The Demise of Public Plant Breeding

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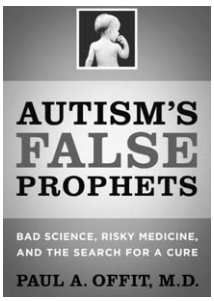
erated. This scare, too, has resulted in outbreaks of infectious diseases in the United States.

Offit has had lots of time to think about how the richest countries in the world can find themselves facing disruptions of public health systems that threaten to return us to a plague of infectious diseases usually associated with the third world. His chapters on "Science and Society" and "Science and the Media" will make you think.

Juries are notoriously prone to fall for emotional arguments and ignore science. But recently, judges have been taking their own role in civil cases with expert witnesses very seriously. That is, they are considering whether the so-called experts before them actually have relevant expertise. If their credibility is questionable, their testimony should not be heard by a jury. Thus far, although cases claiming that vaccines cause autism have been brought against vaccine manufacturers in the United Kingdom, Canada, and the United States, all have been dismissed by judges who found the plaintiffs' experts to be less than credible.

Offit focuses on the "Omnibus Autism Proceeding" before three Special Masters of the US Court of Federal Claims, in which almost 5000 families are suing the federal government for compensation for their children's autism. In this special "vaccine" court, the plaintiffs have every opportunity to make their case. The taxpayers cover their legal expenses and the standard of proof is lower than in the civil courts. The Special Masters decided before the hearings to consider the testimony of any witnesses the plaintiffs chose to present. The first of two hearings focused on the MMR vaccine and was complete when *Autism's False Prophets* was published. Offit presents some of the actual testimony. The reader will see quickly why allthe civil suits have failed. The plaintiffs' experts were not experts, whereas the witnesses for the government were all well-known and active scientists in their fields. Since the book's publication, the Special Masters have released their decisions. Each rejects the plaintiffs' case as being speculative and not supported by the facts. Their conclusion is the same as that reached by the World Health Organization, the Centers for Disease Control and Prevention, the American Academy of Pediatrics, and the Institute of Medicine (twice).



One of the things that impressed me most about this book was that Offit chose to dedicate it to five remarkable parents of children on the autism spectrum. They have braved the same slings and arrows as Offit, and they deserve the accolades of a public that should be grateful for their strength in the face of attack. These are the "real heroes—and true prophets—of this story." Peter Hotez and Michael Fitzpatrick are physicians who have tried to convince the public to stop chasing imaginary cures and to back funding for science and services. Roy Richard Grinker is an anthropologist interested in how different cultures respond to people with autism. Camille Clark and Kathleen Seidel are bloggers with quick wits and clear vision; both have fought tirelessly for the right of all children to be treated with respect and dignity. If you go to Seidel's blog, "Neurodiversity," you will be astonished by what a person with a master's degree in library science can find out from public records. She is astute on many aspects of this story, from bad science to legal chicanery to the profitability of snake oil.

My thanks to Paul Offit for making this very sad story so compelling.

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THE DEMISE OF PUBLIC PLANT BREEDING

Plant Breeding and Biotechnology: Societal Context and the Future of Agriculture. Denis Murphy. Cambridge University Press, 2007. 440 pp., illus. $60.00 (ISBN 9780521530880 paper).

Agriculture is subject to evolutionary processes that have transformed it from simple food production into a globally interconnected, industrial activity that feeds and clothes billions and supplies critical inputs to a vast array of manufactures. Steps toward the spatial integration and intensification that characterize contemporary agriculture have been evident since early post-Neolithic times, although they became especially obvious in the agricultural revolutions of the early 20th century, during which mechanization, industrially produced fertilizer, and plant breeding arrived on the scene. The last of these revolutions is the subject of Denis Murphy's book *Plant Breeding and Biotechnology: Societal Context and the Future of Agriculture.*

Laid out in six parts, the book describes the development of plant breeding, the public and private social contexts that have organized it, the ascendancy of the private sector, the emergence of the current "agbiotech paradigm," plant breeding's relation to contemporary patterns and problems of agriculture, and the future of plant breeding. Murphy's primary goal is to demystify plant breeding so as to advance public knowledge and reinvigorate public plant breeding. Frustration with the collapse of public support for plant breeding, polemical disputes over transgenic seeds, and academic retreat from plant breeding are recurrent themes. The social context alluded to in the subtitle is the policy and institutional environment surrounding plant breeding. Murphy's secondary goal is to examine public attitudes about the activities and outputs of plant breed-

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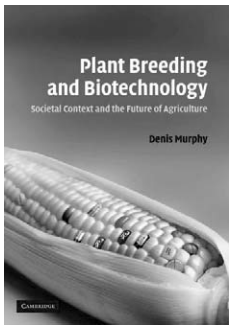
ers, but he is interested mainly in the "upstream" context of plant breeding, which shapes the institutional environment. Virtually no attention is given to the downstream social context of plant breeding: its impact, as part of agricultural intensification and modernization, on the social environment of farming communities.



The centerpiece of *Plant Breeding and Biotechnology* is Murphy's analysis of the changes that occurred in plant breeding in the 1980s and 1990s with the rise of market fundamentalism emanating from the Thatcher and Reagan administrations, along with emergent transgenic breeding practices. The coincidence of these two changes, compounded by negative public attitudes molded by misunderstanding and misrepresentation of plant breeding, had a dramatic impact. The result was the dismantling of public crop-breeding programs, most visibly in Great Britain but also in many national and international agricultural research institutions. A short-lived golden age of plant breeding—the green revolution its crowning achievement—was followed by a withdrawal from public research. While the remnants of public plant breeding in universities and national research laboratories retreated into more academic research, commercial "agbiotech" arose to supply farmers with new varieties. The reigning agbiotech paradigm, which combines a radical shift to privatization and heavy reliance on transgenic breeding, gives us the worst of all possible worlds. Consequently, the public, which otherwise might oppose the gutting of such venerable institutions that have provided so much benefit, has been put off by the rhetoric targeted against genetic modification.

Appointed in 1989 to head one of three departments of Britain's Plant Breeding Institute (PBI) that remained in the public sector, Murphy has had an excellent vantage point from which to observe these changes. In 1987, the year that PBI was sold to Unilever, almost 90 percent of Britain's cereal area was planted in PBI varieties. While the United Kingdom remains innovative in plant science, it has lost its former capacity in practical crop breeding. The tragedy is that crop breeding is jeopardized at a time when it is sorely needed to help feed the growing world population, to meet changing diets, and to cope with environmental protection and change. Meanwhile, the commercial agbiotech sector has profited from two traits—insect resistance and herbicide tolerance—but it has not been technically innovative or quick to address more pressing needs of farmers and consumers.

Murphy's history of scientific plant breeding shows how new crops were developed by induced mutation and through wide crossbreeding of species and genus lines, belying the argument by both proponents and the opposition that transgenesis is a radical departure from previous practices. A serious issue is the emergence of a four-company oligopoly that controls a large portion of commercial breeding and patents relating to transgene technology. Companies are stymied by the public's hostile attitude toward plant breeding, but they have not signed onto such popular causes as reducing greenhouse gas emissions or increasing agricultural sustainability.

An irony is that the plagues of privatization and antitransgenesis have most affected the United Kingdom and Europe. Despite its association with the economists of the University of Chicago and the political rhetoric of Ronald Reagan, privatization has not affected public plant breeding at US universities as much as it has in the United Kingdom, Europe, and developing countries that were subjected to structural adjustment. Murphy explores the causes behind this difference to some degree, but he overlooks the structural factors in American politics that help explain American exceptionalism. The disengagement of the American public from the anti–genetic modification movement is likewise overlooked in his discussion of rebalancing the public debate about plant breeding. Nevertheless, the fact remains that US preeminence in plant breeding has been strengthened by European malaise, characterized by a disconnect between plant science research and its application.

Murphy is bold enough to make several recommendations. Prospects for the United States are brighter than for Europe, but in both areas, public research needs to be strengthened through such steps as improving school and university curricula, giving greater recognition for applied research, and developing open-access technologies. The private sector needs to find more effective ways to cooperate with public institutions and to diversify. Governments must pursue patent reform, deregulation of crop production, and reduction of subsidies.

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Given his ambitious and comprehensive exploration of an important but troubled field of science, Murphy may be forgiven for neglecting the downstream social contexts of plant breeding, which have drawn the critical attention of social scientists. Since the rapid diffusion of hybrid maize in the United States after 1930 (the first agricultural revolution fueled by plant breeding), social scientists have observed unintended negative impacts, such as the restructuring of agriculture toward fewer and larger farms (Kloppenberg 1988) and the loss of local knowledge and skills among farmers (Fitzgerald 1990). These issues,

the grist of popular writing on American agriculture (Berry 1977), were amplified in criticisms of the green revolution (Griffin 1974). As Murphy successfully shows, plant breeding is subject to the vagaries of social policy and attitudes. Although plant breeding cannot be fully separated from the wider context of agricultural intensification, it is appropriate to scrutinizethe impact of plant breeding on the social context of agriculture. *Plant Breeding and Biotechnology* is prophetic in these times of questioning the wisdom of retreating from publically supported science. However, rebalancing the public debate about plant breeding will not be accomplished until downstream contexts of plant breeding are put into a common framework with the upstream contexts. Murphy has provided a provocative, uncompromising, and valuable book toward this end.

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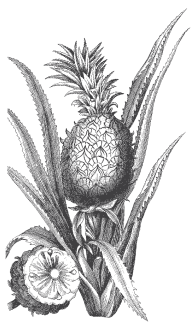

FACILITATION RULES

Positive Interactions and Interdependence in Plant Communities. Ragan M. Callaway. Springer, 2007. 415 pp., illus. $249.00 (ISBN 9781402062230 cloth).

Throughout most of the history of ecology, competition has been deemed the primary interaction structuring plant communities. Indeed, this seems obvious, given that plants require the same fundamental resources, and if we accept the assumption that those resources are chronically limiting, then competition among plants must be intense and pervasive. *Positive Interactions and Interdependence in Plant Communities,* however, puts that fundamental assumption to the test. In this very interesting, stimulating book, Ragan M. Callaway makes a strong case for a more ecumenical approach to understanding how interspecific interactions, writ large, vary along environmental gradients, and how those interactions ultimately govern plant community structure.

It seems worth asking why facilitation, an interaction in which one plant enhances the growth, survival, or reproduction of another plant, has received much less mechanistic respect from ecologists than competition. Facilitation has a long history in plant community ecology. It is one of the key mechanisms in the relay–floristics model of succession proposed by Frederick Clements, the ecologist we all mistakenly love to hate for his "organismal" model of ecological succession. In that model, the collection of species in one seral stage alters the environment, making it more suitable for the next seral stage. Although widespread acceptance of group selection in the first half of the last century did not inhibit development of selectionist viewpoints, the concept of *group* facilitation may have eclipsed recognition of facilitation's role as a potential mechanism of interspecific interaction other than in rare contexts (e.g., nurse plants in the Sonoran Desert promote the establishment of saguaro cacti, which are depicted on the cover of Callaway's book). Furthermore, examples of positive interactions between individuals and species seldom appear in textbooks and other publications to illustrate natural selection and survival of the fittest. For that reason, together with the development of elegant mathematical models of interspecific competition, the stage is set for one mechanism—competition—to be viewed as overwhelmingly important.

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What this volume does is highlight the key role of positive interactions that cause greater integration among species within communities, without taking us back to the untenable holistic community concept.

With this book, Callaway is out to shake our competitive value systems. He can see positive interactions where many have not looked before. The book contains only six chapters, including an introduction that provides the motivation and background for the rest of the text. In particular, the author states, "this book was written in part to address a surprisingly static idea; the individualistic conceptual paradigm of plant communities." Thus, Callaway clearly intends to place facilitation into a larger conceptual framework once he convinces us that it is pervasive in nature. And, indeed, chapter 2 provides a comprehensive review of countless studies to illustrate the direct mechanisms of facilitation, including canopy effects on microenvironments, soil oxygenation, disturbance, and other examples. There is even a section on the controversial topic of communication between individual plants. Chapter 3 is an equally comprehensive review of the indirect mechanisms of facilitation, including associational resistance, positive density effects on pollination and dispersal,