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First person – Angéline Geiser

First Person is a series of interviews with the first authors of a selection of papers published in Journal of Cell Science, helping researchers promote themselves alongside their papers. Angéline Geiser is first author on 'A novel 3D imaging approach for quantification of GLUT4 levels across the intact myocardium', published in JCS. Angéline is a PhD student in the lab of Prof. Gwyn W. Gould at Strathclyde Institute of Pharmacy and Biomedical Sciences, University of Strathclyde, Glasgow, UK, where her research focuses on the molecular study of metabolic disorders and cardiovascular diseases, with a newly spurred interest in super-resolution microscopy techniques.

Angéline Geiser

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

Let me tell you about the journey of sugar molecules across your body. When you eat, the sugar in your food is first digested in your stomach and then travels through your gut, where it is absorbed into your bloodstream. Once in your blood, these sugar molecules can be thought of as cargo loaded into a transportation truck travelling across your entire body. The end goal is to distribute these molecules to all of your organs where they can be used as a source of energy. Specifically, sugar plays an essential role in fuelling vital organs, such as the heart, allowing them to function properly at all times. When arriving at your heart, our 'sugar-truck' needs to enter the cells of the heart to deliver the sugar molecules. To do that, the truck enters the cells via a sugar-specific gate, which in the heart (as well as in muscles and adipose tissue) is a protein known as GLUT4. However, it has been suggested that in certain diseases, such as diabetes and obesity, these gates might not be present in as high quantities as they should be across the heart. In this paper, we therefore wondered how this problem could be investigated.

Unfortunately, the microscopes currently available for molecular-level visualisation can only focus on a small portion of the organ at a time, preventing us from getting a complete picture of GLUT4 distribution. To overcome this limitation and gain a more comprehensive understanding of the distribution of GLUT4 across the heart, we have developed a new imaging technique allowing the visualisation of GLUT4, or any other proteins or molecules of interest, in large tissue samples and in three dimensions all at once. Using mouse hearts to test our hypothesis, we discovered that GLUT4 is arranged in specific patterns across the heart and that these patterns change when mice are fed a high-fat diet. We also found that these patterns differ between male and female mice. Hopefully, this new imaging method will help researchers better understand how different parts of our organs are organised at a molecular level and how diseases might affect this organisation.

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

The inter-disciplinary nature of this project, requiring the combination of animal and cellular work, as well as the use of a novel microscopy approach, initially challenged my skills as a scientist trained in cellular and molecular biology. Simply put, the answer to this challenge was to ask questions and persevere in a field that was not originally mine. Fortunately, I was surrounded by numerous knowledgeable individuals, from biologists to physicists, and I was determined to use this to my advantage. While initially overwhelming, this project taught me the importance of inter-disciplinary research and the unlimited opportunities that collaboration with colleagues from different fields can offer. I would like to direct the reader to the essay by Martin Schwartz, titled 'The importance of stupidity in research', which reminds us that it is okay not to know the answer. That is why it is called 'research'!

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

During the initial optimisation phase, the moment when we obtained our first set of data, successfully cleared and imaged, stuck with me. I remember being fascinated by this 3D-rendered heart, thinking about the work achieved to obtain this result and the unlimited potential that this new imaging approach processed.

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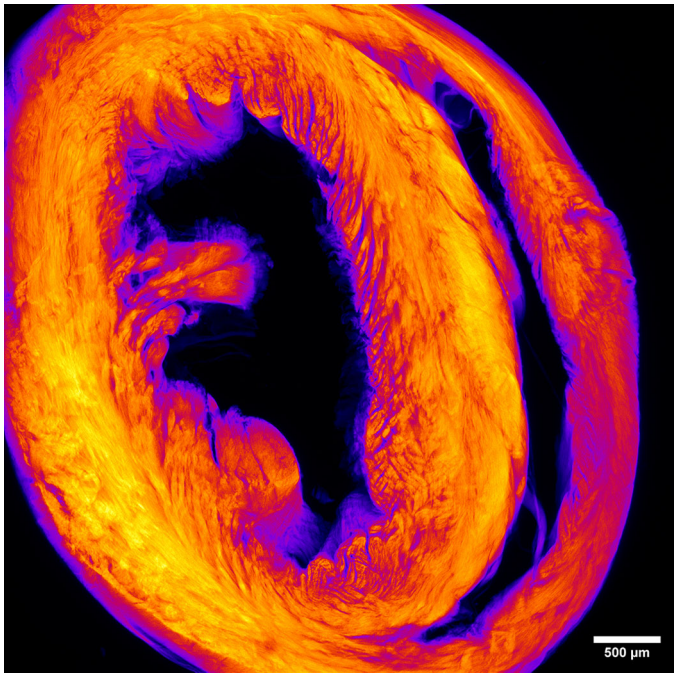

Representative average intensity axial-projections of GLUT4–GFP fluorescence within a control (healthy) murine heart. The specimen was imaged over a 5 mm×5 mm×3 mm volume using a z-step size of 5 µm, and a sampling rate of 1 pixel per µm. The image was colour-coded by fluorescent intensity using the "fire" lookup table.

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

Journal of Cell Science is a well-established, high-quality journal with which our group has had agreeable experiences when publishing previous articles. When we came across the upcoming publication of a Special Issue focusing on Imaging Cell Architecture and Dynamics, we believed that the scope of this issue would match the aims of our project. I express my sincere gratitude to JCS for considering and now publishing our work, which marks a significant achievement in my PhD journey.

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

As mentioned above, as a cell biologist by training, I have been fortunate during my PhD to have had such a helpful and multi-disciplinary supportive network of individuals. I am deeply grateful and privileged to have been able to work and collaborate with Dr Peter Tinning, Prof. Gail McConnell and her group. They taught me the basics of optical physics, introduced me to the world of super-resolution microscopy and allowed me to take advantage of the imaging capability of the Mesolens. I was, and still am, fascinated by the unlimited range of structures and biological processes that can be studied using such techniques. This showed me the importance of inter-disciplinary research, a lesson I will keep with me going forward throughout my career. I am also grateful to the staff of the biological procedure unit at the University of Strathclyde, who taught me about the seriousness that comes with animal research. Finally, I would like to thank my supervisor, Prof. Gwyn W. Gould, who wisely introduced me to these mentors and the ever-growing field of GLUT4 biology 8 years ago.

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?

Although I have been set on pursuing my study in the field of biology from a young age, I believe that my personal experience with type 1 diabetes further pushed me toward a career in research. When I was diagnosed, I remember my fears lifting as the doctor first explained to me, in simple teams, what was happening in my body. Over the years, as I started my bachelor's degree, my knowledge about the insulin pathway and the causes and consequences of diabetes increased. I became more and more confident about understanding what was happening in my body at the molecular level and was proud to be able to explain it to the people around me. Beyond being able to build up awareness, I believe that understanding the science behind a disease's mechanisms can help patients demystify and better accept their diagnoses. I am very grateful today to be able to pursue a career which allows me to discover new things and answer new questions every day.

What's next for you?

Next in my academic career is a postdoctoral position at the Institut de Recherche Expérimentale et Clinique of Université catholique de Louvain in Belgium, where I will further explore the impact of metabolic disorders, including diabetes, on the cardiovascular system at the clinical, cellular and molecular levels.

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

As a kid, I lived on a sailing boat for 5 years in the south of France. Additionally, after 8 years of living in Glasgow, I still remain deeply conflicted about how Scotland deep-fries their Mars bars and pizzas…

Reference

Geiser, A., Currie, S., Al-Hasani, H., Chadt, A., McConnell, G. and Gould, G. W. (2024). A novel 3D imaging approach for quantification of GLUT4 levels across the intact myocardium. *J. Cell Sci.* **137**, jcs262146. doi:10.1242/jcs.262146