

## TECHNOLOGICAL SKEPTICS: SEERS OR SCAREMONGERS?

In his Opinion column "Physicists in the 'Age of Diminished Expectations'" (March 1992, page 61), Arthur Kantrowitz defines "the Malthusian pretense" as "pretension to the ability to predict mankind's limitations." His point is that in trying to predict the future we do not adequately know the technological or human factors that may make things better. That is obviously true. His example is the Reverend Thomas Malthus's inability to "foresee that with increasing wealth the birthrate would drop" in "the particular population for which he predicted mass starvation, namely England in the Industrial Revolution."

However, Malthus's true insights are much more important to us now than those he missed. Since Kantrowitz uses "the Malthusian pretense" so pejoratively it is useful to reiterate how "generally correct" (in Kantrowitz's words) Malthus was. Here is Kenneth Boulding's description of a key insight of Malthus: "If there are no checks on the growth of population except starvation and misery, then the population will grow until the people are miserable and starve."<sup>1</sup> Today an estimated 500 million people are malnourished, 20 million per year die of malnutrition-related diseases, and world population is increasing by almost 100 million per year. Boulding continues with a corollary: "Unless technical progress itself leads to conscious checks on births—as it may not do—technical progress in the long run merely enables more people to live in misery than before, and any improvement which it brings in levels of living will be a mere prelude to a greater mass of misery." Kantrowitz writes, "This column is intended to pose the question, How can physicists help in restoring the hope cherished by many generations of Americans that their children would live in a better world?" One of the possible ways is for physicists to educate themselves, their families and associates, their Congressmen and their President about what Malthus got right.

Kantrowitz seems to see only the "repeated unsuccessful attempts to foresee the limitations of science-based technology" and the cases where we have underestimated "the responses humanity could make to new challenges." He fails to consider that in trying to predict the future we often cannot factor in negative or inadequate responses of humanity, or unforeseen harmful consequences of technology. Consider some examples:

▷ Who could have predicted that an estimated 100 million couples worldwide would like to avoid conception but do not do so because they are unable to obtain contraceptives or sterilization, while at the same time the most powerful nation in the world funds international family planning at less than \$400 million per year but gives many times that amount in military aid?

▷ Who could have predicted that there now would be an estimated 10 million adults infected with the AIDS virus, given that ways to avoid AIDS are well known?

▷ Who could have predicted that soil in the Tigris-Euphrates valley, which was salinated (primarily by irrigation) over 2000 years ago, would still be ruined?

▷ Who could have predicted the following effects of building the Aswan Dam on the Nile: more cases of schistosomiasis, destruction of sardine fisheries and the washing of delta farmland into the sea?

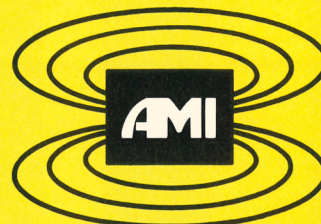
▷ Who could have predicted that diethylstilbesterol would cause cancer in the daughters of women who used it? The cancers did not occur until the daughters reached puberty.

▷ Who would have predicted that Morton-Thiokol management would override its engineers who expressed concerns about the O-rings on the space shuttle Challenger?

▷ Who thought about the people downstream when radioactive waste was either being poured on the ground or stored very poorly near the Hanford, Washington, nuclear facility, within four miles of the Columbia River?

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There could be books full of such examples. And there could be books full of interviews with those who looked at only one part of a problem and assumed their solution to it had no other effects. We often tend to forget that "we can never do only one thing."<sup>2</sup> The point is not that people are foolish or have bad motives. The point is that in guessing the future, it is as easy to overestimate the benefits of technological solutions or the response of humanity as it is underestimate them.

Finally, I'll hazard two guesses in response to the initial question of Kantrowitz's article: Why has there been a decline in the growth of US productivity?

First, the culture of a society and its productivity are closely linked. US culture is now heavily influenced by television, a technology that is used primarily not to elevate or educate but to make people want to buy things. Someone whose values and modes of thinking are heavily influenced by television may be less able to invent or manufacture a television than someone whose culture is more linked to older values.

Second, some years ago in the US there were vast tracts of uncut timber, rivers that had not yet been dammed, land inhabited by very few people, enormous supplies of easily extracted oil, and oceans that could be fished extensively. Now none of the above are in great supply. However, the population of the US continues to grow, primarily because of immigration, at about 10% every ten years. Consequently, the per capita supplies of these resources have been declining and will continue to decline. Our children and grandchildren will have smaller shares of all of them. It is difficult to continually be more productive while resources are declining and many resources must be used to clean up problems of the past.

We do need to develop improved science-based technology in areas such as energy, materials, food production, hazardous wastes, computers and contraception. Since resources are declining as population increases, technology will need to improve rapidly if a constant standard of living is to be maintained. But in trying to predict the future and spend our time and resources most wisely we must use our best scientific judgment, try to see all the relevant aspects of problems and try to avoid letting our emotions take us in unwise directions. "Faith" in science-based technology, the erosion of which concerns Kantrowitz, may be most enhanced by those scientists and technologists who try to

ask all the questions and are skeptical of the answers. As for those who think technology can keep up with the current increases in the US and world populations—they certainly do appear to have great faith in technology and the human response to problems.

## References

1. K. Boulding, *The Organizational Revolution*, Harper & Brothers, New York (1953).
2. G. Hardin, *Filters Against Folly*, Penguin, New York (1985).

STEVEN C. HILL  
Las Cruces, New Mexico

4/92

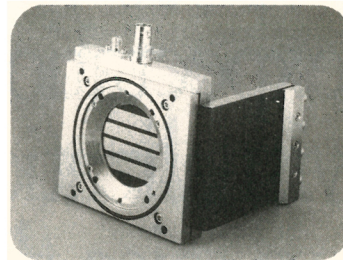
Arthur Kantrowitz presented a very learned, but flawed, defense of the conventional wisdom concerning the decline in productivity in the United States over the last two decades.

Kantrowitz attributes this decline in part to "the quest for a risk-free society." A "risk-free" society is a good straw man. What are we going to do with nuclear wastes? Who is going to pay for their disposal? Why does the nuclear industry insist on a cap on insurance claims for catastrophic failures? Who bears the social costs of that cap? Some eminent physicists predicted that nuclear power would be so cheap and plentiful that it would almost be given away. Were those scientists, perhaps, "opportunists compet[ing] for control of the public perception of scientific facts" and "exploit[ing] that control for their own ends"—very much like the opportunists who Kantrowitz worries will dominate public perception "in the absence of a clear signal from the scientific community"? Today, nuclear power can compete with other energy sources only with the aid of massive subsidies. If only \$1 billion of that subsidy were applied each year to research into alternative, renewable energy resources, and if that research were aimed at a dispersed, as opposed to a concentrated, energy system, how well would nuclear energy be able to compete? And what effect would this change in emphasis have on future productivity?

Kantrowitz missed two additional points that should at least be mentioned. The first was illustrated by President Bush's trip to Japan and by his companions on that trip. US auto executives are grossly overpaid in relation to their Japanese counterparts, while presiding over massive failures in sales and profits. Their emphasis on the bottom line each quarter and their disregard for the future are symptomatic of the ills afflicting American enterprise today.

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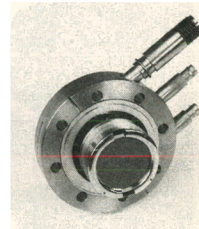


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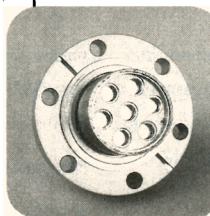
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In addition, the Japanese cars are exceeding the requirements for mileage and emissions controls, whereas American auto executives annually go to Washington to demand a relaxation of standards. That is precisely the opposite of Kantrowitz's argument. Japanese productivity has not decreased in the auto industry. The Japanese have penetrated the American market *because* they planned for the future.

A second point not raised by Kantrowitz is that most research by the US has been funded for the purpose of developing weapons. A comparison of the number of physicists in secret, compartmentalized jobs in the US with the number in Japan might be instructive. There is more profit in cost-plus weapons systems than in competitive consumer electronics. The percentages of engineers and physicists involved in the development of weapons systems in the US, Japan and Germany probably will show an inverse relation to productivity.

There are interesting questions concerning our decline in productivity. Kantrowitz missed some of them by concentrating on the public's health concerns and on the neo-Malthusians.

DAVID R. DAWDY  
3/92 San Francisco, California

I heartily agree with Arthur Kantrowitz that we are plagued by exploiters of fear and ignorance who exaggerate risk, discourage innovation and burden the economy with unwarranted litigation. But in seeking the source of those burdens, I think he is off the mark in implying that religion is to blame—as when he writes that “the quest for a risk-free society and the Malthusian pretense are striking in their similarity to the medieval ecclesiastical assertions that science is ‘dangerous’ and ‘futile.’”

If one examines the ideological backgrounds of the scaremongers, one finds far more left-wing, anticapitalist thinking than proreligion, anti-science attitudes.

Sociologists Ronald Stark and W. S. Bainbridge, in *The Future of Religion* (U. California P., 1985), paint a picture far different from that of Enlightenment warriors against religion. And E. J. Dijksterhuis, in his *The Mechanisation of the World Picture* (Princeton U. P., 1986), shows that medieval scholasticism was actually the birthplace of modern science.

Among scientists, an antireligious posture that ignores neoscholastic research has been dominant in Western

society since the Enlightenment. Such views have helped to divide it into warring camps, strengthening antireligious, collectivist economic ideas and weakening efforts to promote individualist entrepreneurship and individual exercise of reason and high ethical standards. Part of the reason for our “diminished expectations” may lie in that division inherited from the Enlightenment. The quest for a risk-free capitalist society is another embodiment of the Marxist quest for perfect economic security.

Neoscholasticism should have a counterpart in a neo-Enlightenment. Neo-Enlightenment would embrace science, reason and capitalism, but reject war on religion and its moral-ethical systems.

LAWRENCE CRANBERG  
3/92 Austin, Texas

KANTROWITZ REPLIES: Steven C. Hill rises to defend “Malthus's true insights.” Malthus's errors must also be pointed out, since they continue to mislead so many to this day.

A recent UN Food and Agriculture Organization report states that chronic undernourishment in developing regions has declined from 36% to 20% in the last 19 years.<sup>1</sup> In the same period, the report notes, population in those countries has increased by 1.3 billion, or 50%. The public acceptance of the Malthusian pretense deflects attention from this remarkable triumph, which I have not seen mentioned in the lay press. If our young people knew about it and about the science-based technologies that made it possible, it could help to persuade them to devote themselves to the pursuit of such powerful technologies.

Hill gives seven examples of unpredicted “harmful consequences,” some of which were related to new technology. I did not imply and I do not believe that innovation is risk free. We can reduce the harm by objective analysis. However, I am convinced that the pretension to prophecy will not improve the human condition. The great imperative in my opinion is to improve the communication of what science knows and especially what science does not know so that professional knowledge can play its proper role in informing the public perception. In what Hill calls “guessing the future,” we must not allow opportunists to exploit the confused signal that science too frequently sends today.

The exhaustion of resources is well known to economists and does not account for the decline in the growth of US productivity. I would add that

we must remember that elements of nature, including the examples Hill gives, became “resources” only with the advance of technology. Is there any reason to doubt that further advance would be as powerful in transforming other elements of nature into new resources?

David R. Dawdy expresses a series of doubts about nuclear energy that are part of the ruling public perception in the US. Persuasion of the public of the validity of these fears has forced our retreat. The widespread use of nuclear energy in France is based on a different perception. This difference is an illustration of the failure of science to communicate the known objective facts, which are the same in the US and in France.

Dawdy's point about the competitiveness of the US automobile industry is not “precisely the opposite” of my argument, since I made no mention of our auto industry. I have no problem with regulation when the public perception that supports it is consistent with professional knowledge.

Lawrence Cranberg raises very serious issues in examining the “ideological backgrounds of the scaremongers.” While it is unfortunate enough for ideologists to distort science for their purposes, it is much more serious for scientists, in assessing scientific facts, to examine the ideological backgrounds of their proponents. While the former certainly has contributed to our difficulties, if we adopt *ad hominem* attacks, we abandon science.

I am concerned with the apparently rising force of ideologies ancient and modern, left and right. Coping with their almost universal antagonism toward the independence of science remains a great challenge.

## Reference

1. Science **257**, 876 (1992).

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## Can ‘Band-Aids’ Close the Ozone Hole?

Patrick Hamill and Owen Toon's fascinating article on polar stratospheric clouds and the ozone hole (December 1991, page 34) brings to mind an obvious but farfetched possibility that deserves to be mentioned once (but perhaps only once) in print.

The only genuine solution to the ozone problem is to stop dumping chloro- and bromocarbons into the atmosphere. Sadly, as we know, even