Wasp Social Evolution: But Don't Ask “Why?”

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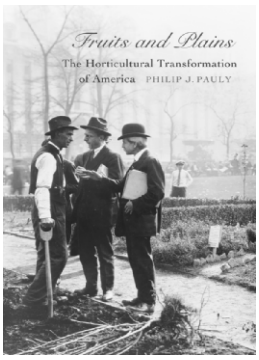
Plant Culture and the Culture of the United States

Fruits and Plains: The Horticultural Transformation of America. Philip J. Pauly. Harvard University Press, Cambridge, MA, 2008. 352 pp., illus. $39.95 (ISBN 9780674026636 cloth).

In the 1988 reprint of U. P. Hedrick's *A History of Horticulture in America to 1860,* Elisabeth Woodburn states that "Hedrick's *History of Horticulture in America* is the only account of the development and growth of horticulture in North America.… Updating this work would be formidable and would require a work of several volumes." Philip Pauly's work, *Fruits and Plains: The Horticultural Transformation of America,* is intellectually formidable—and it's a single volume. He examines 250 years of plant growing in America and, like the horticulturalists he documents, looks for the strong patterns that define the form as he prunes off the "witches' brooms" of detail that fill Hedrick's work. Moreover, rather than simply recanting a history of the development of American horticulture, Pauly articulates how the evolution of American horticulture influenced the development of the country.

Unlike Hedrick, who was an eminent horticulturalist comprehensively enumerating the people and events associated with the development of horticulture in this country, Pauly is a professor at Rutgers University whose expertise is the history of science. Consequently, he looks at the evolution of American horticulture from a broader perspective and is able to identify a handful of stages through which the discipline has progressed. He convincingly argues that the activities of horticulturalists not only had a profound impact on native vegetation in the United States but also profoundly influenced economics, social developments, common experience, and international relations from the colonial period through the present. "In the 1800s… horticulture was the equivalent to what is now called plant biotechnology."

American horticulture, argues Pauly, is characterized by four major themes. The first, *introduction,* extends from the colonial period into the 20th century. The second, *naturalization,* which corresponds roughly to the founding of the Massachusetts Horticultural Society in the late 1820s, played a dominant role for the next 100 years. The third, *native potential,* had its roots in maize and tobacco in the colonial period and continues to be important today. Finally, *excluding undesirables* can be traced to the postrevolutionary "Hessian fly" invasion and extends to contemporary alien and invasive species.



Thomas Jefferson is an exemplar of the first theme and the focus of the first chapter, "Culture and Degeneracy: Failures in Jefferson's Garden." It is no surprise that colonists brought with them plants from the "old country" to establish in their new home. Hedrick offers extensive examples of recorded seed lists and cultural varieties individuals brought to each of the colonies. Although one might plausibly think that all of these introductions would be successful in the fertile new soil of the New World, Pauly makes it clear that the normal response of most of these European transplants was failure, and he explains why. In doing so he introduces several conceptual themes that extend throughout the book—culture, native versus naturalized versus alien species, and evolution.

The first of these concepts, culture, has social connotations that imply a differentiation between developed high culture and crude low culture. This dichotomy was even more stark 200 years ago, as the "culture" of horti*culture* was being developed, than it is today. The wealthy landowners and merchants of Europe, the men of high culture, could afford to develop the practices necessary to improve, propagate, and grow the cultured varieties. It is obvious, then, why these cultured varieties could not survive in the New World: Americans lacked the high culture necessary to grow the plants. This fact contributed to a "degeneration hypothesis," according to which the colonists, like their plants, were doomed to revert to a less cultured, less civilized state. Jefferson, a man of culture, was determined to be a successful horticulturalist and thereby to discredit this hypothesis.

"The United States' First Invasive Species: The Hessian Fly as a National and International Issue" is a poster-child chapter on the ecological consequences and evolutionary implications of native versus alien species. And, as the title suggests, this Hessian fly outbreak amply illustrates the impact of plants (and plant pests) on international relations. Native and naturalized species are easily confounded, with sometimes high-stakes consequences; Pauly addresses this problem frequently throughout the remainder of the book and highlights it in the last section, along with current efforts to manage introduced noxious weeds.

If his lectures are anything like his writing, Pauly must receive excellent student evaluations. Like a good lecturer, he begins each chapter with an introductory section to orient the reader to the main themes and concepts of that chapter. Then he tells the story or stories that illustrate these ideas. For instance, what happens when a conflict arises between efforts to introduce new species and efforts to exclude undesirable

species? There's no better story than the attempt by David Fairchild (head of the USDA section on systematic plant introduction) to plant ornamental Japanese cherry trees around the tidal basin in 1909, only a year after Charles Marlatt (head of the USDA Bureau of Entomology) had taken charge of the USDA campaign to control plant imports by inspecting nursery stock at US ports of entry. We all know there are cherry trees around the tidal basin, but these trees were planted in 1912, after Fairchild's original cherry trees on the grounds of the Washington Monument had gone up in bonfires ordered by Marlatt in 1910, instigating a "string of horrors for U.S. hopes in Asia" (p. 150).

In addition to being highly readable, *Fruits and Plains* is well documented with copious endnotes for each chapter. Every plant biologist should have a copy of this book, and it should be well worn from thorough reading. Those who teach will find interesting examples for the classroom. Researchers will appreciate the historical perspective as a context for their own work.

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WASP SOCIAL EVOLUTION: BUT DON'T ASK "WHY?"

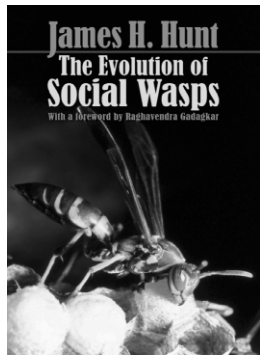
The Evolution of Social Wasps. James H. Hunt. Oxford University Press, New York, 2007. 280 pp., illus. $44.50 (ISBN 9780195307979 paper).

James Hunt's recent book *The Evolution of Social Wasps* is an unusual contribution to the social-insect literature. On the one hand, it presents a great deal of detailed and useful information on the biology of social wasps. Thus, the book will be an important point of reference for anyone wanting to learn more about wasps. On the other, the author sees things from an unusual viewpoint with respect to W. D. Hamilton's theory of inclusive fitness. This is a theory that many people, but certainly not Hunt, feel has greatly enhanced our understanding of insect eusociality, which is characterized by individuals (workers) that reproduce very little or not at all and devote their lives to helping others—usually their mother and father—to reproduce more. The book also presents Hunt's own ideas concerning the evolution of worker behavior.

The book is arranged in three sections. The first ("History") puts the social wasps in their phylogenetic context with chapters narrowing in from the Hymenoptera as a whole to "Paper Wasps and Vespines," with the final chapter focusing on the phylogeny of the Vespidae, the family containing almost all the eusocial wasps, and traits that influence sociality in this group.

Hunt introduces the second section ("Dynamics") by stating his belief that "many, perhaps most, of the mysteries of hymenopteran sociality might be resolved if investigators would 'follow the protein'." Unsurprisingly, the following chapters—"Individuals," "Colonies," and "Populations"—emphasize food and feeding and their effects on things such as the body size of the reared individuals. The final chapter in this section, "The Dynamic Scenario of Social Evolution," is perhaps the most important in the book because it presents what Hunt probably feels is his greatest contribution to the study of wasp evolution: a mechanistic scenario in which individuals in social groups forgo reproduction on the basis of traits involved in controlling the reproductive physiology of noneusocial wasps with two generations per year.

The third section ("Paradigm Lost—and Found?") completes the book. I am not sure whether it will prove to be usefully controversial and hence stimulate a debate, or whether it will simply be ignored because its stance is uncompromising—Hunt makes no attempt to build bridges. Inclusive fitness theory and behavioral ecology get little credit or sympathy, and perhaps not surprisingly, Hunt proposes his own "general conceptual framework to study sociality and a specific research agenda for the future study of hymenopteran social evolution."



Hunt dismisses the widely accepted idea that it is possible to profitably study both "how " and "why" questions in animal behavior, with the latter questions solidly in a subservient role: "Why questions, do, indeed, stimulate enquiry, but they should be used appropriately. They should be used to sketch out outlines of hypotheses. Those hypotheses then can be formalised, and rigorous tests can be designed to attempt falsification of those hypotheses. Those tests should be grounded in phylogeny and/or mechanisms. Once the data are in, they will address questions of how. Only then may interpretation (perhaps!) be couched in terms of why" (p. 193).

Important insights into reproduction, conflict, and conflict resolution within insect societies that have arisen from the application of inclusive fitness theory are not only dismissed or effectively ignored, they are also seen as likely to cause errors in judgment: "An investigator studying 'investment ratios' is narrowly constrained by preconceptions, whereas an investigator studying patterns of reproduction is less constrained. An investigator studying 'worker policing' will look for only a limited range of causes and explanations, whereas broader inquiry and interpretation are open to an investigator studying oophagy.… 'Oophagy' is a term reserved to science, and it has no use or implied meaning in human culture. Thus it can be studied in objective neutralism" (pp. 187–188). In fact, worker

policing, in which workers prevent each other from reproducing, is mechanistically diverse. Worker policing also consists of more than egg eating alone (occurring through aggression in some contexts), so anyone following Hunt's recommendation would actually be more, not less, narrowly constrained. On page 193 Hunt quotes a colleague as saying "the problem is not with the question; the problem is satisfaction with the answer!" Clearly, Hunt finds little satisfaction with the kinds of insights that inclusive fitness theory can provide, and little of value in "why" questions.

In conclusion, the book presents the evolution of social wasps from the viewpoint of a person who combines decades of experience in studying wasps with very clear views of what is and is not interesting to study, and how that study should be conducted. If Hunt had been a 17th-century physicist, he would have had no problem with Tycho Brahe, but he probably would have objected somewhere between Kepler and Newton.

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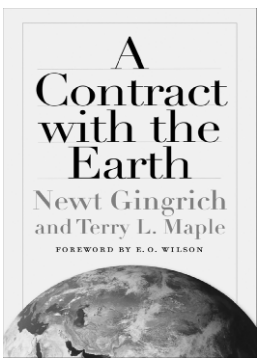
UNITING ENVIRONMENTALISM AND ENTREPRENEURSHIP

A Contract with the Earth. Newt Gingrich and Terry L. Maple. Johns Hopkins University Press, Baltimore, 2007. 256 pp., illus. $20.00 (ISBN 9780801887802 cloth).

Newt Gingrich, long known to have a soft spot for animals, has produced a short book in collaboration with well-known zoo director Terry Maple. *A Contract with the Earth*—named after the Republican Party's 1994 *Contract with America,* which Gingrich helped fashion—is their blueprint for how Americans should tackle the major environmental challenges that confront us.

It is news that the strategist behind the Republican takeover in the 104th Congress takes the environment seriously, and the book contains nuggets that surprise, such as the suggestion that there be a US government endowment for conservation. Not surprisingly, however, the book's policy prescriptions usually, but not always, tend to favor incentives, environmental markets, and entrepreneurial activity ("carrots") rather than command and control ("sticks"); experience tells us, I believe, that the strongest prescription is one that includes both elements.



Although Gingrich and Maple are to be commended for taking on the environmental predicament, the book tends to underestimate the challenge and the task of remedying the situation. Dismissive references to "doomsday scenarios," "doomsday visions," "doomsday environmentalism," and "doomsday theorists" are not necessary to their thesis but are nonetheless scattered throughout the book. Indeed, the authors seem not to appreciate that the real value of projections such as Paul Ehrlich's *Population Bomb* (Ballantine Books, 1970) is that they inspire activity that keeps those projections from becoming fulfilled predictions. It is discouraging that they still question the human role in climate change—even the Bush administration now concedes that human activities "very likely" cause global warming—but, fortunately, they do favor reducing carbon loading in the atmosphere, and they call for greater government funding for energy research. And the call for civil dialogue and bipartisan approaches could not be more on the mark. One can only applaud the notion that the "environment may become the world's most inclusive political issue."

I think the book's message would have been stronger had more attention been paid to US environmental history. The environmental achievements of the Clinton years—especially those of the Department of the Interior, but also NOAA and the Environmental Protection Agency—dwarf those of the current administration. Also, it would have been instructive and useful to sketch in the bipartisanship Gingrich and Maple correctly value. Witness the extraordinary legacy of environmental law and institutions from the Nixon and Ford administrations; this legacy and the accomplishments of Theodore Roosevelt's administration amply demonstrate that the environment and conservation are indeed part of a thoughtful conservative's agenda—as *A Contract with the Earth* emphasizes.

I suppose it is not surprising that a former politician—if there is such an animal—would write a book that resembles a stump speech in places, as it calls on the American people to muster good old American know-how and can-do. Of course, the environment certainly needs all that we can muster. Phrases such as "creating solutions for our emerging democratic neighbors," however, can be interpreted as condescending, which is unfortunate because some of the most pressing environmental problems—climate change and restoration of oceans' and fisheries' productivity, for example—require international collaboration of the highest order.

It is also clear that the book was issued in haste to appear in time for the current election campaign, with the inevitable result that substantial errors failed to be rectified. Carbon dioxide emissions from deforestation are not three times those from fossil fuels; rather, they are about 20 percent of the total (i.e.,

roughly one-fourth of fossil fuel emissions). Gifford Pinchot was head of the Forest Service, not the National Parks Service. If one focuses on the overall thesis of the book, however, these are not fatal flaws.

It would be easy to dismiss *A Contract with the Earth* on the basis of the deficiencies cited above, but that would be a mistake. A more serious flaw that cannot be overlooked, however, is the allegation of overstatement by science and media—the reality is that most environmental science has been objective, even if self-correcting, as science inevitably is. Still, it is fair to ask whether the world has been well served by an international scientific body—the Intergovernmental Panel on Climate Change—that has tended to underestimate problems. Yet even in this instance, I can only agree with Gingrich and Maple: there is a need for objective science and greater scientific literacy.

In the end, this is an important little book because its senior author is a prominent conservative who not only considers the environment a serious matter but also was willing to write about it with his longtime collaborator Terry Maple. It comes at a time when collaboration on these matters could not be more important.

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