# The End of the Future

**Summary**

Peter ThielOctober 3, 2011 8:00 AM

*When He opened the third seal, I heard the third living creature say, "Come and see." So I looked, and behold, a black horse, and he who sat on it had a pair of scales in his hand. And I heard a voice in the midst of the four living creatures saying, "A quart of wheat for a denarius, and three quarts of barley for a denarius; and do not harm the oil and the wine." (Revelation 6:5–6)*

I.

Modern Western civilization stands on the twin plinths of science and technology. Taken together, these two interrelated domains reassure us that the 19th-century story of never-ending progress remains intact. Without them, the arguments that we are undergoing cultural decay — ranging from the collapse of art and literature after 1945 to the soft totalitarianism of political correctness in media and academia to the sordid worlds of reality television and popular entertainment — would gather far more force. Liberals often assert that science and technology remain essentially healthy; conservatives sometimes counter that these are false utopias; but the two sides of the culture wars silently agree that the accelerating development and application of the natural sciences continues apace.

Yet during the Great Recession, which began in 2008 and has no end in sight, these great expectations have been supplemented by a desperate necessity. We need high-paying jobs to avoid thinking about how to compete with China and India for low-paying jobs. We need rapid growth to meet the wishful expectations of our retirement plans and our runaway welfare states. We need science and technology to dig us out of our deep economic and financial hole, even though most of us cannot separate science from superstition or technology from magic. In our hearts and minds, we know that desperate optimism will not save us. Progress is neither automatic nor mechanistic; it is rare. Indeed, the unique history of the West proves the exception to the rule that most human beings through the millennia have existed in a naturally

brutal, unchanging, and impoverished state. But there is no law that the exceptional rise of the West must continue. So we could do worse than to inquire into the widely held opinion that America is on the wrong track (and has been for some time), to wonder whether Progress is not doing as well as advertised, and perhaps to take exceptional measures to arrest and reverse any decline.

The state of true science is the key to knowing whether something is truly rotten in the United States. But any such assessment encounters an immediate and almost insuperable challenge. Who can speak about the true health of the ever-expanding universe of human knowledge, given how complex, esoteric, and specialized the many scientific and technological fields have become? When any given field takes half a lifetime of study to master, who can compare and contrast and properly weight the rate of progress in nanotechnology and cryptography and superstring theory and 610 other disciplines? Indeed, how do we even know whether the so-called scientists are not just lawmakers and politicians in disguise, as some conservatives suspect in fields as disparate as climate change, evolutionary biology, and embryonic-stem-cell research, and as I have come to suspect in almost all fields? For now, let us acknowledge this measurement problem — I will return to it later — but not let it stop our inquiry into modernity before it has even begun.

II.

When tracked against the admittedly lofty hopes of the 1950s and 1960s, technological progress has fallen short in many domains. Consider the most literal instance of non-acceleration: We are no longer moving faster. The centuries-long acceleration of travel speeds — from ever-faster sailing ships in the 16th through 18th centuries, to the advent of ever-faster railroads in the 19th century, and ever-faster cars and airplanes in the 20th century — reversed with the decommissioning of the Concorde in 2003, to say nothing of the nightmarish delays caused by strikingly low-tech post-9/11 airport-security systems. Today's advocates of space jets, lunar vacations, and the manned exploration of the solar system appear to hail from another planet. A faded 1964 Popular Science cover story — "Who'll Fly You at 2,000 m.p.h.?" — barely recalls the dreams of a bygone age.

The official explanation for the slowdown in travel centers on the high cost of fuel, which points to the much larger failure in energy innovation. Real oil prices today

exceed those of the Carter catastrophe of 1979–80. Nixon's 1974 call for full energy independence by 1980 has given way to Obama's 2011 call for one-third oil independence by 2020. Even before Fukushima, the nuclear industry and its 1954 promise of "electrical energy too cheap to meter" had long since been defeated by environmentalism and nuclear-proliferation concerns. One cannot in good conscience encourage an undergraduate in 2011 to study nuclear engineering as a career. "Clean tech" has become a euphemism for "energy too expensive to afford," and in Silicon Valley it has also become an increasingly toxic term for near-certain ways to lose money. Without dramatic breakthroughs, the alternative to more-expensive oil may turn out to be not cleaner and much-more-expensive wind, algae, or solar, but rather less-expensive and dirtier coal.



Warren Buffett massively capitalized on both of these trends with his $44 billion investment, most made in late 2009, in BNSF Railway — making it the largest non-financial company in the Berkshire Hathaway portfolio. Understandably, the Oracle of Omaha proclaimed "an all-in wager on the economic future of the United States" and downplayed any doubts he might have harbored. For present purposes, it suffices to note that 40 percent of railroad freight involves the transport of coal, and that railroads will do especially well if the travel and energy consumption patterns of the 21st century involve a regression to the past.

In the past decade, the unresolved energy challenges of the 1970s have broadened into a more general commodity shock, which has been greater in magnitude than the price spikes of the two world wars and has undone the price improvements of the previous century. In the case of agriculture, at least, technological famine may lead to real old-fashioned famine. The fading of the true Green Revolution — which increased grain yields by 126 percent from 1950 to 1980, but has improved them by only 47 percent in the years since, barely keeping pace with global population growth — has encouraged another, more highly publicized "green revolution" of a more political and less certain character. We may embellish the 2011 Arab Spring as the hopeful by-product of the information age, but we should not downplay the primary role of runaway food prices and of the many desperate people who became more hungry

than scared.

While innovation in medicine and biotechnology has not stalled completely, here too signs of slowed progress and reduced expectations abound. In 1970, Congress promised victory over cancer in six years' time; four decades later, we may be 41 years closer, but victory remains elusive and appears much farther away. Today's politicians would find it much harder to persuade a more skeptical public to start a comparably serious war on Alzheimer's disease — even though nearly a third of America's 85-year-olds suffer from some form of dementia. The cruder measure of U.S. life expectancy continues to rise, but with some deceleration, from 67.1 years for men in 1970 to 71.8 years in 1990 to 75.6 years in 2010. Looking forward, we see far fewer blockbuster drugs in the pipeline — perhaps because of the intransigence of the FDA, perhaps because of the fecklessness of today's biological scientists, and perhaps because of the incredible complexity of human biology. In the next three years, the large pharmaceutical companies will lose approximately one-third of their current revenue stream as patents expire, so, in a perverse yet understandable response, they have begun the wholesale liquidation of the research departments that have borne so little fruit in the last decade and a half.

III.

By default, computers have become the single great hope for the technological future. The speedup in information technology contrasts dramatically with the slowdown everywhere else. Moore's Law, which predicted a doubling of the number of transistors that can be packed onto a computer chip every 18 to 24 months, has remained broadly true for much longer than anyone (including Moore) would have imagined back in 1965. We have moved without rest from mainframes to home computers to the Internet. Cellphones in 2011 contain more computing power than the entire Apollo space program in 1969.

From the perspective of Palo Alto, a return to the party year of 1999 appears almost within reach. All that glitters seems to be golden. Thousands of new Internet startups launch each year, and valuations of Web 2.0 businesses have surged; and not entirely without reason, as maybe two to six per year of these newly minted ventures will break into the billion-dollar-plus valuation zone within five years of their founding. In tandem with this new life for the new economy, Google has led a parallel move

towards a near-doubling of wages for the most talented computer engineers, all in just the last three years. Beyond the dollars, one must look no farther than *The Social Network* to see the ways in which Facebook and its 750 million users have captured the new zeitgeist.

The economic decoupling of computers from everything else leads to more questions than answers, and barely hints at the strange future where today's trends simply continue. Would supercomputers become powerful engines for the miraculous creation of wholly new forms of economic value, or would they simply become powerful weapons for reshuffling existing structures — for Nature, red in tooth and claw? More simply, how does one measure the difference between progress and mere change? How much is there of each?

IV.

Let us now try to tackle this very thorny measurement problem from a very different angle. If meaningful scientific and technological progress occurs, then we reasonably would expect greater economic prosperity (though this may be offset by other factors). And also in reverse: If economic gains, as measured by certain key indicators, have been limited or nonexistent, then perhaps so has scientific and technological progress. Therefore, to the extent that economic growth is easier to quantify than scientific or technological progress, economic numbers will contain indirect but important clues to our larger investigation.

The single most important economic development in recent times has been the broad stagnation of real wages and incomes since 1973, the year when oil prices quadrupled. To a first approximation, the progress in computers and the failure in energy appear to have roughly canceled each other out. Like Alice in the Red Queen's race, we (and our computers) have been forced to run faster and faster to stay in the same place.

Taken at face value, the economic numbers suggest that the notion of breathtaking and across-the-board progress is far from the mark. If one believes the economic data, then one must reject the optimism of the scientific establishment. Indeed, if one shares the widely held view that the U.S. government may have understated the true rate of inflation — perhaps by ignoring the runaway inflation in government itself, notably in education and health care (where much higher spending has yielded no

improvement in the former and only modest improvement in the latter) — then one may be inclined to take gold prices seriously and conclude that real incomes have fared even worse than the official data indicate.

This dismal and straightforward conclusion tends to be obscured by a range of secondary issues, which are important but do not really change the larger point about trends since 1973:

-Mean incomes outperformed median incomes (inflation-adjusted in both cases), and there was a trend towards greater inequality. Median incomes rose by only 10 percent. Mean incomes rose by 29 percent, which works out to a glacial pace of only about 0.7 percent per year — much slower than in the preceding four decades.

-Non-wage benefits, mostly health care, increased by about $2,600 per worker, for an additional 0.2 percent per year since 1973. So if the U.S. government has underestimated inflation by only 0.9 percentage points per year, then mean wages and benefits have been completely stagnant.

-Corporate profits increased from 9 percent to 12 percent of GDP — again, a significant but easily exaggerated shift.

-Women were hired in the 1980s and men were fired in the 2000s.

-College graduates did better, and high-school graduates did worse. But both became worse off in the years after 2000, especially when one includes the rapidly escalating costs of college.

-The era of globalization improved living standards by making labor and goods cheaper, but also hurt living standards through increased competition for limited resources. Free-trade advocates tend to think that the first effect dominates the second.

-Economic progress may lag behind scientific and technological achievement, but 38 years seems like an awfully long time.

The economic future looked very different in the 1960s. In his 1967 bestseller *The American Challenge*, Jean-Jacques Servan-Schreiber argued that accelerating technological progress would widen the gap between the United States and the rest of the world, and that by 2000, “the post-industrial societies will be, in this order: the United States, Japan, Canada, Sweden. That is all.” According to Servan-Schreiber, the difference between the United States and the rest of Europe would grow from a

difference of degree into a difference of kind, comparable to the difference between Europe and Egypt or Nigeria. As a result of this steady divergence, Americans would face less pressure to compete:

In 30 years America will be a post-industrial society. . . . There will be only four work days a week of seven hours per day. The year will be comprised of 39 work weeks and 13 weeks of vacation. With weekends and holidays this makes 147 work days a year and 218 free days a year. All this within a single generation.

We need to resist the temptation to dismiss Servan-Schreiber's space-age optimism so that we can better understand how the consensus he represented could have been so terribly wrong — and how, instead, for many Americans, the Fourth Commandment ("Remember the Sabbath day, and keep it holy") has been effectively forgotten.

V.

Like technology, credit also makes claims on the future. "I will gladly pay you a dollar on Tuesday for a hamburger today" works only if a dollar gets earned by Tuesday. A credit crisis happens when earnings disappoint and the present does not live up to past expectations of the future.

The current crisis of housing and financial leverage contains many hidden links to broader questions concerning long-term progress in science and technology. On one hand, the lack of easy progress makes leverage more dangerous, because when something goes wrong, macroeconomic growth cannot offer a salve; time will not cure liquidity or solvency problems in a world where little grows or improves with time. On the other hand, the lack of easy progress also makes leverage far more tempting, as unleveraged real returns fall below the expectations of pension funds and other investors.

This analysis suggests an explanation for the strange way the technology bubble of the 1990s gave rise to the real-estate bubble of the 2000s. After betting heavily on technology growth that did not materialize, investors tried to achieve the needed double-digit returns through massive leverage in seemingly safe real-estate investments. This did not work either, because a major reason for the bubble in real estate turned out to be the same as the reason for the bubble in technology: a mistaken but nearly universal background assumption about easy progress. Without fundamental gains in productivity (presumably driven by technology), real-estate

values could not go up forever. Leverage is not a substitute for scientific progress.

VI.

The technology slowdown threatens not just our financial markets, but the entire modern political order, which is predicated on easy and relentless growth. The give-and-take of Western democracies depends on the idea that we can craft political solutions that enable most people to win most of the time. But in a world without growth, we can expect a loser for every winner. Many will suspect that the winners are involved in some sort of racket, so we can expect an increasingly nasty edge to our politics. We may be witnessing the beginnings of such a zero-sum system in politics in the U.S. and Western Europe, as the risks shift from winning less to losing more, and as our leaders desperately cast about for macroeconomic solutions to problems that have not been primarily about economics for a long time.

The most common name for a misplaced emphasis on macroeconomic policy is "Keynesianism." Despite his brilliance, John Maynard Keynes was always a bit of a fraud, and there is always a bit of clever trickery in massive fiscal stimulus and the related printing of paper money. But we must acknowledge that this fraud strangely seemed to work for many decades. (The great scientific and technological tailwind of the 20th century powered many economically delusional ideas.) Even during the Great Depression of the 1930s, innovation expanded new and emerging fields as divergent as radio, movies, aeronautics, household appliances, polymer chemistry, and secondary oil recovery. In spite of their many mistakes, the New Dealers pushed technological innovation very hard.

The New Deal deficits, however misguided, were easily repaid by the growth of subsequent decades. During the Great Recession of the 2010s, by contrast, our policy leaders narrowly debate fiscal and monetary questions with much greater erudition, but have adopted a cargo-cult mentality with respect to the question of future innovation. As the years pass and the cargo fails to arrive, we eventually may doubt whether it will ever return. The age of monetary bubbles naturally ends in real austerity.

On the political right, we are seeing a quiet shift from the optimism of Jack Kemp to the pessimism of Ron Paul, from supply-side economics to the Tea Party, and from the idea that we can combine tax cuts with more spending to the idea that money is

either hard or fake. A mischievous person might even ask whether “supply-side economics” really was just a sort of code word for “Keynesianism.” For now it suffices to acknowledge that lower marginal tax rates might not happen and would not substitute for the much-needed construction of hundreds of new nuclear reactors.

VII.

We have seen that even the simple question of *whether* a technology slowdown has occurred is far from straightforward. The critical question of *why* such a slowdown seems to have occurred is harder still, and we do not have the space to tackle it fully here. Let us end with the related question of *what* can now be done. Most narrowly, can our government restart the stalled innovation engine?

The state can successfully push science; there is no sense denying it. The Manhattan Project and the Apollo program remind us of this possibility. Free markets may not fund as much basic research as needed. On the day after Hiroshima, the *New York Times* could with some reason pontificate about the superiority of centralized planning in matters scientific: “End result: An invention [the nuclear bomb] was given to the world in three years which it would have taken perhaps half a century to develop if we had to rely on prima donna research scientists who work alone.”

But in practice, we all sense that such gloating belongs to a very different time. Most of our political leaders are not engineers or scientists and do not listen to engineers or scientists. Today a letter from Einstein would get lost in the White House mail room, and the Manhattan Project would not even get started; it certainly could never be completed in three years. I am not aware of a single political leader in the U.S., either Democrat or Republican, who would cut health-care spending in order to free up money for biotechnology research — or, more generally, who would make serious cuts to the welfare state in order to free up serious money for major engineering projects. Robert Moses, the great builder of New York City in the 1950s and 1960s, or Oscar Niemeyer, the great architect of Brasilia, belong to a past when people still had concrete ideas about the future. Voters today prefer Victorian houses. Science fiction has collapsed as a literary genre. Men reached the moon in July 1969, and Woodstock began three weeks later. With the benefit of hindsight, we can see that this was when the hippies took over the country, and when the true cultural war over Progress was lost.

Today's aged hippies no longer understand that there is a difference between the election of a black president and the creation of cheap solar energy; in their minds, the movement towards greater civil rights parallels general progress everywhere. Because of these ideological conflations and commitments, the 1960s Progressive Left cannot ask whether things actually might be getting worse. I wonder whether the endless fake cultural wars around identity politics are the main reason we have been able to ignore the tech slowdown for so long.

However that may be, after 40 years of wandering, it is not easy to find a path back to the future. If there is to be a future, we would do well to reflect about it more. The first and the hardest step is to see that we now find ourselves in a desert, and not in an enchanted forest.

*— Peter Thiel, the founding CEO of PayPal, is an American entrepreneur and venture capitalist. As an undergraduate he founded the* Stanford Review*, a conservative/libertarian newspaper at Stanford University. The Hertog/Simon Fund for Policy Analysis provided funding for this article.*