

BECOMING GOOD ANCESTORS



HOW WE BALANCE
NATURE, COMMUNITY,
AND TECHNOLOGY

David Ehrenfeld

BECOMING GOOD ANCESTORS

HOW WE BALANCE NATURE,
COMMUNITY, AND TECHNOLOGY

David Ehrenfeld

OXFORD
UNIVERSITY PRESS

2009

OXFORD
UNIVERSITY PRESS

Oxford University Press, Inc., publishes works that further
Oxford University's objective of excellence
in research, scholarship, and education.

Oxford New York

Auckland Cape Town Dar es Salaam Hong Kong Karachi
Kuala Lumpur Madrid Melbourne Mexico City Nairobi
New Delhi Shanghai Taipei Toronto

With offices in

Argentina Austria Brazil Chile Czech Republic France Greece
Guatemala Hungary Italy Japan Poland Portugal Singapore
South Korea Switzerland Thailand Turkey Ukraine Vietnam

Copyright © 2009 by Oxford University Press, Inc.

Published by Oxford University Press, Inc.
198 Madison Avenue, New York, NY 10016

www.oup.com

Oxford is a registered trademark of Oxford University Press

All rights reserved. No part of this publication may be reproduced,
stored in a retrieval system, or transmitted, in any form or by any means,
electronic, mechanical, photocopying, recording, or otherwise,
without the prior permission of Oxford University Press.

Library of Congress Cataloging-in-Publication Data
Ehrenfeld, David.

Becoming good ancestors : how we balance nature, community,
and technology / David Ehrenfeld.

p. cm.

Rev. ed. of: *Swimming lessons* / David Ehrenfeld. 2002.

Includes bibliographical references and index.

ISBN 978-0-19-537378-3 (pbk.)

1. Human ecology. 2. Nature—Effect of human beings on.
 3. Environmental degradation. 4. Civilization, Modern—21st century.
 5. Technology—Social aspects. I. Ehrenfeld, David. *Swimming lessons*. II. Title.
- GF49.E47 2009 304.2—dc22 2008007199

This book includes material previously published in the author's
Swimming Lessons (Oxford University Press, 2002).

1 3 5 7 9 8 6 4 2

Printed in the United States of America
on acid-free, recycled paper

CONTENTS

| | |
|---|------|
| <i>Preface</i> | ix |
| <i>Bookmap</i> | xiii |
| | |
| <i>Part 1. In Search of Honesty</i> | |
| Pretending | 3 |
| Brainstorming Has Its Limits | 18 |
| Nothing Simple | 22 |
| The Comforts of Fantasy | 27 |
| | |
| <i>Part 2. Keeping Track of Our Losses</i> | |
| Rejecting Gifts | 37 |
| The Uses and Risks of Adaptation | 42 |
| When Machines Replace People | 47 |
| Pseudocommunities | 51 |
| Obsolescence | 58 |
| Accelerating Social Evolution | 63 |
| Writing | 69 |
| | |
| <i>Part 3. Toward a Sustainable Economics</i> | |
| Affluence and Austerity | 77 |
| Energy and Friendly Fire | 82 |

| | |
|--|---------|
| Durable Goods | 87 |
| Preserving Our Capital | 91 |
| Conservation for Profit | 97 |
| Hot Spots and the Globalization of Conservation | 106 |
| Putting a Value on Nature | 121 |
| The Downside of Corporate Immortality | 127 |
| <i>Part 4. Relating to Nature in a Human-Dominated World</i> | |
| Wilderness as Teacher | 137 |
| An Opposing View of Nature | 141 |
| Death of a Plastic Palm | 147 |
| Scientific Discoveries and Nature's Mysteries | 151 |
| I Reinvent Agriculture | 157 |
| Thinking about Breeds and Species | 163 |
| Strangers in Our Own Land | 169 |
| Teaching Field Ecology | 176 |
| The Ubiquitous Right-of-Way | 181 |
| A Walk in the Woods | 186 |
| Old Growth | 190 |
| Intimacy with Nature | 196 |
| <i>Part 5. Restoring the Community</i> | |
| The Utopia Fallacy | 203 |
| Traditions | 210 |
| Jane Austen and the World of the Community | 216 |
| Universities, Schools, and Communities | 222 |
| What Do We Owe Our Children? | 229 |
| Epilogue: A Call for Fusion and Regeneration | 240 |
| <i>Notes</i> | 259 |
| <i>Credits</i> | 291 |
| <i>Index</i> | 293 |

PREFACE

It was a fine, late summer day, and my wife and I were sitting in a pontoon boat moving upstream on the Hackensack River through the marshes of the Jersey Meadowlands. Fish were jumping. Manhattan was only five miles away to the east, across another river, the Hudson. The purpose of the trip was to see birds. We had passed a multitude of them, including snowy and great egrets, great blue herons, double-crested cormorants, greater and lesser yellowlegs, assorted seagulls, northern harriers, and a single Caspian tern, with its bright red beak. As our boat glided under a highway bridge, someone shouted, "Look!" There, sitting on a concrete bridge support not far above our heads was a large, female peregrine falcon, watching us calmly. Nearby, on other beams under the bridge, were two more peregrines, a male and another female.

Why begin my preface with this anecdote? Because a half-century earlier, the river was filthy, there were almost no fish in it, the only birds were seagulls feeding on garbage and hawks eating rats at the many dumps near the river, and the peregrine falcon was well on its way to what seemed certain extinction. Then, a fortuitous combination of events and people turned the situation around. The U.S. Clean Water Act eliminated unregulated garbage dumping. Andy Willner, of the American Littoral Society, started the New York/New Jersey Baykeeper;

and Bill Sheehan gave up his safe job as a cab driver and dispatcher to start the Hackensack Riverkeeper. These organizations mobilized concerned citizens throughout the regional watershed and became powerful forces to ensure that conservation gains were preserved. Meanwhile, Derek Ratcliffe, chief scientist of Britain's Nature Conservancy Council, discovered that DDT was the cause of the decline of the peregrines and other hawks and eagles, ultimately leading to widespread banning of the pesticide. And in the United States, Tom Cade, of Cornell, began an emergency program to release captive-reared peregrines into the wild. In 1974, when he released his first falcons, there were fewer than forty pairs nesting in the lower forty-eight states. By 1999, the number of nesting peregrines had grown to more than two thousand, and the bird was removed from the endangered species list. Nature is resilient if we give it a chance.

Victories like these are a true cause for celebration. But they are all too infrequent, occurring only when highly specific, defined problems have equally specific and defined solutions—regulate garbage dumps and other point sources of pollution; form effective, local nonprofit organizations to monitor local habitats and lobby for their protection; ban the use of toxic chemicals that are persistent in the environment; and breed replacements for the animals that the chemicals affected. Unfortunately, most of our problems these days are not so simple to understand or straightforward to solve, and they are growing in severity and number.

The complex interactions among society, technology, and the natural world in the twenty-first century may seem beyond our comprehension, yet there are underlying, destructive patterns that we can grasp. Some of them are: retreat from reality, alienation from nature, unthinking acceptance of new technology and rejection of the old, loss of our ability to discriminate between events we can control and those we cannot, denial of noneconomic values, and the disempowerment of local communities.

Becoming Good Ancestors is an examination of these destructive patterns through down-to-earth examples, and a discussion of how we can use what we learn to move ourselves and our society toward a more stable, less frantic, more responsible, and far more satisfying life. A life in which we are no longer compelled to damage ourselves and our environment. A life in which our parents and our children have a future. A life in

which we hear more truth than lies. A life in which fewer species are endangered and more rivers run clean.

Such goals are not utopian pipe dreams. As the example of the Hackensack River and the peregrines shows, our society has an inherent sense of what is right and the creativity and persistence to make good things happen. It is now time to apply our intelligence guided by our moral judgment to the very largest difficulties we all face. We are in the eye of the future and should behave accordingly.

This book is an expanded, extensively revised, and updated version of my book *Swimming Lessons*, published in 2002. The chapters in *Swimming Lessons* first appeared as “Raritan Letters” in *Orion* magazine, and I thank *Orion* for giving me permission to reprint them. My editor at *Orion*, Aina Barten, worked with me on all of the Raritan Letters, providing her invaluable critical judgment of both the literary style and the content of what I had written. Emerson Blake, then the managing editor at *Orion*, was also immensely helpful and supportive.

My present editor at Oxford University Press, Peter Prescott, first suggested that I should turn the original book into something new, with greater cohesion and sharper focus—a book that would meet the real needs of the twenty-first century. And it was Peter who, with kindly but pointed criticism, prompted me to revisit every sentence and every claim in the older book, in a rewriting that took far longer than I had first anticipated. I thank him for his wisdom, his confidence, and his endurance.

Many people have helped and inspired me in my work. I am especially grateful to my friends Wendell Berry, David Orr, and Wes Jackson, undergraduates too numerous to name, and my present graduate students Kristi MacDonald-Beyers and Joe Paulin. I also thank professor Kristen Conway-Gómez and the other faculty and students in the First Year Experience course at California State Polytechnic University, Pomona, for their insightful criticisms and suggestions.

As the readers will discover, my ideas are inseparable from my life and experiences, and this means inseparable from my children: Kate and her husband Dan, Jane and her husband Michael, Jon, and Sam. They are woven into my stories as they are woven into my existence, both of which are enriched beyond my power to thank or describe. And as they grow older, I have found their comments about what I

have written increasingly valuable. They have suggested new sources, criticized my ideas, helped me rewrite paragraphs that didn't work, ruthlessly deleted sections they didn't like, and laughed at me when they felt it was necessary. Rarely can a parent have been blessed by so much wisdom and love from his daughters and sons. No doubt they take their cue from their mother, Joan, my companion and guide for thirty-eight years. Joan, a distinguished ecologist, has read and improved every sentence of this book. Her love and care have supported me throughout its creation.

Needless to say, with friends and family like these, the only parts of *Becoming Good Ancestors* that are exclusively mine are any errors that may have remained.

New Brunswick, New Jersey
January 2008



BOOKMAP

This book has been twenty years in the making, piece by piece, and for more than half that time I didn't know it was going to be a book. Not surprisingly, the parts of the book fit together the way the parts of a life fit together—the connections are not necessarily obvious even though there are underlying themes that run throughout. I expect that my readers will want to know where they are headed in the pages that follow, so here is the bookmap for *Becoming Good Ancestors*.

The first section, “In Search of Honesty,” continues an idea that I developed in my earlier book, *The Arrogance of Humanism*. The idea is that although we humans can use our unique brains and rational powers to create and do remarkable things, we can't do everything; not all limits we face are temporary. But the incredible successes of some of our inventions—from laptops to kidney transplants—have blinded us to the failures of others; the “Star Wars” missile shield and our indiscriminate use of genetic engineering in agriculture are but two examples. We pretend that we can brainstorm and invent our way out of every fix without making any fundamental adjustments in our lives. This is a fantasy. As long as we are honest with ourselves and recognize the difference between fantasy and reality, fantasy can help us find solace from harsh realities. When fantasies govern our actions, we forfeit control over our lives.

“Keeping Track of Our Losses,” the second section, is a response to a world changing so rapidly that it is easy to lose sight of the things that have worked well in the past yet have been swept aside in the tsunami of what is called progress. Of course we can say good riddance to many of the evils in the lives people lived one hundred years ago, but can we afford to forget all the social inventions and practical ways of living that have helped us survive up to this point? Here I describe precious features of our former life that are disappearing—stability in the workplace; the ability to take time to make important decisions; the joy of maintaining deep relationships with people who are physically close enough to be seen, heard, and touched; the pleasure of reading the great and lesser works of our literature and being able to write in a way that does credit to our remarkable language. And I cast light on the dark mechanisms that help us forget them—ready adaptation to conditions that we ought to resist; galloping obsolescence that destroys perfectly useful inventions; and the increasingly rapid development of electronic substitutes for human beings. If we are aware of what we are losing and why we are losing it, we have a better chance to halt and reverse the cultural erosion that is taking place around us.

Part 3, “Toward a Sustainable Economics,” is an account of what happens to us and to our environment when we translate all of our values into economic terms and subordinate all of our decisions to techno-economic imperatives and the ethics of globalization and growth. This is a wide-ranging section of the book—it goes from tuna-fishing fleets to Chinese turtle and tiger farms to corporations that live forever and seem beyond the law; from Baffin Island to Lenapehoking (now New Jersey) to the Venezuelan rain forest. Economics has stopped being practical, if it ever was, and has lost touch with the world we live in. When economic beliefs and practices are dissociated from their effects and consequences, and the feedback that fosters positive change disappears, bad things happen. If we stop looking at everything solely through an economic lens, it is much easier to see what we have to do.

“Relating to Nature in a Human-Dominated World,” part 4, has more chapters than any other part of the book, yet it is least in need of a bookmap. I think that the unifying themes are simple and evident: First, we need regular, frequent, informal contact with nature to keep ourselves and our world healthy, but modern life increasingly walls us

(especially our children) off from the living environment. Second, despite the amazing discoveries of our science and the more amazing claims of its publicists, many of nature's workings remain a mystery to us. Third, there are many ways to reconnect with nature. Fourth, nature can and usually does regenerate by itself if you let it; our substitutes for nature don't. And fifth, nature presents a parade of fascinating surprises. A few of the surprises that I discuss are: thousand-year-old black spruce trees in Quebec that are little more than a foot tall; a six-hundred-pound female Alaskan grizzly bear ordering her two cubs to stay away from a terrified hiker who has fallen down a few feet from her path; huge Louisiana alligators that, in the nineteenth century, refrained from attacking the little boys who often swam next to them and pelted them with mud for fun; and English lime (linden) trees that won't spread to apparently suitable parts of the countryside adjacent to their present stands if these adjacent areas are outside the boundaries of what once were the Neolithic forestlands where lime trees used to grow.

The last section, "Restoring the Community," is neither a hearkening back to good old communities that never existed nor an anticipation of utopian communities that never will exist. Rather, it is a recognition (perhaps prediction would be a better word) that in a world constrained by growing shortages of energy and raw materials, and fractured by the breakdown of globalization, local communities will regain a good deal of their former importance. In other words, local communities will be coming back, like it or not, and it will be greatly to our advantage if we learn the elements that make them good places in which to live, places that reconcile human freedom and responsibility in harmony with the environment. We also need to learn how to avoid or ameliorate those elements that can make local communities terrible. This is not going to be an easy task, and it certainly will be done in many ways, according to circumstances. There is no single blueprint for community restoration. However, we can be aware of the place of traditions; we can try to identify the social mechanisms that stabilized communities in the past; we can learn how to make our schools and universities more responsive and useful to the neighborhoods around them; and we can discover how to raise children who will be assets to their communities. Throughout the section on "Restoring the Community," and in the sections before it, my

arguments are tied to one central assumption: The way we behave and the values we espouse are at least as important for repairing the world as the plans we make for improving the future. Finally, in the epilogue, I explore those tenets of conservative and liberal philosophies that will have to be brought together if community, national, and planetary restoration is to succeed, and I look at some early, practical ways in which this is being accomplished.

There is a great deal of overlap among the five sections: for example, nature and ecology appear throughout the book. The themes of these sections are related; they are all part of a larger whole, my vision of what we have to know and have to do to make our way of life sustainable, deeply enjoyable, and fulfilling—a life that will make us good ancestors for our descendants.

The vertigo of the twentieth century needs no permission of yours or mine to continue. The tornado has not consulted any of us, and will not do so. This does not mean that we are helpless. It only means that our salvation lies in understanding our exact position, not in flattering ourselves that we have brought the whirlwind into being by ourselves, or that we can calm it with a wave of the hand.

Thomas Merton, "A Letter to Pablo Antonio Cuadra
Concerning Giants"

This page intentionally left blank

ONE

IN SEARCH OF HONESTY

Never has failure been so ardently defended as though it were success.

John Ralston Saul, *Voltaire's Bastards*¹

This page intentionally left blank

PRETENDING

For as high as [the ostrich's] body is, yet if they thrust their head and neck once into any shrub or bush, and get it hidden, they think then they are safe enough, and that no man seeth them.

Pliny the Elder, *Natural History*¹

My earliest memory—was I two? three?—is of a nurse or babysitter who was dressed in white and had a bad smell. When she came into my room, I would pretend to be asleep. She looked down at me (I could sense her presence), then, satisfied by my closed eyes and quiet, if shallow, breathing, would turn and leave the room. Soon her odor would go away, too, and I could breathe deeply again. This taught me a lesson of dubious value: when helpless in a situation, pretending can give you power. A small, weak child, I had controlled the movements of an enormous, smelly adult. It was some time later, I suppose, when I learned that pretending usually doesn't work. Although I can't recall the time or place, I know that on one grim day of disillusionment and reckoning I discovered that when I closed my eyes I didn't become invisible; I couldn't transport bullies to distant, foul places by imagining them there or alter the course of unwelcome events by pretending they were otherwise.

Healthy children come to know the difference between pretending that is relaxing, stabilizing, healing, necessary—we call it fantasy—and pretending that is dangerous. A hot fire burns, even if we pretend that it

won't. In our personal lives most (but unfortunately not all) of us learn to instantly distinguish harmless from harmful pretending so that we do not pretend in a way that endangers our lives or physical well-being.² Strangely enough, this discrimination does not seem to apply to many common beliefs that we share within our society. For at least the past fifty years, probably longer, we have been working hard as a high-tech civilization to ignore the limits of safe pretending.³

To be fair to ourselves, our pretending is not exactly of the childhood fantasy variety—it is not derived from magical thinking, like the remarkable abilities of Harry Potter or the superhuman destructive powers granted to the players of electronic video games. Instead, our pretending springs from very real, solid beginnings, and this is what makes it so difficult to recognize and to control. When reality transitions seamlessly into pretending, and when both are certified by experts as true, how do we know where to draw the line?

In the next few pages, I give three case studies of this most dangerous kind of pretending, in which the initial reality camouflages the subsequent fantasy: genetic engineering in medicine and agriculture, the use of scientific models to predict future events, and the “Star Wars” research to develop ways of shooting down incoming enemy ballistic missiles. Although superficially dissimilar, these case studies have a number of features in common. There is an initial, well-intentioned, even benevolent goal that no right-minded person could reject—curing all genetic diseases and ending world hunger; predicting how long our beach stabilization measures or nuclear waste storage facilities will remain effective and safe; preventing the annihilation of cities by nuclear-tipped warheads loosed by a rogue power. In each case, there have been enough successes or partial successes to give some credence to our hopes. And in each it is finally a few of the experts themselves who say, “Enough! Our pretending is causing real damage, and it’s time to stop.”

The first case study is genetic engineering. In my last year of college, I was fortunate to have as one of my teachers a visiting professor from England, Francis Crick of Watson and Crick fame, who taught part of an upper-level biochemistry course on the structure and function of macromolecules, especially deoxyribonucleic acid, or DNA. Those were exciting days. Crick, a master teacher, explained his and Watson’s model of DNA with brilliant clarity. The structure of DNA, the

sequence of its four kinds of component molecules (bases), was like a book, in that it contained information that was then copied into a sister molecule, RNA. RNA, in turn, used this information to direct the synthesis of the many different proteins that formed or helped to synthesize all the molecular parts of the cell. This was the “central dogma” of molecular biology: DNA makes RNA makes protein. Genes are made of DNA, and the genetic “code” of the DNA molecule, it appeared, is the same for all organisms—plants, animals, microbes. Decipher the DNA code of one, several, or perhaps all the genes of a species, and the possibilities for manipulation and control of the growth, metabolism, form, and behavior of that organism are limitless. At least that’s what we believed.

In the 1960s and ’70s, the central dogma gave birth to the new field of genetic engineering. At the core of genetic engineering was transgenics, the semicontrolled transfer of genes from one individual to another, even across species boundaries. In the decades that followed, bacterial genes were moved into corn and soybeans; goats were engineered to express the silk-making genes of spiders; human genes were transferred to sheep, pigs, salmon, and other creatures. Genes have been deleted, added, and, to some extent, modified to achieve the desired results. The very nature of a species and the boundaries between species have come to be seen, at least to uncritical eyes, to be as malleable as soft clay. Genetic engineering, as portrayed by many of its practitioners and believed by much of the lay public, appears to have a limitless potential to modify humans and other life forms in desired directions—to cure most major diseases, to improve physique, to raise IQ, to overcome the limits of the most basic biological processes (such as photosynthesis), and to alter for the better any other biological attribute seen as undesirable. The student genetic engineering club at my college calls itself “Designer Genes.”

Yet such claims fall far short of reality. Despite the enormous popular enthusiasm whipped up by the press and the financial markets, only a small proportion of the simplest possible genetic manipulations among the many that have been tried have worked at all. And many of these have turned out to be disappointing, dangerous, or both. The central dogma concerning the importance of DNA remains largely true, and its discovery is rightly celebrated as one of the greatest feats of

twentieth-century science, but the precise control attributed to it is mostly imaginary. It has become increasingly apparent that DNA is only a part of the story—itsself subject to other regulating and modifying influences in the cell, influences that we dimly understand. Rather than being at the top of a simple linear chain of command, the DNA of the gene should be seen as one piece of an interacting complex of regulatory systems and feedback loops, with no single element “running” the cell, let alone the entire organism.

Richard Lewontin, a senior molecular biologist at Harvard and a member of the U.S. National Academy of Sciences has said: “The bottom line is that life in all its manifestations is complex and messy and cannot be understood or influenced by concentrating attention on a particular molecule of rather restricted function.”⁴ Nowhere is this wisdom more studiously ignored than in the claims and promises of genetic engineers that our knowledge of the sequence of the human genome will lead to cures of most diseases. Lewontin has commented frankly about these claims:

Unfortunately, it takes more than DNA to make a living organism. . . . According to the vision [of the genetic engineers], we will locate on the human chromosomes all the defective genes that plague us, and then from the sequence of the DNA we will deduce the causal story of the disease and generate a therapy. Indeed, a great many defective genes have already been roughly mapped onto chromosomes and, with the use of molecular techniques, a few have been very closely located and, for even fewer, some DNA sequence information has been obtained. But causal stories are lacking and therapies do not yet exist; nor is it clear, when actual cases are considered, how therapies will flow from a knowledge of DNA sequences.⁵

Why are the hopes of the public being raised so recklessly? There are many reasons, of course, including the unrealistic expectations that the public has of scientists. But I do not think it is cynical to cite another motive. I quote Lewontin again from the same reference: “No prominent molecular biologist of my acquaintance is without a financial stake in the biotechnology business.” Sheldon Krinsky, a bioethicist at Tufts

University and former member of the National Institutes of Health Recombinant DNA Advisory Committee, has carefully documented the spectacular increase in recent years in the number of academic biotechnologists who are on the boards or scientific advisory committees of or own stock in the for-profit companies that are supporting their research. Krinsky asks:

Can this pattern of behavior continue without any detriment to science? An editorial contributor to the *Journal of the American Medical Association* wrote: "When an investigator has a financial interest in or funding by a company with activities related to his or her research, the research is lower in quality, more likely to favor the sponsor's product, less likely to be published, and more likely to have delayed publication."⁶

The British molecular biologist and biophysicist Mae-Wan Ho has described the biological reasons that underlie the multiple failures and dangers of genetic engineering and related technologies such as cloning. In her very important and lucid book *Genetic Engineering: Dream or Nightmare?* Ho explains some of the biological challenges to genetic engineering. They include the instability of transgenes, overlapping genes, gene amplification and inactivation, environmentally induced changes in gene expression, inheritance that does not involve the DNA code, and even, possibly, the inheritance of acquired characteristics. She asks: "Would anyone think of investing in genetic-engineering biotechnology if they knew how fluid and adaptable genes and genomes are? The notion of an isolatable, constant gene that can be patented as an invention for all the marvellous things it can do is the greatest reductionist myth ever perpetrated."

In other words, the idea that these patented transgenic organisms (and there are now many) are genetically stable and capable of performing consistently as desired for long periods of time and through many generations, like a patented machine, is not biologically warranted. Ho also carefully evaluates the hazards of genetic engineering, particularly the increased risk of spreading antibiotic resistance among disease organisms and human and animal populations, and the risk that gene-transfer technologies will create new varieties of virulent pathogens. Citing the

molecular geneticist Joe Cummins, Ho pointed out that “the powerful promoter from cauliflower mosaic virus, which is routinely used to drive gene expression in transgenic plants is closely related to the human hepatitis B virus and also has sequence homologies to human retroviruses such as the AIDS virus,” and she warned that “two kinds of potential hazards can be envisioned: the reactivation of dormant viruses, and recombination between the CaMV promoter and other viruses . . . to generate new super-infectious viruses or viruses with a broadened host range.”⁷

Genetic engineers have not reacted kindly to Ho’s book. For example, in 2002, the genetic engineer M. Tepfer criticized Ho’s fears of the CaMV promoter as “implausible”; yet in a 2004 paper, Tepfer and his colleagues admitted that “the multiple complexities and uncertainties involved in this work introduce an element of risk that cannot be ignored.”⁸

In a well-documented case, the risks of creating genetically modified organisms were proven to be very real. At the Cooperative Research Center (CRC) for the Biological Control of Pest Animals and the John Curtin School of Medical Research at the Australian National University, both in Canberra, researchers produced a genetically altered mousepox virus designed to control rodent populations in Australia. To their horror, the recombinant virus wiped out all the experimental animals, even those that had been vaccinated against it. The leader of the research team, CRC director Bob Seamark, said: “This is the public’s worst fears about GMOs come true. . . . We . . . had shown that a commonly used technique could overwhelm resistance and render vaccination useless.” Anabelle Duncan, a former head of the United Nations inspectors in Iraq and chief of molecular scientists at Australia’s Commonwealth Scientific and Industrial Research Organization (CSIRO) commented: “This shows that something we had thought was hard—increasing the pathogenicity of a virus—is easy.” The only positive aspect of this terrifying episode is the honesty and public-spirited behavior of the scientists who conducted the research.⁹

The Australian researchers destroyed the deadly recombinant mousepox virus before it could escape to the outside environment. Unfortunately, because of the enormous number of recombinant organisms being tested by many laboratories in many venues, genetic hazards are not always discovered in time. In the so-called ProdiGene Incidents,

corn engineered by a small Texas company to produce drugs for diabetes and diarrhea contaminated soybean fields in Iowa and Nebraska, as well as a Nebraska grain elevator. The U.S. Department of Agriculture ordered the 500,000 bushels of contaminated soy in the grain elevator destroyed, and 155 acres of contaminated fields in Iowa burned. The Grocery Manufacturers of America, speaking for an alarmed food industry, called for a moratorium on food crops genetically modified for drug production, pending strict government regulation.¹⁰ But even the limited safety protocols that are in place are not necessarily followed.¹¹

Some biotechnologists are scrupulously honest about the implications of their work. For example, in an article in the March 30, 2001, issue of *Science*, MIT's Rudolf Jaenisch and the Roslin Institute's Ian Wilmut (the cloner of Dolly) described the "drastic defects that occur during development" and the "high failure rates" that are part and parcel of the cloning of mammals; and they warn that the cloning of humans would be "dangerous and irresponsible," and will remain so for the "foreseeable future."¹² But these scientists may be exceptions. Commenting on biotechnology's frantic rush to create new organisms, Ho writes, "What the public is up against is a selective blindness to evidence among the genetic engineers and a single-minded commitment to look solely for the exploitable, which is the hallmark of bad science." In other words, most genetic engineers are pretending that their technology works as claimed, is stable, and is safe—that the euphoria of 1960 is still scientifically justified, in spite of what we have learned since then. Nor is the public entirely blameless in the matter. Especially in the United States, we have been all too willing to make the effortless choice of following the biotechnologists into uncharted territory, eyes and minds tight shut, delusions intact.

One of the most blatantly unrealistic forms of pretending is the faith that agricultural biotechnology, including genetic engineering to produce genetically modified organisms (GMOs), will end hunger. Peter Rosset, an expert on agricultural technology and codirector of Food First/The Institute for Food and Development Policy, in Oakland, California, has submitted this claim to critical analysis. There is no relationship, he finds, between the prevalence of hunger in a given country and the density of its population. "For every densely populated and hungry nation such as Bangladesh or Haiti, there is a sparsely populated and

underpinnings of biospheric services that will be degraded and destroyed by our progressing use of energy and materials.⁴

For a little while there will be more conglomeration and centralization, and a few decades of additional damage—but the days of globalization seem numbered. Now is the time to prepare ourselves for the world that will likely follow, a world of increasing smallness, fragmentation, and decentralization, a world with re-empowered communities and exciting possibilities but also great problems—not Utopia.

It may seem premature to anticipate the demise of globalization while giant corporations are merging or swallowing each other up at a frightening rate, and new technologies that shrink the earth and enhance our ability to change it are announced almost daily. Yet remember the Soviet Empire in 1970: the tightness of its control over each and every individual and nation in its vast domain was unprecedented in human history. Who would have predicted that it would all be over twenty years later? The philosopher of history John Ralston Saul has written, “Nothing seems more permanent than a long-established government about to lose power, nothing more invincible than a grand army on the morning of its annihilation.”⁵

After globalization comes to an end, are we likely to find large numbers of healthy communities well-stocked with public-spirited, self-sufficient women and men, communities in balance with other, similar communities, all contained within ecologically reasonable bioregions? Will we have enough good, wholesome food to eat, snug houses, roofs that don’t leak, and the health to enjoy these blessings? Will we find, as Frodo did at the end of *The Lord of the Rings*, “a sweet fragrance on the air . . . the sound of singing . . . over the water,” and see “the grey rain-curtain turned all to silver glass and . . . rolled back,” revealing “white shores and beyond them a far green country under a swift sunrise”? I doubt it. Frodo was leaving the world in which he had struggled so long and to such good effect.⁶ We will have no such choice.

We have to stay put, and it will not be Utopia. What we will find is that the damage already done to the earth’s “biospheric services” (such as healthy ecosystems and a relatively stable atmosphere) and the damage to its people, plus the hidden costs of the ending of the present

techno-economic system with both the bad and the good that it contains, will have conspired together to deprive us of the world of our dreams. Once the problem of bigness and globalization has faded or disappeared, other problems will take its place, just as the nineteenth-century scourge of child labor was followed by the twentieth-century scourge of idle teens haunting the street corners, drug-intoxicated and violent. Many of the troubles of the decentralized, low-tech world to come are not hard to predict, and this is the time, during the tumultuous transition, to think about them if we can. In an address delivered to the International Academy of Philosophy, meeting in Liechtenstein in 1993, Aleksandr Solzhenitsyn said: "We all see and sense that something very different is coming, something new and perhaps quite stern. No, tranquillity does not promise to descend upon our planet and will not be granted us so easily."⁷ The new problems, I believe, will sort themselves out into two overlapping groups: techno-environmental problems, and human social and economic problems.

It is too early to assess the extent and permanence of the many kinds of damage done to the earth in our time, nor can we gauge the effects of this damage on our successors. For example, during the first centuries of European colonization in North America, there was rich, uncontaminated topsoil almost everywhere; abundant, easily accessible oil and iron; and apparently limitless old-growth forests containing massive trees beyond number. In the twenty-first century, these resources are sadly depleted. To fill the resource gap, we have turned to other, poorer and economically defenseless regions of the world, stripping them bare; the harm done to these places is greater than what we have inflicted on ourselves. How will we manage with what is left? A society of rich consumers is about to become a society of poor scroungers: ripping shingles, plumbing, and fixtures from abandoned suburban houses, searching the innumerable rubbish heaps left behind by a spendthrift culture for yesterday's trash—tomorrow's necessities.⁸

Some of the myriad concerns that the residents of Utopia will face are scarcity of clean drinking water, the droughts, storms, and floods brought on by grievously disrupted climates, toxic dumps everywhere, the widespread disappearance of useful, practical skills and knowledge, the spread of destructive exotic species, and poorly controlled infectious diseases. Ironically, all of this will happen in the absence of the power-

ful, globally coordinated science and technology that might have been counted on to give real assistance, or at least reassurance.

And what will become of the countless inventions and services created during the technological explosion once technology and its parent, science, have been starved by shortages of resources, money, and well-educated recruits? What will survive and what will disappear? Many of us will not miss supporting the army of technicians and technocrats working on an antiballistic missile defense shield that is almost certainly doomed to fail, or the production of expensive, high-tech weapons that don't win wars. The demise of NASA's hideously expensive interplanetary program and the space shuttle will not be mourned by all. These are technologies that eat up a nation's wealth while offering little that is commensurate in return, and their production requires a level of centralization, coordination, and control unique to history. In like spirit, we can gladly wave goodbye to recombinant bovine growth hormone, along with the totally unnecessary social, medical, and economic problems it has spawned.⁹

But there are technologies we may be more reluctant to lose. Computers, peripherals, and computer networks consume an inordinate amount of electric power to run and fresh, clean water and other resources to produce—far more than may be available if the majority of the world's people decide to go electronic. How much of this technology will we be willing to do without? The earth-observing satellites, both NASA and private (Landsat, EOS, Digital Globe, etc.), provide a host of vital information about climate change, sea level rise, human population shifts, and other variables that used to be very hard to measure. Similarly, we ought to wonder and worry about what it might mean to give up magnetic resonance imaging (MRI), a benign and useful but resource-consuming technology that depends for its existence on a high order of economic centralization, exploitation, and reliable energy. The Global Positioning System (GPS—also dependent on satellites), which has revolutionized navigation, is a similar example. Many other technologies in this category seem equally vulnerable.

Perhaps under ideal circumstances we will be able to selectively save some of the softer, more beneficial technologies for use in our decentralized green Utopia. More probably, the entire technological system is so heavily interlinked and so thoroughly dependent on political and

INDEX

- Abbey, Edward, 142
Abkhazia, 50
Adams, John, 209
Adams, Scott, 65
adaptation, adaptability, 42–47,
65, 171, 174
adelgids, woolly, 168
administration, administrators,
66, 225–228
affluence, 81, 246
Africa, African, 92, 104, 117, 165,
168, 215, 216
African Americans, 168, 216, 224
agribusiness, 162
agriculture, 187, 188, 190, 204,
211, 223, 252, 256; Board on
(NAS), 10; community support-
ed (CSA), 86; diversity of, 92;
ecological, low chemical, 208;
traditional, 10–13; U.S.
Department of, 9, 11. *See also*
monoculture
agroecologist, 11
AIDS virus, 8
Ailanthus, 43, 177
Air Inuit, 192
Akiba, Rabbi, 214
Alaska, 94, 156, 172, 199
albatrosses, 155
alligators, xv, 59, 63, 103, 173, 174
Allingham, Margery, 33
Altamaha River, 148
Altieri, Miguel, 11, 12
Amazon (.com), 255
Amazon River, 156, 184
American Cyanamid, 147
American Littoral Society, ix
American Physical Society, 16
American Rare Breed Association
(ARBA), 168, 169
Amos of Tekoa, 90
Amtrak, 182
Anatolia, 92
Anglo-Saxon, 189
anomic, 223
Antarctica, 132
antibiotic resistance, 151, 252, 290
Antimissile Defense Shield (Star
Wars), 4, 15–17, 207
ants, Argentine (fire), 165, 168
Apollo moon voyages, 156
Appalachia, 107
Appalachian Trail, 42, 240
Appiah, Kwame, 249
apple, 40, 158, 185; Cortland, 142;
Red Delicious, 41
Applegate, Jim and Carol, 169,
170, 176–179, 183
apricot, 158
aquaculture, 85
aquifer, 104
Arctic, 109, 132, 168
Argentina, 11, 113, 114
Arizona, 107, 146, 147, 171, 255
Arky, Dr., 229
Ascension Island, 153
ash (trees), 122, 189
Asia, 24
ATVs, 240
Austen, Cassandra, 217
Austen, Jane, 54, 216–222,
287–288
austerity, 81
Australia, Australian, 103, 156, 215
Australian National University, 8
Austria, Austrian, 151, 154
avens, mountain, 110
Avery Island, Louisiana, 173
azalea, flame, 158
Baffin Island, 107–111
bald eagle, 198
Balick, Michael, 105
Balkanization, 209
Balkans, 165, 209
Baltic countries, 153, 154
bamboo, 175, 211
Bangladesh, 9, 224
Banning, James, 57
barberry, Japanese, 178
Bar Kokhba, 213
barley, 92
Barnard College, 176
Barron, Stephanie, 33
Bartlett, Albert A., 94, 96
Bartram, John and William, 148
basswood, American (linden), 189
Bates, Henry Walter, 156
Bayer Corporation, 132

- Baykeeper, New York/New Jersey, ix
- Baytril, 132
- BBC, 216
- beach erosion, 13, 14, 180–181
- beans, 92, 159; castor (*see* castor bean); scarlet runner, 140
- bears, 101, 170; Alaskan brown (grizzly), xv, 199; black, 172, 173, 174, 175; grizzly, 197, 198; polar, 110, 138
- Beaufort gravels, 110
- beech, 189
- beef, 130
- beetles, dung, 41, 46
- Belgium, 15
- Belize, 105
- Benbrook, Charles, 10
- Berkes, Howard, 190
- BerkShares, 254, 255
- Berlin, Isaiah, 209
- Berry, Thomas, 135
- Berry, Wendell, xi, 18, 61, 75, 118, 167, 201, 234
- Berthold, Peter, 151–154
- Bertoni, Moises, 106
- Bible, Hebrew, 210, 217, 232, 234
- bicycle, 97
- bigness, 195, 203
- bike trails, 182
- Bill of Rights (U.S.), 209
- biodiversity (natural diversity), 19, 20, 86, 106, 112, 113, 117. *See also* species
- biofuels, 82, 271
- biophilia, 170
- biosphere, 132
- biotechnology, biotechnologists, 6–11, 17, 50, 208
- birches, 108, 119, 138, 139, 148, 182
- birds, 59. *See also under individual common names of birds*
- birdwatchers, 174, 175, 281–282
- Bisbee (Arizona) copper mine, 146
- Bismarck, 209
- bittersweet, 178
- blackcaps, 151, 152
- blindness. *See* Vitamin A deficiency
- blueberry, 139, 178
- bluebirds, 167
- bobcat, 139
- bogs, 163, 164, 168, 169, 198
- Boniface River, 192
- boreal region, 114
- Bosnia, 209
- Boston, 182, 227
- Boswell, James, 259
- botanists, 174, 175, 228
- Botswana, 104
- bougainvilleas, 106
- bovine growth hormone, recombinant (rBGH), 10, 207, 262
- box elder (maple), 119
- Bradfield Woods, 189
- brainstorming, 18–22
- Brazil, Brazilian, 10, 104, 106, 114
- breeds, 163–169
- Bridgestone-Firestone tires, 131
- Brisbin, I. Lehr, Jr., 168, 169
- Britain, British, 81, 96, 110, 111, 151, 152, 186–190, 219
- British Columbia, 196
- Britons, 190
- Bronx, 42
- Brookhaven National Laboratory, 48
- Bt insecticide, Bt corn, 11
- buffalo, 103
- Bulgaria, 239
- bulldozers, 22
- buntings, indigo, 154
- Bureau of Labor Statistics, 237
- Burgess Shale, 62
- Burpee Seeds, 39
- Burke, Edmund, 242
- butterflies, 106, 152; monarch, 78
- cactus, 147, 180
- caddis fly, 178
- Cade, Tom, x
- California, 107, 114, 120, 194, 216
- California Academy of Sciences, 102
- California State Polytechnic University, Pomona, xi
- Cambodia, 208
- CaMV promoter, 8
- Canada, Canadian, 85, 103, 107, 109, 113, 114, 138, 139, 156, 172, 190, 192, 196, 204
- Canada geese, 170, 175
- canoes, canoeing, 107, 138–140, 156
- capital: conservation/saving of, 91–96; human, 95
- capitalism, capitalists, 96
- carbon offsets, 116
- caribou, 109, 193
- carotene, beta-carotene, 12, 39
- Carr, Archie, 43, 99, 109
- Cascade Mountains, 144
- Cascade River, 108
- Caspian Sea, 168
- castor bean, 39–40
- Cates, George, 191, 195
- Catholic University of Campinas, 106
- cats, feral, 159
- cauliflower mosaic virus, 8
- Cayman Islands. *See* Grand Cayman Island
- Cayman Turtle Farm, 99–101
- cedars: Atlantic white, 177; eastern red, 181; western red, 198; yellow, 198
- cell phones, 46, 68, 80
- Celts, 144
- Center for Defense Information, 16
- Center for Veterinary Medicine (FDA), U.S., 132
- Centers for Disease Control, U.S., 132
- central dogma, 5
- centralization, 205, 207, 249
- Central Park, 143
- Centre d'Études Nordiques, 192
- chainsaws, 198
- Champion Tree Project, 191, 195
- char, Arctic. *See* fish
- Chargaff, Erwin, 69, 226
- Chatham Islands, 208
- cherry: black, 181; sour, 122, 158
- chestnut, American, 61
- chestnut blight, 165
- cheetah, 104
- chickens, 41, 132
- Chiapas, Mexico, 10
- children, child, childhood, xv, 3, 4, 47, 81, 87, 140, 164, 166, 170, 171, 173, 183, 196, 197, 204, 223, 226, 227, 229–240, 246
- China, Chinese, 23–26, 29, 86, 101, 102, 122, 144, 167, 204
- Chinese Academy of Sciences, 102
- Chittagong University, 224
- chlamydiosis, 99
- Christian, 213
- Christian Science nursing, 240
- Christmas, 216
- Christmas trees, 180
- chromosomes, 161
- chronic wasting disease. *See* spongiform encephalopathy
- Churchill, Manitoba, 138
- CIMMYT, 228
- Cipro, 132
- Citgo, 115
- citron (*etrog*), 211–214, 216
- civil disobedience, 198
- civilization, 250, 254; contemporary, 41, 199, 223; future of, 240; unstable, fragile, 35, 239
- Clarke, James Stanier, 219

- Clean Air Act, U.S., 130
 Clean Water Act, U.S., ix
 climate change, environmental
 change, 58, 85, 203, [206](#), [207](#),
 250, 252
 climate regulation, 122
 cloning, cloned, [9](#), 40, 191, 195
 coal, 82, 95, 204, 251
 coastal engineering, 14
 Cobb, John, 116
 collards, 158, 160
 colonialism, 117
 Colorado State University, 57
 Columbia Space Shuttle, 45
 Columbia University, 223, 226
 commandments (biblical), 233,
 234
 commercialization, privatization,
 223
 Committee of Public Safety, 220
 communications revolution/com-
 panies, 237
 communism (Soviet), 97
 community, communities, xv, xvi,
 46, 47, 56, 75, 117, 133, [205](#),
 208, 215, 216, 218, 220–222,
 226–228, 234, 237, 239, 246,
 248–250, 254–257; global, 55,
 56, 116, 223; pseudocommuni-
 ties, 51–58, 248, 249; service,
 224, 225; threats to, 53
 compass sense, 153–156
 complexity, complex, 15, 72, 155,
 249
 compost, 160–162
 Computer Professionals for Social
 Responsibility, 16
 computers, 49, 72, 170, [207](#)
 Conan Doyle, A., 28, 32, 34
 Confucius, 24
 Concorde, 195
 Congo (Kongo), 117, 118
 Conjuring Rock, 139
 Conoy Indians. *See* Indians,
 American
 conservation, conservationist, [6](#),
 97–121, 242, 243, 245
 Conservation International, 112,
 [113](#), 115, 275
 conservative, conservatives, con-
 servatism, xvi, 96, 204, 241–254
 Constitution, U.S., 129, 209, 250
 consumer, consumption, 22, 23,
 27, 30, 53, 83, 85, 86, 93, 97,
 204, [206](#), 237, 243, 246–248
 Convention on International
 Trade in Endangered Species
 (CITES), 100, 102
 Conway-Gómez, Kristen, xi
 Cooperative Research Center,
 Canberra, [8](#)
 copper, 95
 coppice, coppicing, 189, 190
 coral reefs, 104
 coriander (cilantro), 159
 cormorants, double-crested, ix
 corn (maize), 92, 180, 211, 216,
 228
 Cornell University, x, 84
 corporate charters, 129, 132
 corporations, 61, 81, 95, 127–133,
 147, 203, [205](#), 208, 226, 243,
 249
 Costanza, Robert, 121, 122
 Costa Rica, 148, 227
 cougar, 196–198
 courtesy, 46
 cows, 41
 Coyle, Philip E., III, 16
 coyotes, 70, 170–172, 175
 craft, crafts, craftsmanship, 95,
 231, 235–240. *See* skills.
 Cranbury, New Jersey, 170
 Cretaceous, 58, 62
 Creutzfeldt-Jakob Disease. *See*
 spongiform encephalopathy
 Crick, Francis, [4](#)
 crocodiles, 59, 101, 103
 crops: annual, 92; tropical, 208;
 varieties of, 12, 95, 223, 279, 280;
 yields, 10, 11
 crows, 170, 171, 175
 CSIRO, [8](#)
 Cuba, 208
 Cummins, Joe, [8](#)
 cucumbers, 39
Cucurbita, 161
 currency, local, 86, 254, 255
 Czech Republic, 86
 Daly, Herman, 116
 Dartmoor, 187
 Dartmouth College *vs.*
 Woodward, 129–130
 Darwin, Charles, 64, 156
 Daumier, Honoré, 145
 Davis, Mike, 96, 97
 Day, Sherri, 129
 DDT, x
 debt-for-nature swaps, 115. *See also*
 nature
 debt, national, 246
 decentralization, [205](#), 208
 deer, 103, 169, 170, 174, 175, 178,
 182, 185, 187–189
 deforestation, 84
 Delaware-Raritan Canal, 182
 Delaware River, 89, 172
 Delhi, 55
 Denali Park, 199
 dendrochronology, 192, 193
 dendrology, 178
 De Palma, Paul, 67
 Depression, Great, 91, 97, 246
 desert, polar, 110
 detectives, detective stories, 28–34
 Devon, 186, 187, 190
 Diamond, Jared, 208
 diesel fuel, 84
 Digital Globe, [207](#)
 digital storage media, 60
 Dilbert, 65, 269
 dinosaurs, 58–60, 62, 151
 diseases, infectious/emerging, 85,
 86, 99, [206](#), 223, 252, 256
 distance learning, 44
 DNA (deoxyribonucleic acid),
 [4–7](#)
 Dobson, Andrew, 107
 dogs, 159, 163–169
 Dolly, [9](#)
 dreams, 137, 138, 140, 141
 Drew, Nancy, 29
 Duane, Thomas K., 129
 Dudley, Patricia, 176
 Duncan, Anabelle, [8](#)
 Dutch. *See* Netherlands
 Early Woodland Period, 91
 ecology, ecologist, xii, 176–181,
 186, 208, 224–227, 236, 251;
 field, 169, 176–186, 245
 economics, economic system, the
 economy, 75, 81, 89, 95, 118,
 195, 204, [206–208](#), 246, 250, 254
 economics, environmental,
 121–127
 ecosystem, 75, 85, 97, 103, 104,
 112, 116, 118, 178, [205](#), 252; ser-
 vices, [121–123](#), [205](#)
 ecotourism, ecotourists, 46, 85,
 104, 184
 education, 71, 72, 180, 221, 232,
 256
 Educational Foundation of
 America, 222, 227
 efficiency, 46, 84, 86
 E. F. Schumacher Society, 254
 Egler, Frank, 181
 egrets: great, ix; snowy, ix
 Egypt, 92
 Ehle, Jennifer, 216
 Einstein, Albert, 119
 electricity, electric power, 175, [207](#)
 electromagnetic fields, 182, 183
 electronic commerce/spend-
 ing/money, 44–46

- electronic communication, 52,
54–58, 67
- electronic games. *See* video games
- Eliezer, Rabbi, 214
- elk, 103
- elms, 218. *See also* *želkova*
- E-mail, 28, 34, 47, 53, 54, 56, 57,
68, 173
- Emlen, S. T., 154
- Emma*, 54, 216, 217, 219–221
- enclosures, 188
- Endangered Species Act, U.S.,
130
- energy, 82–87, 175, 204, 205, 208,
241, 246, 248, 250, 252, 256, 273
- England, 60, 143, 144, 153, 154,
186–190
- English. *See* language, English
- environmental damage/disrup-
tion, 83
- environmental history, 247
- environmentalist, 22
- environmental justice, 250, 251
- environmental problems/crisis,
21, 241, 245
- environmental studies, 226
- EOS, 207
- ethnic background/ethnicity, 165,
167, 248
- ethnic cleansing, 209
- etrog*. *See* citron
- cucalyptus, 144
- cuonyms, winged, 178
- Europe, 167, 168, 223, 255
- European/Europeans, 88, 90, 91,
117, 141, 187, 206, 213
- European Union, 130
- evolution: biological (Darwinian),
64, 68, 151, 256; social, 63–69
- Experiment Station (New Jersey),
39, 40
- experts, 21, 228
- extinctions, 58, 59, 61, 62, 65, 98,
101, 113
- E-Z Pass, 45
- falcon, peregrine, ix–xi
- family, families, 25–27
- farming. *See* agriculture
- fax, 47, 67, 208
- feedback, 249
- field guides, 175, 281–282
- fig, 158
- Finch, Justice, 129, 131
- fir, Douglas, 200
- firewood, 190
- First Nations of Western
Vancouver Island. *See* Indians,
American
- fish, 152, 155; char, Arctic, 108;
cod, 84; salmon, 85, 108, 156,
157; swordfish, 84; trout, 85,
108, 192; tuna, 84
- fisheries: long-line, 98; marine, 84
- Flexcar, 255
- Flint Hills, 114
- floodplain, 179
- floods, 252
- Florence, Italy, 155
- Florida, 109, 144, 174, 238
- fluoroquinolones, 132
- fly, caddis, 178
- Food and Drug Administration,
U.S., 132
- Food First, 9
- footprint, ecological, 271
- Ford Explorers, 131
- forests, 61, 84, 104, 106, 114, 115,
180, 181, 185, 187, 188,
190–196, 198, 206. *See also*
woodlands
- foundations, 222, 223, 227, 229
- foxes, 170, 172, 175
- France, 153, 154, 220
- Franklinia*, 148
- Franklin Lakes, New Jersey, 147,
150
- Freecycle Network, 255, 256
- Freedman, David, 124
- Freeling, Nicolas, 33, 34
- Freeman, R. Austin, 32
- free trade, international/global,
56, 116, 256
- French Revolution, 242
- Friedman, Thomas, 115, 116
- Frodo, 205
- frogs, 62
- fuel cells, 82
- fusion energy, 204
- Gabriel, Trip, 57
- GAF, 147
- Gagliardo, Anna, 155
- Galveston, Texas, 99
- Gangel-Jacob, Phyllis, 128
- gardener, gardening, garden,
157–162, 184
- Garibaldi Provincial Park, 196
- gas, 182, 240, 272
- Gash, Jonathan, 33
- Gaskell, Elizabeth, 54, 267
- gasoline, 93, 96, 175, 246, 273
- Gates, Bill, 59
- Geist, Valerius, 103
- gene bank, 93
- General Motors, 61
- genes, 256
- Genesis, 92
- gene therapy, 6
- generalists, 175
- genetic engineering, genetic engi-
neers, 4–12, 40
- genetically modified/engineered
organisms/food (GMOs, GM
or GE food), 9–11, 17, 208
- Gentry, Alwyn, 104
- Geographic Information System,
240
- George Washington Bridge, 42,
46, 160
- Georgia, 144, 148
- Germany/German, 132, 151, 152
- Germany, German armies, 92, 209
- Giuliani, Rudolph, 128
- Glacier National Park, 160
- globalization, 114, 115–117,
203–206, 208, 249
- Global Positioning System (GPS),
207
- global warming, 132, 146, 240. *See
also* climate change
- God, 211, 222, 232, 234
- godwit, bar-tailed, 156
- Golden Gate Bridge, 46
- Goldsmith, James, 204
- Goodwin, Archie, 30–32
- gorillas, mountain, 104
- Gould, James, 155
- GPS units, 81
- Gramscian Bank, 224
- Grand Canyon, 145
- Grand Cayman Island, 99
- grants, 223, 225, 226, 288
- grapes, 158, 178
- Gray, John, 204
- grazing, 253
- Great Barrington, Massachusetts,
254
- Great Smoky Mountains, 43
- Great Spirit (Kishelēmukong), 90
- greenhouse gases, 85
- Grigg, Gordon, 103
- Grocery Manufacturers of
America, 9
- Groot, G., 156, 157
- gross national product (GNP), 195
- gross national product, global,
121–122
- growth, exponential, 93, 94
- gulag, 92
- Gulf of Mexico, 93, 252
- gulls, herring, 166
- gum, sweet, 182
- Guyana Shield, 115, 116
- Hackensack River, ix, xi
- Hackensack Riverkeeper, x

- Hague, 153
 Haidinger, Wilhelm Karl
 von/Haidinger's brush, 154
 Haitao, Shi, 101
 Haiti, [9](#)
 Halley's Comet, 151
 Hamilton, Alexander, 209
 handicapped people, 209
 Hardin, Garrett, 23
 Hardy Boys, 29
 harrier, northern, ix
 Harriman Park, 145
 Harris, Richard, 149–150
 Harvard University, [6](#), 174, 179, 223
 Havel, Vaclav, 86
 Hawaii, 107
 Hawkins, Sally, 216
 hazelnuts, 190
 heath, 188
 heather, white, 110
 Hebrew. *See* language
 Hegel, G. W. F., 240
 Heilongjiang, China, 102
 Heinz Endowments, 222, 226, 228
 helium, 93, 95
 Hell's Canyon, 160
 hemlocks, 158, 168, 180
 Henderson, Hazel, 254
 Hengdaohezi tiger farm, 102–103
 hepatitis B virus, [8](#)
 herbicides, 10, 11, 182
 herons, great blue, ix
 herring gulls, 166.
 Highland Park, New Jersey, 254
 Highlands, New York/New Jersey, 114, 181
 highways, interstate, 183–185
 hikers, hiking, 174, 197, 239
 Hillerman, Tony, 33
 Himalayas, 10
 Hispanics, 168, 224
 history, appreciation of, 247
 Hobsbawm, Eric, 214, 215
 hogs. *See* pigs
 holly, 180
 Holmes, Sherlock, 28–30, 33, 34
 Ho, Mac-Wan, 7–9
 homing, 151–157
 homosexuals, 209
 honeybees, 154, 155
 honeysuckle, Japanese, 177, 184
 Hong Kong, 102
 horseshoe crabs (*Limulus*), 62, 63
 hot spots, 106–121
 Hough, Fred, 40, 41
 Hucker, Charles O., 26
 huckleberry, 185
 Hudson Bay, 138, 192
 Hudson River, ix, 42
 Hudson Strait, 107–108
 hunger, [4](#)
 hunts, hunting, hunters, 169, 170, 173, 174, 182, 208
 Hutcheson Forest, 177, 181
 hybrid plants, 161, 162
 hydrogen, 82
 I. G. Farben, 132
 iguanas, 103
 Iguazú Falls, 106
 Illis, Hugh, 228
 immigrants, 137, 140, 165, 180
 improvised explosive devices (IED), 209
 India, 10, 12, 86, 215, 216
 Indians, American, 120, 156, 169, 187; Conoy, 90; Cree, 193; First Nations of Western Vancouver Island, 198; Lenape, 87–91, 181; Mahican, 90; Nanticoke, 90; Navajo, 33, 164; Ojibway, 139; Shawnee, 90. *See also* Native American
 Indonesia, 10
 inertial guidance, 155–157
 information, loss of, 60
 information technology, 60, 67
 insecticides, 41
 Institute of Plant Industry, 92
 Internal Revenue Service (IRS), 226
 International Academy of Philosophy, [206](#)
 International Forum on Globalization, 204
 International Monetary Fund (IMF), 115
 Internet, 28, 29, 34, 53–58, 68, 115, 175, 180, 226, 237, 249, 267
 Inuit, 108, 110, 193
 Iowa, [9](#), 11, 223
 iPod, 81, 146
 Iqaluit (Frobisher Bay), 107, 110
 Iquitos, Peru, 104
 Iran, 215
 Iraq, 209, 238
 Ireland, 153, 154
 Iskander, Fasil, 50
 isolation,
 Israel, Israeli, 144, 169, 212–215
 Italy, 155
 Ithaca, New York, 155
 Ivanov, Dimitry, 93, 96
 ivy: English, 186; poison, 181
 Jackson, Wes, xi, 118, 252
 Jaenisch, Rudolf, [9](#)
 James Bay, 139
 James, P. D., 33
 Japan, 24, 180
 Japanese, 145, 160, 161, 178, 184
 jays, gray, 197
 Jefferson, Thomas, 209
 Jersey Meadowlands, ix
 Jerusalem, 212, 213
 Jesus, 213
 Jews, Judaism, [210](#)–215, 231–233, 235; Babylonian exile of, 212; holidays (festivals) of (*see* *Passover*; *Shemini Atzeret*; *Sukkot*)
 jobs, 237, 238, 246
 John Curtin School of Medical Research, Canberra, [8](#)
 Johnson, Samuel, 244, 259
 Jonah, 40
 Jones, James Earl, 50
 Joseph, 92
 Judah, Rabbi,
 justice, 80
 Kalashnikovs, 209
 kangaroos, 103
 Kansas, [114](#), 118
 Karenga, Maulana, 215, 216
 Katrina, Hurricane, 252
 Keating, H. R. F., 33
 Kelly, Jack, 50, 51
 Kephart, John, 125, 126
 Kilmer, Joyce, 194
 Kilmer Oak, 194
 Kimmirut (Lake Harbour), 110
 Kingsolver, Barbara, 117
 Kirschvink, J. L., 155
 Kittatiny Ridge, 89
 knowledge, loss of, 40, [206](#), 247
 Knudsen, David, 140
 Kohr, Leopold, 195
 Kongo (Congo), Kingdom of, 117
 Koran, 92
 Kosovo, 209
 Kozol, Jonathan, 224
 Kraft, Herbert C., 87, 88, 90
 Kramer, Gustav, 152
 krill, 155
 Krinsky, Sheldon, [6](#), [7](#)
 Kriyer, Georgy, 93
 kudzu, 165, 168
 Kunstler, James Howard, 182
 Kuujuaaraapik, Quebec, 192, 193
 Kuwait, 93
 Kwanzaa (Kwanza), 215, 216
 Lake, Frank, 120
 Lake Obobika, 138, 139

- Lake Temagami, 138–141
 Landauer, Thomas, 67
 land grant colleges, 225
 Land Institute, 118
 Landsat, [207](#)
 landscape, British, 186
 Langskib. *See*
 Northwaters/Langskib
 Language: Chinese, 26;
 Delaware, 88; English, 69, 70,
 193, 217, 234; French, 193;
 global, 204; Hebrew, 88, 211,
 234; Kikongo, 117; Munsee,
 88; Spanish, 70, 228; spoken,
 71; Swahili, 216; Ukrainian,
 27; Unami, 88; written,
 71, 72
 Lao, Michael, 101
 Lapkin, Michael, 229, 230
 larch, 110
 lasers, airborne, 16
 leaf blowers, 18, 246, 263
 legumes, 92
 Lenape Indians. *See* Indians,
 American
 Lenapehoking, 87, 91
 Lenin, 210
 Leningrad (St. Petersburg), 92, 93
 Leon, Donna, 33
 Leonhardt, David, 45, 46
 Leopold, Aldo, 43, 245
 leukemia, 183
 Lewontin, Richard, [6](#)
 liberal, liberals, liberalism, xvi,
 204, 241–244, 247, 250, 251,
 253, 254
 lichens, 107, 108, 185, 197
 Liechtenstein, [206](#)
 lime (pry, linden), xv, 188–189
 liquid natural gas (LNG), 204
 Lithuania, 236
 lobsters, 155
 Locandro, Roger, 199
 locust, black, 178
 Logsdon, Gene, 41
 London, 28
 Lopez, Barry, 142
 Louisiana, xv, 173
 Louv, Richard, 171
 low-intensity conflict, 209, 241. *See*
also wars, local
 Luddites, 54
lulaw. *See* palm frond
 lynx, 139
 Lyons, 208
 Lysenko, Trofim Denisovich, 92
 MacArthur Foundation, 113
 macaws, scarlet and blue, 106
 MacDonald-Beyers, Kristi, [114](#)
 Macedonia, 209
 MacMillan Bloedel, 198
 mad cow disease. *See* spongiform
 encephalopathy
 Madison, James, 209
 magnetic fields, navigation by, 155
 magnetic resonance imaging
 (MRI), [207](#)
 Mahican Indians. *See* Indians,
 American
 Maimonides, 213
 Maine, 77, 109, 114
 maize. *See* corn
 mammals, 59
 Manhattan, ix, 42, 43, 140, 141,
 171
 Manitoba, 138
Mansfield Park, 216, 217, 221, 222
 manure, 41
 Mao Tse-tung, 26
 maple: Norway, 177; red, 182. *See*
also box elder (maple)
 market, world, 101
 Marshall, John, 129
 Marsh, George P., 127, 130
 Marx, Marxism, Marxist theory,
 208, 210
 Massachusetts, 93, 227, 254
 Massachusetts Institute of
 Technology (MIT), [9](#)
 materialism, 89, 91, 223, 230, 231
 matriarchs, four, 213
 Mayans, 10
 mayfly, 178
 McCauley, Douglas J., 105
 McIlhenny, E. A., 173, 174
 McNeill, J. R., 174
 Meadowlands. *See* Jersey
 Meadowlands
 Meares Island, 198
 mechanization, 44
 medical care, 80
 medicines, traditional, 105
 Mediterranean countries, 151, 152
 melons, 39
 Melville, James, 33
 Mendelsohn, Robert, 105
 Merton, Thomas, xvii
 Meta Incognita Plateau, 107, 110
 Mexico, Mexican, 10, 84, 85, 216,
 228
 Miami, 26
 mice, field, 185
 Michigan, 191
 micro-lending, 224
 Middle East, 214, 216, 238
 Midgley, Mary, 21
midrash, 212, 215
 migration, animal, 151–157
 Milarch, David and Jared, 191
 Milky Way, 155
 Millennium Ecosystem
 Assessment, 23
 millet, 92
 Millstone River, 119, 182
 Minerva, 240
 Minneapolis, 26
 miracle seeds, 10
 Mirren, Helen, 50
 Missile Defense Agency, 16
 Mississippi River, 252
 Mitsubishi Motors, 131
 Mittermeier, Russell, 112
 models, [4](#), 13–15, 63
 monarch caterpillar, 120
 Mongolia, 113
 mongooses, banded, 104
 monoculture, 10–12
 Monsanto, 11
 moorlands, 144
 Morgan Stanley, 67
 Moriori, 208
 Moscow, 50
 Moses, Law of, 210
 mosquitoes, Asian tiger, 165
 moths, gypsy, 168
 mousepox virus, [8](#)
 Muir, John, 200
 multinationals. *See* corporations
 Mumford, Lewis, 52, 177
 Murrab Building, 253
 mushroom hunters, 175
 mussels, zebra, 168
 mustard, red, 159
 Myers, Norman, [111–114](#), 120
 myrtle, 211–214
 Nabhan, Gary, 252
 Nanticoke Indians. *See* Indians,
 American
 NASA, [207](#)
 NASCAR, 175
 Nash, Professor Leonard, 179
 National Academy of Sciences, [6](#),
 10
 National Aeronautic and Space
 Administration (NASA), 45
 nationalism, 215, 245
 National Marine Fisheries Ser-
 vice, 99
 National Public Radio, 45, 190,
 191
 National Research Council, 67
 National Tree Trust, 191
 National Weather Service, 47–50
 Native American, 88. *See also*
 Indians, American