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# First person – Mirren Charnley

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. Mirren Charnley is first author on 'A new role for Notch in the control of polarity and asymmetric cell division of developing T cells', published in JCS. Mirren is a postdoc in the lab of Prof. Sarah Russell at Swinburne University of Technology, Melbourne, Australia, investigating the use of microfabricated cell culture platforms to determine how cell fate is regulated during T cell development.

Mirren Charnley

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

All multicellular organisms start life as a single cell. A critical question in cell biology is how you go from that single cell to a fully developed organism with multiple different cell types. We used developing T cells as a model system to explore how cells diversify and acquire different cell fates. We were particularly interested in a protein called Notch. In dividing cells the regulators of Notch are differentially inherited in a process called asymmetric cell division (ACD). This results in different levels of Notch signaling in the daughter cells and a diversification in cell fate. Notch itself is typically viewed as a passive participant as it is the regulators of Notch that control this process. In this work, we show that Notch drives the asymmetric distribution of proteins within the developing T cell. It also controls the asymmetric inheritance of itself and other cell fate proteins in the daughter cells. Thus, Notch actively controls cell fate in developing T cells.

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

To contain the cells within the field of view during live cell imaging, we seed them into cell paddocks. These paddocks are made from a hydrophobic polymer and we were having issues with air bubbles becoming trapped in the paddocks or the paddocks lifting off from the surface of the imaging chamber. From my previous position I have experience in microfabrication so I used a technique that is frequently used in microfabrication called air plasma treatment. This treatment made the grids hydrophilic so they were easier to hydrate and stuck firmly to the sample chamber, which made the live cell imaging much easier and more consistent.

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

Traditionally, developing T cells are cultured *in vitro* on a stromal cell line called OP9-DL1. However, OP9-DL1 stromal cells provide a range of cues and I wanted to use surfaces functionalised with the Notch ligand DL1 to separate out the role of these cues. We, and others, have shown that T cell development is slightly slower on DL1 functionalised surfaces and I therefore assumed that I would need to incorporate other cues to trigger polarised divisions in the developing T cells. I was therefore very pleasantly surprised when the level of polarised divisions on the DL1 surfaces so closely mirrored the level in developing T cells cultured on the OP9-DL1 stromal cells. For me, this also really underscored the importance of Notch in driving this process.

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

We selected Journal of Cell Science as it is a highly respected multi-disciplinary journal that publishes cutting-edge research. It also has a strong commitment to ethical publishing, as highlighted by the transparent peer-review process and requirement for rigorous and open scientific practice, which we feel should be the way forward in manuscript publishing. We are very happy to have the opportunity to publish in Journal of Cell Science, especially as part of the Special Issue 'Cell Biology of the Immune System'.

**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?**

I have always enjoyed science, even from a young age. I enjoy both the stories and patterns that science contains and the principles that underpin it and give us insights into how the world works.

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

I have been fortunate to have had excellent PIs during my career, from my PhD with Prof. John Haycock and postdocs with Prof. Marcus Textor and currently with Prof. Sarah Russell. They all have a passion for their scientific fields that has really inspired me. They are also all committed to the promotion and support of younger researchers, which I have found invaluable, and which I will endeavor to emulate in my career.

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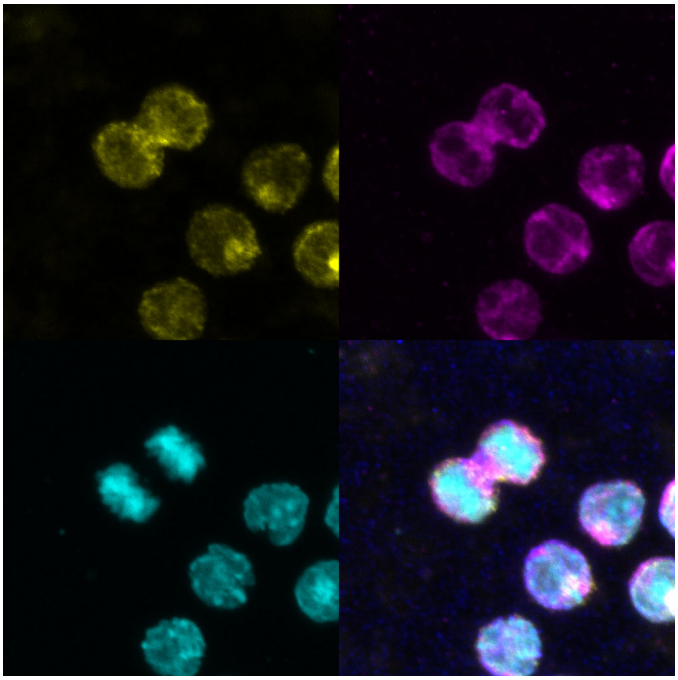

**Confocal image of a dividing developing T cell stained for the nucleus (DAPI, cyan), Notch1 (yellow) and α-adaptin (magenta).**

## What's next for you?

I am currently working on a complementary project where I am trying to push live cell imaging to its limits and see if we can watch changes in the balance of cell fate in real time.

### Reference

**Charnley, M., Ludford-Menting, M., Pham, K. and Russell, S. M.** (2020). A new role for Notch in the control of polarity and asymmetric cell division of developing T cells. *J. Cell Sci.* **133**, jcs235358. doi:10.1242/jcs.235358