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Biologists

FIRST PERSON

First person – Zhen Zhang and Yen Wei Lim

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. Zhen Zhang and Yen Wei Lim are joint first authors on 'ImaEdge – a platform for quantitative analysis of the spatiotemporal dynamics of cortical proteins during cell polarization', published in Journal of Cell Science. Zhen Zhang is a PhD student in the lab of Pakorn Kanchanawong at the National University of Singapore, developing novel and robust computational tools to analyse microscopic images and videos. Yen Wei Lim is a PhD student in the lab of Fumio Motegi at the National University of Singapore, investigating the intricacies behind cell fate determination by answering one fundamental question: how does an individual cell decide which fate it should adopt?

Zhen Zhang and Yen Wei Lim

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

YWL: In order to develop, every cell in an animal has to have the ability to change its shape. This dynamic behaviour makes it difficult for us to accurately track individual cells and their cellular proteins during the course of development. This limitation, in turn, makes it hard to understand how these proteins work within a cell. To address this problem, we created ImaEdge, software that accurately tracks and quantifies proteins associated with the outer edge of cells. It displays results as colour-coded heat maps for clear data visualisation, greatly improving the ease of quantitative analysis of changes in cell shape and the proteins associated with it.

ZZ: People are good at perceiving patterns and spotting changes. However, perceptions often lead to biases. This could lead us to misjudge the extent to which these changes occur. For example, our eyes might not be able to pick up on a small increase in protein intensity, let alone be able to compare these small changes across multiple situations. This can easily result in a subjective and unreliable conclusion. We sought to eliminate this bias by developing software that can quantitatively extract intensities in fluorescently tagged proteins in the zygote of the roundworm *Caenorhabditis elegans*.

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

YWL: Zhang and his mentor are the true computing experts. By contrast, I am not fluent in coding or computing languages. As a developmental biologist, I aim to understand the mechanisms of cell polarity regulators (i.e. the PAR proteins). To understand how these proteins work in an unbiased manner, we had to come up with a tool that allowed us to accurately track changes in the distribution of cortical PAR proteins during embryonic development. This sparked the beginnings of a fruitful collaboration between two seemingly different labs.

We were initially concerned with the jargon they might use, and vice versa. These concerns quickly evaporated into thin air. Zhang and his colleagues patiently listened and understood what questions developmental biologists wanted to answer. They used simple language to explain to us how ImaEdge works. They were also very accommodating in helping us optimise the system to accurately track cortical PAR protein intensities. Mutual understanding and patience quickly turned what could have been potential challenges into efficient and effective teamwork.

"[…]mutual understanding is essential for smooth conversations between two groups."

ZZ: This is a collaborative project between two labs from two different institutes. I worked with researchers with distinctly different backgrounds and approaches. To facilitate communication, I read a number of review papers on the PAR proteins and tried to understand how Yen Wei viewed biological questions. I learned that mutual understanding is essential for smooth conversations between two groups.

Because ImaEdge was meant for biologists, it had to accurately track cortical proteins and, at the same time, be as user friendly as possible. Ideally, it also had to process images as fast as possible. I found it challenging to integrate software development, quality assurance and user friendliness into a single package. I am thankful to Yen Wei, Peng and Fumio, as they helped to prepare samples in order to optimise the software and provided suggestions to improve on ImaEdge's interface.

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

YWL: I remembered trying to amplify a short length of DNA for two weeks, failing at every try. It was quite disheartening. I developed a mini phobia of checking for PCR products under the UV light; the

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band I so desperately wanted was never there! My colleagues and mentor were supportive and gave me many constructive suggestions. Encouraged by everyone's support, I pressed on. Finally, on the third week, I saw the band I had been waiting for. I'd tell first-year PhD students to not be afraid of failing. You will fail. When that happens, seek comfort in your lab members, in your supervisor and in the scientific community. Press on. Success is waiting for you!

ZZ: Novelty is the main motivator for me to work hard. I would like to encourage new PhD students to understand novel points in their projects. This will help them to find interesting projects they feel passionate about and motivate them to give maximum value back to the community.

"…[don't] be afraid of failing. You will fail…. Press on. Success is waiting for you!"

What's next for you?

YWL: I'm hoping to get my doctorate at the end of this year. Actually, I am writing my thesis right now. In the meantime, we are also trying to publish another paper with the use of ImaEdge.

ZZ: I am always passionate about applying informatics to bioimaging data. Now we are trying to use super-resolution techniques to visualise cell-derived vesicles whose shapes are highly heterogeneous. We would also like to mathematically characterise the features of such vesicles and apply machine learning strategies to automatically classify them by using their feature parameters.

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

YWL: I enjoy public speaking. I love communicating and sharing ideas with people from different walks of life. Communicating and sharing ideas allows me to obtain information and expand existing knowledge efficiently and effectively.

ZZ: Data science has always been interesting to me. In my spare time, I like learning new programming languages and trying new packages on machine learning. I view unanalysed data as a friend; data analysis is like talking to a friend.

Reference

Zhang, Z., Lim, Y. W., Zhao, P., Kanchanawong, P. and Motegi, F. (2017). ImaEdge – a platform for quantitative analysis of the spatiotemporal dynamics of cortical proteins during cell polarization. *J. Cell Sci.* **130**, 4200-4212.