

**Please provide all the information requested below, and your responses to our first-author questions.**

Once you have filled in your responses, please email this form back to us within one week to [jcs@biologists.com](mailto:jcs@biologists.com). Please also send us a picture of yourself and a picture of a particularly striking, interesting or unusual image from your research (at least 9 cm wide at 300 dpi), and include a short caption below.

Note that we will publish 'First Person' submissions depending on space in the journal; we will only contact you if your submission is selected.

Article title: Three-dimensional geometry controls division symmetry in stem cell colonies

Manuscript number: JCS/2021/255018

First name: Agathe

Last name: Chaigne

Preferred pronouns: She/her

Your **current\*** job title: postdoc

Your **current\*** PI's name: Ewa Paluch

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A one-line synopsis of your research interests: I investigate the cross-talk between cell division and cell fate transitions during development.

A short caption for your research photo: Mouse Embryonic Stem cell dividing in a colony. Magenta: Actin (phalloidin); Green: Tubulin; Blue: DNA (Hoechst).

**\*If you have moved to a different lab**, please also provide the following details from the lab where the research in your article was carried out:

Your **previous** job title: Your job title when you carried out the research.

Your **previous** PI's name: The name of your PI when you carried out the research.

Your **previous** institute contact address: Your institute contact address when you carried out the research.

**PLEASE NOTE:**

If you are a co-first author, please check if your co-author would also like to submit answers, then work together and send in one set of responses. Please click on the '+' icons in the right-hand margin above to reveal spaces for entering details of a second author.

[See an example of a co-first author interview here.](#)

Please tell us more about yourself by answering the questions below. You can answer all or just some of the questions, and you may also suggest additional questions and provide your answers to them if you wish.

We would ask that you keep your answers relatively brief; a maximum of 10 sentences. We may edit your answers for conciseness and adherence to our house style. For examples of the appropriate style and length of answers, [see previous First Person interviews here.](#)

1. How would you explain the main findings of your paper in lay terms? Please do not re-write your abstract - think about how you might explain your findings to non-scientific family and friends.

When an embryo develops, the cells grow then divide to increase the size of the organism. How these cells divide, and in particular how they make sure that the 2 daughter cells are the same size, is important to control that the embryo develop properly. We know many things about how cells control the orientation and the control of daughter cell size in cells that grow in 2D, for example epithelia on a flat surface, but much less about balls of cells like the ones in the mouse embryo. Using mouse embryonic stem cells as a model system, I showed that pluripotent cells in 3D colonies divide asymmetrically in size, especially if they are situated at the periphery of the colony. I found that the connections between cells acts as a stabilizer of the cell division machinery and thus having a lot of connections (and being in the center of the colony) pushes the cell to divide symmetrically. When cells evolve towards differentiation, they change their organization from a 3D ball to a 2D sheet and this is accompanied by a switch to more symmetric divisions.

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

The most significant challenge- but also one of the most exciting aspect- associated with the project was the fact that these cells live in 3D colonies. As such, I needed to perform fast 3D live imaging, which is always challenging in terms of phototoxicity. Fortunately, the LMCB has an amazing imaging facility with incredible core staff, in particular Andrew Vaughan, who helped me tremendously set up my spinning disk imaging. A second part of the challenge was the analysis of 3D volumes, and this was performed using a brilliant plugin (Deforming Mesh 3D) from my co-author Matthew Smith- it is amazing to extract all sorts of features from 3D round cells (stem cells, organoids...), and it is free for all to use.

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

Yes! I had two. The first was when I realized that growing the cells on an E-Cadherin coated substrate, which I took as an approach to mimic a cell growing inside a colony, made the division more symmetrical in size! The second was when after months of trying on and off to do an immunofluorescence on the protein NuMA I managed to find a protocol that worked great and Rocio, an amazing Spanish undergrad student from UCL, did a series of amazing experiments showing that pluripotent stem cells do not recruit it at the cortex thus explaining the lack of control in spindle position, while cells differentiating did.

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

I like papers from the Journal of Cell Science- they are usually clear papers moving the field forward. I think the journal also has a strong interest in the fundamental mechanisms of cell division. I felt this was a good home for this paper and I have been extremely satisfied with the peer review process: it was transparent, everyone was fair and courteous, the editor was available and really understanding of work and personal circumstances such as COVID related lab shutdowns and maternity leave.

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

I am lucky to be surrounded by amazing mentors! I get different things from each of my mentors: from Ewa Paluch, my PI, I get the expertise for all things biophysics. From Kevin Chalut, my secondary PI, I get the stem cell expertise. From Buzz Baum, whose

lab I regularly invade, I get the cell division expertise. And all the discussions with my peers, the PhD students and postdocs from the LMCB in general and these 3 labs in particular have also made my research stronger and better.

6. 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 wanted to be a medical doctor when I was a kid- but then I decided that this was not for me. I was in a privileged enough background that I knew about research, and the possibility of having a career in science, which was the closest thing. I tried it, I loved it, I stuck around. I am interested in many aspects of science, which is why I have a journalism degree, and a teaching degree. I also have a degree in Chinese language and literature but that is just because I like it!

7. Who are your role models in science? Why?

I am not very much into the idea of role models in science. I suppose I prefer the idea that science is made by normal people, that may be passionate about their jobs but do not need to become a role model by, for example, sacrificing their personal life or poisoning themselves with polonium. My role models are my fellow colleagues that are excited about their research, day to day, sometimes despite disappointing results, grant and paper rejections.

8. What's next for you? (If you are planning on leaving academia, please tell us why!)

I will be starting my own lab sometime in the next few months and I could not be more excited!

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

I play ice hockey (usually left forward, but sometimes left defender)!

10. If you would like to add a question of your own, enter it here.

Enter your response.