

Soft Machines

Thoughts on the future of nanotechnology from Richard Jones

« [Ideologies and nanotechnology](#)

In praise of Vaclav Smil

In my efforts to educate myself about how new technologies might impact on our economy and society, the author from whom I've learnt the most is unquestionably [Vaclav Smil](#). Smil is a Professor in the Department of Environment and Geography at the University of Manitoba, but his writings cover the whole sweep of the interaction of technology and society. What I appreciate about his books is their emphasis on rigorous quantification, their long historical perspective and global span (Smil is an expert on China, among many other things), and their grounding in the things that matter - how we get the food we eat and the energy that underlies our lifestyles.

My introduction to Smil's work came when I needed a rapid introduction to energy economics. His 2003 book [Energy at the Crossroads: global perspectives and uncertainties](#) does this job in an admirably clear-headed and realistic way. It has a particularly sobering view of the poor record of energy forecasting in the past, and of the evolution of linkages between economic growth and output and energy inputs. [Enriching the Earth: Fritz Haber, Carl Bosch, and the Transformation of World Food Production](#) takes a historical view of the linkage between energy and food. Few people nowadays stop to think about the importance of artificial nitrogen fixation, powered by fossil fuels, in feeding the world. Yet it is clear that without artificial fertilizers more than half of the current population of the earth would not be alive today. We are effectively surviving by eating oil. This theme is developed in [Feeding the World: A Challenge for the Twenty-First Century](#), which asks the fundamental question, just how many people could the world feed? After a period of plentiful and cheap food, at least in the West, we've forgotten about some of the more apocalyptic visions of mass famine. Yet the world food supply equation is probably more fragile than we'd like to think. This is likely to get worse, as climate change, water shortages, and environmental degradation puts pressure on yields, and increasing demand for [biofuels](#) increases demand for non-food uses of crops.

Many of these themes are brought together, with many other trends, in two of Smil's most recent books,

[Creating the Twentieth Century: Technical Innovations of 1867-1914 and Their Lasting Impact](#) and

[Transforming the Twentieth Century: Technical Innovations and Their Consequences](#). Taken together, these two volumes offer the best overview of how the world we live in now has developed that I know of. At one level, this is simply a narrative history of modern technology, albeit one that takes a holistic view of the way in which many different inventions come together to make important innovations possible. In this sense, it's the story of

accelerating change, in which one technological development facilitates another. But he is explicitly dismissive of those who are too quick to plot exponential curves and extrapolate from them. The title of his first book makes it clear that in Smil's view, the true technological revolution took place in the last part of the 19th century, and what we have seen since then is largely the unfolding of the developments that were initiated in this great saltation. And he is by no means certain that the rapid change will continue, noting the degree to which it has been built on a massive, and probably unsustainable, growth in energy consumption. His agnostic outlook is summed up in the last chapter, where he asks:

“have the last six generations of great technical innovations and transformations merely been the beginning of a new extended era of unprecedented accomplishments and spreading and sustained affluence - or have they been a historically ephemeral aberration that does not have any realistic chance of continuing along the same, or a similar trajectory, for much longer?”

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