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This month's Museletter comprises 3 short essays. The first is my impressions from the recent UN "High Level Meeting on Wellbeing and Happiness; in the second I respond to an essay on the fracking industry by Randy Udall; the third has some fun playing with current trends - this last essay has been picked up by Live Science and turned into an info graphic which you can see [here](#).

Talking Happiness

I'm writing this on a plane, on my way home from four conferences on the "new economy." Clearly there is rapidly growing interest in this subject, due in no small degree to the ongoing disintegration, and worsening dysfunction, of our present economic system. All four conferences (one in Berkeley; one in Tarrytown, New York; one at Harvard, organized by students; and one at the United Nations) were interesting and important, but the UN conference on "High Level Meeting on Wellbeing and Happiness: Defining a New Economic Paradigm," organized by the nation of Bhutan, was especially noteworthy.

That conference encompassed four days, of which the first, third, and fourth were working sessions tasked with producing an agenda and preliminary report. The second day was a more public event (still by invitation) in which I participated. Six hundred dignitaries, scholars, and NGO representatives crowded into a windowless UN meeting hall for six hours of speeches, comments, and questions—all focused on the government of Bhutan's initiative to replace or augment GDP as a measure of national and global economic progress.

Bhutan has already done impressive work along these lines, beginning in the early 1970s, developing a "Gross National Happiness" indicator and continuing to refine methods of measuring personal, social, and environmental well-being. This tiny Himalayan, mostly Buddhist, kingdom of 800,000 still has a low per capita GDP, but its citizens are among the happiest in the world. The current King and Prime Minister are evidently unwilling to rest on these accomplishments; they have set their sights on global happiness.

The conference featured opening statements from UN Secretary General Ban Ki Moon, the President of the UN General Assembly, the President of Costa Rica, and official representatives of France, Australia, the UK, Israel, Morocco, and Thailand. Renowned economists Jeffrey Sachs and Joseph Stiglitz spoke of the limitations

and perversity of GDP and of recent efforts to develop alternatives. All the speakers seemed delighted to endorse the notion that happiness is a desirable societal goal.

Fittingly, the boldest and most eloquent statement of the day came from Lyonchhen Jigmi Thinley, the Prime Minister of Bhutan, who observed that GDP growth is killing the planet, destroying our future, and making humanity less equitable and, on the whole, more miserable. This framing of the situation placed him on one side of a subtle (and in fact never clearly articulated) divide that persisted throughout the conference—a schism between those who see GDP growth as fine and necessary, especially for poor nations, though needing supplementation with growth in other dimensions; and those who see further GDP expansion as unattainable or undesirable.

The inadequacy of the former, ostensibly more moderate, position was revealed in a presentation late in the morning by Mathis Wackernagel of the Global Footprint Network, who pointed out that humanity is already using resources at one-and-a-half times the rate Earth can regenerate them annually (the temporary imbalance being enabled by a one-time-only drawdown of fossil fuels). This being the case, then presumably our global consumption of resources—and hence the global economy itself—must actually *shrink* substantially if we are to avert the catastrophic consequences of ecological overshoot.

The strategy of reining in population as a way to reduce total consumption without as much per capita sacrifice was not mentioned by anyone during the day.

Neither did anyone in the room explicitly call for de-growth. There were plenty of expressions of disgust at overconsumption in rich nations such as the US, and at the predatory behavior of the financial elite (the now-infamous "one percent"). But most speakers hewed to a politically safe notion that less-industrialized nations need more GDP growth in order to eradicate poverty.

Vandana Shiva of India garnered hoots and vigorous hand-claps for her insistence that farmers and the food system be put front and center in economic reform, pointing out that agriculture is responsible for 75 percent of the ongoing loss of biodiversity on the planet, and that the majority of people in many poor countries are farmers who are being forced by global agribusiness either to go into debt to adopt expensive soil-killing technologies, or to give up and move to the city (or, in the worst instance, commit suicide, as a quarter-million Indian farmers have done).

Prince Charles of Great Britain put in an appearance by video recording, eloquently ticking off the ecological and social crises brought on by industrial growth and calling for development along other lines.

Spiritual leaders of several faiths chimed in to point out that happiness, as a state of mind, can be actively cultivated regardless of one's material circumstances.

Many mentions were made of the Rio Plus 20 meetings set to take

place later this year, where nations will propose and agree upon strategies to expand the "green economy." While all speakers seemed eager to include happiness and well-being economic indicators in those discussions, the prospects are not good. It's late in the game: the Rio agenda is already largely set.

Further, that agenda may actually be regressive in its implications for people and planet. I had recently come from a meeting of indigenous leaders and ecological economists, most of whom are actively preparing for the Rio gatherings. The word from the indigenous leaders is that the "green economy" (as designed and marketed by the world's wealthy nations and big corporations) will actually consist mostly of a monetization or commodification of nature's services, such as carbon sequestration by forests. Indigenous communities may in some instances benefit from payments for forest protection, but in the end the result will likely be competition and division among native communities, along with an explosion of trading in carbon derivatives—which will merely further enrich the "one percent."

There are likely to be impediments to the realization of a global happiness and well-being agenda. As one of the speakers pointed out, unless all nations make substantial new investments in surveys and the management of statistics, the adoption of Gross National Happiness targets and metrics will be practically meaningless. I might further mention (though no one did so publicly at the conference) that governments will find it nearly impossible to reduce their manic pursuit of GDP until they find another way of financing their operations (since declining GDP means a declining tax base).

A Chinese delegate offered a highly nuanced and somewhat admonitory official comment, while a handful of EU official representatives made somewhat more encouraging noises. But notably absent was any official representative of, or statement from, the United States. One can only imagine the puzzlement among State Department functionaries at the notion of Gross National Happiness, or the hoots of derisive laughter in Congress should the issue ever arrive there for consideration.

The next steps following from the conference include a report to the Secretary General, which will be forwarded to all UN member nations; the establishment of an ongoing commission to further study the development of a new economic paradigm; and the building of a global new-economy movement that includes youth organizations and a wide range of NGOs.

I had the sense of being at a milestone event, at which a couple of heads of state and several high-level national government representatives were saying almost exactly what ecological economists like Herman Daly have been telling us for years. Here is a nation—a tiny one, but a nation nonetheless—making its voice heard in the international community, calling for an end to the monomaniacal pursuit of GDP growth above all else. Despite the difficulties ahead, this is a cause worth celebrating and supporting. Once it becomes clear that further GDP growth will be ever more difficult to achieve, national leaders will desperately need ways to make life tolerable for their increasingly restive constituents. It's plain that environmental, psychological, and social well-being must be the

new goal, and we can thank the government of Bhutan for realizing this and blazing a trail that others may follow.

A Dark Fracking Future

In an excellent short essay, "[What Hath Fracking Wrought](#)," Randy Udall discusses the environmental and social consequences of the application of hydraulic fracturing technology to the production of oil and natural gas.

Since year 2000, oil and gas companies have leased a staggering amount of land in the Rockies, Texas, Louisiana, Arkansas, Oklahoma, Pennsylvania, New York, and Ohio. Add it all up, and the industry now holds drilling rights to at least ten percent of the Lower 48, more land than is owned by the U.S. Bureau of Land Management, more land than we will plant in corn, wheat, and soybeans, about ten times as much acreage as we've paved, given over to oil and gas for at least 50 years to come. . . . Nearly 50,000 oil and gas wells will be started in the U.S. this year, more than in all other nations combined. Roughly ninety percent of them wouldn't be spudded unless their target zones could be fracked. Like it or not, and many of my friends seem not to, this technology has become one of the underpinnings of our civilization, as central to it as the cell phone or computer.

Udall doesn't mention the high costs incurred in using this technology (costs for fracking fluids themselves, and for trucking them around and disposing of them; as well as for horizontal drilling); nor the low energy return on energy invested in the process; nor the low per-well production rates (for the Bakken shale an average of 86 barrels per day); nor the high decline rates (a new well drilled in the Bakken may lose 80 percent of its production rate by the end of the first year). He only hints at the telling fact that most of the technological elements of the new fracking boom have been around for decades and are being applied now solely because high fuel prices make drilling in low-porosity plays profitable.

In the shale gas industry, a torrent of production has ensued from astonishing rates of drilling that were in turn set off by record-high natural gas prices just a few years ago. But the supply glut has driven down gas prices to such an extent that none of the companies specializing in fracking is now making money from production; the industry is hanging on by its fingernails, cutting back on drilling, selling off leases, subsisting on investment capital, waiting for prices to recover.

Shale oil producers, in contrast, are still profiting from high oil prices, and in this case higher domestic production is not likely to cause prices to fall (the oil trade is international and so the price is set globally, while natural gas moves mostly by pipeline with only marginal tanker trade and is thus mostly priced nationally or

continentally).

What would happen to shale oil producers if global oil prices were to crater, as happened in the last weeks of 2008? That's by no means unthinkable, as Chris Cook, the former compliance and market supervision director of the International Petroleum Exchange, pointed out [in a recent essay](#). Essentially we would see a re-run of what is happening in the shale gas industry—though we still have to use a little imagination to get a full picture, as the fracking gas bubble is itself only beginning to burst. Let's assume a crash in world oil prices down to a level of \$40-50 a barrel due to falling demand due in turn to world economic contraction possibly magnified by a "buyer's strike" in China and a flushing of speculative money from oil derivatives contracts.

First would come the idling of drilling rigs and a pull-back in investment by the industry. A year or two later, production from the Bakken and other shale plays would start to decline—and the rate of decline would accelerate through the third and fourth year. Remaining demand for oil would continue to be profitably met by production from aging conventional oilfields, while producers specializing in fracking would lose their shirts. Leases by the thousands would be sold or simply allowed to expire.

None of this is meant to dispute the point Randy Udall is underscoring—that fracking is dramatically changing not just the oil and gas industry, but land use and air and water quality throughout the U.S., and potentially much of the rest of the world. The debates about our energy future, and about the fate of the planet, have shifted, and we desperately need new regulations to minimize the destructiveness of this last-ditch effort to coax oil and gas out of dense rock.

One has to wonder, though: is our energy situation about to shift again as a seemingly unstoppable new extractive technology gets pounded by the very market it serves, its marginal energy and financial profitability rendering it mortally vulnerable to further deflation of the global credit bubble?

Fun with trends

If current population trends continue . . .

- The population of the United States will increase to over 600 million by 2080, and in 2150 it will equal China's present size.
- World population will achieve 14 billion by the year 2075 and 30 billion by 2150.

If current energy trends continue . . .

- By 2015 China will be importing more oil than the United States does that year.
- By 2030 China will be absorbing all available global oil exports, leaving none for the US or Europe.
- In just 8 years China will be burning as much coal as the entire

world uses today.

- Natural gas will be virtually free in the US by 2015.
- Officially assessed US natural gas reserves will be exhausted by 2025.

If current economic trends continue . . .

- China's economy will be 8 times as big as it is today by 2040.
- China's economy will surpass the size of the present global economy before 2050.
- The US federal debt will double—from \$14 trillion to \$28 trillion—by 2022.
- In 2072, the federal debt will amount to \$896 trillion, or \$1,629,091 for each American (assuming a US population then of 550 million).
- By the end of the century, each American will "owe" over a billion dollars.
- Thanks to the doubling of US households living on less than \$2 per person per day between 1996 and 2011, in 150 years there will be about 1.5 billion Americans living on practically no income.
- The number of billionaires in the world (having grown from 793 to 1210 in just two years, from 2009 to 2011) will equal the world population in only 70 years. (Given the previous trend, this is especially gratifying news: since the rate of growth in the number of billionaires in the world exceeds the rate of growth in extreme poverty in the US, this means each American will become a billionaire *before* his or her grandchildren plunge into desperate poverty).

If current technology trends continue . . .

- Thanks to Moore's Law (whereby the number of transistors that can be placed inexpensively on an integrated circuit doubles approximately every two years), within 20 years transistors will be the size of an atom, and after another generation or so, "transistors" (if they can be called such, at that point) they will be the size of an electron.
- It will eventually be possible to download into a computer all the memories and even the personality of a human individual.

If current environmental trends continue . . .

- Due to the decades-long decline in male sperm counts, apparently caused by a proliferation of environmental hydrocarbon-based, estrogen-mimicking pollutants, the human species will go extinct sometime within the next two centuries.
- With China's coal consumption climbing at 8 percent per year, annual global greenhouse gas emissions will skyrocket, setting off multiple strong self-reinforcing environmental feedbacks that will ensure the melting of all polar ice, the death of the oceans, and the collapse of most agricultural production on the planet.

* * *

Trends do tend to continue for a while; otherwise they wouldn't be trends. But sometimes trends in different areas work against each other and end up canceling each other out. In fact, *all* trends (except perhaps the expansion of the universe) eventually reach limits and stall out or reverse themselves.

Because projecting future magnitudes according to current trends requires relatively simple math, and because doing so sometimes enables analysts to make accurate short-term forecasts of things like population, sales volumes, and commodity prices, trend watching can confer a sense of mystical power. We can predict the future—and maybe even profit by doing so!

But, as Benjamin Disraeli famously said, "There are three kinds of lies: lies, damned lies, and statistics." Indeed, projecting existing statistical trends out over long time periods often leads to absurd conclusions. Hence the necessity, when observing trends, of knowing (or at least being able to guess successfully) which ones are important or trivial, and which ones are likely to persist longer than others. A skilful trend watcher will note not only the rate of change in a given magnitude, but the rate of change to the rate of change: for example, while world population is growing at a rate of about 1.1 percent annually, its pace of growth has diminished in recent years, and that's an important factor in forecasting world population for, say, 2050 or 2100.

In addition to generalized critical thinking skills, citizens need the ability to assess statistics-based claims in order to arm themselves against people with a political axe to be honed, or buck to be made, by hawking a particular trend. Unfortunately, policy makers don't always have (or use) these skills, and so it's common to encounter unrealistic assumptions about our future based on trends unlikely to continue for long. Often this is not just a matter of sloppy thinking: policy makers *want* certain trends to go on—because if they didn't, there'd be hell to pay.

The obvious example is economic growth. Government officials assume (based on trends over the past few decades) that national economies will continue to expand forever, just as transportation planners assume that automobile traffic will always proliferate. Therefore more highways and suburbs are justified, and more public debt—because *of course* tax revenues will increase. Never mind that, in the US, there's little basis for further real economic growth in light of debt levels and demography; or that vehicle miles traveled have actually declined significantly in recent years. Those are inconvenient trends that politicians and road-builders hope will simply go away. But will they? Certainly not if global oil supplies continue to tighten (another inconvenient trend): scarce oil will discourage both economic growth and driving.

Because business-as-usual assumptions are based on *numbers*, they appear both reassuring and authoritative. But which numbers matter?

More and more numbers look alarming. *There's* a trend—a trend of trends! It might be difficult to total up the disturbing (versus

reassuring) trends in the world and determine the rate of change in abundance of the latter versus the former. But it's hard to avoid the subjective impression that more trends these days point to frightful or absurd outcomes.

Reality check: A snapshot of trends in the year 1200 would have shown temporary rapid change in a few variables (for example, in localized numbers of deaths from famine), but most rates of change were comparatively negligible. Not so in 2012, when rates of change in resource availability, species abundance, greenhouse gas concentrations, and debt levels yield doubling times measured in decades or, in some cases, mere years. Absurdity—or calamity—arrives fast at those rates.

If many key rates of change are accelerating, does this mean we are approaching some sort of historic discontinuity? If so, when will it arrive? What will it actually look and feel like? We can only guess; it all depends on which trends prove decisive. We'd all like to believe the world-weary French proverb, *Plus ça change, plus c'est la même chose* ("The more things change, the more they stay the same"). But what if the less witty formulation is truer: "The more things change, the more they change"?

Amid this uncertainty, there are two things we probably can conclude with some significant degree of confidence. First: many important current trends *won't* continue for long. Second: if you like change, this is a great time to be alive.