

PERSPECTIVES & OPINIONS



Vicki Chandler

PLANT SCIENCE
MATTERS

Melissa Koseman

Vicki Chandler's research on how plants regulate their genes may ultimately inform studies of human diseases. She's leading the Gordon and Betty Moore Foundation's partnership with HHMI to support more of this kind of fundamental plant science.

I often say that because plants don't bleed red or run, they get overlooked. Most people don't realize that plants like corn (maize) and thale cress (*Arabidopsis thaliana*) are excellent model organisms for key areas of biomedical science. Through studies in plants, we've determined how small noncoding RNA can ratchet up or dial down genes, for instance, and how gene regulation responds differently in distinct environments.

But tight plant science funding consistently limits our ability to turn early theoretical gains into on-the-ground advances. Scientists doing absolutely core work in plant genetics, cell biology, biochemistry, and other areas have to vie for scant federal support—and, frankly, it holds us back.

That's about to change. HHMI and the Gordon and Betty Moore Foundation, which supports basic (nonmedical) research, have teamed up to kick-start fundamental plant science research with 5-year, potentially renewable grants to 15 plant scientists (see "Going Green: New Program Provides Vital Support for Plant Sciences," page 40). This is the first time the two organizations have collaborated, and I have high hopes for the outcome.

First, I hope the scientists who are selected are empowered to be more innovative and creative because they will have resources to work with. The funding is roughly equivalent to having two R01 grants from the National Institutes of Health (NIH). Five years of support is enough time to tackle higher risk yet very important questions. If that's all we did with this program—make this research possible for 15 scientists—it would be enough to impact a field and I'd sleep well at night.

But I also have a broader hope for more systemic change. The fact that HHMI and the Moore Foundation are contributing a total of \$75 million to advance a key model system will put a spotlight on the huge research gap—and the opportunities. I hope our investment, and the research it generates, becomes a tool that federal agencies—including NIH, the National Science Foundation (NSF), the U.S. Department of Agriculture (USDA), and the Department of Energy (DOE)—can use to secure more support from Congress for fundamental plant science. We are sending a signal: plant science matters.

In my own research, I realized the relevance of plant science as a biochemistry graduate student. I was studying gene

regulation at the University of California, San Francisco, in the late 1970s, working with mammalian systems. While looking for postdoc opportunities, I realized that maize is an ideal system for studying gene expression—in particular, a remarkable phenomenon in gene silencing called paramutation.

In paramutation, one parental copy (allele) of a gene silences, or turns off, the other parental copy of that gene. This silencing sticks: generations of progeny "remember" this change, dutifully expressing the gene according to the new pattern. And, this happens with no changes in the DNA sequence.

Over the course of 20 years, first at the University of Oregon and later at the University of Arizona, my lab has uncovered some of the underlying mechanisms. They involve RNA-mediated silencing, which occurs in multiple systems. We suspect similar biochemistry works in animals and humans. If so, our paramutation work may ultimately help us better understand certain diseases.

Basic plant research—even top-notch research—falls between the funding cracks. Because NIH focuses on humans and animal model systems, it has not traditionally supported plant science. USDA leans heavily toward applied science, while DOE focuses on bioenergy. At NSF, basic plant science competes with other biology fields for funds. Even at HHMI—with its track record of supporting innovative, interdisciplinary research across model systems—the number of researchers specializing in plant science can be counted on one hand.

We all want to make progress. My role leading the science program at the Gordon and Betty Moore Foundation is to identify fundamental research areas in which a foundation can make a difference. We support varied research, from marine microbiology to the largest land-based telescope. Part of our culture is to take smart risks because major leaps forward in science won't happen without them.

With HHMI, we're thrilled to strategically grow plant science. By funding top people at various career stages, we're poised to make a real—and lasting—difference.

INTERVIEW BY KATHRYN BROWN. *Vicki Chandler is the chief program officer for the Gordon and Betty Moore Foundation's Science Program.*