

Meet Whitehead Institute's Newest Faculty Member, Jing-Ke Weng



COMMUNITY

RESEARCH

JANUARY 23, 2014 BY DUSTIN GRINNELL



Dr. Jing-Ke Weng studies the chemical diversity of plants and has already initiated several ambitious projects in his first few months at Whitehead Institute, including his personal quest to demystify ancient herbal medicines.

Q: As a child, you were fascinated by the “magic” of herbal remedies (plants used for medicinal purposes)? Can you talk more about this? Whenever I was sick my mom would give me an herbal remedy. For instance, if I had the stomach flu she would give me an herb, *Pogostemon cablin* (patchouli), which always took care of my fever. If I had a cut or scratch, she would apply an ointment called *Panax pseudoginseng* (Himalayan ginseng). It seals your skin, decreases inflammation and heals the wound quickly. Both of these herbal medicines worked so well—I thought they were magical.

“Following in the footsteps of scientists like Charles Darwin, I am searching for the universal laws underlying the origin and evolution of biological complexity.”
-Whitehead Member, Jing-Ke Weng

When you came to the United States after college, you noticed herbal remedies weren't widely embraced? Herbal medicines were common in China, but few knew about them in the

United States. When I explored the literature, I was surprised to find that little was known about how most herbal remedies worked. So it became one of my long-term goals to understand how herbal remedies function on a molecular basis.

Is this a kind of merging of Eastern and Western medicine? Last month, I attended a talk by Dr. Stuart Lipton, Director of the Del E. Webb Center at Sanford-Burnham Medical Research Institute. He said he's not comfortable prescribing a drug unless he knows exactly how it works. But even if we understand how single molecule-based Western drugs work, there are still limitations, especially when treating complex diseases, such as cancer, diabetes and neurodegenerative diseases. I think mechanism-based Eastern medicine has tremendous potential to uncover new therapeutics in the fight against these devastating diseases. Western medicine has resisted embracing herbal medicines, partly because proving how they work from a mechanistic perspective hasn't been possible.

With advanced technology, is this no longer the case? Using innovative techniques, we can now understand more precisely how new and ancient remedies function. For example, with a combination of techniques such as high-end mass spectrometry, genomics, bioinformatics, biochemistry and structural biology, we can elucidate the structure of chemicals and better understand how they interact with protein targets at atomic resolution. However, it's challenging to find support for these types of projects given the current funding climate, and the dogmatic view of the drug discovery and development process. Such projects are simply too high-risk, and the problems are so complex, that it's unlikely we will see an immediate impact. But these projects have high rewards and could lead to a new era of therapeutics.

LINKS

[About Whitehead Pulse](#)
[Contact](#)
[Subscribe](#)
[Upcoming events](#)
[Whitehead home](#)

CATEGORIES

[Community](#)
[Events](#)
[Honors and Awards](#)
[In the news](#)
[Multimedia](#)
[Research](#)

SEARCH



What kinds of techniques or methods are you using now? When you want to understand complex diseases, such as cancer or metabolic diseases like diabetes, you have to go beyond the idea of one-gene-mutation-causes-phenotype. This is especially true when studying herbal medicines, which are not composed of one molecule, but rather many within a mixture. As such, therapeutic effects are additive, or cumulative. In a complex mixture, 1+1 doesn't always equal 2, but maybe three, or even zero. Effects are combinatorial, so you need a combinatorial or mathematical approach to understand them. In the past few years, I have been collaborating with Dr. Rama Ranganathan, Director of the Cecil H. and Ida Green Center for Systems Biology at The University of Texas Southwestern Medical Center, to use statistical coupling analysis to study protein evolution. Interestingly, the same mathematical method was also adopted to interpret financial markets and predict stock movements based on historical records. I'm now applying this approach to decode the chemical complexity of medicinal plants, so that we can quickly identify interesting molecules linked to therapeutic effects.

What is your ultimate goal as a scientist? Most labs study one mechanism or one enzyme. I want to synthesize a fundamental theory that explains how chemical diversity evolved in plants. I recently watched a documentary by the Howard Hughes Medical Institute (HHMI) about *The Origin of Species* by Charles Darwin. It told the story of how Charles Darwin and Russell Wallace converged on the theory of evolution. I saw overlaps in my life. Both scientists began as naturalists, and like me spent their early years in nature, collecting plants and insects. Over time, a fundamental theory emerged to become *evolution*, the founding theory in biology. But in Darwin's and Wallace's time, they could only observe plants and animals visually. They were limited to tangible observations, such as a bird's feather patterns or beak lengths. We have come a long way since. Today, with advanced technology, we can observe proteins, enzymes, and metabolites at the molecular level. Following in the footsteps of scientists like Darwin and Wallace, I am searching for the universal laws underlying the origin and evolution of biological complexity.

Why did you choose Whitehead Institute? Whitehead Institute is such a unique place. The purpose is to conduct cutting-edge, groundbreaking research. The Institute makes sure you are unburdened in many ways, which frees your imagination and allows you the intellectual freedom to reach your potential. In my opinion, there's no other place in the country doing the same caliber of science. And given that it's right in the heart of Boston's scientific community, I can't think of a better place for a young scientist to flourish.



OTHER NEWS



Meet the Postdocs of
Whitehead Institute



Whitehead Member Jing-
Ke Weng named a Pew
Scholar



Meet the Postdocs of
Whitehead Institute

✉ SUBSCRIBE TO NEWSLETTER

🐦 FOLLOW US ON TWITTER

© WHITEHEAD INSTITUTE, 2012. ALL RIGHTS RESERVED.