

Early Career Researcher Profile: Honglong Zhao

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²*in silico* Plants

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ABSTRACT

Honglong Zhao is a postdoctoral researcher at the Chinese Academy of Sciences Center for Excellence in Molecular Plant Sciences. There, he studies plant systems biology and works on the mathematical model construction of primary metabolism in C₃ photosynthetic leaves. He received a PhD in Botany in 2020 working with Prof. Xinguang Zhu.

HOW DID YOU BECOME INTERESTED IN SCIENCE?

I hold a bachelor's degree from Huazhong Agricultural University (HZAU) in Agronomy. In HZAU, my first scientific project was to uncover the mystery of the effects of photosynthesis system on crop productivity. Since then, I became interested in science because there are lots of things for me to learn.

HOW DID YOUR VIEW OF RESEARCH CHANGE FROM THE BEGINNING TO THE END OF GRADUATE SCHOOL?

At the beginning of graduate school, I just wanted to seek answers to the question 'how can we improve crop yield by manipulating photosynthesis through genetic or cultivation operations?'. After further study, I realized that photosynthesis and its response to the changing environments are so much complex. Such that we needed a quantitative system to better model and understand these complex behaviors of plant photosynthetic productivity. I started my project by constructing systems model of metabolism, which is only a small part in the field of photosynthesis, and an even smaller part of crop improvement. With the efforts, our modelling results have predicted some genetic targets for improving photosynthesis productivity. Besides only seeking the answers, to questions, I want to find and create the methodologies which can help me better understand the operation of organisms and to employ these methodologies to make our life better. In other words, my focus changed from learning science to doing science.

WHAT ADVICE WOULD YOU GIVE TO SOMEONE STARTING OFF ON THEIR PHD NOW?

With the rapid development of techniques in many fields, it would be helpful for us to throw our arms around people who study physics,



chemistry, mathematics and computational science. Secondly, it's important to choose a lab you like and to focus on a project you are really interested in. Writing scientific papers, giving presentations and discussions with others are important ways to make us better understand our projects.

WHAT HAS BEEN THE BIGGEST CHANGE BETWEEN GRADUATE SCHOOL AND POSTDOC WORK?

The biggest change I have as a postdoc is having more pressure to find funding. Previously, during my PhD, I had financial support from the PI. But for my postdoc I need to apply for funding to support my projects by myself. There is intense competition for funds because of the large number of postdocs. Additionally, the number of grants available for modelling project is few and funds are usually not sufficient. Although most of studies in our group are conducted *in silico*, constructing a predictive model requires many high-quality data sets for

training a model. Usually, the data sets for training a new model are difficult to obtain from databases. Some field and laboratory measurements are required, and this is much more costly than constructing a model.

WHY DO YOU THINK COMPUTER MODELLING IS NECESSARY?

We know that the use of models in biology studies is increasingly important since biological systems and their interactions with the environments are so complex. The achievements of systems biology indicate that mathematical models could efficiently help us to summarize the knowledge and propose hypotheses for further testing or for system optimization. Combining experimental data sets and modeling simulations *in silico* have speed up the process of crop improvements and drug developments in practice. Therefore, this strategy is

becoming increasing popular in biological research. Such that, more funds are needed to support modellers.

WHAT DO YOU DO WHEN YOU'RE NOT DOING RESEARCH?

It's the routine for me to have physics exercise for at least 40 min per day, running or playing badminton usually. I also enjoy reading books, such as ones on human history, scientific developments, artificial intelligence, humanities fictions and some poems. Some of my spare time is spent on listening to classical music. I like science research. It's fascinating and so it was my first option when I was at the crossroads of my career. However, physical health and a fulfilling spiritual life are indispensable components of happiness in my life. Additionally, exercise and reading are helpful to my social activities and they make me an integrated man, instead of a working machine. I really enjoyed them.