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First person – Klaus Herburger

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. Klaus Herburger is the first author on 'Localisation and substrate specificities of transglycanases in charophyte algae relate to development and morphology', published in Journal of Cell Science. Klaus has a position in the lab of Professor Stephen Fry at University of Edinburgh, UK, investigating enzymatic remodelling of polysaccharides in plant cell walls.

How would you explain the main findings of your paper to non-scientific family and friends?

Unlike in animals, cells of green plants are surrounded by a cell wall. In a way, this barrier outside of the living part of a cell resembles ferroconcrete, with some of the cell wall polymers providing a load-bearing scaffold (the 'steel' fraction) and others functioning as an embedding matrix (the 'concrete' fraction). Whenever plants change their appearance, for example during growth, they need to modify their cell walls. In the present study, we were particularly interested in the modifications of the steel fraction. Since plants are excellent engineers, they are equipped with a set of proteins (enzymes) that can act simultaneously as a bolt cutter and welder: they cut cell polymers and paste it onto others nearby. Focusing on a highly evolutionary significant group of algae, the ancestors of all land plants, allowed us to show that this type of cell wall modification reaches far back in evolution, when most of life was in the sea and bodies of small water. The spatial distribution of these cutting and pasting enzymes within the cell walls of 'young' and 'old' algae strongly suggest their involvement in cell growth. Thus, land plants might inherited this feature from their algal ancestors.

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

Autofluorescent photosynthetic pigments often cause problems when using microscopic techniques based on fluorescent dyes. In one algal group investigated (*Zygnema* spp.), chloroplast protrusions are located in close proximity to the cell wall, which makes it difficult to distinguish between wall-localised dye and autofluorescence. To get rid of the latter, we tested a number of organic solvents that allowed us to remove most of the pigments, yet did not interfere with the dye. Finally, we used short term incubations in dimethylformamide (DMF).

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

I remember a feeling of excitement after realising that the enzymes we investigated are active in specific areas of the cell wall and that this spatial pattern differs among different algal groups and developmental stages. This observation strongly suggested an involvement of the enzymes in cell growth and allowed us to test this hypothesis in more detail.

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Klaus Herburger

> **"…cells of green plants are surrounded by a cell wall.. [that] resembles ferroconcrete"**

Have you had any significant mentors, and how have they helped you?

Yes, and the research presented here wouldn't have been possible without them. In particular, I am thinking about my dear PhD supervisor, Andreas Holzinger, who set the foundation by allowing me to visit the laboratory of Zoë A. Popper at the University of Galway. From Zoë I learned a lot about cell walls and she taught me a set of techniques that were crucial for investigating enzymatic reaction in algal cell walls.

What's the most important piece of advice you would give first-year PhD students?

Try to combine the two virtues patience and willingness to work hard on your project. Yet allow yourself enough off-time to

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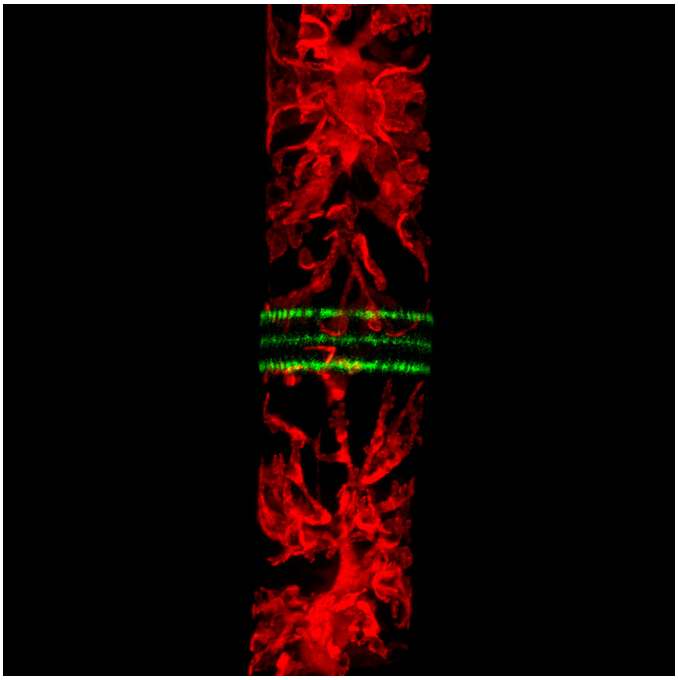

Chlorophyll autofluorescence (red) and immunolocalisation of the cell wall polysaccharide xylan (green) in the green algae *Zygnema* spp.

refocus. Never be afraid of asking experienced colleges in your field if you get stuck. It is my experience that in most cases they appreciate good questions and will be happy to give helpful advices.

"Try to combine the two virtues patience and willingness to work hard on your project"

What changes do you think could improve the professional lives of early-career scientists?

In almost all cases early-career scientists are asked this question, a common response is: the need for much more permanent positions at an early-career stage is high. I couldn't agree more with that position and it would allow such experimenters to focus on a project for more than 2–3 years. Furthermore, being unsure about a regular income and having to move away every 2–3 years is particularly difficult for young colleagues who already have children.

What's next for you?

The present study was part of my PhD thesis. After finishing my PhD at the end of 2016, I started working as a postdoctoral researcher at the University of Edinburgh, where I am currently investigating the enzymatic remodelling of ferns and genetically modified angiosperms.

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

I am passionate about German literature (in particular, I admire the Age of Enlightenment followed by the Romantic era). If time permits, I enjoy drawing comics.

Reference

Herburger, K., Ryan, L. M., Popper, Z. A. and Holzinger, A. (2017). Localisation and substrate specificities of transglycanases in charophyte algae relate to development and morphology. *J. Cell Sci.* **131**, jcs203208.