

Brave new world

For several years, in his talks, climate scientist Will Steffen of the Australian National University has been presenting a visual depiction of the uniqueness of our time. He shows a series of figures for quantities such as global population, water use, damming of rivers, number of telephones, global GDP, species extinctions, atmospheric CO₂ and many other things, and for how they have changed over the past few hundred years. There is a common theme. Every curve shows rapid growth beginning a few hundred years ago, and now seems to be following an exponential path upwards.

Steffen's figures aren't even as dramatic as they might be, as the time series could go back much further. Before the past few hundred years, of course, for thousands and tens of thousands of years, human societies changed much more gradually, and our influence on the Earth was much less significant: we really are experiencing a sudden explosion of human activity on Earth.

In a finite world, of course, exponential growth cannot last indefinitely. In physics and biology, it generally occurs only over short intervals of time, often as a system moves away from an unstable point. The reactions driving a chemical explosive grow exponentially until they exhaust its fuel, much as a bacterial colony grows until it begins to run out of food or habitat. A few years ago, physicists Didier Sornette and Anders Johansen argued that an extrapolation of current growth trends points to a finite-time singularity around 2050. That doesn't mean we'll experience any singularity, of course, but that the extrapolation isn't justified — other forces must come into play to change current trends, and probably quite soon.

Evidence that something has to change soon is all around us. Fully 43% of the available land mass on Earth has been occupied or changed by mankind. We exploit approximately 5% of the total available free energy coming to Earth from the Sun. We're rapidly depleting our key resources, most notably fossil fuels, and seem to have pushed many ecosystems past their safe operating parameters.

From a very different angle, our own technological powers — especially in connection with information processing — have expanded so fast as to begin altering the fundamental nature of science and problem solving. We will create and



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gather more data in the next 10 years than in the entire previous history of humanity. From the design of an aircraft to the search for new medicines, our systems and problems have become so complex that we no longer have scientists and engineers solve those problems, but instead design computational systems capable of finding solutions on their own. We may be entering an era of science in which understanding will no longer be possible — we'll have to manage things without understanding.

Whether that is true or not, most interesting of all is the common human response to the unprecedented challenges we face. It is often not a constructive one, and reflects very old habits of thinking.

One attitude is to see our present situation as the result of human greed, bad economics and the socially irresponsible actions of big business, often furthered by corrupt politicians. There's certainly an element of truth to that. On the other side, 'sceptics' of the importance of climate change and many other environmental issues dismiss all as hysteria whipped up by the overactive imaginations of naive environmental activists. Again, it's partially true — there are many people with naive, romantic views about the harmony and inherently peaceful 'balance' of nature.

But these perspectives share something in common, and I suspect that what really gives them energy is a common instinct — strongly driven by human emotion — that our problems must arise from the purposeful actions of some agent. The human mind likes nothing so much as to cast matters of cause and effect into the outlines of narrative tales decided by heroes and villains. Both perspectives fail to consider a third possibility — that our problems of environment, of political corruption and financial instability, or international conflict, are at once real and serious, yet also not primarily the result of anyone with malicious intent. We'd have similar problems even without greedy

corporations, and they would be serious even without apocalyptic hype.

These problems — and our inability so far to respond to them in any effective way — may instead reflect a deep shortcoming in the human condition. We evolved to thrive in a simpler world that no longer exists, and for 99% of human history, our ancestors evolved to handle very different kinds of problems. The human brain can detect, identify and dodge a stone thrown by an enemy in much less than a second. It can recognize the hostility in a facial expression at 20 metres almost instantaneously. These were skills learned when human groups were relatively small, typically no bigger than 25–50 people, when crowds did not yet exist.

Our world then — socially, and otherwise — could be reasonably understood by studying the parts on their own, or looking at the interactions behind simple alliances or conflicts among several parties. Today, everything has changed and our most pressing problems involve complex webs of feedback. We have amazing science and technology, and with it have made our world far more complex than ever before. Unfortunately, we're stuck with old habits of thinking, and a growing mismatch between our brains and reality. We're still seeking individual agents to blame, when we need a totally new way of thinking — a way to see how ordinary human activity leads to unintended consequences in a thousand settings.

Our greatest hope is that we can change our habits of thinking, as our ancestors must have done in the past. Anthropologists argue that we have faced many similar fundamental challenges in the remote past, for example in making the transition from hunting and gathering to farming. That couldn't have been easy, and must have raised the ire of many sceptics who thought the idea was crazy.

Exponential growth and positive feedbacks, as much as they threaten us, should also give us confidence in the possibility of rapid change. "Most ignorance," Aldous Huxley once wrote, "is vincible ignorance. We don't know because we don't want to know." If we could manage a few small modifications in our habits of mind, we might be surprised how quickly things change. Optimism can still win the day. □

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