

FIRST PERSON

SPECIAL ISSUE: RECONSTITUTING CELL BIOLOGY

First person – Hyunjung Lee

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. Hyunjung Lee is the first author on 'Force-history dependence and cyclic mechanical reinforcement of actin filaments at the single molecular level', published in Journal of Cell Science. Hyunjung conducted the work described in this article while a postdoc in the lab of Larry McIntire at the Georgia Institute of Technology, Atlanta, USA. She is now a research assistant in Shoichiro Ono's lab at Emory University, Atlanta, investigating at single-molecule level how the microenvironment affects cellular motility and functions.

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

Actin is the building block of cellular architecture. Cells sense, bear and adapt mechanical forces through the actin cytoskeleton, like bones and muscles in our body. In this study, we wanted to examine how actin filaments behave under dynamic force-loading conditions at the very smallest unit that makes up organisms, the so-called single molecular level. We observed single actin filaments by using atomic force microscopy, which has very high resolution to measure forces and distances. We found exciting new features that had not been seen under static force-loading conditions: dynamic force dramatically strengthened actin bonds, different force-loading resulted in different degrees of strengthening, and the two ends of the actin filament – the barbed and pointed ends – showed very different behaviors. Our finding will add clues to better understand how mechanical force regulates the cellular architecture and functions.

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

We claimed to examine actin interactions at the single molecule level; therefore, we really needed to make sure to obtain only single molecular interactions. We used atomic force microscopy (AFM) to dominantly observe single molecular interaction and to minimize non-specific interactions. We adjusted the experimental parameters of AFM (contact time, approaching and retrieving speed, indentation and fishing distance) and surface preparation (molecular coating concentration and washing steps). Also, we monitored rupture curves of each binding



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interaction with a time resolution of 1 ms to detect multiple ruptures, indicating multiple interactions, and removed those from the data set.

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

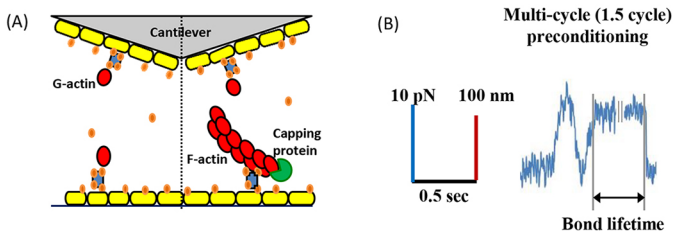
We wanted to reach a broad audience through publishing in an established journal in the cell biology field.

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

I am very lucky to have met my amazing mentors: Dr Larry McIntire inspired me with his warm leadership and insights through decades of experience and gaining knowledge; Dr Shoichiro Ono taught me how to tackle molecular biology problems in detail. Furthermore, Dr Cheng Zhu sharpened my thinking process and refined my presentation skills, and Dr Suzanne Eskin showed me how to balance work and life. Their guidance allowed me to grow as a scientist and to become who I am now.

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?

My father. He is also a scientist, working in the field of atomic energy. I grew up watching his passion for work and his relentless



Schematic of AFM experiments. Functionalization of the cantilever tips and the polystyrene surface for G-actin/G-actin (left) and G-actin/F-actin (right) interactions. Biotin (orange), BSA (yellow), streptavidin (blue) and capping protein (green).

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efforts. He never asked me to become a scientist, but it was natural for me to dream of working as a scientist like my father. He always supports me and listens to me whenever I need it.

What's next for you?

I am looking for a research scientist or independent group leader position to apply my biophysical and neuro-engineering knowledge for a better understanding of cell motility and functions in the tumor-immune microenvironment.

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

I love traveling and exploring new places. I take or draw pictures of my favorite things, places or moments. Therefore, I always carry a small sketchbook and a pouch with pens in my backpack.

Reference

Lee, H., Eskin, S. G., Ono, S., Zhu, C. and McIntire, L. V. (2019). Force-history dependence and cyclic mechanical reinforcement of actin filaments at the single molecular level. *J. Cell Sci.* **132**, jcs216911.