

To conclude the book, several authors went beyond one million years to contemplate the end of the universe. Well, actually, the universe does not seem to end. Sean M. Carroll, in his chapter *The Rise and Fall of Time*, describes heat death, or in other words, the death of heat in the universe. As explained in more depth by Gregory Benford, another noted science fiction writer and physicist, in his chapter *The Final Dark*, when the universe gets to be about 10^{34} years old, even protons will disintegrate, leaving a universe forever composed only of positrons, electrons, and dark matter. Life still might exist in this cold quantum environment as, you guessed it, slow moving computational systems.

The book is not short of grand computational futures but does lack a good dose of humanity. Only one author addressed an issue that could be considered humanistic. In *The Laughter of Copernicus*, Jim Holt predicts that laughter will survive one million years into the future (along with numbers). But what about love? What about religion, spirituality, ethics, and morality? What about family, community, and nation? Do the social sciences, politics, economics, psychology, anthropology, etc., have any value in the distant future? Do these concepts become mere simulations in Vearth? Most of the authors were silent on these points, leaving me wondering how life in the Year Million could possibly be psychologically fulfilling.

The visions presented in the book also fail to convey a sense of what humanity's grand achievements could be in the future. What indeed is the unfinished business of humanity, in the words of the famous futurist Wendell Bell, and will we finish this business before retreating into our M-brains, where nothing of note seems to happen in the real world? Will we create a piece of art so compelling that it could be considered the capstone of any sentient beings and become the pride of the galaxy? Will humans finally understand the meaning of life? Will we meet God? Will we traverse the multiverse to save ourselves from heat death? Will we invade the multiverse to save our creators? Maybe. Maybe not. But, it can be argued that human life needs the sustenance of real, not virtual, challenges and adventures, real, not virtual, heros, and real, not virtual, journeys, else it will wither away into inconsequence.

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Global Catastrophes and Trends: The Next Fifty Years, Vaclav Smil, 320 pp., 74 illustrations, \$29.95/£19.95, 2008.

Vaclav Smil's books are always a refreshing read. At a time when, in many quarters of the futures research community, the ecological collapse of modern civilization is discussed as being almost unavoidable, Smil's analysis reminds the reader that the Earth is a complex system and that sweeping attempts to forecast this system's future in simple terms are likely to be wrong. Smil's newest book *Global Catastrophes and Trends: The Next Fifty Years* is no exception to this view. He bluntly calls Jared Diamond's book *Collapse* "a derivative, unpersuasive, and simplistically deterministic book" (p. 2). This statement is very courageous, given the enormous popularity of Diamond's writings during the last decade. In turn, Smil makes the point that his new book is not a book of forecasts. To pick out one of his many statements on forecasts: "I have a strong personal dislike of such efforts and plenty of historical evidence to demonstrate their ephemeral nature and their repeated failure to portray the complexity of future natural and human affairs" (p. 219). Instead, Smil refers to his book as "simply a multifaceted attempt to identify major factors that will shape the global future and to evaluate their probabilities and potential impacts" (p. viii).

After his biting critique on "how not to look ahead" in Chapter 1, in Chapter 2 Smil examines what he calls "key fatal discontinuities". Some of these discontinuities he discusses are based on volcanic eruptions or the Earth's encounters with extraterrestrial bodies. They must, says Smil, simply be accepted as unavoidable, but since they are highly unlikely they would not need further attention. As part of his discussion on fatal discontinuities Smil gauges the potential impact of major wars and terrorist attacks, that is, he analytically lumps together socially and naturally based radical changes. Interestingly, Smil makes a clear case that the threat of terrorism has been greatly exaggerated in public discourse. In his view, terrorism can and will be managed.

Chapter 3 on "Unfolding Trends" makes up the major part of the book. Here Smil discusses the trends he thinks will be most important until about the middle of the 21st century. He begins his discussion with energy as the basis for the survival of human societies, since without energy, the generation, distribution and consumption of food and commodities will not be possible. Instead of ringing the alarm bell, Smil explains why there will be no transition away from fossil fuels any time soon, despite its desirability. Simply, there are no realistic alternatives. After his relatively short discussion on energy, he jumps to the theme of a new world order, that is, to political, ethnic and economic issues. Despite his preference for quantitative measurements, in this section of the chapter he admits that his "appraisals respect the multifaceted nature of rising or falling national fortunes," and henceforth "do not attempt quantitative international comparisons" nor "definite rankings" or "time frames" (p.91). Instead, he

is poking fun at recent authors who predict that Europe will be the most important economic and cultural force in the 21st century. Smil rightly points to the problematic agricultural subsidies that have been swallowing some 40% of the EU annual budget, the rising unemployment rates in many parts of Europe, the rising retirement costs, and, most important, the low fertility rate of most of the aging European countries, coupled with an active resistance to assimilation by a large number of Muslim immigrants that he sees as a major problem for Europe's future. Smil's summary about Europe is summed up succinctly: "An entity so preoccupied with its own makeup, so unclear about its eventual mission, and so imperiled in terms of its population foundations cannot be a candidate for global leadership" (p. 102). Japan's fate appears to be similar, if we follow Smil, and Russia's current weaknesses will certainly keep it away from reoccupying any superpower position. What is left? China and the USA! Smil believes that by 2040 China will have easily surpassed the Gross Domestic Product of the US. It appears to be a commonplace today to note that the rise of China will transform the world of the 21st century, but Smil also points to some of China's many internal social problems and to the problem of Maoism as the paramount ideology of the ruling party. However, near the end of the chapter, Smil appears to be undecided on what to make of the role of the United States in an age of globalization. On the one hand he ascertains the United States' continuing retreat in its assertive global role, but on other hand he casts doubt that it once again would become simply another member of the community of nations.

In his last substantive chapter, Smil moves back from the geopolitical and socio-economic to environmental issues. He reminds his readers that human impacts on the biosphere via intensive resource usage and large-scale changes of the natural environment are not new, but have brought ecological disaster to many societies over the course of world history. Behind this background, Smil argues that many contemporary commentators deny the uncertainty of all climate change models. However, due to the complexity of interactions between social and ecological factors, knowledge on climate change leads to contradictory scientific findings. Smil does not mince matters when he discusses the global warming debate. In his view, global warming is a reality to be taken seriously, but climate scientists and decision-makers today simply do not know enough about the consequences of global warming. Nevertheless, similar to Smil's outlook on terrorism, he argues that the consequences of global climate change for human life will be manageable without many problems. The problems he sees, however, are that current debate on climate would distract from the real environmental challenges lying ahead. In this line, Smil discusses "real" future challenges such as the alterations of global water and global nitrogen cycles as well as increasing resistance to infective bacteria and antibiotics.

Towards the end of the book, however, the receptive reader is unsure whether Smil always lives up to his own standard of staying away from long-term forecasts. Indeed, he thinks that "there is a great deal of certainty regarding the duration and intensity of rapid aging of affluent populations" (p. 247). If this is the case, it appears to be puzzling that Smil, for instance, ignores the fact that fertility rates in Arab and Muslim countries, as well as among Muslim immigrants in Europe and elsewhere, have been falling very rapidly in recent decades, more rapidly than in any other era of world history, including the European decline in birth rates. Had he considered this, his analysis of Europe being overrun by non-integrable Muslim immigrants probably would have taken a different turn. Reflecting on Smil's discussion of the population implosion, one also wonders if there are not any positive aspects in having fewer people. Smil, who claims to have studied European journals and newspapers on this topic (p. 93), apparently read the wrong ones. Indeed, in recent years many scholarly and public debates on population decline in Europe have shifted from the downsides to the possible merits of having less people, including benefits for the natural world.

These quibbles aside, there is no doubt that *Global Catastrophes and Trends* is a book to be highly recommended to anyone seeking a more rational view on the many facets of the Earth's possible futures. It delivers enlightening and often counterintuitive insights into many of the world's possible drifts and obstacles. Furthermore, the fact that Smil discusses rapid social and natural changes side by side (although he sometimes lacks explanation on the causal connections between the two) makes *Global Catastrophes and Trends* a very important book for interdisciplinary discussions on the complexity of society and nature. The book's affordable price should make it a useful reading assignment in many courses – in both the social and the environmental sciences.

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H. Scheer, Energy Autonomy: The Economic, Social and Technological Case for Renewable Energy, Earthscan, London (2007), 310 pages, £19.99, ISBN: 9781844073559

This book is a persuasive plea for renewable energy as the only permanent, long-term, sustainable solution to the availability of energy for living in the twenty-first century and beyond. It puts forward the argument that renewable energy is the bedrock of a new kind of social organisation that is built on 'energy autonomy' – a decentralised society that derives energy from locally available renewable sources of energy. Energy autonomy has geo-political, economic and ecological