PREFACE

The Jerome and Dorothy Lemelson Center for the Study of Invention and Innovation, based at the Smithsonian's National Museum of American History, was founded on the simple belief that history matters. It is our mission to enhance public understanding of the creative processes involving invention and innovation and to examine these processes in a broad historical context. Guiding all our activities, from symposia and museum exhibits to school programs and book projects like this, is the conviction that historians and innovators have much to learn from each other. We believe that if we bring these two groups together in an informed dialogue on issues of common interest, significant and unexpected findings will emerge.

This strategy seemed particularly appropriate in the case of environment-related inventions, where so much of current practice is based on assessments of past conditions and patterns of change. When we began to explore environmental topics, we were struck by the increasing role, since the nineteenth century at least, of innovative technologies and methods, including the invention of whole new fields such as public health and industrial ecology. In addition, environmental activities are complex and inherently collaborative, involving contributors from many different fields, unified in a common goal of improving the human condition. Coming to grips with such a complex set of activities and approaches requires a broad interdisciplinary perspective. Hence, this volume draws upon the expertise of a wide variety of specialists, including environmental, science, technology, and business historians as well as engineers, scientists, public health experts, architects, and town planners. The subject of invention provides the unifying theme, highlighting contributions from the creative fronts of disparate disciplines.

The main questions raised in this volume grew out of a year-long interdisciplinary program series sponsored by the Lemelson Center in 1998 with

generous support from the Lemelson Foundation and AT&T, which also collaborated with us in the organization of these events. Throughout that year, we addressed questions about how invention may help—or sometimes unintentionally harm—the environment, recognizing from the outset that inventions are not socially neutral. In addition to issues of benefit and detriment, we considered the implied social arrangements of environmental inventions that promote the status quo or seek to forge a new order. Advocating the use of solar energy or alternative building materials like straw bales, for example, carries with it a call to restructure society as presently conceived. Siting photovoltaics on rooftops and making each home its own power plant eliminates the need for centralized generation and distribution of electricity, thereby providing enormous flexibility in housing patterns. The New Town phenomenon, both today and in the past, predicates a new community paradigm on environmental innovation. Even technologies that improve existing ones, like catalytic converters that make cars more fuel efficient and less polluting, have a broad range of consequences, from the larger economic effects of retooling factories down to the transportation choices made by individual commuters. Inventing for the environment, therefore, includes changing not only technology but also the day-to-day way of life of millions of people. We defined "the environment" in the broadest sense—in terms of the interaction of humans and "nature"—arguing that it is impossible to separate human from natural systems. It is this synthetic approach that guides this volume.

The authors were drawn from the lecture series, the symposium, and the historical tours that were offered by the Lemelson Center. Each part of the book focuses on a question about applying invention to environmental issues. In an attempt to answer these questions, each part features two essays, one by a historian and the other by a practitioner, designed to present a balanced dialogue between history and current practice. The "Portraits of Innovation" highlight individuals whose inventive energies have made significant improvements in the environment.

The essays represent what we believe to be among the most innovative areas of current environmental practice. They explore topics in environmental history, issues of public policy, and examples of technological innovation to question how inventions have affected and can affect the environment. Each aims to take an innovative approach to understanding the interconnections of human and natural systems. Thus, the contents of the book lead from discussions of nature itself, through the built environ-

ment, to more specific technologies in such areas as public health and energy. To bring these ideas together, we conclude with an examination of applications of the principles of industrial ecology.

Mixing practitioners and historians is the key, since, as has already been noted, the very concept of the environment is deeply embedded in time and change. Statements about the environment are inevitably teleological and relative, measuring present and future conditions against the past. Advocacy positions, both for and against specific environmental policies and reforms, typically invoke the authority of historical precedent. Defenders of the automobile, for example, point out that the internal-combustion engine, for all its harmful effects on the air we breathe, actually helped to improve urban environments, previously befouled by horses. Champions of alternative energy sources call our attention to neglected stories of roads not taken in such technologies as wind, solar, and tidal energy. Historical examples can provide significant lessons for the present, sometimes even leading to the rediscovery of an old technology, as in the revival of strawbale construction described in one of our essays. As it explores the history of "inventing for [the benefit of] the environment," it is hoped that this book will indeed put the past to use for the common good.

For some time now, the specialty of environmental history has been a growth industry within the field of history, but the role of invention in that story is still relatively unexplored. When technological invention is introduced, it is often with reference to technogenic problems, such as those associated with nuclear energy or the internal-combustion engine; if offered as a solution, it is usually in the simplistic terms of the technological fix. Rarely has it been examined critically or from multiple perspectives. Perhaps one reason for such one-dimensional interpretations is that invention itself has been viewed too restrictively as a gadget-based approach to technological improvement. When the definition of invention is broadened to include not only mechanical devices but also complex innovative processes of all sorts, social as well as technological, the possibilities expand dramatically.

Despite the interdisciplinary nature of the subject, studies of the environment that cut across disciplinary lines are still relatively rare. The majority of books in both environmental studies and environmental history deal with a single facet of technological or social studies. For example, books on alternative energy sources or the conservation movement abound. In contrast, *Inventing for the Environment* fills a need to cross specialists' boundaries,

bring together a range of expertise, and assess the relationships among technologies and philosophies.

The diverse perspectives represented in this book suggest a sense of integration and unification that forms an ecological mindset once popularly known as holism. Not only must the relationship between technology and the natural world be looked at holistically; as Richard White and Steven Pyne argue, this must be done with a recognition that there may be no distinction between the natural and the artificial, between nature and human culture, in the first place. Simply put, technology is not separate from nature. History shows that the distinctions that humans and societies draw between the two are themselves cultural artifacts that have often been politically and ideologically based. But, as a number of papers in this volume argue, once the porosity of the boundary is admitted, all kinds of inventive possibilities open up. Rejecting bipolar concepts of nature and culture can allow for more interesting, seemingly paradoxical strategies, such as those offered by the new field of industrial ecology. Most of all, the integration of nature and technology widens the field of play for the creative imagination, encouraging inventive solutions that view technological society in the broadest ecological terms—and that is what *Inventing for the Environment* is about.

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