eration can be just as demoralizing to a democratic polity as hasty and ill-considered action. For EPA or its successor agency, the real challenge of the coming decades will be to find the right balance between action and deliberation. The choices may well be more difficult than this book lets on, for environmental policy will continue to be made against a backdrop of sharply conflicting expectations. Let us not forget that Ruckelshaus's efforts to educate the citizens of Tacoma, Washington, about risk, an initiative the authors unqualifiedly applaud, was greeted on the editorial pages of the *New York Times* as the unbridled act of a Roman Caesar.

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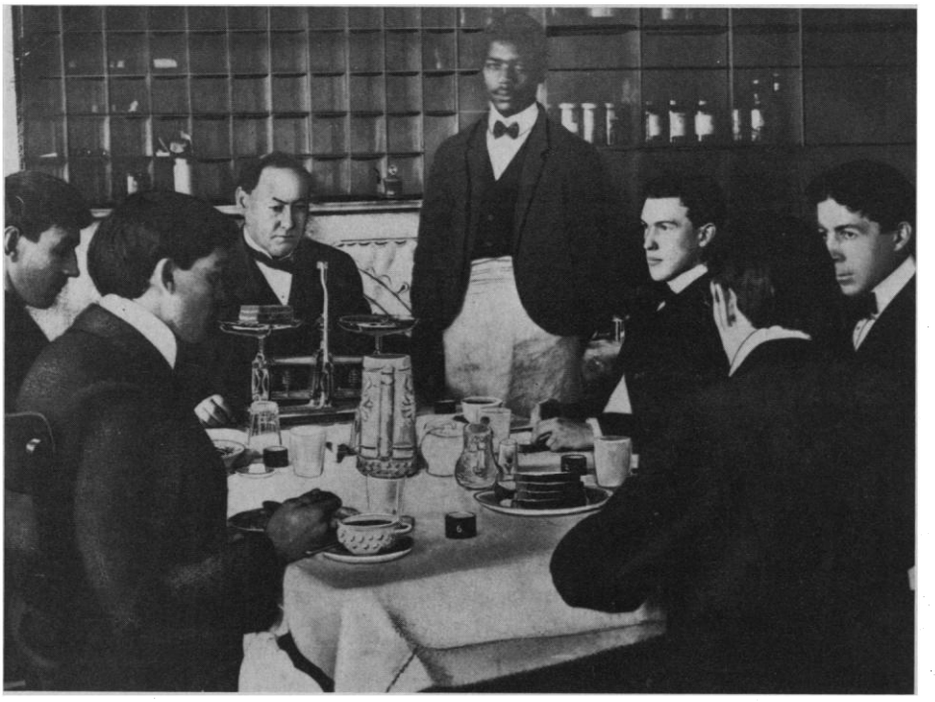
## A Move for Protection

**Pure Food**. Securing the Federal Food and Drugs Act of 1906. JAMES HARVEY YOUNG. Princeton University Press, Princeton, NJ, 1989. xiv, 312 pp. $29.95.

Given the controversies that continue to be generated by issues of food and drug quality, it is of interest to know how previous generations have dealt with such challenges. In *Pure Food: Securing the Federal Food and Drugs Act of 1906* James Harvey Young has interwoven themes from political history, the history of science, technology, and medicine, and economic history into a coherent account of the emergence of concrete and enforceable legislation aimed at protecting the public from "impure" food and drugs. Beginning with the passage of an 1848 law aimed at banning adulterated drugs imported into the United States and ending with the 1906 Food and Drugs Act and Meat Inspection Amendment, the book centers on a period during which America experienced sustained industrialization, urbanization, and professionalization. Scientific knowledge and expertise emerged as an important factor during this time, offering not only new solutions for societal problems, but also new problems, as in cases of food and drug adulterations that were most difficult to detect. Furthermore, the development of science-based technology after the Civil War led to new "synthetic" food products like glucose and oleomargarine, ultimately pitting farmer against manufacturer in the political arena. And as mass production and canning began to dominate the food industry, national, rather than regional or local, markets crystallized, setting the stage for federal government intervention and regulation.


Poster for the movie version of Upton Sinclair's *The Jungle*, "featuring Sinclair's castigation of the packers for their chemical manipulation of meat products." [From *Pure Food*; courtesy of Lilly Library, Indiana University, Bloomington]



"Harvey W. Wiley, chief chemist of the Department of Agriculture, dining at the 'hygienic table' with members of the 'Poison Squad' during his experiments testing food preservatives for safety." [From *Pure Food*; courtesy of the Food and Drug Administration]

The interplay of activists, popular writers, scientists, businessmen, and politicians in responding to these developments is at the heart of Young's story. While scientific works like Lewis Caleb Beck's *Adulteration of Various Substances Used in Medicine and the Arts* and Fredrick Accum's *A Treatise in Adulterations of Food* played a role, it was the vast amount of popular literature related to the problem, including articles written in the 1858 *Leslie's Illustrated Newspaper*, turn-of-the-century muckraker essays in *World's*

*Work, Ladies Home Journal, Colliers*, and *McClures*, and especially Upton Sinclair's *The Jungle*, that was decisive in bringing about reform. The key individual in the pure food and drug story, however, was neither a journalist nor a politician but U.S. Department of Agriculture scientist Harvey Washington Wiley, who in 1890 began to mobilize the scientific and medical communities, consolidate business interests, and bring together reform-minded journalists and women into a tight coalition that actively campaigned for federal regulation. Motivated by both self-interest and redirected religious impulses, Wiley proved instrumental in persuading Congress to move forward and provided scientific expertise at several critical junctures.

Yet after Wiley and his allies achieved victory in 1906 the chief chemist was only partly satisified with the result of his efforts, stating that "The bill is not as good as we should like it, but it is a splendid foundation on which to erect a more perfect structure in the future" (p. 271). Indeed, present-day critics point to insufficient enforcement procedures, inadequate numbers of personnel, and outdated analytical methods as major shortcomings of food and drug inspection. This 20th-century story awaits to be told with the thoroughness and the critical eye with which Young treats its antecedents. With its richness of detail, array of historiographical material, and critical insights, *Pure Food* should serve as a model for such scholarship.

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# Considering the Ants

**The Ants**. BERT HÖLLDOBLER and EDWARD O. WILSON. Belknap (Harvard University Press), Cambridge, MA, 1990. xiv, 732 pp., illus., + plates. $65.

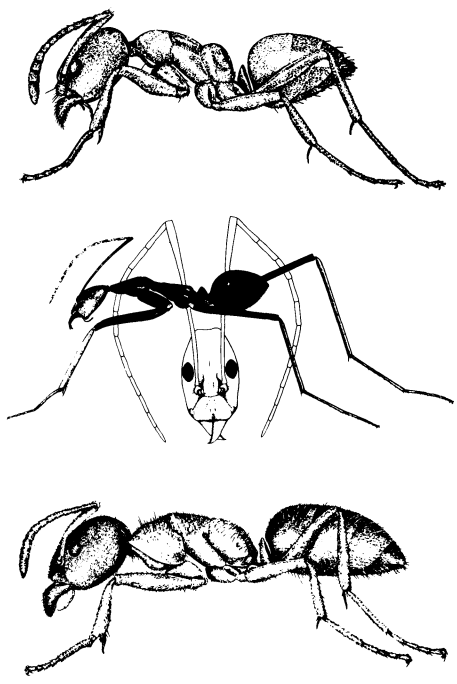
Exactly 80 years ago W. M. Wheeler published his classic book *Ants*, which has remained in print ever since, peerless and known as the ant bible. Now at last we have a new authorized version: *The Ants*. Coming after eight action-packed decades in which the study of ants has helped promote discovery in all aspects of organismic biology and their importance in almost all terrestrial ecosystems has been recognized, Hölldobler and Wilson's mighty tome will surely take its place among the greatest of all entomology books. The subject of the enterprise is a single family of insects. The result is a wonderful exploration of almost every ramification of evolutionary biology, from developmental biology to the structure of ecological communities. Hölldobler and Wilson remind us of August Krogh's famous maxim of biological research: for every problem there is an organism ideally suited to its solution. But actually the authors show that the more one knows about every aspect of the life of one's study organisms the better the biology. Their book is a testament to Darwin's insight that to really understand evolution we must dwell, at least in part, among the finest of fine details.

*The Ants*, like every great book and every ant colony, is much more than the sum of its parts. In writing the book Hölldobler and Wilson have remembered many simple lessons they probably learned in their childhoods. First, entomologists are entomologists because they like looking at insects (the illustrations—which include 24 color plates—in this book are lavish and detailed in the extreme). Second, entomologists remain entomologists because of the extraordinary diversity of their study animals (there may be 20,000 ant species on this planet). Third, many biologists never become entomologists because it can be hard to identify insects and the technical terms can be terminal.

Bearing such considerations in mind, Hölldobler and Wilson begin with not just keys to, but illustrations of, all the 297 known living genera of ants. This is a mammoth undertaking that required the authors to recruit the help of Barry Bolton of the British Museum (Natural History) and Robert Taylor of the Commonwealth Scientific and Industrial Research Organisation in Australia. In a book that does not contain a dull sentence even these keys are readily readable. Furthermore, in an age in which the earth's biodiversity is so vulnerable and uncharted it is an important statement, in itself, to begin with such a wholehearted testimonial to the fundamental importance of systematics.

The importance of myrmecology in biology throughout this century is seen in such diverse concerns as allometry in morphogenesis, the role of kin selection and communication in social behavior and evolution, and the importance of competition as a force that structures ecological communities (as exemplified by territoriality and character displacement). At least one chapter of this huge book is dedicated to each of these topics. The chapter on communication, in particular, shows how far evolutionary biology has progressed in the last few years. Previous reviews of communication in ants have been largely based on a catalogue of chemicals found in the pheromone signals ants send one another. Now Hölldobler and Wilson combine their talents to consider the ethology and evolutionary biology of communication in a quantitative, theoretical framework. As a result we are on the verge of a theory of the syntax of ant communication. Each chapter provides a thorough and largely up-to-date literature review spiced with wit and wisdom. A favorite example of a humorous calculation that provides serious insight is that one milligram of the trail substance of the leafcutting ant, *Atta texana*, if laid out with maximum efficiency, would be enough to lead a colony three times around the world.

Hölldobler and Wilson are advocates of what they call a bottom-up approach. They are not just referring to the natural posture of the ant collector but to the need to observe and understand how ants are behaving, organizing their lives, and making a living before attempting to generalize about, for example, competition and community structure. This ongoing need for careful observations in the field coupled with experimentation in field and laboratory is surely of paramount importance. Only after such studies should one venture an interpretation of adaptations within the context of constraints imposed by the animals' phylogenetic history.



Three genera of the subfamily Dolichoderinae as represented in *The Ants*. Top to bottom, *Iridiomyrmex*, *Leptomyrmex*, *Lometopum*.