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

M.A. and L.H.: Centrioles are among the tiniest organelles in the cell. During our PhDs, we both focused on how these organelles initiate their formation and grow to the right size. Centrioles are composed of two main structures: a central nine-fold structure that forms a ‘barrel’ (called the cartwheel), and microtubule bundles that symmetrically decorate it. When we were embarking on our work, it was already known that the cartwheel and centriolar microtubules grow from opposite ends of the centrioles (proximal and distal ends, respectively). Despite their spatially segregated growth, they can grow in unison and rough synchrony. How this coordination is achieved has remained unclear. In our work, we attempted to address this question by examining how proteins involved in regulating either process might crosstalk, or influence one another, biochemically through the cytoplasm or physically through the growth of these structures. In a nutshell, we revealed that CP110 and Cep97, proteins that normally cap microtubule growth at the distal-end of centrioles, can influence the growth of cartwheel at the proximal end. Our findings suggest that such crosstalk is unlikely to happen through the cytoplasm, and highlight the very beginning of centriole formation (when the two ends of the centriole are close to each other) as an ideal spatiotemporal context to explore in the future.

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

M.A. and L.H.: As with any project, there were indeed several challenges! Though many may not appreciate it while reading the paper, one of the centriolar proteins we worked with, CP110, is located on the X-chromosome. So, generating flies with triple balancers and recombinations that involved the CP110 deletion mutations took many months! We think these flies will be a tremendous source to the fly community, as CP110 emerges as a protein involved not only in centriole formation, but also in centrosome maturation and the maintenance of cilia. From a technical standpoint, another challenge we faced was trying to develop a super-resolution coupled machine learning algorithm to...
Confocal image of an early *Drosophila* embryo expressing Ubq-GFP-Cep97, which localises at the centrosomes.

measure microtubule growth on centrioles in real-time. Along with our co-author Felix Zhou, this took us nearly 1.5–2 years to fine-tune (experimentally and computationally). Although the trends we observed were in line with previous reports and with our own work, the data were unfortunately noisy and had large spreads. We decided that a further refinement to this technique is necessary before we can confidently use it for measuring fine differences between wild-type and mutant embryos.

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

**M.A. and L.H.:** The main ‘eureka’ moments made it to the abstract, but there were two very surprising moments that have indeed stuck with us. One was observing that oscillatory recruitment of CP110 and Cep97 happens largely on the growing daughter centriole but not the mothers. Unlike Plk4 oscillations, which initiate and time daughter cartwheel growth, we found that CP110 and Cep97 oscillations do not necessarily play an equivalent role for regulating centriolar microtubule growth on the daughters. So, the role of CP110 and Cep97 oscillations on daughter centrioles, if any, remains an open question (we have ideas, though none are intuitively obvious!). The other shocking finding we had was the persistent growth of the cartwheel structure at the proximal-end even when we removed the CP110 and Cep97 cap from the distal-end of centrioles. This result could be interpreted in two ways: (1) given that Plk4 is located at the proximal end and catalyses this process, the cartwheel will naturally continue growing from this end (and outweigh any cartwheel growth that might happen stochastically at the distal end), or (2) the proximal end is structurally primed for further addition of the cartwheel building blocks, hence preventing any growth at the distal end. These possibilities remain as future questions to be explored.

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

**M.A. and L.H.:** We initially submitted our paper through the Review Commons (RC) platform. JCS was one of the journals participating in the RC system, and historically the Raff lab has had pleasant editorial experiences in publishing with JCS. Since our study is relevant to the community of centrioles, centrosomes and the cell cycle, we agreed that its scope will be in line with JCS’s vision. JCS was therefore our first choice!

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

**M.A.:** While this manuscript was in submission, I started my own group at UCSF in the middle of the pandemic. During this time, three very special people – Pat O’Farrell, Sophie Dumont and Mohammad Mofatteh – helped me foster a new focus for my laboratory, which eased guiding my time between my group’s work and the work that we wanted to complete in Oxford. Through the paper revision process, we had to even ship flies to do some of the experiments in San Francisco, as laboratories were shut down in England! This shows, yet again, that science is simply without boundaries!

**L.H.:** I’ve been fortunate to have had many excellent mentors at different points in my life, ranging from schoolteachers who believed in my academic abilities to undergraduate tutors who nurtured my intellectual independence and offered advice during my transition to postgraduate studies. Most recently, the lab colleagues that I worked with during my PhD have been fantastic. The collaborative and friendly nature of Jordan’s lab meant that it was always easy to ask for advice. The final stages of my doctoral studies were also completed during the pandemic, and the guidance of my lab mates was incredibly important during this difficult time. I am therefore truly grateful for the time that so many people have taken to offer support over the years, and I would particularly like to highlight the constant encouragement I have received from my parents.

**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?**

**M.A.:** I cannot refer to any glorious ‘biologist’s story’ from my childhood that motivated me to pursue sciences. I didn’t collect dead beetles, nor was I fascinated by looking at the pond scum from a nearby lake with the scope my parents gifted. This isn’t because I didn’t enjoy them, it is because they never happened! I grew up in one of the most ancient cities in the world, Istanbul, where one has sincere luck finding a shred of green! One of my favourite pastime activities in high school was watching a Turkish TV program called ‘Teke Tek’ (literally meaning one-to-one), where the moderator invited a different scientist, historian or scholar on various topics every week, which revealed novel depths of knowledge for me periodically. One that stuck with me was an episode with the late Halil İnalçık, a world-renowned doyen of Ottoman history, whose respect and scholarly attitude for fundamental scientific research affected me on the spot! Why I chose biology specifically is a topic for another day, though I still try visiting İnalçık’s eternal spot in Fatih Mosque every time I am in Istanbul, precisely to refresh memories of the reason that motivated me to pursue knowledge!

**L.H.:** I was interested in the natural world from a young age, and was lucky that my parents are scientists and so were keen to encourage this interest (and were also ok with me traipsing mud through the house!). I remember sitting down to watch ‘Walking with Dinosaurs’ together, and running around the Natural History Museum in London with my brothers on the hunt for the coolest
skeletons! This led me to study Biological Sciences at the University of Oxford, which I thoroughly enjoyed due to the broad nature of the course. During my degree, I was able to complete some short lab projects, including summer work at Aix Marseille University, and these experiences gave me the sense that I would enjoy life in the lab. However, I wasn’t sure exactly what I wanted to focus on, as my interests were still very broad. I decided to stay on at Oxford when I was offered a place on the Wellcome Trust’s four-year PhD in Chromosome and Developmental Biology. This proved to be a great programme for me, since it allowed me to spend my first year rotating between different labs. This experience was invaluable and gave me a clearer sense of the sort of research I wanted to pursue. I eventually settled in Jordan’s lab, which was a wonderful environment. With Jordan’s support, I was able to enrol in the famous Physiology Course at Woods Hole, which perhaps unsurprisingly was where I experienced some of the most interesting moments of my scientific journey!

Who are your role models in science? Why?

M.A.: My role models in science evolve almost constantly, so I cannot cite the entire history of that evolution! I always had, though, a few people from whom I drew inspiration on different aspects of knowledge. In a sentimental vein, I am currently inspired by Eric Kandel. It is rather rare to see how someone can beautifully merge their intellectual interests with scientific work at the bench (I highly recommend his recent book There is Life After the Nobel Prize). In a more practical vein, I have been examining the career of Marc Kirschner, whose attitude for training the next generation of scientists (or helping them grow in their own way) seems to have flourished a tremendous palette of researchers, most of whom are well-known today (if you don’t believe, I dare you to visit his lab website’s alumni tab!). Finally, for improving my skills in communicating knowledge, I have been following the late Wendy Beckett, a British religious sister who did art critiques for BBC television for many years. Type her name on YouTube; I assure you how amazing it is to hear her describe even the subtlest artistic details with great panache and clarity!

L.H.: My role models in science are those who persevere and try to stay true to themselves in the face of the pressures associated with a career in research. I’ve met so many researchers carrying out wonderful work in diverse sectors, and I’m constantly awed by the brave decisions they have made to get there.

What’s next for you?

M.A.: After my PhD in the Raff lab, I took on a group leader position as a Sandler Fellow at UCSF. I am truly enjoying the friendly and scientific atmosphere we cultivated in the lab, and the ‘immediate next’ for us is to disseminate some of the early fruits of our group – including a discovery we made on cytoplasmic divisions, which is quite orthogonal to the conventional wisdom and shall appear online very soon!

L.H.: During my PhD, I realised that I really enjoyed communicating research. This ranged from presenting posters at meetings to writing research highlights and news stories for my department’s website. I also won the 2019 BSCB Science Writing Prize, which increased my confidence. I therefore decided to explore science communication as a career. Jordan was very supportive of my decision, and I was able to apply for jobs while working as a postdoc in the lab. Since 2021, I have been the Science Communications Officer at The Company of Biologists, where my role involves promoting the Company’s journal content and charitable activities.

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

M.A.: That I collect fountain pens is something I take pride in and will never be on my CV sadly!

L.H.: I enjoy creative writing in my spare time, and have been trying to teach myself guitar for several years with limited success.

Reference