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Facilitation Rules

Author: Collins, Scott L.

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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.

STEPHEN B. BRUSH
Stephen B. Brush (e-mail: sbbrush @ucdavis.edu) is a professor in the Department of Human and Community Development at the University of California, Davis.

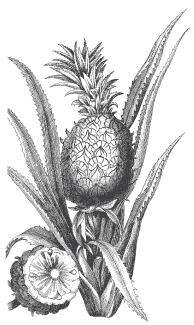
References cited

Berry W. 1977. The Unsettling of America: Culture and Agriculture. Sierra Club Books.

Fitzgerald D. 1990. The Business of Breeding: Hybrid Corn in Illinois. Cornell University Press.

Griffin K. 1974. The Political Economy of Agrarian Change: An Essay on the Green Revolution. Harvard University Press.

Kloppenburg JR Jr. 1988. First the Seed: The Political Economy of Plant Biotechnology 1492–2000. Cambridge University Press.



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,

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and positive indirect effects of competition. Chapter 4 reviews the context for interactions between competition and facilitation and how their relative roles may change along productivity-stress gradients. Although Callaway consistently views the world through the lens of facilitation, the presentation is quite evenly balanced. Competition gets fair mention, experimental deficiencies are acknowledged in many of the case studies, and areas for further research are frequently noted.

Chapter 5 is one of the most important in the book because it details a number of studies that clearly document direct species-specific positive interactions. This and the previous chapter present the core evidence for positive interactions, as well as the environmental contexts in which either positive or negative interactions will most likely predominate. In chapter 6, Callaway integrates the role of positive interactions into several broader conceptual areas, including the diversity-productivity relationship, diversity-stability models, conservation ecology, species invasions, and the individualistic hypothesis. For the most part, this chapter successfully embeds positive interactions into a number of current areas of inquiry.

Conceptual context is particularly relevant for the author's goal of stimulating new thinking about the individualistic hypothesis. Callaway contends that if there is a substantial number of species-specific positive interactions in nature, then plant communities are far more integrated than most ecologists care to admit. To some extent this premise is based on an admittedly extremist view of the individualistic hypothesis, one that views species associations as more the product of chance and environmental sorting than interspecific interactions. In that regard, the historical focus on competition in plant communities is sufficient to dispel the noninteractive maxim of the individualistic hypothesis.

My own viewpoint is that the individualistic hypothesis has always had species interactions at the core, primarily interspecific competition, and therefore this hypothesis is based fundamentally on interspecific interactions. It is likely, however, that the direction and strength of species interactions vary among participants in a community and that distributions are spatially hierarchical. 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.

As Callaway points out, what is needed now is a conceptual model that incorporates positive, neutral, and negative interspecific interactions, and an understanding of how those interactions vary along environmental gradients, to explain pattern and process in plant communities. Indeed, neither the community-unit nor the continuum concept (a product of the individualist distribution of species) effectively describes actual community structure along gradients, and these models fall far short of incorporating the full suite of mechanisms that create gradient structure. Thus, I think that Callaway's desire to stimulate conceptual advances in community ecology is commendable, and I am encouraged by the recent resurgence in thinking about models and mechanisms in plant community ecology.

The book closes with an astonishing 77 pages of references, which, at an average of around 14 citations per page, would be a massive EndNote file of approximately 1070 references. For the most part, *Positive Interactions and Interdependence in Plant Communities* is very readable and interesting, but the volume is riddled with a number of typographical errors, a function of poor copyediting and proofreading. The list price for the hardback version is $249, and at that cost I would expect flawless production. Despite that minor annoyance, the book is a detailed, comprehensive treatise on positive interactions in plant communities that will be of particular interest not only to plant ecologists but also to those ecologists involved with environmental restoration and management. Callaway's book is a fabulous resource and it contains much food for thought and lively discussion.

SCOTT L. COLLINS
Scott L. Collins (e-mail: scollins @sevilleta.unm.edu) is a professor of biology at the University of New Mexico in Albuquerque.

A BAZAAR CONCEPT

Biobazaar: The Open Source Revolution and Biotechnology. Janet Hope. Harvard University Press, 2008. 448 pp., illus. $27.95 (ISBN 9780674026353 cloth).

From the early 1980s, the implications of including biotechnological innovations within current intellectual property (IP) systems have attracted increasing attention and concern, especially since the internationalization of these systems under the World Trade Organization in 1995. Flaws in the current system have been recognized, particularly regarding its negative effects on access both to the products of innovation (e.g., essential medicines) and to the scientific information and knowledge on which they are based. We now need to construct viable alternative models of innovation management that are able to coexist with IP law, a point strongly argued in *Toward a New Era of Intellectual Property: From Confrontation to Negotiation* (*www.theinnovationpartnership.org/en/ieg/report/;* see also Beardsley 2008).

Janet Hope, of the Australia National University Center for Governance of Knowledge and Development, presents one possible model in *Biobazaar: The Open Source Revolution and Biotechnology.* Hope, who has worked for several years on open-source biotechnology, covers complex conceptual and theoretical ground, but I urge the nonspecialist not to be put off—the exploration of alternatives to the current system of innovation management is an important topic, and general readers will have a

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