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The Plant Science Decadal Vision: Response to the Martin Commentary


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COMMENTARY

The Plant Science Decadal Vision: Response to the Martin Commentary

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The plant science community is being called upon as never before to carry out research that addresses challenges in food, climate, and health, to educate a populace inundated with science misinformation, and to excite and recruit a new generation of scientists from among that populace, all while investments in basic research are stagnant or even declining in many countries. The Decadal Vision (Plant Science Research Summit, 2013) represents a response from that community, one that launches a meaningful and ongoing dialogue about how best to accomplish these goals. In that spirit, we welcome this thoughtful commentary by Cathie Martin (Martin, 2013).

We wish to remind readers that the impetus to embark on the development of a plant science decadal vision, by design from a U.S. perspective, derived from several national science and agriculture reports (Plant Science Research Summit, 2013; see “A National Call to Action”). Each of these reports, from the National Academies or the White House, called upon plant scientists for solutions, with an unambiguous tone of urgency. The reports inevitably pointed to the inconsistency between the great opportunities from and the chronic underinvestment in research. The plant community held its first summit in 2011, organized by Gary Stacey (University of Missouri, Columbia) and attended by 150 stakeholders and observers. That event was a critical step in identifying the most important plant science research challenges. At ASPB’s request, we convened a second Plant Summit in January 2013, attended by 17 diverse members of the plant science community, including one from Europe (see “Participants and Support,” Plant Science Research Summit, 2013). We used a facilitated strategic

planning process to distill national calls to action, community input, and ideas from the first summit to discrete, definable goals. The prioritization process, although difficult, was necessary to assemble the strongest and most compelling argument possible for why plant science research is primed for substantial investment. The process also explains why the goals included in this document are not intended to be exclusive of other aspects of plant research.

The goals presented in the Decadal Vision are bold, designed to focus systems-level biological research toward practical plant-based objectives. This will lead not only to innumerable discoveries into plant, gene, and ecosystem function but also positive outcomes for agriculture, the bioeconomy, and biodiversity. In short, basic and applied research must be integrated as never before. However, with the shortage of research dollars in the United States, we contend that industry must do its part in facilitating this translational science. That is to say, as we call for increases in basic research funding, we also call on entities that capitalize on that research to contribute through direct investment and training. We further assert that barriers need to be lowered for plant science entrepreneurs, so that those who wish to pursue ideas from laboratory bench to the business environment have the proper training to do so.

Some of Martin’s comments illustrate how the Decadal Vision can stimulate imaginative lines of thinking that are not expressly mentioned in the report; for example, the thought that “Training a generation to analyze databases will not compensate for the generation of plant breeders we are losing to retirement.” Indeed, it is perhaps ironic that plant biology skills are more and more in demand just as genomics and bioinformatics

gain more and more of the headlines. In fact, what is needed most is training that bridges big data and real organisms in whatever environment they are found. This is part of the concept behind T-training, our call to reimagine the way in which we educate plant science doctoral students.

Martin also comments that the Decadal Vision has missed an opportunity to highlight the importance of food chemistry along with biotherapeutics. If the Decadal Vision seems to imply that 20,000 chemical profiles should be obtained only from medicinal plants, this is an unfortunate consequence of the writing style. We give examples of where plant chemistry has given us important medicines to illustrate some potential benefits of studying unique aspects of plant metabolism. However, the hundreds of thousands of compounds unique to plants are also what we eat and smell and, more importantly, what plants use for defense, adaptation, pollination, and myriad other biological processes. For the basic researcher, the evolutionary origins and biological purposes of plant chemistry may be more compelling than their possible industrial or agronomic use. Again, this points to the agenda of the Decadal Vision as a research plan, with the application thereof (“nutritional improvement of food crops”) in the bailiwick of commercial partners, albeit ones whose engagement is critical to the success of the initiative.

Martin’s commentary reinforces the Decadal Vision’s view that plant science doctoral training must prepare individuals for a diversity of career tracks. The relatively lengthy time to degree in the United States has multiple causes, but it is clearly viewed as a barrier to entry. The concept of T-training for plant scientists should enhance the skill base of students, not only in bioinformatics and computation, but likewise in practical

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plant improvement, communication, and entrepreneurship. The training section of the document has already begun to generate passionate discussions because although we all share the goals of attracting the brightest young minds to careers in math and science, there is no one-size-fits-all solution. Devising an effective suite of training regimens will, we believe, require blue sky thinking to avoid the temptation of merely tinkering with a formula that has changed little for many decades.

Finally, Martin makes the point that plant research is a truly global enterprise. We completely agree. International collaborations are part of many of our daily activities, and many international funding mechanisms have already produced results. Although the Decadal Vision has one eye firmly on the lagging U.S. support for plant

research, its other eye is on maximizing the impact of plant science globally through the broadest possible coalition. As one example, two members of the National Plant Science Council, which is charged with updating and communicating the Decadal Vision within the United States, attended the recent annual meeting of the Global Plant Council, where the Decadal Vision was presented, and opportunities for future collaborations were broached. It is essential that we fully engage the international plant science community at every opportunity. This will place us in the strongest position to advance our ultimate collective goal: turning the outcomes of these productive discussions into the strongest possible argument to halt the precipitous decline in plant science research

funding and to make the Decadal Vision a reality.

AUTHOR CONTRIBUTIONS

D.S. and S.M. contributed equally to writing this commentary. The Decadal Vision itself represents the contributions of numerous individuals as listed at the end of the report.

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