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FIRST PERSON

First person – Takuro Tojima

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. Takuro Tojima is first author on 'Spatiotemporal dissection of the *trans*-Golgi network in budding yeast', published in JCS. Takuro is a Research Scientist in the lab of Akihiko Nakano at Live Cell Super-Resolution Imaging Research Team, RIKEN Center for Advanced Photonics, Wako, Saitama, Japan, investigating molecular mechanisms of membrane traffic.

Takuro Tojima

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

The *trans*-Golgi network (TGN) is a membrane compartment acting as a sorting station for newly synthesized and recycled proteins in almost all eukaryotic cells. Previous studies have shown that the TGN is generated from the Golgi apparatus by cisternal maturation, but the detailed transition process remained unclear. In the present study, by using a super-resolution confocal live imaging microscopy (SCLIM) technique developed by our team, we examined the detailed spatiotemporal dynamics of the TGN biogenesis. We found that the Golgi–TGN transition process can be classified into the following three successive stages: the 'Golgi stage', when cargo protein glycosylation occurs, the 'early TGN stage', when retrograde cargo reception occurs, and the 'late TGN stage', when cargo export occurs. Notably, during the stage transition periods, earlier and later stage marker proteins resided simultaneously within a single cisterna in a spatially segregated manner. Furthermore, at late TGN, various coat/adaptor proteins exhibited distinct assembly patterns, which would contribute to efficient cargo sorting and packaging into different types of carriers. Taken together, we characterized the identity of the TGN as a membrane compartment that is structurally and functionally distinct from the Golgi apparatus.

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

Throughout our project, we used high-speed and high-resolution confocal microscopy that was developed by our team. Multicolor and three-dimensional time-lapse live-cell imaging is not easy to use for experiments and requires much skill and experience, but with the great help of our lab members, including microscopy specialists, I succeeded in taking many beautiful movies of Golgi/TGN dynamics in live cells. I would like to thank them a lot.

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

One of my 'eureka' moments was when I observed a yeast strain expressing GFP-tagged Tlg2 (a t-SNARE that mediates cargo reception) and mCherry-tagged Clc1 (a clathrin light chain, that mediates cargo export). I found both proteins are segregated clearly within a single cisterna. This observation convinced me that the TGN should be classified into two sub-stages: early and late TGNs.

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

Journal of Cell Science is one of the high-impact journals in the field of cell biology, and our study completely fits the journal's scope. I am very happy that our work was accepted by JCS!

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 have been interested in biology since I was a kid. Soon after starting my undergraduate research, I noticed that biology textbooks are not always accurate. Since then, I have been enthusiastic about doing experiments by myself to find out the truth.

Who are your role models in science? Why?

My current supervisor, Dr Akihiko Nakano. In addition to his outstanding career as a scientist, his enthusiasm for science and mentoring young people makes him the best role model for me. I appreciate his constant support, valuable advice and encouragement.

What's next for you?

In the near future, I hope to become a principal investigator and expand my research to reveal general mechanisms of membrane traffic conserved among different species and cell types. In particular, I am interested in neuronal cells. I have previously shown that localized exocytosis and endocytosis at the growth cone, a highly motile structure at the tip of growing axon, play pivotal roles in axon guidance. In the next step, using state-of-the-art microscopy techniques, I would like to unveil the detailed spatiotemporal dynamics of membrane traffic systems inside the growth cone and their roles in neural circuit formation and regeneration in the brain.

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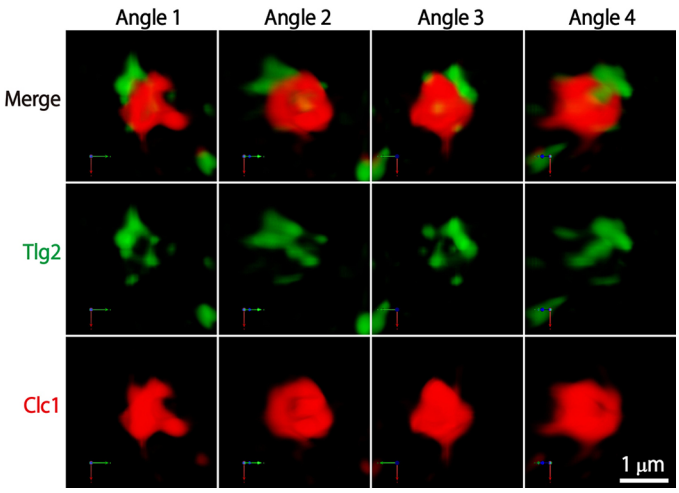

Dual-colour three-dimensional SCLIM images of a TGN cisterna in yeast cell. The cell expresses GFP–Tlg2 (green; an early TGN marker) and Clc1–mCherry (red; a late TGN marker). A single cisterna is viewed from four different angles. Note that Tlg2 and Clc1 are distributed separately within the single cisterna. The green, red, and blue arrows represent the spatial *x*, *y*, and *z* axes, respectively.

Reference

Tojima, T., Suda, Y., Ishii, M., Kurokawa, K. and Nakano, A. (2019). Spatiotemporal dissection of the *trans*-Golgi network in budding yeast. *J. Cell Sci.* **132**, jcs231159. doi:10.1242/jcs.231159