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12 Mega-Uncertainties for the Decades Ahead

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Many observers of current global trends and prospects increasingly write of growing uncertainty and complexity. A forecast or single scenario of what life may be like in 2050 or 2100 has some value (e.g, the recent Jorgen Randers report to the Club of Rome, **2052**; GFB Book of the Month, July 2012). But it can also be an easy escape from addressing the many huge and interconnected uncertainties of the early 21st century and the unfolding Global MegaCrisis/MegaMess of climate change, population growth, scarce resources, inadequate governance, shaky economies, disruptive technologies, and more. Even several scenarios can easily be way off the mark, because there are hundreds of possibilities, depending on when and if the MegaMess is largely resolved, and how. As clearly stated by Allenby and Sarewitz, we must face **The Techno-Human Condition** we have created (GFB Book of the Month, June 2011).

Addressing major *uncertainties*—key issues where little is known, forecasts are impossible or implausible, and a wide range of disconnected and/or disputed facts and opinions prevail—shifts the focus from what is known (and forecasting what is probable), to learning more about fuzzy realms so as to enable tentative scenarios of what might happen and shed light on wild cards and emerging "not-so-wild" cards.
Facing these uncertainties and complexities sooner, rather than later, will likely make life in the early 21st century better for most or all people, and improve our chances that we will even make it to the 22nd century. In the "Michaelian" spirit of searching for elephants and beyond (see GFB Book of the Month for Dec 2011, **In Search of the Missing Elephant** by the late Donald N. Michael), consider a dozen big and overlapping questions—surely not the only ones to ponder, but good candidates for a short list that should be widely circulated, deeply pondered singly and together, and continuously updated.

1) **HOW MUCH GLOBAL WARMING IS AHEAD?**
The world has already warmed by 1°C over pre-industrial levels, and there is near-zero chance of stopping warming at 2°C, where trouble begins. Many climate scientists now think that worrisome 4°C warming is most likely in the 2050-2100 period, and that a disastrous 6oC or more is possible. (See GFB Book of the Month for May 2010, **Requiem for a Species.**) Some scientists, such as James Hansen of NASA, warn of possible tipping points leading to runaway global warming "out of humanity's control."

2) **WILL METHANE ECLIPSE CARBON DIOXIDE?**
CO_2 currently gets the most attention as the major greenhouse gas. But it may soon be eclipsed. Methane in the atmosphere is only about one-fifth of CO_2 in volume, but is 20-23 times more potent as a greenhouse gas, although not as long-lasting. In addition to other sources such as livestock, it is now being released in large quantities by melting Arctic ice and permafrost—a process nearly certain to accelerate as positive feedback from the "albedo effect" kicks in. If large amounts of methane are also released from abundant

clathrates on the ocean floor, catastrophe is likely. But this uncertainty is huge, so even rough estimates are impossible as to what could trigger how much release, or when. Adding to the methane threat is nitrous oxide, about one-tenth of CO_2 in volume, which is 300 times more effective than CO_2 in trapping heat. (See **The Atlas of Climate Change,** GFB Book of the Month, Feb 2012).

3) **HOW HIGH WILL SEA LEVELS RISE?**

The conventional projection of sea-level rise by 2050 is currently about 1-2 feet (See *GFB Update,* 2:10). But check out **The Fate of Greenland: Lessons from Abrupt Climate Change** (MIT Press, April 2011; GFB Book of the Month, Oct 2012), where the authors warn that "in the fate of Greenland lies clues to the fate of the world" and that "uncertainties dominate on the bad side." Based on past ice core records, it is possible that the Greenland ice sheet could melt in a few decades, raising sea levels by some 24 feet worldwide. Melting of the West Antarctic ice sheet would raise sea levels by another 16 feet. How likely in the decades ahead? A very wild "Black Swan" event? A classic wild card of 2% probability? Or a "not-so-wild card" of 10-30% probability?

4) **WILL WE RUN OUT OF ESSENTIAL RESOURCES?**

Renewable resources (notably water) and many non-renewable resources (oil, arable land, minerals, rare earth elements) are becoming more difficult to acquire, especially as demand increases. This leads to what Michael T. Klare calls "the end of easy everything," and a global contest for what's left. (See GFB Book of the Month for May 2012, **The Race for the Last World Resources.**) Prices are rising and will surely continue to do so, as companies and nations also scramble to adapt through conservation, substitution, and new technologies (these three strategies—together—may still be quite inadequate). One writer estimates that supply shortfall by 2030 is "nearly certain" for cadmium, gold, mercury, tellurium, and tungsten. (Also see the World Economic Forum report on **Water Security,** GFB Book of the Month, April 2011.)

5) **HOW MANY PEOPLE IN 2050?**

Global population projections are pretty much settled on 9-10 billion people by 2100, or roughly 50% growth from today's 7.1 billion—which is a substantial addition, even as the rate of growth slows. The latest annual projection from the Population Reference Bureau, however, is a worrisome 9.6 billion people by 2050. It may now be more appropriate to think in terms of four scenarios: *Sharp Decline* due to a global pandemic (quite thinkable by public health experts) or a world war (unthinkable?); *Slow Decline* where modernization leads to smaller families (see July 2012 GFB Book of the Month, **2052** by Jorgen Randers, who forecasts a peak of 8.1 billion in the 2040s); *Slow Increase* due to general improvements in medicine and health outpacing smaller families; and *Rapid Increase* due to success in anti-aging and life-extending technologies, made accessible to many people. Demographers and those already concerned with overpopulation never consider this not-so-wild-card possibility, but experts on William Halal's TechCast.org panel forecast life extension to 100 years as probable before 2040, with .67 confidence (see *The Futurist* Special Report, Sept-Oct 2012, p.36). However, there will be a problem of proving that this has happened or is happening, for better and worse, leading to more uncertainty, controversy, and complexity.

6) **WHAT QUALITY OF PEOPLE IN 2050?**

Genetic and robotic enhancements may create "better" or at least different human beings, but will these options be popular? Even if widely available at low cost, could these improvements be more than offset by endocrine disruptors and other pernicious chemicals in the environment, people ingesting overdoses of drugs or inappropriate drugs (both illegal and legal), and continued overeating of food leading to obesity and diabetes? Will we develop and appreciate an adequate number of "persons of tomorrow" who can deal with the complex and messy problems of the 21st century? (See GFB Book of the Month for Dec 2012, **Dancing at the Edge** by Maureen O'Hara and Graham Leicester.)

7) **WILL DECENT EMPLOYMENT BE AVAILABLE TO ALL?**

Assuming that basic goods and services will not be free to all, will everyone have jobs or self-employment that enable provision for basic needs? At present, this is a serious long-term problem, especially for younger generations, aggravated by digital technology and robotics. See **Race Against the Machine: How the Digital Revolution is Accelerating Innovation, Driving Productivity, and Irreversibly Transforming Employment and the Economy** by Erik Brynjolfsson and Andrew McAfee of MIT's Center for Digital Business (Digital Frontier Press, Oct 2011/76p). The authors' views on robots now quietly taking over many jobs were featured on CBS-TV's *60 Minutes* segment on robotics, Jan 13, 2013. The quantity of jobs is a major issue, but so is the quality of jobs that pay at least a living wage and provide decent working conditions, as urged by the ILO.

8) **WILL INEQUALITY AND PLUTOCRACY CONTINUE TO INCREASE?**

Global trends to more inequality within and between nations are unmistakable in recent decades and seem likely to continue, as well as the parallel trend to governance by the very rich "1%". There is no definition as to when a "democracy" becomes overtaken by "plutocracy," but, arguably, this is happening or has happened, with no substantial reversal in sight. See **The Price of Inequality: How Today's Divided Society Endangers Our Future** by Nobel Prize-winner Joseph E. Stiglitz (W. W. Norton, 2012, 414p), on the "inefficient" US economic system, and 20 other books on rising inequality (*GFB Update* newsletter, Nov 2011).

9) **WILL THE ENERGY TRANSITION BE A CLEAR AND RAPID SUCCESS?**

A major transition away from fossil fuels has begun, toward energy that is cheap, safe, non-polluting, renewable, and available to all. But this transition will likely take decades at best, and the ultimate mix is highly uncertain and will vary by nation: solar, wind, nuclear, biomass, hydro, and geothermal are the known competitors to oil, gas, and coal, but could soon be joined by ocean algae, ultra-deep geothermal, solar power beamed from space, nuclear fusion, widely-distributed LENR (low-energy nuclear reactor) generators, or other technologies not yet on the horizon. The competition is fierce, and a level playing field with public comparison of *all* costs and benefits will surely help this crucial transition, which, in turn, would mitigate global warming. Unfortunately for sustainable energy, the transition is being delayed due to new and controversial hydrofracking technology that enables easier access to unconventional oil and especially natural gas. Opinions vary widely as to whether "peak oil" and "peak gas" are imminent (but "peakists" seem to have a weak argument). For an overview, see the IEA's **World Energy Outlook 2012** (GFB Book of the Month, Nov 2012), the IEA's **Medium-Term Renewable Energy Market Report: Market Trends and Projections to 2017** (Fall 2012, 176p), and Daniel Yergin's **The Quest: Energy, Security, and the Remaking of the Modern World** (GFB Book of the Month, Nov 2011).

10) **WILL NUCLEAR WEAPONS OR BIOWEAPONS BE OUR UNDOING?**

The global stockpile of nuclear weapons is slowly declining (although the number of nations with such weapons may soon expand), while bioweapons—much easier to make—are probably increasing. The Cold War megathreat of nuclear holocaust and/or the follow-on global environmental disaster of nuclear winter has lessened, but is still a not-so-wild card--or a wild card at least. And widespread global use of bioweapons could be disastrous for many people. Much depends on the future of religious and ideological fanaticism, leading to use of these destructive technologies and/or others. See **Over the Horizon Proliferation Threats** edited by Wirtz and Lavoy (Stanford UP, April 2012, 328p) and **Preventing a Biochemical Arms Race** by Alexander Kelle *et al.* (Stanford UP, Oct 2012, 256p).

11) **CAN EFFECTIVE GLOBAL GOVERNANCE AND LAW EMERGE?**

We have created a global economy and global problems such as climate change, but this is not at all matched by effective institutions of global governance and global law in our emerging multipolar world (see March 2012 GFB Book of the Month on N**o One's World: The West, The Risking Rest, and the Coming Global Turn** by Charles A. Kupchan, and other books on emerging multipolarity in *GFB Update,* April 2012), as well as extensive biblioessays on "Law in Transition" (covering some 100 items; *GFB Update* newsletter, Feb 2012) and "Global Governance" (covering some 150 items; *GFB Update,* Sept 2011). Adding to the chorus of calls for global governance, however, are growing concerns about national governance capacities in many nations, notably in the US.

12) **DOES THE EXPLODING WORLD OF INFORMATION ABUNDANCE HELP OR HINDER US?**

Clearly the answer is both, and, arguably, the hindrance is greater than the help. We increasingly have ready access to huge amounts of information, but this infoglut can also be a burden, especially with huge amounts of entertainment, commercial messages, and trivial exchanges competing for eyeballs in the burgeoning infosphere. See GFB Book of the Month for March 2011, **Is the Internet Changing the Way You Think?,** and for July 2010 on **The Shallows**, as well as *GFB Update* newsletters for Feb 2011 and March 2011 describing some 30 books on impacts of new ICTs, mostly negative.

This brief survey of a dozen mega-uncertainties is by no means all that might be considered. A briefer list is more manageable, but overlooks many key questions, while a longer list of 15, 20, or more is more daunting and adds further complexity. And there are many ways to phrase the questions and combine them (e.g. the Millennium Project's annual **State of the Future** report, the GFB Book of the Month for Sept 2010, posits 15 Global Challenges). There are no easy answers to how much to include or how little, and how to present them. But some arrays are better than others. And all can be improved.

Other leading candidates for the uncertainties list might very well include how to stem ever- rising costs and demand for both health care and education (see *GFB Update* for July 2011 on higher education problems), whether we are exceeding planetary boundaries (see GFB Book of the Month for Jan 2013, **Bankrupting Nature,** a new report to the Club of Rome), coping with the growth of transnational organized crime (one of the 15 Global Challenges in the Millennium Project's **State of the Future** reports), the possibility of economic collapse (GFB Book of the Month, Jan 2012: **Future Global Shocks** by the OECD futures unit), and the transition to new and appropriate economic thinking for the 21st century (see biblioessay of some 120 books, *GFB Update* newsletter, Sept 2012).

In 2003, the renowned British scientist, Sir Martin Rees, wrote that "the odds are no better than 50-50" that our present civilization will survive to 2100. It's still a pretty good bet. A decade later, Paul R. Ehrlich and Anne H. Ehrlich ask "Can a Collapse of Global Civilization be Avoided?" (invited Perspective to the Royal Society; rspb.royalsocietypublishing.org, 14 Jan 2013), concluding that "Humanity has the assets to get the job done, but the odds of avoiding collapse seem small because the risks are clearly not obvious to most people and the classic signs of impending collapse, especially diminishing returns to complexity, are everywhere."

Is this overly pessimistic? Can we somehow muddle through? The arguments for optimism are generally—perhaps universally—narrow, shallow, and/or poorly documented e.g. **Abundance: The Future Is Better Than You Think** by Peter H. Diamandis of Silicon Valley's techno-ecstatic Singularity University (GFB Book of the Month, Aug 2012), **Acceleration: The Forces Driving Human Progress** by Ronald G. Havelock (Prometheus Books, Jan 2011), and no less than President Bill Clinton, "The Case for Optimism: 5 Ways the World Is Getting Better All the Time" *(Time* Cover Feature, 1 Oct 2012, pp 38-44), describing cell phones fostering equality,

healthy communities and winning the fight against HIV/AIDS, growth of the clean energy sector and green economies, women gaining social and economic power, and "former antagonists now working together to solve problems." Many of these social trends and new technologies should certainly be applauded.

But the top 10 or top 20 mega-uncertainties must also be identified and respected, lest we blindly succumb to the paradox of many relatively minor improvements in the midst of growing inadequacy in human well-being, if not outright global catastrophe or collapse.

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