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FIRST PERSON

First person – Fabrice Senger

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. Fabrice Senger is first author on 'Spatial integration of mechanical forces by α-actinin establishes actin network symmetry', published in JCS. Fabrice is an engineer in the lab of Laurent Blanchoin and Manuel Théry at the Cytomorpholab, Université Grenoble-Alpes, Grenoble, France, where he is mainly focused on cytoskeletal dynamics and more particularly on actin and microtubules, aiming to address how each of these structures, or their interaction, allow the maintenance of cellular homeostasis with respect to size, mechanical status and intracellular organization.

Fabrice Senger

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

Cells possess a skeleton, called the cytoskeleton. One part of this skeleton is made of actin molecules. In contrast to the body skeleton, which comprises bones and joints, actin assembles into filaments and meshworks, which are connected by specialized molecules called cross-linkers. Furthermore, when the cell is moving, the whole cytoskeleton has to re-organize – constantly breaking apart and re-assembling. This entire process allows the cell to precisely adapt its shape, or to move, in response to stimulations present in its environment.

We have shown that α-actinin, an actin cross-linker, is essential for that process and more particularly, for the establishment of actin network symmetry. Symmetry and asymmetry of the network are determinants for cell fate, and, at a larger scale, for the establishment of the entire body plan.

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

Most of the life-cell experiments were challenging; thus, each step had to be optimized before performing the full experiment. A rigorous time schedule and intermediate controls were essential. For traction force microscopy (TFM) using patterned gels, it is most important to check the quality of the bead suspension and the pattern transfer to the gel, just to give an example. This is even more critical if you combine TFM with patterning and laser ablation.

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

In traditional TFM, cells are allowed to attach to a gel in which beads are embedded. Thus, the cells exert traction on the gel and consequently induce a bead movement. Next, when you detach the cells from the gel, the gel relaxes and the beads will move accordingly. The force calculation relies on the observed bead displacement. While performing the experiment you cannot directly visualize the result on the microscope. So, when we decided to combine TFM with laser ablation to infer the mechanical stress distribution within the cells, I didn't expect to see any particular phenotype at the microscope. To my great surprise when I cut the first cell, a control cell, I could directly see the relaxation of the whole cell. What was even more exciting was the fact that all the control cells relaxed in the same way, along the same direction. Next, I went to the α-actinin-depleted cells and I have to say that I was super excited to see how these cells behaved and whether I could again observe the relaxation of the cells upon laser-ablation. All the cells did indeed relax, following the same direction, but this direction was clearly orthogonal to the relaxation observed for control cells. At that moment, I knew already, without performing any quantification, that our hypothesis was true: α-actinin is essential for the proper mechanical stress distribution within cells.

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

I read a lot of JCS papers and my colleagues do as well. I think JCS is a well-recognized journal with a broad audience within the cell biologist community. Last, but not least, JCS is a not-for-profit organization.

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?

Actually I didn't think about a career until I became a dad. I thought about becoming a teacher in my early years, but realized that it was performing experiments that I found really thrilling. I was lucky to get my first position at EMBL in Heidelberg in Eric Karsenti's lab. There, I did not only perform experiments but was associated with the projects and their evolution. The whole atmosphere was highly interdisciplinary and emulating. Most of the people I met there could balance science with a fulfilling private life. It is the kind of

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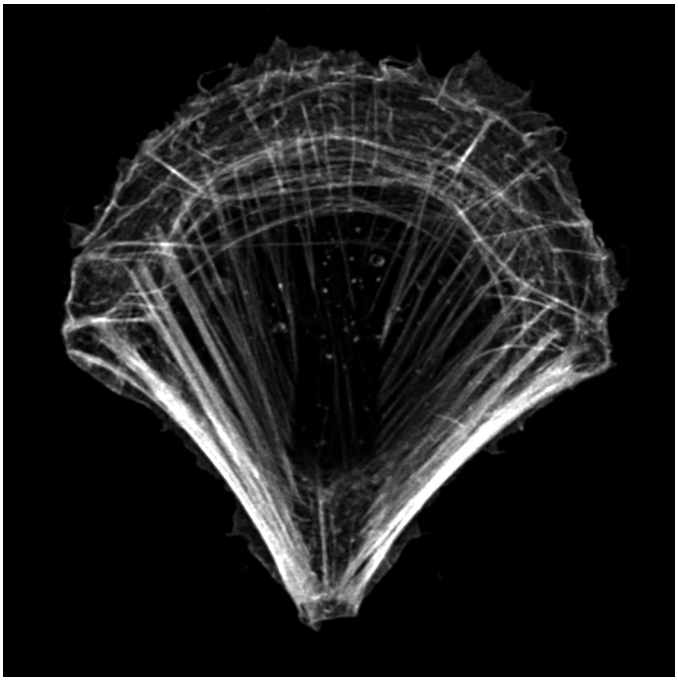

An RPE1 cell on a crossbow pattern. Actin is stained with phalloidin. Image taken with Airyscan. Note the actin organization at the top of the cell. Radial fibres are perpendicular to the edge of the cell and contact transverse arcs (running parallel to the cell edge). Of particular interest, some transverse arcs appear really straight and are connected at both sides with radial fibres, suggesting a connected system that is under tension.

atmosphere I also found in the Cytomorpholab. Here, motivated by Laurent and Manuel, I completed my PhD. Among the many crazy things we do, I remember our stay at Woodshole at the Physiology course in 2016, a total immersion into science for two weeks.

Who are your role models in science? Why?

I'm still impressed by Eric Karsenti and his career. When I was working in his lab, it was about the cell cycle – using cells, egg extracts, microscopy, modeling. Now he is working on the Tara-Ocean project, so he found a way to accommodate two of his passions, biology and the sea.

What's next for you?

Actually, I got a permanent position at CNRS as an engineer in 2006, 10 years before I even defended my PhD, so I do not have to struggle with what comes next. I will continue to work with the Cytomorpholab, as we still have lots of crazy ideas to test.

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

I'm married to an electron microscopist.

Reference

Senger, F., Pitaval, A., Ennomani, H., Kurzawa, L., Blanchoin, L. and Théry, M. (2019). Spatial integration of mechanical forces by α-actinin establishes actin network symmetry. *J. Cell Sci.* **132**, jcs236604. doi:10.1242/jcs.236604