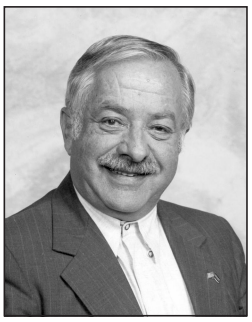
ASA in the 21st Century: Expanding Our Vision for Serving God, the Church, and Society Through Science and Technology

Kenell J. Touryan



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The new knowledge gained through science has led to spectacular achievements in technology. This has led technological optimists to argue that human ingenuity will overcome all limits. Pessimists, on the other hand, insist that the world is an inexorable course to human and ecological catastrophe. A more realistic approach acknowledges negative impacts of the global scale of human activity but works to mitigate them. As an affiliation that explores any and every area relating to Christian faith and science, ASA should face these challenges head-on. ASA members should direct sustained attention to studying the global crises, counter the sweeping tide of scientific materialism, and help both the private and public sectors make wise use of all technological advances for the physical and spiritual welfare of humankind.

Are there limits to what humankind can do through science and technology?

In its sixty-two-year existence, ASA has provided a forum where scientists (physical sciences, life sciences, and social sciences), engineers, philosophers, and theologians have been able to interact with one another and help shape Christian views of science and technology. In its mission statement, ASA is committed to provide advice and direction to the church and to society at large, in how best to use the knowledge and insights gained through science (and the advances in technology) while preserving the integrity of God's creation.

The dazzling light shed by science has led to technological achievements unequaled in human history. The successes, which bear on nearly every aspect of human endeavor, have eclipsed contributions from the humanities, including religion.

In the optimism of the Enlightenment, technology assumed a high position in Western societies, and subsequently at times has been so exalted as to become a religion.[1] In fact, science and technology have become the twin gods of the past century and no doubt will continue to entrench their lofty positions throughout the twenty-first century.

Are there limits to what humankind can do through science and technology? To answer this question, let us look at the account given in Gen. 11:1–9. Shortly after the flood, humankind designed and began to build the first skyscraper of record, "*a tower that reaches the heavens,*" as protection against natural

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** ASA President Ken Touryan presented this paper as his presidential address at the 2003 ASA Annual Meeting at Colorado Christian University, in Lakewood, CO, July 28, 2003.*

catastrophes, like the flood. In verse 6, God comes down to see the construction[2] and makes an amazing assessment: "*If as one people, speaking the same language they have begun to do this, then nothing they plan to do will be impossible for them*" (Gen. 11:6). In other words, whatever humans decide to do, as in science and technology, they will be able to accomplish.

It was not *technology* per se that God was against, but the hidden motive behind the plan: *"make a name for ourselves."* Humans thus declare their autonomy, "Technology will solve all of our problems." Unfortunately, this autonomy, this declaration of independence, has led humankind to the threshold of global disaster, their scientific and technological achievements notwithstanding.

Technological optimists do not fret about the "two-edged sword" of technology, i.e., the environmental, social, aesthetic, and spiritual impacts of modern civilization. Most technological optimists—and apparently all economic determinists—believe that the boundless potential of human intellect will overcome problems of physical limits, thus making the earth's physical resources essentially inexhaustible. Edward Teller wrote: "Technology has opened the possibility of freedom for everyone."[3]

Most arguments about macroeconomics have, at their core, conflicting presuppositions about limits. Limited *sources* include biodiversity, cultivatable land, minerals, and energy; limited *sinks* include the ability of global ecosystems to accommodate the solid, liquid, and gaseous waste products of human activity. The exploit-and-move-on land use ethic prevalent in the United States in the nineteenth and twentieth centuries rested upon the supposition that the earth's resources are immeasurably greater than any conceivable human withdrawals, and thus could support human activity essentially without limit. Predictions that resource exhaustion would limit population growth, such as those of the nineteenth-century British economist Thomas Malthus, have not been borne out on a global scale because resource substitutions and new technology have overcome some of the physical limits. Nevertheless, archaeological evidence tells us that whole populations have disappeared due to the exhaustion of accessible resources. The long-running debate in the journals and media between economist Julian Simon of Harvard University and bioscientist Paul Ehrlich of Stanford University included wagers over evidences for their convictions.[4] Simon cited historical evidence to argue that human ingenuity will remove all limits to growth, whereas Ehrlich insisted that we are on course to resource exhaustion and ecological catastrophe. Their wager was settled in Simon's favor during his lifetime. But today the scale of human activity is so large that the impact on the earth's systems is becoming global and recovery times are measured in centuries.

Ten Pressing Issues Facing the Earth Today

Following Ehrlich, it is not hard to make a list of critical issues generated by the global scale of human activity. In order of their impact on living systems, I offer a list of ten such pressing issues cascading from one impending crisis to the next. Briefly stated they are:[5]

1. **Energy: increasing demand, dwindling supplies.** The rate at which we are exploiting our nonrenewable resources, such as fossil fuels, will inevitably lead to a global crisis in mid-century. For example, the USA alone consumes 27% of the world's energy, yet constitutes only 5.5% of the world's population.

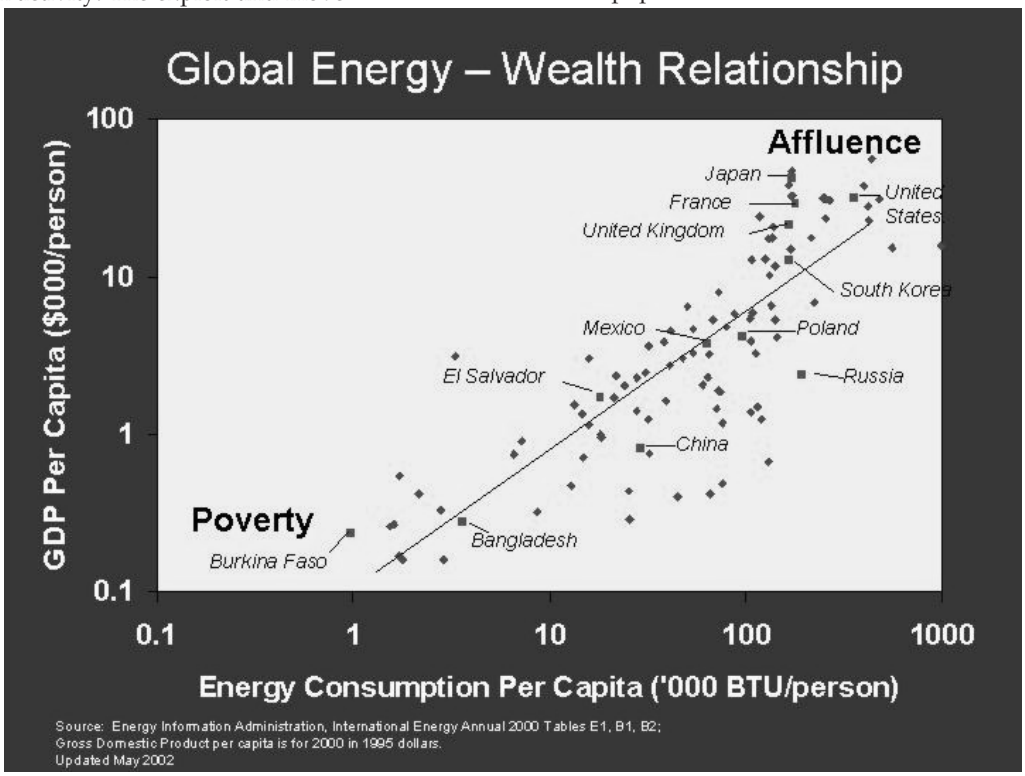

Figure 1.

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As shown in Figure 1, at this rate of use, and with the rest of the developing countries striving to achieve increased technological sophistication, global power consumption will increase from 14 TW[6] today to 30–60 TW by 2050. Where will this energy source come from? (See Figure 2.)

2. **Need for clean, fresh water.** Without adequate energy sources, the availability of renewable fresh water will be in jeopardy. Fresh water constitutes only about 2.5% of the total volume of water on Earth, and two-thirds of this fresh water is locked in glaciers and ice caps.[7] Just 0.77% of all water (~10 million km^3) is held in aquifers, soil pores, lakes, rivers, plant life, and the atmosphere. Only fresh water flowing through the solar-powered hydrological cycle is renewable. Non-replenishable groundwater can be tapped, but such extraction depletes reserves much the same way as extractions from oil wells. As of today, twenty-seven countries, such as those in the southern Sahara, are considered water-stressed countries.

3. **Food production and distribution.** With dwindling energy resources and without sufficient fresh water, severe strains will be placed on food production [on a global scale], genetically modified crops notwithstanding. As reported by Rosegrant and Cline, crop yield recently has fallen in many areas because of declining investment in research and infrastructure, as well as increasing water scarcity.[8] Additionally, climate change and the HIV/AIDS pandemic are crucial factors affecting food security in many regions.

4. **Environmental overload.** Technological advances can ameliorate the shortages mentioned above, but at what price on the environment? Atmospheric pollution, the greenhouse effect, and degradation of the biosphere and the lithosphere continue to plague the planet. Full cooperation on an international scale will be required to avoid irreversible environmental damage, such as the Kyoto Protocol of 1997. However, disagreements on how to implement regulations called for at the Kyoto Protocol cast a dark shadow on such cooperation. Again, technological innovations no doubt can develop some substitutes, assist conservation and recycling, and design benign chemicals to replace some of the toxic ones—but technological optimists believe that human ingenuity will permit us to overcome *all* limits to economic growth.

5. **Increased poverty with an increase in world population.** Although some estimates claim that the globe can sustain eleven billion people, unequal food distribution exacerbated by the crises in the availability of new energy resources and renewable fresh water could continue to leave 20% of the world's population in extreme poverty. It is sobering to realize that every year the global population increases at a rate equivalent to the population of Mexico (88 million as of 2002), mostly in less developed countries.

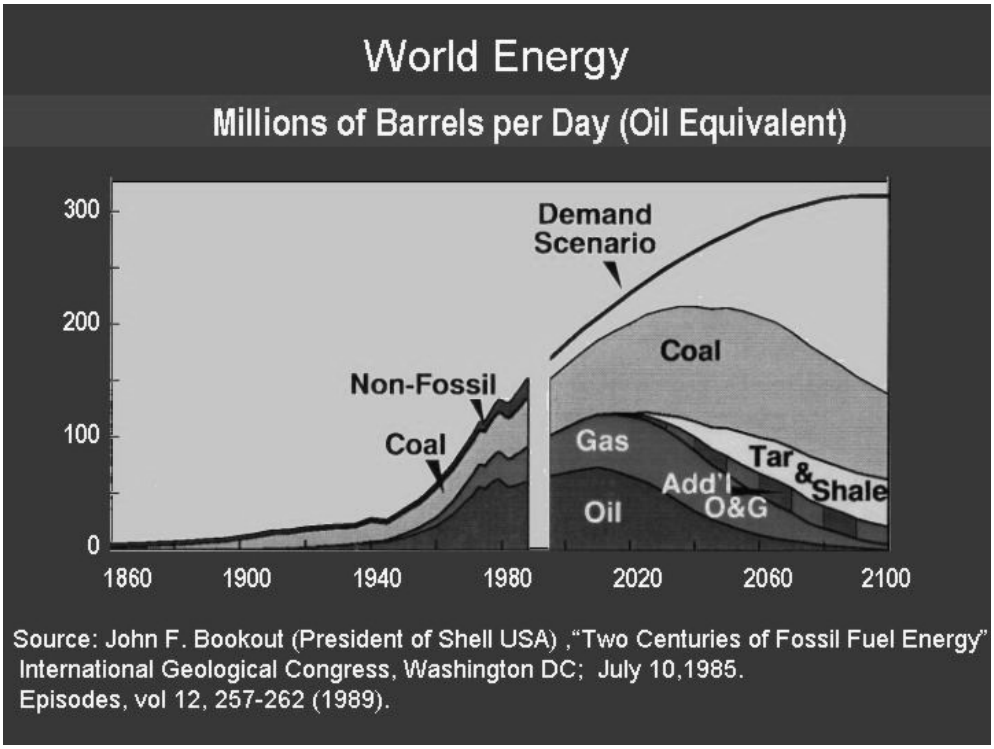

Figure 2.

6. **Pandemics and chronic diseases.** One unintended consequence of globalization is the spread of diseases that are affecting millions throughout the world. According to M. W. Mascie-Taylor and E. Karim, "the unabated pan-

demic of childhood and adulthood obesity and concomitant co-morbidities are affecting both rich and poor nations while infectious diseases remain an important public health problem, particularly in developing countries."[9] HIV/AIDS has infected forty million people worldwide, with three million deaths annually. World Vision estimates that by 2010, there will be over twenty million orphans, mostly in Africa—a potential catastrophe unequaled in human history! And all of this is occurring despite unparalleled breakthroughs in the medical sciences.

7. **Ethnic unrest and terrorism**. If technological advances in communication have increased globalization and interdependence among nations, its polar opposites, fragmentation through ethnic unrest, the rise of militant fundamentalist movements, and the availability of more sophisticated weapons (nuclear, chemical, and biological) are fueling terrorism that recognizes no boundaries.

8. **Technologically-driven ethical issues** in biotechnology, nanotechnology (manipulation of matter at the molecular and atomic levels), robotics, and cyborg technologies (interfacing the nervous system tissues with electronics) represent the next challenge. Those who glorify human ingenuity would call these breakthroughs the creation of the "transhuman species."

9. **Erosion of Judeo-Christian moral values.** The ninth crisis follows on the heels of the emerging transhumanist philosophy, more commonly described as the low but inexorable growth of secularism. With Christianity claiming that the fundamental problems of humankind arise from the corruptions of the human heart, there exists a growing confrontation between the secular and Judeo-Christian values. All of this is exacerbated by the relentless persecution of Christians, especially in third-world countries. One estimate by Paul Marshall puts martyrdom of Christians in the twentieth century alone at 26 million.[10]

10. **A nonlinear interaction exists among several of these global problems**, such as the feedback loop among demography, economics, ecology, and epidemiology. With the West's sense of responsibility to God growing dimmer, all of this could eventually lead to the loss of human dignity, human freedom, and democracy—the most tragic of all of the consequences.

How Can an Organization Such as ASA Deal with Any of These Issues?

The Chinese word for crisis consists of two characters: danger and opportunity. In his influential essay published in *Science* thirty-five years ago, Garrett Hardin suggested pessimistically that "mankind was doomed to over exploit global resources, common to humankind, unless the freedom to breed was relinquished."[11] If ASA chooses to face "the challenge of opportunity," it has to find a balance between two biblical mandates: the Creation Mandate and the Great Commission. The Creation Mandate states: *"Be fruitful and increase in numbers, rule over every living creature"* (Gen. 1:28) whereas the Great Commission states: *"Go and make disciples of all nations"* (Matt 28:18). The real challenge for the church in general, and ASA in particular, is how to maintain this balance. In what specific ways can it meet these daunting challenges? Working for new and non-polluting sources of energy? Conservation of our limited resources? Aggressive efforts at environmental protection? Insisting on proper ethical boundaries in technological advances in biotechnology, nanotechnology, and robotics? Working to limit technological growth? As the Apostle Paul states in his second letter to the Corinthians: *"Who is equal to such a task?"* (2 Cor. 2:16).

We must maintain a distinction between the creation and the Creator (Romans 1). Nature (natural resources) and technology may be used for human benefit, but usage must be measured.

Cautions from within the church against the uncritical application of technology are relatively sparse; well-known exceptions include Jacques Ellul[12] and Donald MacKay.[13] Certainly the Christian church has not hesitated to employ the latest technologies to help spread the message of the gospel. Consider missionary aviation, radio, sound systems, movies and television, computer-based concordances, and online Bibles. More recently the church has begun to wrestle with the implication of technologies that are clearly value-laden, such as weapons of mass destruction, medical sciences, GMOs, environmental damage, artificial intelligence, and the concept of sustainability.[14] God's directive on human endeavor recorded in Genesis 1 and 2 does not preclude technology as a legitimate response to the dominion mandate. The directive is supplemented, however, by significant constraints. Neither technology nor nature are to be worshiped; rather, humans must learn to operate within revealed constraints. We must maintain a distinction between the creation and the Creator (Romans 1). Nature (natural resources) and technology may be used for human benefit, but usage must be measured. Achieving sustainability requires self-assessment, the outcomes of which then must be used to

guide the collective self-limitation that will permit civilization to operate within constraints set forth in Scripture. Here are some practical suggestions for ASA members.

Identify the Special Expertise of ASA Members

As an organization with a broad spectrum of specialties, ASA can and often does provide experts who can address every one of the problems identified above. At present, there is no easy way to identify who these members are (see below).

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In addition to individual contributions, ASA can provide *collective* strength to address the above challenges. ASA has three affiliations (Biology, Christian Engineers and Scientists in Technology [CEST], and Geology) and eight commissions (Bioethics, Communications, Creation, Global Resources and Environment, History and Philosophy of Science, Physical Sciences, Science Education, and Social Sciences). Some of these affiliations and commissions are active; others are not.

ASA has established a communication infrastructure that consists of a bi-monthly newsletter and a refereed quarterly journal. The ASA web site, still under development, can be modernized to provide: (1) an online directory for members to identify and contact other members on geographic location and topics of interest; (2) a moderated, low-volume, opt-out announcement e-mail list that would include alerts, critical information, and regular feature articles; and (3) a strategy of referral marketing for attracting new members, specially those with expertise in the new technical fields of biotechnology, nanotechnology, and robotics.[15]

Better Utilize ASA Resources

In the past, ASA members have placed emphasis on position papers, monographs, presentations, and special symposia conducted by various active commissions at our annual meetings. All of these are commendable efforts and should continue, but ASA has the ways and means of directing sustained attention to studying big issues. It can marshal a greater breadth of expertise than normally comes together in other venues, and it can provide helpful contributions to ethical issues. Here are some practical ideas.

♦ ASA commissions can develop supplementary texts or booklets for high school and college students and use the ASA web site to add the ingredients of the real world missing in secular texts regarding the kingdom of God in human affairs.[16] These supplementary materials could counter the sweeping tide of scientific materialism. One such effort is the Lay Education Committee project. The committee is preparing a book and video with the working title: "Knowing Creation: What Science and the Bible Reveal about the Heavens and the Earth."

♦ Greater member participation in the commissions and more proactive involvement in the above issues can be gained through the use of the new online directory. For example, expanding the mission of the Bioethics Commission to include biomedical ethics, environmental ethics, and professional/research ethics. Recent highly publicized episodes of misconduct and fraud in physics, such as the fraudulent claim of creating element 118 at Lawrence Berkeley Laboratory,[17] have prompted the American Physical Society to update and expand its professional ethics guidelines. The list of ethical issues in the biomedical and environmental fields is long: the gene pool as a resource for future economic activity; genetically engineered organs; fusion of computational electronic and genetic technologies; global reseeding of the biosphere with laboratory-conceived transgenic plants, and finally the legitimation of the framework for the biotech century.[18] All of these may be tools to enhance life and produce liberation, but if history is our guide, they also will engender unanticipated consequences and be used to further tyranny.

♦ The CEST Affiliation provides a forum for establishing ethical standards in engineering. The most difficult question for engineers, scientists, and businessmen is whether there should be limits set on technological growth. For example, robust growth in nanotechnology will lead to nanoelectronics to revolutionize computers and sensors, nanoelectronic based robotics with AI, and cyborg technology. Some of these advances will enable construction and maintenance in space, assist the creation of new materials that are defect-free and low cost for myriad applications, and provide access to vast information. But how will humans make wise use of these advances for the physical and spiritual welfare of all peoples?

♦ Active participation in decision-making bodies at the county, city, and state levels and on federal commissions will place the ASA members in strategic positions to influence new policies.

♦ Senior members should actively recruit and mentor graduate students, offer them guidance in their selection of majors and encourage them to seek employment in the private and/or public sector that are addressing one or more of these critical issues.

♦ Finally, ASA can have a global outreach by exporting the ASA concept beyond Canada (CSCA) and England (CiS) to other European countries; Former Soviet Union countries; and Asian, African, and Latin American countries, creating international affiliates that would adapt the ASA concept to their local cultures.

Reversing an Important Ratio

A Christian understanding of the meaning and place of technology in our lives must be neither pessimistic nor optimistic, but rather—as so often turns out to be the proper biblical exegesis—balanced between the two extremes. A Christian approach to technology must not be *pessimistic* because through the liberating, redemptive work of Jesus Christ we gain the ability to manage the creation responsibly rather than just for our personal benefit. We are (or more precisely, we can be) freed from the grip of *technique* just as we can be freed from enslavement to other sinister forces. Neither should the Christian approach be blindly *optimistic*, because taken to an extreme, technology can be exalted to the point where we become devoted to it and we expect it to save us from most of our problems. Devotion such as this is idolatry and enslavement to a master other than Jesus Christ.

As further encouragement to ASA members, we should be aware of the fact that God challenges us with an unusual ratio: Human Resources divided by Challenges (R/C) is <<1 (very much less than one). Recall for example, the resources David had against Goliath; Gideon with his 300 fighters against the challenge of the Midianites (30,000 strong); and the boy with five loaves and two fish versus a hungry crowd of over five thousand people.

The reason God permits this great imbalance to occur is that he wants to use a quantity that *he* holds, namely, the divine infinity (∞). To better picture how God reverses this inequality by using his secret quantity, let us represent the inequality by a formula R/C <1, where R represents our limited resources and C the great challenges. For example, for Gideon, this ratio was probably 0.01 (300 divided by 30,000). The same was true for David facing Goliath and the young man holding his brown bag, facing a "stadium" full of hungry people.

What God did in each of these cases, however, is *enter* the equation in the *numerator* with his resources. David knew from experience what God could do and indeed "*the battle is the Lord's*" (1 Sam. 17:37, 47). David used this knowledge, believed God, and charged the enemy. The infinity he used was the "*name of the Lord Almighty*" (v. 45). Any number—no matter how small—when multiplied by infinity, reverses the R/C ratio, and makes it much greater than 1.

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For Gideon, the infinity was "*a sword for the Lord and for Gideon*" (Judges 7:20). For the young man with the fish and loaves, it was our Lord's empowered hands, all of which reversed the ratio from very much less than one, to very much larger than one.

The following principles emerge from the above situations:

1. God does not like "nothing" or "0." After all, he created something from nothing. Multiplying "0" with "∞" is indeterminate or zero! There is no resource too insignificant for God that he cannot use it.
2. Each of us needs to yield our resources, talents, and gifts—no matter how meager—to him to multiply by his infinite power. Any number, no matter how small (but greater than "0"), when multiplied by infinity overpowers the greatest challenge in the world.
3. By taking our resources and multiplying them, God becomes our partner, albeit the *senior partner*, in having us face seemingly insurmountable odds. Only once in Scripture do we read that God took upon himself to bring salvation (Isa. 63:5). God's exclusive preference is to use his people as his hands and feet.

The outcome of all of this is victory over life's numerous, often-daunting challenges, but where all glory and honor go to the Triune God. This was clearly articulated by David who gave no credit to his skilled marksmanship in downing Goliath, but rather to the name of the Lord (1 Sam. 17:45). In fact, we can join David, when he later wrote Psalm 20, declaring *"…some trust in chariots, and some in horses, but we trust in the name of the Lord our God."*

The Apostle Paul expresses this inner working of God's power, through his Holy Spirit by coining a new Greek

word—*oupper-ik-parisso*—translated in the NIV to *"'immeasurably more' than we ask or think"* (Eph. 3:21). The word actually means *super-extra-abundance*, an extreme state of affairs, which only the power of the indwelling Holy Spirit can bring about. Therefore, with Apostle Paul we can say with confidence *"And God is able to make all grace abound to you, so that in all things at all times, having all that you need, you will abound in every good work"* (2 Cor. 9:8, NIV). ⁂

Acknowledgment

The author acknowledges with gratitude the valuable contributions made to this article by Dr. Jack Swearengen. Jack carefully reviewed the original manuscript and provided the information and insights regarding the challenges that make technology a "two-edged sword," and how churches have begun to wrestle with the uncritical application of technology.

Notes

[1]David F. Noble, *The Religion of Technology: The Divinity of Man and the Spirit of Invention* (New York: Penguin Books, 1999).

[2]In a humorous account, the Bible states that God had to come down in order to see this "mole hill" humankind was building (Gen. 11:5).

[3]Edward Teller, *Better a Shield than a Sword* (New York: The Free Press, 1987), 151.

[4]Julian L. Simon, ed., *The State of Humanity* (Oxford, UK: Blackwell, 1995); Julian L. Simon, "'Finite' doesn't fit here," *The Oregonian* (Portland), February 11, 1997; Julian L. Simon, "Earth's Doomsayers Are Wrong," *San Francisco Chronicle*, May 12, 1995; Paul Ehrlich, *The Population Bomb* (New York: Ballantine Books, 1971); and Paul Ehrlich and Stephen Schneider, "A $15,000 Counteroffer," *San Francisco Chronicle*, May 18, 1995.

[5]For details dealing with the first six issues, the reader is referred to *Science* 302 (12 Dec. 2003): 1906–29, where nine articles discuss some aspects of these issues under the broad title "Tragedy of the Commons?"

[6]A terrawatt is 10^{12} watts; a number equivalent to a thousand, 1000 Megawatt power plants (fossil fuel or nuclear).

[7]S. L. Postef, G. C. Daily, and P. R. Ehrlich, "Human Appropriation of Renewable Fresh Water," *Science* 271 (1996): 785–8 and Peter H. Gleick, "Global Freshwater Resources: Soft Path Solution for the 21st Century," *Science* 302 (2003): 1524–8.

[8]M. W. Rosegrant and S. A. Cline, "Global Food Security: Challenges and Policies," *Science* 302 (12 Dec. 2003): 1917–9.

[9]C. G. Nicolas Mascie-Taylor and E. Karim, "The Burden of Chronic Diseases," *Science* 302 (12 Dec. 2003): 1921–2.

[10]Paul Marshall, *Their Blood Cries Out* (Dallas, TX: World Publishing, 1997), 3–14.

[11]Garrett Hardin, "'Common Pool' Resources," *Science* 162 (1968): 1243.

[12]Jacques Ellul, *The Technological Society* (New York: Vintage Books, 1964).

[13]Donald M. MacKay, *The Clockwork Image* (Downers Grove, IL: InterVarsity Press, 1974).

[14]Philip Schafran, "Is Mankind the Measure? Old Testament Perspectives on Mankind's Place in the Natural World," *Perspectives on Science and Christian Faith* 47, no. 2 (June 1995): 92–102; James Peterson, "Should We Be Concerned About People Who Do Not Yet Exist?" *Perspectives on Science and Christian Faith* 47, no. 2 (June 1995): 103–9; Bruce Beaver, "Science, Sand, and Spirit," *Perspectives on Science and Christian Faith* 52, no. 2 (June 2000): 118–22; Ian Hutchinson, "Faith in the Machine," *Perspectives on Science and Christian Faith* 52, no. 4 (December 2000): 260–2; and Glenn Morton, "Planning Ahead: Requirement for Moral Accountability," *Perspectives on Science and Christian Faith* 51, no. 3 (September 1999): 176–80.

[15]Memo submitted to the ASA Executive Council by Ernest Prabhakar, Dec. 5, 2003.

[16]Ralph Winter, "Editorial Comment," *Mission Frontiers* (Nov.–Dec. 2003): 4–5.

[17]Bertram Schwartzschild, "Lawrence Berkeley Lab Concludes that Evidence of Element 118 Was a Fabrication," *Physics Today* (Sept. 2002): 15–7.

[18]Jeremy Rifkin, *The Biotech Century* (New York: Tarcher Putnam, 1998).