Book Review: Nanotechnology for a Sustainable World: Global Artificial Photosynthesis as Nanotechnology's Moral Culmination, by Thomas Faunce

Rick Docksai

World Future Review 2013 5: 221
DOI: 10.1177/1946756713491376

The online version of this article can be found at:
http://wfr.sagepub.com/content/5/2/221.citation
business drift . . . Coca-Cola began as a pharmaceutical product, Tiffany & Co . . . started life as stationery store . . . Raytheon, which made the first missile-guidance system, was a refrigerator maker (one of [its] founders was no less than Vannevar Bush, who conceived the teleological linear model of science . . .).

The teleological or goal justification model Taleb refers to follows this progression: scientific research > innovative technology > marketable products > sales > profits. But this ideal is not borne out by optionality (i.e., the right to choice) in the chain science > technology > material gains. NNT continues,

Nokia, who used to be the top mobile phone maker, began as a paper mill (at some stage they were into rubber shoes). Dupont, now famous for Teflon nonstick cooking pans, Corian countertops, and the durable Kevlar fabric, [began] as an explosives company.

These are all, indeed, noteworthy examples of business drift. Fragility is thereby nonlinear, and antifragility all the more so—yet responsive to the unexpected. Readers are likely to agree.

The Concave and the Convex

Author Taleb’s narrative is at times hard to follow, however, and readers should be prepared for instances of astonishing invective and even denigration. He uses these to dispatch conventional views of both economic theory and its application to the innovative mechanics of successful technical research. His descriptions of convexity and concavity in relation to Black Swan events, for example, are not easy to follow and demand considerable concentration.

Taleb closes his book with an amusing Epilogue, a practical Glossary, and most helpfully, Appendices that depict graphically some of the author’s key arguments. All in all, he has given the world a remarkable thesis (his work is currently available worldwide in about thirty-five languages), and his surprising conclusion—that things actually gain from being disordered—deserves to be considered carefully by anyone involved with planning for the future.

—Jacques Richardson

Note

1. “Unknowledge” is reminiscent of former U.S. Secretary of Defense Donald Rumsfeld’s much-cited “unknown knowns” and “known unknowns,” probably borrowed from the U.S. Army’s Strategic Studies Institute. There, Nathan P. Frier (2008, November) discussed known unknowns and unknown unknowns in a seminal paper on shocks confronting developers of strategy. Contact with Col. Frier can be made via carol.kerr@us.army.mil.


Reviewed by: Rick Docksai, World Future Society, Bethesda, MD DOI: 10.1177/1946756713491376

Keywords

sustainability, nanotechnology

Nanotechnology could be humanity’s means for solving the most seemingly unsolvable social and environmental crises of the present era, but only if we are wise about the uses toward which we put it, argues Thomas Faunce, Australian National University professor and Australian Research Council future fellow. He surveys the current uses of nanotechnology and some social concerns that arise from nanotechnology-based products now in use. He then outlines desirable directions in which nanotechnology’s developers could proceed if they want not only to maximize the public good but also to garner widespread public support.

The art of creating better materials and products by customizing their very atoms and subatomic particles has grown into an area of
$10 trillion of annual research-and-development funding worldwide, and has raised hopes of revolutions in electricity generation, clothing manufacturing, food production, medicine, building construction, and many other fields of industry. In the long run, Faunce contends, a global nanotechnology-based environmental sustainability (NES) project, coordinated by the United Nations and other global institutions, which could direct nanotechnology development toward the most socially beneficial ends and steer clear of socially harmful ones, may be our only way to transcend the unsustainable business processes that are debilitating our planet’s biosphere today.

Unfortunately, any NES project will run into opposition from corporate and corporate-funded interests that view NES as unwelcome competition. Governments whose lawmakers are the targets of extensive corporate lobbying will likewise tend to impede its emergence, as they have similarly discouraged prior commercial endeavors that their business constituents have pressured them to oppose.

An NES project will need strong backing from the general public to overcome this entrenched opposition, Faunce suggests, but he does not foresee such public support taking shape at present. Many consumers remain leery of the nanotechnology applications that businesses and governments are currently pursuing, such as nanoparticle-laced foods, or the use of nanotech in medicine to extend human life. Civic activists and researchers, meanwhile, have observed real risks to human and environmental health arising from nanotechnology-based industries.

For example, nanosilver, widely used for killing microbes in laundry machines, food packaging, and other consumer applications, has built up in some ecosystems killing off their benign microbes, and thereby disrupting natural food chains. Also, carbon nanotubes, now a popular component of choice for sporting goods such as bicycles and tennis rackets, as well as in building materials such as pavers, can cause asbestos-like lung injuries to those who inhale them. Numerous nongovernmental organizations have called for a moratorium on nanotechnology development due to their fears regarding possible human and societal harms.

The technology’s development path to date seems to have been far more influenced by corporate profit than by public welfare interests. Government legal proceedings take place secretly, with little public participation, while the development of nanotechnology applications typically prioritizes achieving shareholders’ expectations for maximum profits or, in those cases where a government is the benefactor, national self-interest. As long as this status quo of nanotechnology appearing to benefit the few rather than the many persists, public backing for nanotechnology’s further advancement will remain limited at best.

Yet, nanotechnology can win over skeptical publics and government leaders, and proceed to greatly advance our species’ material progress. The key is to infuse nanotechnology innovation within a larger mission to enhance ethics and natural law. Nanotechnology’s proponents need to make the case to the larger global community that nanotech-based projects are not only safe and profitable but also fundamentally moral. They can do so with honesty, Faunce argues, if they direct nanotechnology development toward socially beneficial development ends and steer clear of socially harmful ones. He goes on to distinguish the good from the bad in several specific sectors.

Food security. Global NES food projects might enhance the nutritional value of produce; reduce carbohydrates, fat, and caloric content; develop more potent fertilizers; add nanosensors that could detect crop or animal disease outbreaks before they spread and infect large numbers of victims; make it easier for developing nations to diversify their farm produce and move away from dependence on “cash crops”; and help bring consumers lower-price foods, steadier food supplies, and improved nutrition, while relieving malnutrition and starvation.

Water security. Nanofilter systems are powerful tools for water purification, and
could offer lifesaving relief to the hundreds of millions of people who have only polluted water available for their needs. NES projects should address water supplies. They should not, however, make nanosilver one of their components. Exposing consumers and ecosystems further to this compound will endanger public health and most likely sap public support for nanotechnology.

**Housing.** An NES housing project could substantially cut resource use and maintenance costs in construction sectors across the globe, through such cutting-edge innovations as “self-cleaning” walls that wash grime away of their own accord. It will yield even more good if it extends its aims beyond simple building and urban design, to develop houses that store ample emergency supplies of water automatically, are adequately fireproofed and easier to secure from home invasion, and even capable of generating their own power from on-site renewable-energy units. Any NES housing project will have a number of technical challenges to overcome, however, including how to effectively monitor potential nanoparticle toxicity. Some nanoparticles are potentially more toxic than standard compounds, and occupational health and safety approaches and toxicity-prediction models need updating to fit nanotechnology.

**Health.** More than two hundred pharmaceutical companies are now investing in nanomedicine, with the largest concentration of research going toward development of medicines for age rejuvenation and life extension. The companies are catering to the demographic on which they make their largest revenues now—that is, older, affluent residents of the most developed nations—but their endeavors risk alienating the large global public, much of which holds deep reservations about artificially extending life spans.

Faunce urges nanomedicine to shift its priorities toward curing diseases and treating serious medical conditions, a goal that will be much more likely to draw mass support. In addition, nanomedicine shows great potential in this regard: nano-compounds may render a range of medications more effective and more compatible to an individual’s biochemistry, for example, or they could be added to a patient’s bloodstream and draw upon molecules that already exist within the patients’ own bodies to help heal disorders or injuries with far less impact to the patients.

**Defense.** China, Great Britain, India, Russia, Sweden, and the United States are each funding substantial research-and-development efforts to enhance nanotechnology’s potential national-security uses. Applications already under development include detection mechanisms to identify and thwart bioterrorist agents, advanced armor-piercing projectiles, lighter and more durable vehicles, stealth weapons that could evade conventional alert systems, and miniature nuclear bombs.

A world where nanotechnology-enhanced weapons are deployed will be one in which instantaneous responses will be critical, and the risks of accidental wars or uncontrolled escalations will therefore be much higher. It will also be a domain in which much more extensive electronic surveillance increases the risk of excessive incursions on civil liberties. An ethical NES policy should strive to elevate civilian populations’ security from attacks while simultaneously protecting the human rights and privacy of ordinary citizens.

**Energy and the environment.** Proponents of “geo-engineering” envision using nanotechnology to quickly undo the impacts of human activity on the environment. For example, engineering massive algae blooms might generate sufficient photosynthesis to extract much of the atmosphere’s carbon dioxide and thereby reverse global warming.

“It is quite possible to imagine a future in which almost every product we use has a nanotechnology component, where nanotechnology has become a ubiquitous part of our civilization.”

Faunce does not think highly of such endeavors. They are needlessly high-risk, in his view, and they fail to correct the human
activity that caused the ecological damage in the first place—critics will rightly denigrate them as business-as-usual approaches that enable ecologically harmful industrial activity. Far more preferable and more likely to garner popular support, in his view, would be to use nanotechnology to boost the output of solar and hydrogen power installations.

[Note: Thomas Faunce offers a fascinating synthesis of philosophy and technology, showing not just the what and the how, but also the why behind this vast and eventful frontier of scientific discovery. The end result is a deep and scholarly action plan for nanotechnology development worldwide, one that makes worthwhile reading for both researchers and educated members of the general public. Nanotechnology for a Sustainable World is a technical and academic volume, but not overly so. Those who know little about nanotechnology will find a thorough introduction to it in this volume.]

—Rick Docksai


Reviewed by: Jacques Richardson, Decision + Communication, Authon la Plaine, France. DOI: 10.1177/1946756713491390

Keywords
global topography, world affairs, statism, governance

Foreseeing is what really counts . . . and being ready.

—Jose Marti, Cuban liberationist, 1894

Robert Kaplan, journalist, world traveler, and chief geopolitical analyst at Stratfor (a private intelligence service, based in Austin, Texas), has produced what is probably the world’s first complete primer on geopolitics—the drama of the Earth’s surface and its irregularities that obliges states to develop policy and create defenses for protection against incursive neighbors undeterred by mountain massifs, rivers and their beds, coastal indentions, ocean depths, sand, snow, ice, foul climate, or poor arability. The book has three segments: Visionaries, The Early Twenty-First Century Map, and America’s Destiny.

Napoleon firmly believed that “to know a nation’s geography is to know its foreign policy.” The new social science of geopolitics thus becomes “the influence of geography on human divisions” or “the study of the outside environment faced by every state when determining its own strategy.” This environment includes, of course, “the presence of other states struggling for survival or advantage.”

Kaplan’s geopolitical forerunners are the patrons of a discipline only six generations old. He cites liberally Alfred T. Mahan (the United States), Otto von Bismarck (Germany), Sir Halford J. Mackinder (the United Kingdom), Mackinder’s pro-Hitler disciple Karl Haushofer (Germany), Fernand Braudel (France), Hans J. Morgenthau (Austria–United States), and Nicholas J. Spykman (Netherlands–United States). Today’s practitioners of focused geopolitics include, among others, the Iranian leadership, Syria’s Bashar al-Assad, the late Hugo Chávez of Venezuela, North Korea’s Kim dynasty, Zimbabwe’s Robert Mugabe, the Democratic Republic of the Congo, the Taliban, and al Qaeda (as nonofficial organizations), and even America’s own Henry Kissinger, and numerous neoconservatives.

Heartland and Rimland

When this reviewer was introduced to geopolitics as a graduate student under political scientist Charles Callan Tansill in the 1950s, the study’s sacred trinity of preachers was already Mackinder–Mahan–Spykman. Their core thesis was the interaction between the “Eurasian heartland”—now Russia and more or less the European Union—and its “Rimland” running from Iberia through North Africa and Turkey, and on to India, China, the