Bioethics: Are Our Priorities Right?

PAUL R. EHRLICH

Neither biologists nor nonbiologists in today's society are paying adequate attention to the escalating ethical issues raised by the human predicament, and the expertise of biologists seems to demand they make additional contributions to environmental ethics, broadly defined. Massive environmental destruction and the development of biological and nuclear weapons have changed the world; cultural evolution of ethics has not kept pace. "Bioethics" must be expanded from its focus on medical issues to consider such things as the ethics of preserving natural capital for future generations and those of dealing with overconsumption. Bioethics should examine issues as diverse as the ethics of invading Iraq to increase the role of the rich in generating climate change and the ethics of the Lomborg affair. Achieving a sustainable global society will require developing an agreed-upon ethical basis for the necessary political discourse, and the time to start is now.

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The human enterprise has expanded to the point that society's long-term biophysical sustainability and sociopolitical stability are seriously threatened. In other words, the "human predicament" is intensifying. In this critical time, one of the elements most lacking in our society is broad-based discourse on ethics, or culturally shared values that involve notions of right or wrong (Ehrlich 2000). Even as the United States was invading Iraq, for example, there was little public discussion of the many deep moral issues raised by that action. Here I would like to address questions about the ethical obligations of citizens, particularly citizen biologists, in the domain of the life sciences—that is, questions of bioethics. The main questions are these: How large should our bioethical commitment be? As biologists, how much are we obliged to consider the moral rights and wrongs in our areas of expertise? Are our obligations different from those of other citizens? Are we fulfilling those obligations, and are our priorities right? If not, how can we do better?

To avoid repeatedly prefacing my remarks with "in my opinion" or "I believe," I stipulate that I am usually expressing personal beliefs. In addition, my use of "society" is often shorthand for "society in the United States," although the statements sometimes may apply more broadly. I also stipulate that my own ethical approach is relativistic, with a substantial dose of utilitarianism (e.g., Singer 1972, 2002, Bentham [1789] 1988, Mill [1863] 1998). I am an atheist, and I do not subscribe to evolutionary ethics—the deriving of moral lessons from the process or results of evolution (e.g., Farber 1994). I see little evidence for a genetic evolution of particular ethical positions, nor do I see a basis for grounding a choice of which behaviors are ethical in an understanding of possible "genetic tendencies" contributing to them (Ehrlich 2000, Ehrlich and Feldman 2003). Finally, I do not claim to have led a particularly ethical life even according to my own ethical standards. Being holy is difficult for a social animal, which is probably why so many holy men have been hermits. But I do believe that unless we all start getting holier fast, our descendants (and some of us) are likely to pay a very high practical price for it.

Paul R. Ehrlich (e-mail: pre@leland.stanford.edu) is Bing Professor of Population Studies in the Department of Biological Sciences at Stanford University. He has been a member of the Stanford University faculty since 1959. His research is in the field of population biology, which includes ecology, evolutionary biology, behavior, and human ecology. Ehrlich has carried out field, laboratory, and theoretical research on a wide array of problems in these disciplines. He is the author and coauthor of more than 800 scientific papers and articles in the popular press and more than 35 books, most recently On the Wings of Checkerspots; Butterflies: Ecology and Evolution Taking Flight; Human Natures: Genes, Cultures, and the Human Prospect; *and* Wild Solutions: How Biodiversity Is Money in the Bank. *This article is an expanded version of a plenary address delivered at the 54th annual meeting of the American Institute of Biological Sciences, "Bioethics in a Changing World," held in Arlington, Virginia, 21–23 March 2003. The original address may be viewed online at the AIBS Virtual Library:* http://aibs.digiscript.com/presentation/index.cfm?media_id=10940.

Citizens' ethical responsibilities

People make ethical decisions continually in their daily life: Should I tell Sam about Sue's indiscretion? Should I give the beggar some money, and if so, how much? Should I vote for a politician who will give me a tax break I don't need, or should I vote for the one who will give a break to those less well off than I am? Should I confront a colleague who is behaving badly or mind my own business? But few people spend much time evaluating the ethics of their society as a whole. Even when they do, people often don't see ethical issues where others, contemporaneous or distant in time or space, would. Slavery was not an issue for Plato; women's suffrage was not much of an issue for America's founding fathers, although slavery was becoming one. Sex with children is unethical in the United States but not among the Etoro of New Guinea (Ehrlich 2000).

Thus, citizens' ethical responsibilities also vary in space and time. Our ethical responsibilities as members of an urbanized society in an overpopulated and environmentally deteriorating world are different from those of a Massachusetts farmer in 1776, just as they are different from those of a Yanomamö leader today. People create their ethical systems (hardly a new idea; e.g., Feuerbach [1843] 1989); I personally have found no evidence of a source of ethics external to human societies, such as Plato and Kant believed existed. As the human predicament deepens, it becomes all the more important that as many people as possible participate in the shaping of ethical guidelines for their societies and for a global society. Our ethical responsibilities are now very large, yet few of us spend enough time and effort thinking about ethical issues, promoting discussions of them, and acting on our conclusions. Indeed, both biologists and nonbiologists pay too little attention to the critical ethical issues that confront humanity and spend too little time helping to shape fundamental institutions so that society becomes more ethical (and automatically—since we have ethical obligations to generations unborn—more sustainable). If we cannot create a decent world for our descendants, they can rightly blame us.

I disagree with those who think that power politics can continue to control nations or even the entire world without destroying Earth's carrying capacity for large technological societies. The question of the merits of such politics is not new. There has been a long argument between the "realism" of Plato ([ca. 387 BC] 1991), which is based on social and philosophical ideals, and the "realism" of Machiavelli ([1513] 1981), which is based on power politics. The argument persists today between those who urge ethical goals to help guide the behaviors of governments and those of the apparently dominant "anything that works" school.

I suspect, however, that the question has largely been settled by population growth, the extraordinary expansion of the human enterprise, and the rapid pace of cultural evolution in science and technology (Ehrlich 2000). Plato has won the intellectual argument (if not the battle), because the human predicament now makes it imperative to evolve a system of ethics designed to develop and support a sustainable global society. In Platonic terms, rulers should do "right"; their goal should be to maximize the collective happiness of citizens of the state. Some sense of what is right is essential to a well-ordered global society; the human and environmental costs of doing wrong now are vastly greater than when the ancient civilizations of the Tigris and Euphrates valleys or the classic Maya, Anasazi, and Easter Island societies were suffering localized collapses.

Machiavellian power politics may have sufficed to sustain hunter–gatherer groups, in which proper behavior was determined by verbally transmitted traditions and by individuals with physical strength, intellectual prowess, a claimed connection with spirits (Sapolsky 1997), or the accumulated wisdom of the aged. A state based on power politics could still be sustainable a few hundred years ago, when it took weeks or months for news, new ideas, or pathogens to travel from one part of the world to another, when the closest things to weapons of mass destruction were muzzle-loading artillery or the blankets of smallpox victims, and when the most environmentally damaging technologies were axes, plows, and long rifles.

But ideas had a way of spreading even in the ancient world, and although the precise mechanisms of cultural evolution are just beginning to be discussed and debated (Cavalli-Sforza and Feldman 1981, Ehrlich 2000, 2002), there can be no doubt that technological advances—first writing, then the printing press, followed by increasingly rapid physical transport, and finally instantaneous communication via telegraph, telephone, radio, television, fax, satellite, and the Internet—have greatly accelerated the process. Those technologies were all products of a rapidly expanding human enterprise, and they quickly transformed more or less local ethical debates (such as those held long ago among a few tens of thousands of Athenian citizens and immortalized in the Socratic dialogues) into global questions of freedom, justice, and governance. In the modern era, these questions have concerned activists such as Thoreau, Gandhi, Franklin Roosevelt, and Martin Luther King, as well as a raft of philosophers from Hobbes, Locke, Kant, and Mill through Marx, Foucault, Rawls, and Singer.

Machiavelli was still in the intellectual debate at least up to the Second World War, but by then nuclear weapons and an accelerating communications revolution had made it clear that some form of global governance, based on agreed-upon ethical principles, was required. The idea goes back at least to Kant ([1797] 1996) and has its present embodiment in the United Nations. Even Machiavelli's intellectual descendants—Saddam Hussein, Ariel Sharon, Richard Cheney, and others who apparently find it acceptable that brutality can control gigantic modern nations or areas of the world—need only look to the history of the Third Reich, Imperial Japan, European colonial empires, and the Soviet Union to find cause to rethink their assumptions. The age of mass communications and global culture has been increasingly inhospitable to autocrats, precisely because it is now much more difficult to stop the spread of information and ideas than it was just a half century ago.

Democracy of one form or another seems to travel hand in hand with the openness promoted by the communications revolution. That a change in international ethics has been occurring, if slowly, is suggested by the widespread agreement that deposing Saddam Hussein was a good thing, despite widespread disagreement on whether the invasion of Iraq was an ethical way of accomplishing that.

One result of the near-universal connection of societies by modern communications is that providing people with "human rights," a somewhat controversial but widely understood term, has become a virtually universal goal. Indeed, the invention of rights has become a cottage industry for the moral entrepreneurs (Becker 1963) within increasingly complex societies, starting millennia ago with the rights of citizens in Athens and becoming more of an issue around the time of the French and American Revolutions and the Bill of Rights (e.g., Ehrlich 1968, Burke [1789–1790] 2001). But the question of exactly which rights each autonomous citizen should be endowed with remains controversial (and I suspect will continue to evolve into the distant future). All too often in the West, "spreading democracy" has been code for "civilizing the natives," and our enthusiasm for providing human rights has often not extended to people who have made the "wrong" democratic choices (such as Chileans and Algerians in the recent past). American conservatives (e.g., William Kristol on *Nightline*, 5 March 2003) still talk about "democratizing" Arab nations, confident they know what is right for others. But whether they do or not, there appears to be broad agreement that *some* set of individual rights must be determined by each society. Sadly, there is much less interest in the responsibilities that must accompany those rights.

Another result of the communications revolution has been the ability to mobilize much more rapidly against actions that are widely viewed as ethically flawed. During the months leading up to the invasion of Iraq, the American media were supine. (Low points were an "investigative" reporter writing what many might see as a hagiography of President George W. Bush [Woodward 2003] and right-wing propagandists clogging the Sunday TV talk shows—and talk radio and the Fox network all week long.) Nevertheless, a substantial antiwar movement developed even before the Bush administration could launch the war. Much of the credit for that goes to e-mail and the Internet (Lee 2003). Few doubted that people in Iraq would be better off if they could be freed from the yoke of Saddam Hussein. But I, and hundreds of millions of others, did not believe the most ethical way to throw off the yoke was through what could be interpreted as a geopolitical move intended to extend American hegemony. The rapid generation of a broad international debate about such an attempt itself hints why Machiavelli may be on the way out. It also shows citizens meeting their ethical responsibilities.

The debate has thus already shifted. A large proportion of people appear to believe that running a vicious dictatorship in which many people are deprived of liberty and life is unethical. Now the discussion is about finding ethical means to end those conditions when the process of toppling the dictator is likely to harm large numbers of innocent people, especially children. How is one to balance innocent lives lost in a "preventive" war against innocent lives that might potentially be saved in the future by that war? Is a relatively stable, democratic, and sustainable world likely to be created by the use of lethal force by a lone superpower?

If humanity fails to find ways to create a more equitable, sustainable world, it faces the prospect of a chaos of nuclear explosions, humanmade plagues, bio and chemical terrorism, and environmental and economic collapses. One only need consider South Asia, where a weapons-exporting Pakistani society, armed with nuclear weapons and packed with dedicated Islamists, confronts a nuclear-armed India dominated by Muslim-hating Hindu fundamentalists (Mishra 2003). A nuclear war between those two nations could send an overstressed global society into a downward spiral of economic uncertainty, distrust, and despair from which it might not recover. Such confrontations have long been foreseen, as has the possibility of nuclear terrorism, which could trigger large-scale nuclear conflicts (e.g., Ehrlich et al. 1977). As Anne Ehrlich, John Holdren, and I wrote almost 30 years ago, "all countries that want nuclear bombs *eventually* will get them, but it is essential to slow the process as much as possible, in order to give the world political community as much time as possible to work out institutions and measures that will make the use of nuclear bombs less likely" (Ehrlich et al. 1977, p. 916). The world has wasted that opportunity, with the United States being one of the leading culprits. Among other things, the United States has failed to meet its obligations under the Nuclear Nonproliferation Treaty, and US citizens have not met their ethical responsibilities in preventing their government from going back on its agreements, just as it did in its wars of conquest against Native Americans. One of the all-too-real possibilities (some of my contacts in the security community consider them near-certainties) is the detonation of nuclear weapons in US cities by terrorists.

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Ethical questions have grown much more complex for all Americans. How does the nation that possesses the largest nuclear arsenal on the planet now deal ethically with accelerating proliferation? How does the world's richest nation explain the ethics of being one of the stingiest with foreign aid? Today, despite its rhetoric (Office of Homeland Security 2002), the United States ranks 15th among rich nations in terms of development assistance, donating only one-tenth of 1 percent of its gross national product. Denmark, the Netherlands, Sweden, and Norway all give more than eight times that percentage, and all on the list of donor nations but Italy give

proportionally more than twice as much (French 2002). Why has there not been a national debate on the Internet and elsewhere about this and other possible ethical failures that may have helped generate recent terrorist attacks and may be followed by much worse ones (e.g., Ehrlich and Liu 2002)? Perhaps grimmest of all, what should be the US response to nuclear terrorism, if the source of a detonation is uncertain because the warhead came from old, badly guarded Soviet stocks?

Biologists' special ethical responsibilities

All these questions have bioethical implications, but biologists have little more expertise than other citizens for addressing them. However, there are other areas in which biologists have specialized knowledge with implications for public policy. Anyone with special expertise should attempt to benefit society by carefully considering the ethical implications of that expertise and communicating conclusions to others. A few interrelated biological examples that immediately come to mind include the ethics of abortion, cloning, racial and gender prejudice, habitat destruction, overexploitation of biotic resources, greenhouse gas emissions, and disruption of ecosystem services. As scientists, we face some special problems and responsibilities in dealing with communication at the interface between science and society.

Biologists already deal with difficult ethical questions surrounding such issues as the health effects of smoking and dietary choices, the use of antibiotics, the risks of side effects in the use of drugs and contraceptives, the pursuit of stem cell research, the allocation of organs for transplantation, the availability of genetic counseling and therapies, the treatment of laboratory animals, and the safety of genetically modified organisms (e.g., Kitcher 1996, Bryant et al. 2002). For example, parents who insist on immediate antibiotic treatment of a young child with an ear infection may turn out to be acting ethically toward that child but unethically toward all future children. Parents who wait until the infection is shown to be bacterial may be slightly increasing the risk to their own child's health, but they are acting to retard the evolution of resistance to the antibiotic and improving the epidemiological environment for that child in the future and for humanity as a whole.

Biological expertise extends into many other areas dealing with human health and happiness. A commonly discussed one is the vexed issue of abortion. I think this is a difficult question for most people—and most biologists would probably prefer to see safe and effective contraception available to and used by all sexually active people, so that the abortion controversy, perhaps the major source of ethical dispute in our society today, would go away. (That is certainly my view—I think it was expressed once by Bill Clinton as "I want abortion to be safe, legal, and rare.") But biologists' expertise can contribute neutrally regardless of our ethical views. The issue of when human life starts is often thought important to the abortion debate. But human life started, of course (depending on definitions), sometime between a few hundred thousand and a few million years ago. Sperm and eggs are every bit as much human life as an adult human being is. The designation of the start of personhood, on the other hand, is an emotional and legal question, not a scientific one. A society must determine what rights it is ethical to impute to fetuses (and newborns), and the definition of those rights may easily evolve with time and technology. A parent who has seen the ultrasound image of a three-month fetus may bond to it more closely than he or she would have before such visualization was possible.

Similarly, biologists can show that the premises on which racism is based are biologically groundless and that many common and injurious ideas about sex and gender have no scientific support (Roughgarden 2004). Biologists can warn of the broad trends that increase humanity's susceptibility to vast epidemics (Daily and Ehrlich 1996a, McMichael 2001). They can give evidence on the potential consequences of global warming (e.g., Parmesan et al. 1999, Beever et al. 2003, Root et al. 2003) and the importance of equity for the prospects of giving everyone a decent life within Earth's carrying capacity (Daily et al. 1995). They can analyze human prospects for getting more food from the sea (e.g., Pauly et al. 1998). They can put the scale of the human enterprise into a context of what Earth might be able to support (Vitousek et al. 1986, 1997). They can demonstrate that the ecological costs of large-scale nuclear war are likely to be horrendous (Ehrlich et al. 1983) and show that the idea that human beings are evolutionarily programmed to be violent is questionable, to say the least (Ehrlich and Feldman 2003).

All these scientific conclusions are related to more ethically loaded questions of the human predicament, but the conclusions themselves are relatively (and I emphasize *relatively)* value free. But some value-laden conclusions related to today's headlines seem obvious. Considering how devastating nuclear war can be, we biologists who are citizens of states in the "nuclear club" should work to get our nations to meet their obligations under the nonproliferation treaty if—like the United States and Russia—they are signatories, and we should work to sign them up if—like China, India, and Pakistan—they are not. And even though our statements are rarely front-page news, biologists should be urging caution relative to many of the trends that our research and knowledge base tells us may be mortgaging the human future. Among those risky trends are increasing population size and per capita consumption, destruction of natural capital, and growing concentrations of greenhouse gases in the atmosphere and of toxic synthetic chemical compounds almost everywhere. Biologists should be arguing on many grounds for a more economically equitable world (e.g., Ehrlich et al. 1995), despite the difficulty of convincing people (often including ourselves) that overconsumption (Arrow et al. 2004) is unethical. The lure of eating steaks and pork chops, having huge air-conditioned houses, growing green lawns in deserts, and so on is strong indeed in our current culture. One important reason to argue for a more ethical society is that it would automatically be more sustainable, since a major ethical goal

must be to achieve intergenerational equity (Daily and Ehrlich 1996b).

Where our priorities need adjustment. Evidently, I think, bioethics is sometimes defined too narrowly—for example, it is often restricted to medical ethics—and with no real attempt to assign priorities to concerns (e.g., Bryant et al. 2002). So I think the answer to the title question is "No, we do not have our priorities right." Bioethics must give much more attention to issues not directly related to medicine; there are more important areas of ethics that deserve attention. There are opportunity costs of focusing too much effort on deciding, say, whether buying a kidney from China for transplant is ethical, while an unethical foreign policy may be endangering the lives of millions. Social capital is finite, and, like other forms of capital, it should be allocated with care.

The growing area of environmental ethics (Rolston 1988, Schmidtz and Willott 2002) should be one central focus of bioethics. Peter Singer (1975) has had a major voice in arguing, in effect, that the species that invented ethics is now obliged to extend them beyond the limits of *Homo sapiens.* That obligation is now almost universally accepted in the West, at least as far as the treatment of domestic animals or those used in research is concerned, even though not all philosophers accept Singer's reasoning. But the current concern about the rights of domestic animals should, many argue, be enlarged to deal with the rights of the biota as a whole (e.g., Naess 1973). Should, for instance, all plants, animals, and microorganisms, or even entire ecosystems, have "standing" (Stone 1974)? Is it unethical to consider that nature has only instrumental value; should we assign it intrinsic value? Ethics needs to deal with the preservation of Earth's living capital, with a major goal being maintenance of the planet's human carrying capacity. A related question is whether we should also value that capital for its own sake. My own view is that we should foster a quasi-religious concern for our only known living companions in the universe. I believe that is the best way of maintaining their instrumental value.

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Surely bioethics in a gigantic globalizing society must extend to the consideration of the human behaviors that are degrading the ecosystems that support society and creating more direct threats to the health, happiness, and security of the human population. After all, ethics are a product of human biological and cultural evolution, and the focus of ethics should be primarily on the state of humanity (including our ethical state in terms of how we behave not only toward other human beings but toward other organisms). Ethical systems must address questions like those raised prominently by Singer (1993, 2002): How far do our ethical duties extend in space and time? Should Americans care more about their fellow citizens' welfare than they do about that of other countries' citizens? How much of our natural capital heritage are we ethically obliged to save for people 10 generations in the future, given great uncertainties about such things as technological change, future population sizes, and the preferences of our descendants? How ethical is it for a rich person to consume vast quantities of resources when the basic human needs of many poor people go unfulfilled and overconsumption by the rich threatens human life-support systems?

The policies of the current US administration represent an enormous threat to humanity. With the active or passive cooperation of many Democratic and Republican politicians, media moguls, industrial interests, and conservative think tanks, the administration is mounting a deliberate (e.g., Burkeman 2003), gigantic, and effective attack on the environment and thus on all human beings. The ethical standards of the administration can be surmised from a statement in a memo by Republican party consultant Frank Luntz, urging the administration to keep on misrepresenting global warming and other issues: "A compelling story, even if factually inaccurate, can be more emotionally compelling than a dry recitation of the truth" (Burkeman 2003). The administration is quietly opening public lands to unrestrained logging and mining, removing restraints on polluting businesses, and fighting effective steps to limit global warming. It is working hard to keep a dangerous fossil fuel–based economy going until those benefiting from this policy have milked all the profits from it that they can, while it fights steps to limit population growth and puts women's lives at risk in the process. And those fighting to keep the petroleum economy flourishing are exacerbating one of the most serious environmental threats—rapid climate change.

The Bush administration started a regional war in Iraq primarily, I submit, to establish control over huge oil supplies as Saudi Arabia became increasingly unstable and to gain leverage over other nations, especially China. By enraging the Chinese (and the Russians, by invading their sphere of influence and threatening their oil interests), it may well be destabilizing a hard-won, if far from perfect, world system, forcing a return to the days when large-scale nuclear war was likely and threatening a human and biological holocaust (Ehrlich et al. 1983).

The crucial ethical issues relating to all these trends, and to the administration's consistent misrepresentations about its motives and its attempts to suppress dissent, should be the prime focus of biologists' efforts today (as well as those of all other responsible citizens). Freedom to disagree with governmental policies is critical for everyone. We must be able to question loudly and clearly, for example, the ethics of the statement the first President Bush made shortly before the first Earth Summit: "The American way of life is not negotiable." Is it ethical for us to keep guzzling gasoline, no matter what the consequences may be for people in Iraq today or for the environment of future generations? The policy of precautionary war to preserve the super-

consuming lifestyle of the United States raises ethical issues that dwarf those of the legitimate use of stem cells or genetically modified crops. Wouldn't a policy of striving to ease Americans out of that lifestyle, reducing its manifest temptations (and inconveniences, such as long-distance commuting), be much more ethical?

Of course, my own ethical conclusions as implied above might be disputed by many, including some scientists. That's fine. People have a right to their opinions; the key thing is to get the discussion going, ventilate the issues, and educate ourselves and others. There has never been a better time to stand up and be heard.

Ethical problems close to home. One of our special ethical obligations as biologists is to ensure that decisionmakers and the general public are supplied with the best possible consensus science in our areas of expertise (for some of the problems of doing this, see Schneider [1997]). Fortunately, work is already well under way to improve the ability of environmental scientists to communicate with the decisionmakers and the general public. The most successful training of this kind has been organized by the Aldo Leopold Leadership Program of the Ecological Society of America *(www.leopoldleadership.org/content/index.jsp),* for which we are all deeply indebted to the leadership of Jane Lubchenco. Things are moving, but we have a long way to go.

Perhaps the most difficult problem, besides making communication by scientists more effective, is finding ways of dealing with all-too-frequent campaigns of disinformation (Ehrlich and Ehrlich 1996). An obvious case in our own backyard is creationism, but that one is not going to be solved by college professors. If it is to be solved at all, it will be by people willing to take up politics at state and local levels, get elected to boards of education, and beat the creationists at their own game. But we can support those who are fighting creationism and help them develop sound strategies for countering a socially dangerous doctrine—one that leaves most Americans ignorant of their origins, of what is known about the sources of their behavior, and of major threats to their health (especially the evolution of various sorts of resistance). One complication is that some Christian fundamentalist groups have now joined other religions in the fight to save biodiversity, saying that no one should destroy God's creation (Van Houtan and Pimm 2004). That support is important to encourage, and efforts to damp down animosity toward individual creationists (as opposed to creationist arguments) could be helpful.

The notorious Lomborg affair highlights serious ethical problems for biologists in balancing concerns about freedom of speech with the way power and privilege can be used to control what people know. A Danish statistician, Bjorn Lomborg, wrote an error-riddled book, full of selective, bungled, and misleading examples, purporting to demonstrate scientifically that concerns about the future of human life-support systems were misplaced. Lomborg's tract, which was greeted with joy by the far right, hoodwinked much of the journalistic community (for a first-rate journalist's discussion of the press coverage, see Woodard [2001]). Lomborg's book gained much momentum by being published by Cambridge University Press (CUP). (That press always asks manuscript reviewers to comment on an author's publication record; curiously, CUP must have ignored the answers in this case, because Lomborg had just one publication, and it was in statistics.) Because of the high quality of many of CUP's previous publications, and the voluminous references in Lomborg's book, some naive observers assumed it to be a scientifically peer-reviewed work. The book subsequently received uniformly scathing reviews from the scientific community, not surprisingly, given that its errors of fact and analysis made it look like an expansion of a freshman term paper by a weak student (see, e.g., the series in the January 2002 issue of *Scientific American).* However, CUP continued to promote Lomborg's volume vigorously; the CUP Web site had wild praise for the book on 14 September 2003, well after the results of the Danish investigation debunking it (see below) were widely known. (The pertinent sites were *http://us.cambridge.org/features/lomborg/author.htm* and *http://titles.cambridge.org/catalogue.asp?isbn=0521804477.)*

Less surprisingly, the conservative magazine *The Economist* relentlessly promoted Lomborg's book and invited Lomborg himself to write a 2500-word essay on it ("The truth about the environment," 2 August 2001). The magazine then gave the book a glowing review, stating, "This is one of the most valuable books on public policy—not merely on environmental policy—to have been written for the intelligent general reader in the past ten years" ("Doomsday postponed," 6 September 2001). *The Economist* followed up its review with a steady drumbeat of attacks on environmental scientists, paying no attention to the universal condemnation of the book by the scientific community or to an investigation by the Danish Committee on Scientific Dishonesty of the Danish Research Agency, Denmark's equivalent of the National Academy of Sciences. The committee's decision, announced in January 2003, found that Lomborg's book violated Danish standards of scientific practice and met the criteria for "scientific dishonesty." *The Economist* responded by attacking the Danish committee, even though its members were not environmental scientists and therefore could not be presumed to be predisposed against Lomborg's work: "The panel's ruling—objectively speaking—is incompetent and shameful." *The Economist,* which prides itself on its "objectivity" (see the Economist Group's statement at *www.economistgroup.com/),* offered a heavily slanted story: *The Economist*'s deputy editor, Clive Crook, wrote that the Danish decision "offers nobody any reason to change their minds on Lomborg's books *[sic].*" Crook went on to declare that the Danish committee's ruling had "a rather Stalinist ring." After the ruling and all the reviews in scientific journals, *The Economist*'s editor still stated that the volume, loaded with elementary statistical errors (especially selective use of data), was an "outstanding statistical study" (Woodard [2003] cites similar statements from other Lomborg fans).

One assumes that the magazine's staff are not deliberately trying to destroy the world; perhaps they believe that pushing their political agenda will do no harm and perhaps do good. They are products of an educational system in Great Britain, like that in the United States, that can turn out "educated" people who are vastly ignorant of how the world works. Evidence of this is the work of *The Economist*'s staff in the field of economics itself. As Sir Partha Dasgupta, Frank Ramsey Professor of Economics at the University of Cambridge and one of the world's most distinguished economists, wrote, "The *Economist* staff (even those higher up) who claim to be economists are PPE (Philosophy, Politics, Economics) inspired. The magazine writers write very well indeed (the undergraduate tutorial system from which they have emerged focuses on writing skills), but the economics on which they base their pieces (be they on the environment, on trade, on EMU [European Monetary Union], on productivity growth, or on whatever) is rarely above the sophomoric.... I would urge you not to infer the state of modern economics from the *Economist*" (e-mail to a series of colleagues, 13 January 2003). For details on ecological–economic issues, consult Dasgupta's fine book, *Human Well-being and the Natural Environment* (2001).

Who shares the ethical responsibility for the lack of environmental understanding of *The Economist*'s staff, their American counterparts who write for the editorial pages of the *Wall Street Journal,* and a frightening proportion of citizens and decisionmakers around the world? I do, and so do you. We have all too often made science and economics courses in colleges and universities dull, daunting, or both; avoided boring assignments on university curriculum committees; paid little attention to what was happening in early education; and not accepted any responsibility to directly educate the public. We have "stuck to our lasts," and now we are stuck with the results. Stanford University has one of the best environmental science faculties in the world, but university politics has not allowed an environmental science course to be required of all students. Science (including social science), mathematics, and technology make up more than half of Western culture (i.e., society's body of nongenetic information), and the future of that culture is imperiled by environmental deterioration, racism, gross economic inequities, and weapons of mass destruction. Nonetheless—and unfortunately—it is not unusual for a presumably educated person to be totally unfamiliar with ecosystem services; heritability; shadow prices; the sources of food, water, and energy; and critical masses.

There is no ethical question of censorship in the Lomborg affair. The question about Lomborg is not whether he should be allowed to voice his views, but whether he should be granted venues that suggest support and approval from communities that neither support nor approve his views. The ethical question is one of truth in packaging. Publication by CUP implied review by competent environmental scientists, assuring that the work had met at least minimal scientific standards.

Scientists, like other citizens, have the right to criticize, boycott, or take whatever actions (within the law) they deem appropriate against a press that publishes fraudulent material or those who promote it. Indeed, at this level, it seems to me that the ethical duties of the scientific community are manifest and partially fulfilled. Convincing the public or decisionmakers that the environment is not deteriorating (the Julian Simon–Lomborg–*The Economist* thesis) is both incorrect and dangerous (e.g., NAS 1993, UCS 1993). Taking a utilitarian approach, it is also prima facie unethical, because its consequences are likely to cause great misery for billions of people, far outweighing the pleasure obtained by those who benefit from sponsoring the deterioration. In addition to behaving unethically at a global scale by augmenting the threats to the human future, by promoting meretricious material, CUP puts at risk the reputations of other scientists who publish with the press, and now reviewers must take special care in evaluating the books CUP publishes.

How to balance freedom of expression and minimal standards of objectivity is just one of the ethical problems we can discover in our own backyard. Perhaps the most uncomfortable problem to address is the need to examine the ethical implications (if any) of our own research priorities. I will leave that monster for future consideration, since I find wrestling with it personally difficult.

How can we do better?

The basic answer to "How can we do better?" is to do everything possible to encourage discussion and debate of the ethical issues facing society. That goal should be subject to tithing—ideally, everyone puts 10 percent of his or her time into trying to improve society's functioning. Fortunately, there are many ways to build involvement, and many biologists are already tithing in one way or another. Remember, societies must evolve their own ethics, and society is globalizing. It is imperative that the attitudes and institutions necessary to speed the process be developed before the human predicament overwhelms us.

Those of us who teach in colleges and universities are presented with more and easier opportunities than most. We can add coverage of ethical issues to many courses and to our textbooks, and we can invite speakers to seminars to discuss those issues. We are confronted with ethical issues all the time, and the more open we are about them, the better. The National Institutes of Health already requires that applications for research training grants include a description of a program to provide instruction in the responsible conduct of research. The areas to be covered include conflict of interest, authorship of papers, data management, use of animal and human subjects, and policies for handling misconduct. At Stanford, this has led to two graduate seminars on scientific ethics, one with a biomedical orientation and one that combines biomedical and environmental issues. It is a small start, but a move toward what is really needed—a much broader explicit consideration of ethical issues at all levels of education.

As indicated above, one of our main ethical responsibilities as biologists is to communicate up-to-date, consensus-based biological science to the rest of society. Here, again, there has been progress. The most ambitious attempts have been made by the Aldo Leopold Program, mentioned earlier; among other things, it trains midcareer scientists to talk to the press, give interviews on television, and testify before legislative bodies. In addition, the American Institute of Biological Sciences has for years held sessions to help improve the communication between scientists and society at large. But senior scientists still have a long way to go in changing the culture of science so that communication of research results and conclusions to nonscientists is seen as an integral part of the duties of junior scientific faculty and as one requirement for the tenure, promotion, prizes, and other perquisites of good scientists.

Once we have improved our communication of consensus-based science, we have another responsibility: to attempt to interpret the results and to suggest actions that might be taken on the basis of the information. Scientists should do much more than "just report the facts." We do not give up our rights as citizens because we are scientists; rather, we are ethically bound to give our fellow citizens the benefit of our best counsel on issues at the interface between science and society. But we should also be required to inform our audiences when we are dispassionately attempting to present a scientific consensus (species extinctions are accelerating), when we are presenting a dissenting scientific opinion (the scientific focus pays too much attention to conservation of species relative to conservation of populations), and when we are giving a personal opinion, not a scientific view (the Bush administration is likely to make both problems much worse). Environmental scientists, especially, should be sure to interpret their observations. Biomedical scientists are not accused of advocacy when they recommend use of condoms to avoid contracting HIV, press for quarantines in the face of a new killer flu, or point out that smoking is frequently lethal. Rather, they are viewed as meeting their responsibilities to the public. Environmental scientists have an equal responsibility to diagnose the ills that afflict our life-support systems and to recommend how the assault on these systems can be lessened and their vital health restored.

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Finally, and perhaps most important, we must all work to establish more institutions whose mission is to ensure that ethical issues are continually addressed in more or less democratic forums. Some already exist, such as the Institute for Global Ethics *(www.globalethics.org),* which has the broad goal of promoting ethical behavior from the individual to the national level; the Eco-Ethics International Union *(www.eeiu.org),* which focuses on ecological (environmental) ethics; the Ethics Resource Center *(www.ethics.org),* which concentrates on institutional ethics (e.g., business ethics, anticorruption practices); and institutions connected with organized religions (e.g., the World Council of Churches, the American Ethical Union *[www.aeu.org],* and the Unitarian Universalist Church), including those with specific moral missions, such as opposing abortion, euthanasia, and infanticide (e.g., the Center for Life Principles *[www.lifeprinciples.net]).* But none of these has the global reach and access to the media that is achieved by forums such as the Intergovernmental Panel on Climate Change (IPCC). Biologists themselves could press to add working groups on ethics to the IPCC and to the related Millennium Ecosystem Assessment.

Needless to say, broadscale ethical discussions are sure to generate conflict—as, for example, between those of us who believe abortion is undesirable but often justifiable and those who consider it entirely immoral. Ethics are tough territory, and generating discourse about them is not without risk. Today, as an unprovoked war waged by the United States against a poor country with a population already battered by embargoes and a grim dictatorship—waged while civil rights in the United States were being rapidly confiscated—seems like it may never truly end, we must remember what happened in Nazi Germany. There, an ethical system evolved under which many, if not most, people came to believe that merely being Jewish, Gypsy, gay, or Slav was reason to be denied equal rights, and a substantial minority of Germans was persuaded that genocide against such people was justified. The stakes involved in a society's ethical decisions are high, and the dangers of ethical change are serious. But not moving to speed the evolution of ethics to fit today's realities carries its own great risks. Do we dare *not* take the chance?

But, you may be tempted to say, things are now so dismal that we might as well relax and enjoy the decline of civilization. After all, as the old saying goes, "If you've booked passage on the *Titanic,* there's no point in going steerage." Human affairs are moving in the wrong direction. George W. Bush is winning in his campaign to roll back protections for the environment, the rights of women to control their reproduction safely, and civil rights in general—and, perhaps unknowingly, working hard to destabilize the world political system and increasing the chance of political chaos, economic collapse, and even World War III. Why struggle to create a sustainable world for our descendants when the chances of success seem so small? My first answer is that, for me, it would be worth the effort even if humanity's chances were only one in a thousand. I would consider it my ethical duty to my grandchildren's generation to try to increase those chances to two in a thousand.

But I have an even more personal reason. I agree with one of the common threads of philosophical thought that stretches at least 2500 years from Plato through the existentialists to Singer. A human life has only the value acquired by the way that life is lived, and especially by its impacts on other mem-

bers of our highly social species. None of us leads an entirely ethical life; none of us even knows what that would mean, because cultural evolution has not led to universal agreement on what such a life would be—although nearly everyone would agree that Gandhi came close and Hitler did not. Complete agreement is probably permanently impossible, since what is ethical in one circumstance or environment is often unethical in another.

But in my view, leading an ethical (and thus meaningful and pleasurable) life entails being engaged in the cultural evolution of ethics. It involves a bottom-up approach—trying to be a moral entrepreneur, attempting to steer cultural evolution in directions that will allow as many people as possible to live satisfying lives without doing harm to other human beings or to the carrying capacity of Earth. Each of us should, I think, choose one or more areas of bioethics in which to be entrepreneurs—and contribute according to our expertise, talents, positions, and dispositions. Remember that even small actions that we take in our classes, research projects, and communities may have great impacts. Among other things, we never know when we may be influencing a Gandhi or a Darwin of the next generation. Idealistic? Perhaps. But today what seems like idealism may be the new realism. Inducing more rapid evolution of our ethical systems may be the only practical way to avoid global calamity.

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