

PHYSICISTS IN THE 'AGE OF DIMINISHED EXPECTATIONS'

Arthur Kantrowitz

Distinguished economists such as Paul Krugman of MIT have great difficulty in accounting for the decline in US productivity growth in the last two decades. Krugman reports¹ that "even among the experts... stagnant American productivity is not a fashionable topic... Why did it happen? And what can we do about it? The answer to both is the same: We don't know."

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? I will not deal with the undoubtedly great contribution physics has made to technology but with the even greater contribution it has made in enlarging humanity's view of the world. Perhaps the time has come to do it again.

Two ideas have become prominent during the decades of decline but do not get much attention from economists. These are the quest for a "risk-free" society and what I shall call the Malthusian pretense. Both are major changes in attitudes supported by images of the world *allegedly* informed by modern science.

The quest for a risk-free society

A few examples drawn from these decades of decline will illustrate the impact of this quest on innovation, an important component of productivity growth:

▷ The US led the world in retreating from nuclear energy.

▷ The US reformed its legal system.² Now innovators are liable for any damage related to their innovations, even when no knowledge existed that

could have warned of danger. Previously, to collect damages, it was necessary to show negligence. Today the liability tax on innovation has a chilling effect.

▷ A recent comparison³ of the US with other leading industrial countries in the approval of new drugs showed that of the 55 new drugs approved by the Food and Drug Administration in 1987–89, 80% were available in foreign markets for a mean time of 6.5 years before being approved in the US.

The quest for a risk-free society is far advanced at the present time, so that in raising research funds, it is frequently more effective to call attention to a possible disaster than a possible advance, to appeal to fear rather than to hope.

The Malthusian pretense

The Reverend Thomas Malthus's observations⁴ on the limitation of population growth by food supply contributed to our understanding of evolution. Although Malthus was generally correct, he was wrong about the particular population for which he predicted mass starvation, namely England in the Industrial Revolution.

In assessing the future food supply, Malthus projected a "yearly increase greater than the boldest speculator can imagine." He could not foresee the unprecedented growth of England's industrial and agricultural power, which made possible the provision of whatever food supply its rulers desired. He also could not foresee that with increasing wealth the birth-rate would drop.

But that is just the point. Malthus could not foresee all the responses that humanity could make to new challenges, especially when new technology multiplies the options available. Pretension to the ability to prophesy mankind's limitations is what I call the Malthusian pretense. Malthus regarded the idea of progress

and the notion of the perfectibility of man as blasphemous. His pretension to prophecy was written in defense of his faith.

It is remarkable that after repeated unsuccessful attempts to foresee the limitations of science-based technology (which would amount to negative theorems about human capabilities), Malthusian pretenses would dominate so much of our thinking today.

Communication of information

Without pretending to understand all the causes of our retreat toward a risk-free society and our widespread acceptance of Malthusian limits, I should note that both of these attitudes depend on information, not available to the naked eye, provided by people who claim credibility by citing their scientific credentials—that is, information allegedly certified by the credibility of science. Thus, public attention is drawn to invisible radiation (of which most Americans are ignorant) rather than to automobile accidents (about which most Americans have firsthand information).

But if the forecasting of limits for future technology is to escape the Malthusian pretense—recognizing the difficulties of establishing negative theorems—it must depend on the rigorous application of well-established principles. Predictions of mankind's limitations must not simply reflect the limitations of the author's imagination or wishful thinking in defense of the author's faith or values.

Science bears a heavy responsibility for *communicating* (not merely announcing) information basic to the public's attitudes toward the risks and limitations of science-based technology. It is incumbent on the scientific community to reexamine its procedures for communicating what it knows, and especially what it does not know, to the public when controversial scientific facts and facile predictions have a large role in forming

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public attitudes and thus in creating an "age of diminished expectations." As the importance of science in business and in politics has grown, so has the competition to control the public perception of scientific findings. In the absence of a clear signal from the scientific community, opportunists will compete for control of the public perception of scientific facts and will exploit that control for their own ends. Reexamining and strengthening the methods used by the scientific community to communicate with the public are necessary⁵ before America can regain its confidence in the magnificent adventure of science-based technology.

The quest for a risk-free society and the Malthusian pretense are striking in their similarity to the medieval ecclesiastical assertions⁶ that science is "dangerous" and "futile." Until these views were modified, science could not develop in Europe.

Until we modify the public's perceptions of risks and restore our faith in the potential of science-based technology, how can we persuade our young to devote themselves to its pursuits?

Physicists have in the past acted to change public attitudes. The profession can be properly proud of its role in informing the world that nuclear weapons must not be seen as, in John Foster Dulles's characterization, "a bigger bang for the buck."

Physics has been effective on an even larger scale. The triumphs of Newtonian mechanics, its unification of terrestrial and celestial mechanics, played a major role in establishing the faith of reason, the French Enlightenment and the realization of some of its ideals in America.

Surely we should now be able to shed light on the "invisible" evils of the late 20th century and challenge the Malthusian pretenders whose prophecies have such currency today.

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