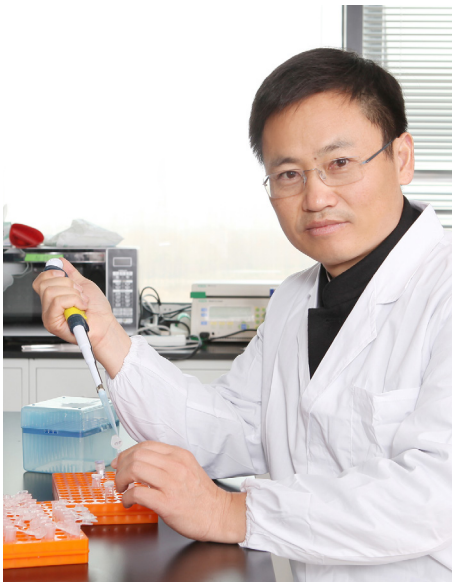
Jian-Kang Zhu

How did you spend your career?

I received my BS in soil science and agricultural chemistry from Beijing Agricultural University in 1987 and my MS in botany from the University of California, Riverside, in 1990, followed by my PhD in plant physiology from Purdue University in 1993. I was a postdoc in the lab of Nam-Hai Chua at Rockefeller University in New York for a short time, after which I accepted my first faculty position at Auburn University in Alabama at the end of 1994. Starting in 1996, I was assistant professor at the University of Arizona in the Plant Sciences Department, and in 2000 I was promoted to full professor. In 2004, I moved back to where I obtained my MS, the University of California, Riverside, where I accepted the directorship of the Institute for Integrative Genome Biology and a professor appointment in the Department of Botany and Plant Sciences. From 2009 to 2010, I was founding director of the Plant Stress Genomics Research Center at the King Abdullah University of Science and Technology in Saudi Arabia.

In 2011, I moved to Purdue University as a distinguished professor in the Department of Horticulture and Landscape Architecture and the Department of Biochemistry. In 2012, I became founding director of the Shanghai Center for Plant Stress Biology, Chinese Academy of Sciences. I have been splitting my time between Purdue and the institute in Shanghai. Throughout my career, my research program has focused on the study of plant signaling pathways that govern responses to environmental stresses such as salinity, drought, and low temperatures, as well as molecular mechanisms of epigenetic gene regulation and gene editing technologies.



What do you consider to be your most important contributions to plant science?

I consider my most important work to include the following:

- discovery of the salt overly sensitive (SOS) signaling pathway that plays a central role in ion homeostasis and salt tolerance in plants. The stress → calcium signal → calcium sensor → protein kinase → ion transporter pathway has become a paradigm of signal transduction not only for salt stress, but also for a number of other abiotic stresses, such as low potassium, high magnesium, and high pH.
- contributions to elucidating the core signaling pathway for the plant stress hormone abscisic acid (ABA). My lab discovered several important components of the ABA biosynthesis and signaling pathways and achieved, for the first time, in vitro reconstitution of the core ABA signaling pathway. We discovered ABA-mimicking small chemicals that can be applied to plants to activate the ABA pathway to reduce transpiration water loss and induce the expression of drought-responsive genes, thus leading to drought resistance in plants. These chemicals are easy to synthesize, nontoxic, and much less expensive and more stable than ABA; thus, they have enormous potential for applications in the agriculture, turfgrass, and horticultural industries to protect plants from drought stress and benefit the environment by reducing the depletion of available freshwater resources.
- identification of several regulatory factors for plant cold stress response, such as ICE1, HOS1, and MAPKs.
- discovery of a number of plant miRNAs and siRNAs and elucidation of their function in regulating plant stress responses.
- discovery of the Arabidopsis 5-methylcytosine DNA glycosylase/lyase ROS1. ROS1 is the first DNA demethylase (the enzyme initiating active DNA demethylation) established by genetic and biochemical evidence. It is the long-sought-after enzyme that initiates a base-excision repair pathway for active DNA demeth-

continued on next page

ylation to erase DNA methylation marks and to prevent DNA methylation-mediated gene silencing. My lab identified nearly all the enzymes in the pathway for active DNA demethylation in plants. We also identified the first known eukaryotic protein complex that functions in regulating active DNA demethylation, which contributed to our understanding of targeting DNA demethylase for the precise control of DNA methylation reprogramming that occurs during development, stress responses, aging, and diseases, including cancer.

- discovery of several important components of the RNA-directed DNA methylation (RdDM) pathway that controls de novo DNA methylation in plants.
- elucidation of the mechanism of coordination between DNA methylation and demethylation activities. We proposed the concept of a "methylstat" that senses and balances genome-wide DNA methylation and demethylation activities.
- development of efficient methods for precise gene editing in plants using TALEN and CRISPR/Cas. Targeted gene insertion and precise sequence replacement are the Holy Grail of genetic engineering in plants. We used the egg cell– and early embryo–specific DD45 promoter to drive expression of Cas9, which made efficient gene targeting in Arabidopsis possible for the first time. We also developed the tandem repeat–homology-directed repair approach for efficient sequence insertion and replacement in rice, contributing to crop functional genomics research and breeding.

When did you become a member of ASPP/ASPB?

I became a member of ASPP when I was a PhD student at Purdue University. I was encouraged to attend the annual meetings as a student, and I found the atmosphere at the meetings exciting and inspiring. Many collaborations and friendships that began at the ASPB annual meetings have continued throughout my career.

How did the Society impact your career, and what motivated you to become a Founding Member of the Legacy Society?

Being given the opportunity to publish in ASPB journals allowed my research findings to reach a large audience. Many collaborations started from researchers reading about my results in an ASPB journal and reaching out. Because of the immeasurable advantage this has afforded me, I did not hesitate when asked to become a Founding Member of the Legacy Society. I wanted to support the Society so it can continue its important work for plant biologists.

What important advice would you give to individuals at the start of their career in plant science?

The first and most important thing is to spend as much time as you are able *reading!* You must stay current on the state of the art of your field in order to succeed. Second, find something you are passionate about, so that your excitement and curiosity will continue through the inevitable times when your progress is slowed by difficulties.

Academic Family Tree
https://academictree.org/cellbio/tree.php?pid=649249