

FIRST PERSON

First person – Justyna Meissner

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. Justyna Meissner is the first author on 'The ARF guanine nucleotide exchange factor GBF1 is targeted to Golgi membranes through a PIP-binding domain', published in Journal of Cell Science. Justyna is a postdoctoral fellow in the laboratory of Dr Elizabeth Sztul at University of Alabama at Birmingham, USA, investigating the structure and function of large GEFs.

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

When I used to teach cell biology, I always explained to my students that as many events happen in a single cell in the human body every single second as in the whole universe. Each of our cells is like a little 'microcosmos', and you can imagine the cell as an extremely well-organized little world. Science helps us to understand that organization. For example, police officers, security guards, inspectors and controllers in the cell are called enzymes, and they regulate all cellular events. My co-authors and I wanted to understand how one of the enzymes (called GBF1) knows where and when it needs to be to successfully perform its function. Our enzyme must localize to a part of the cell called the Golgi, where it initiates a chain of specific interactions that leads to the formation of transporters called 'vesicles'. Proper vesicle formation is necessary for the organization and working of a complex transport network called the secretory pathway. A functional secretory pathway is essential for the lives of cells and humans, and alterations in the secretory pathway are the hallmarks of many human diseases. Thus, discovering a new mechanism by which GBF1 regulates the secretory pathway may lead us to finding novel therapeutic strategies to modulate secretion in human diseases.

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

The biggest challenge for me during this project was to optimize the purification of GBF1 from human cells. We needed to have a homogenous preparation of GBF1 for my studies, and that proved to be more difficult than I anticipated. The purification of small proteins or protein fragments from bacteria is relatively easy (at least in my limited experience). However, it is difficult to make a 200–220kDa protein in bacteria, and we had to express and purify GBF1 from the more complex mammalian system. The expression levels are always lower in mammalian cells and I had to grow tens of plates of HEK cells to generate the material for lipid-strip binding and liposomal flotation assays. Thanks to my supportive lab, I was 'given' my own CO₂ incubator for the few weeks it took me to 'manufacture' the protein. Once I obtained equal amounts of



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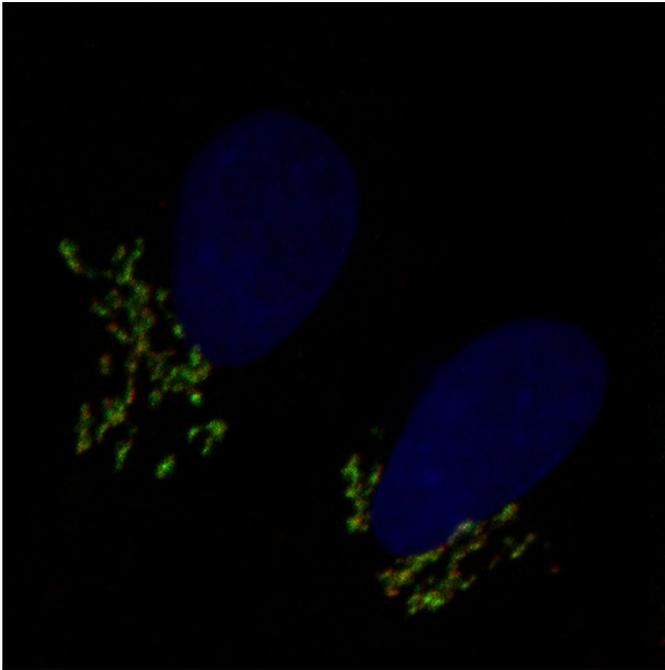
purified proteins for all the GBF1 constructs, generating the lipid-binding data was relatively easy and very exciting.

“...find a project that really interests you and then...find a mentor who will help you with exploring that interest”

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

During my graduate scientific studies, I developed targeted liposomal carriers for genetic drugs to treat human leukemia. At the same time, I also worked in the fields of immunology, cell death and the utilization of human stem cells in regenerative medicine. During that time, I never really considered the inner workings of a cell and how my research might impact my understanding of cell function. My 'eureka' moment came when I was working in the lab over Christmas 2016, a year into my post-doc in the Sztul laboratory. I was doing liposome flotation assays and found that GBF1 binds lipids, and more specifically, that it 'likes' specific phosphoinositide lipids. This made me realize that my previous training in lipid biochemistry was directly applicable to my new project in cell biology, and that everything I knew about lipids would have direct relevance to my new project. The blending of my past experience with my new area of research is very exciting to me, and I hope to use my knowledge of lipids to understand the molecular mechanisms that regulate the recruitment of the large ARF exchange factors to membranes.

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Localization of GBF1 in HeLa cells. GBF1 (green), Golgi marker 130 (red), nuclei (blue).

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

I have been very lucky to do my doctoral studies under the guidance of Professor Aleksander F. Sikorski in the laboratory of the Biotechnology Faculty in University of Wrocław, Poland. Prof. Sikorski is a leading figure in the biophysics of lipids and their interactions with cytoskeletal components, and is also a well-known expert in the field of liposome-based therapies. He has been my inspiration in science ever since I started working in his lab. He taught me all the laboratory rules, how to design and perform experiments, how to interpret results and how to critically reach conclusions based on those results. Even more importantly, I learned from him how to be a responsible, organized, hard-working and self-disciplined researcher. I'm equally lucky in my choice of my post-doc mentor, Professor Elizabeth Sztul at University of Alabama in Birmingham, USA. All the work that is presented in this article would not be possible without her extensive knowledge, continuous input and unabashed excitement about the project. One of the key things that I'm learning from Prof. Sztul is scientific independence and the soft skills needed for success in science, such as writing and communicating, professional networking and time management. She is very committed to the success of her mentees, and I have really appreciated the opportunity to attend two international cell biology meetings where she introduced me to the most important scientists in the field. I think that these two mentors inspire me in my pursuit of a scientific career and represent amazing role models that I would like to emulate.

“...persistence and determination are key in science...”

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

The most important advice I have is to find a project that really interests you and then to find a mentor who will help you with exploring that interest. I think that a good project explores a biological process and aims to explore something that is unknown. A good mentor is essential because that person will support you in every step of your scientific and professional development. Optimally, you would select a mentor who has a good team that you can work with, who knows how to lead the team effectively and how to motivate every person in the lab, and who cares about their mentees and their success while in the lab and after they pursue independent careers. Another piece of advice is that persistence and determination are key in science, and you must persevere even when you really don't feel like it.

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

It would be optimal if post-docs were treated equally with university employees in terms of health insurance benefits or maternity/paternity leave, and if our work counted towards a pension plan or social security/retirement fund. Post-docs should have university-generated opportunities, such as funding for going to conferences or scientific meetings. I'm lucky that my mentor considers meetings important and pays for my travel and registration, but I know many post-docs that have insufficient financial support to attend meetings.

What's next for you?

I plan to continue my scientific future in cell biology, and focus on exploring how the trafficking machinery integrates with lipid homeostasis. I am planning to continue my studies in Prof. Sztul's laboratory for a few more years and learn more about the secretory pathway, master additional methods and technologies, and develop a network of contacts and collaborators in the field. I am currently working on multiple projects related to the regulation of the secretory pathway and I hope to develop one of those projects to pursue in the future as an independent researcher in a cell biology field.

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

I love all kinds of animals, but I am a total freak about dogs, and have recently gotten a puppy. My passion is classical music and opera, and my favorite composer and personal idol has always been Ludwig van Beethoven. However, probably my biggest personal hobby is following and supporting the career of my nephew, Igor Walilko, who is one of the youngest Polish drivers in German Euro Formula ADAC and Euroformula Open F3, driving for Italian RP and British Fortec Motorsport teams. He represents Poland in a prestigious Porsche Supercup series and is currently preparing for a 24-h race in Dubai. I'm a very proud aunt!

Reference

Meissner, J. M., Bhatt, J. M., Lee, E., Styers, M., Ivanova, A. A., Kahn, R. A. and Sztul, E. (2018). The ARF guanine nucleotide exchange factor GBF1 is targeted to Golgi membranes through a PIP-binding domain. *J. Cell Sci.* **131**, jcs210245.