working at the interface of cell biology, developmental biology and engineering, her laboratory investigates how biochemical and mechanical cues affect individual cells during organ morphogenesis and what happens when organs are destroyed in diseases such as cancer and fibrosis.

What inspired you to become a scientist?

I loved biology, it was an interesting topic, but until I got into the lab, science, molecular biology and cell biology were things that you learned, not things that you did. I hadn't really thought about what people did to uncover the findings that are described in textbooks. It wasn't until my second year of college that someone asked me to help them with an experiment, and from that moment on I was hooked. It was just a matter of convincing myself that I had it in me to help to contribute to the field of cell biology.

What drives you now?

I like solving puzzles and science is all about puzzles. There's so much that we still don't know about how cells work and how they come together in a tissue. It's a giant mystery, and it's a lot of fun to design experiments to try to figure out how all the pieces come together to make life.

What is the research focus of your group?

Broadly speaking, we're interested in trying to understand the physical complexity of life. We're focused on studying how groups of cells physically position or turn themselves into tissues. We have two separate areas that are like two sides of a coin. On one side, we try to understand the cell biological mechanisms that lead to the formation of the beautiful architectures that are present within the tissues in your body, such as the airways of the lungs or the ducts of the mammary glands. How do those form, how are they maintained and how is it that, within these populations, where there are millions of individual cells, they learn what to do to build this structure? On the flipside, we look at what physically takes place when these tissues are destroyed during disease processes, such as fibrosis, tumour formation and cancer progression. While we do dive into



molecular mechanisms, we're agnostic on the specific molecular signalling pathways that might be involved, and more focused on the diversity of events that could transpire to generate these kinds of structures and, in turn, destroy them as we age.

What elements, inside or outside the lab, have been key to your success so far?

I have really amazing students and postdocs. They work incredibly hard, they're creative, excited about what they do and open to new things. We would not be successful without everyone working together. I also think strong mentors, people who encourage you and cheer you on through difficult times, are key for anyone. Then I would say communication is a big thing in science, and being able to communicate with other people is absolutely critical. It doesn't matter if we make the biggest discovery of the century if we can't explain to others why it's important. We put a lot of emphasis on communication in my group, and that has been a big factor in the success of the lab. And perhaps most importantly, I have a generous and understanding husband who has been supportive at every stage.

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What characteristics do you look for when recruiting new group members?

I look for people who are just very excited and passionate about what they do. I think so long as someone is passionate and excited

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Celeste having fun with her husband Joe and son Terry.

they're usually able to overcome technical challenges. Being able to convince yourself to get out of bed the next morning after a day full of failed experiments is sometimes the difference between a successful project and a project that goes nowhere.

What challenges did you face when starting your lab that you didn't expect?

One day I was still a postdoctoral fellow, but when I started here the next day, as soon as somebody introduced me as 'Professor Nelson' I was perceived differently, even though I didn't feel any different. I knew I wasn't any smarter that day than I was the previous one. Speaking with students becomes a very different kind of activity once you're the person in charge. Your words carry more weight, so how you communicate has to change. Before, I could criticise work and people didn't really care much about what I said [laughs]. But once you're a professor, it actually matters! It really shouldn't matter so much, but it does. It was a big challenge, learning how to take all of the extra weight that comes with being in charge and re-think how I communicate with people so that they wouldn't be completely destroyed when I told them that they could be doing something differently.

How are the challenges different now that you are transitioning to becoming established?

There's not enough time for us to tackle all the questions that we find exciting. I really have to pay attention to triaging what we work on, simply because there are several dozen things that I would like to accomplish in my career, and I now realise that it's going to be

impossible to do all those things. Time is really the most important commodity that we have.

How do you achieve work-life balance, especially in the early stages of your career as an independent investigator?

One strategy is to choose your priorities. Mine are to make sure that our projects move forward in a compelling, useful and impactful way, and that they're presented carefully to the community. My family and teaching are also things that I don't let slip through the cracks, but other things do, so my house isn't as clean as it could be. The other strategy is not to worry so much about the dichotomy between work and life. My son frequently comes to the lab; he knows the passwords to get inside and all of the postdocs and students in the group. Sometimes school schedules don't match with work schedules and it's important for my students to see how it's possible to do this job while having a family, and it's important for my son to see that what I do is important.

What is the best piece of science-related advice that you ever received?

The best advice I was ever given was from my postdoc advisor Mina Bissell, who frequently tells people 'don't be arrogant'. When starting on a project, whether as a PhD student, postdoc, head of a lab or transitioning between career stages, the key is that science, especially cell biology, is so much richer than any of our preconceived notions about it, and so if you approach a problem with the solution already in your mind you might miss the real answer. Be open-minded and realise that you know far less about a problem than you might want to. That also allows you to take advantage of serendipity, which is how some of the best scientific findings and advances have come along.

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What is the most important advice you would give to someone about to start their own lab?

The advice I've been giving people these days is to be kind. Be kind to yourself, because this is a very difficult and often unforgiving vocation. It's important to realise that we're not going to do things perfectly the first time, so we need to forgive ourselves for being human. Also, be kind to other people. We're all highly critical of ourselves, and our jobs require us to criticise other people's work, but that doesn't mean we shouldn't do it without some constructive and compassionate approaches.

Could you share with us an interesting fact about yourself that wouldn't make it onto your CV?

I started in science by washing dishes in the lab. It was a graduate student in that lab who pulled me aside one day and asked me if I wanted to do an experiment with him and that was the event that started me thinking about not just learning science, but about doing science and being a scientist. I also like to crochet little animals. For me, it's something creative that I can do without thinking too much about what I'm doing.

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