LETTERS

edited by Jennifer Sills

Biomedical Research: Strength from Diversity

THE RECENT EDUCATION FORUM BY M. J. GRAHAM AND COLLEAGUES ("INCREASING PERSISTENCE of college students in STEM," 27 September, p. 1455) called for widespread implementation of a much-needed framework for increasing persistence of college students in science, technology, engineering, and mathematics (STEM) fields. The Persistence Framework that they describe is evidence based, drawing from a rich body of research that has identified the relevant education and psychosocial issues that must be addressed, as well as effective strategies.

Recognizing that the biomedical research enterprise would be greatly strengthened by attracting the most talented individuals from all groups, the National Institutes of Health (NIH) has been intensively engaged for more than 2 years in a planning process. As a result, a distinguished working group (*1*) has made a series of bold recommendations that are now in the process of being implemented. These include the systematic evaluation of NIH training programs, the appointment of a Chief Office for Scientific Workforce Diversity, and the launch of a new three-component program that will provide the resources necessary to implement and assess, on a large scale, approaches such as those described by Graham *et al*. Developing new ways to engage college students, sustain their interest in research, and provide trainees at all career stages with the strategies and tools to thrive in the biomedical research workforce are the goals of the "Enhancing the Diversity of the NIH-Funded Workforce" program (*2*). This program will consist of three highly integrated initiatives:

(i) The National Research Mentoring Network (NRMN) will develop transformative approaches to mentoring. The network will engage diverse mentors from many biomedical research disciplines and link them to mentees at multiple career stages.

(ii) The Building Infrastructure Leading to Diversity (BUILD) initiative will support relatively under-resourced academic institutions with a demonstrated commitment to students from highly diverse backgrounds. These institutions will have the opportunity to develop a series of potentially transformative education and training activities that address the many factors underlying student/trainee persistence in biomedical research career paths and successful transition into the research workforce. BUILD emphasizes and requires the provision of research opportunities. The program will seek strength through collaboration across the spectrum of types of institutions.

(iii) The Coordination and Evaluation Center will work with both the BUILD consortium and NRMN to assess the efficacy of the various approaches that are being piloted.

History has revealed that addressing problems that disproportionately affect minority populations has often had a transformative impact for the majority as well (*3*). We predict that transformative approaches to student engagement and training developed through the Common Fund's Diversity Program will have a similar far-reaching impact on training everywhere.

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Pest Control: Embrace Marketing

IN HIS NEWS STORY "VIETNAM TURNS BACK a 'tsunami of pesticides'" (special section on Smarter Pest Control, 16 August, p. 737) D. Normile attributes the increase in pesticide use in Asia to "very powerful marketing forces." Yet, the campaigns that convinced Vietnamese rice farmers to use less pesticide also used marketing principles and tools, such as strategic use of posters, leaflets, radio soap operas, and television commercials. Although marketing principles are usually used to communicate the value of a commercial product or service to a cus-

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tomer, they can also be applied to promote the social good, as practitioners in the field of social marketing have done for decades in areas such as public health (*1*).

It is time that those working to mitigate threats to the environment recognize that marketing principles have much to offer by providing a tried and tested framework that can be used to influence human behavior, a key driver of threats to biodiversity worldwide (*2*). For this to happen, marketing needs to be acknowledged as an amoral set of tools that can be used for a variety of ends, depending on who applies them. It is true that marketing has been traditionally used by businesses, and often to promote behaviors that are environmentally unsustainable. This is exactly why we need to engage with these effective principles and level the playing field. After all, why should the devil have all the best tunes (*3*)?

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Pest Control: Biopesticides' Potential

THE SPECIAL SECTION ON SMARTER PEST Control (16 August, p. 728) highlighted the threats that chemical pesticides pose to human health and the environment, and some of the smart alternatives, including genetically modified (GM) crops. However, an important and emerging technology against insect pests was overlooked: biological pesticides.

Biopesticides are "derived from such natural materials as animals, plants, and bacteria" (*1*). They include microbial pesticides produced from fungi, protozoa, nematodes, baculoviruses, and bacteria (such as the widely used *Bacillus thuringiensis*, known as Bt). In the United States, there are about 400 registered biopesticide active ingredients and over 1250 products; there are many fewer in Europe (*2*). There has been substantial growth in biopesticides in recent years, especially in Asia, but they still comprise less than 4% of the global pesticides market (*3*).

Market growth is undermined by the variable efficacy of some biopesticides, smaller market niches, and policy/regulatory barriers (*2*, *4*). However, the potential for biopesticides is substantial, and many constraints can be overcome if, like other crop protection technologies, biopesticides also become smarter through research and innovation. Rather than treating biopesticides as synthetic chemicals, there is scope to develop and adopt novel production and delivery approaches that exploit their positive biological attributes (such as higher target specificity, capacity for secondary cycling, sublethal effects, genetic diversity, and transgenerational transmission) and minimize their negative ones (such as slower speed of kill and greater environmental sensitivity).

GM technologies do have the potential to radically reduce pest damage, but their global-scale acceptability and adoption remain a long way off. In the meantime, biopesticides in general, and microbial pesticides in particular, offer the potential to reduce the chemical burden on the landscape while minimizing the evolution of resistance. In addition to delivering a more environment-friendly alternative to synthetic chemicals that is compatible with organic farming and integrated pest management programs, biopesticides may provide cheaper solutions for crop protection globally if policy and regulatory barriers can be minimized and harmonized (*4*).

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Pest Control: Risks of Biochemical Pesticides

IN THE SPECIAL SECTION ON SMARTER PEST Control (16 August, p. 728), scientists propose smarter and safer pesticides. One increasingly popular solution that the section did not discuss is biochemical pesticides. Because of their unique mechanism of action, biochemical pesticides have minimal mammalian toxicity (*1*). However, these pesticides may put other facets of the environment at risk. For example, strobilurin fungicides have become the most widely used biochemical fungicides around the world. Yet, almost all strobilurin fungicides are highly toxic to fish and other aquatic organisms (*2*) and can contaminate surface and ground water (*3*). Statements on the product's labels that warn users to take precautions around water do not adequately address these concerns. As we search for pesticide alternatives, we must bear in mind that abuse or overuse of biochemical pesticides could be incredibly dangerous to our environment.

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CORRECTIONS AND CLARIFICATIONS

Books *et al.*: "*Artemisia*, malaria, and the Red Queen," by W. Lawley *et al*. (11 October, p. 195). In the book's title, "Contol" should be "Control." The HTML and PDF versions online have been corrected.

News & Analysis: "India aims a probe at Mars—and at earthly prestige" by P. Bagla (20 September, p. 1328). The article incorrectly states that comet Siding Spring (C/2013 A1) is expected to collide with Mars in late 2014. Calculations earlier this year determined that the comet is likely to only make a close approach to the planet, with a negligible probability of colliding with the surface.

News Focus: "A floating lab explores the fringes of science and gastronomy" by K. Kupferschmidt (17 May, p. 809). Kevin Krajick was mistakenly listed as the author in the HTML version online. The author name has been corrected on the article page and the corresponding Table of Contents page.