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THE DECLINE OF AMERICAN INNOVATION

HOW TO GET BACK ON TOP AND WIN THE FUTURE

BY FAREED ZAKARIA

47

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Innovation in the U.S.A.

Is America Losing Its Mojo?

Innovation is as American as baseball and apple pie. But some traditions can't be trademarked.

BY FAREED ZAKARIA

BY MOST MEASURES, AMERICA REMAINS the world leader in technological achievement. Consider the 2009 Nobel Prizes: of the 13 people honored, nine were American. Once you take out the economics, literature, and peace prizes, the United States, with 5 percent of the world's population, still won close to 70 percent of the awards. Even amid a terrible recession, the country still dominates the fields of information technology, life sciences, and nanotechnology, all key industries of the future. The World Economic Forum routinely cites America as having the most competitive economy on the planet (though this year it was narrowly overtaken by Switzerland). When decision makers are asked to rank countries on innovation, the United States always comes first by a large margin.

Americans like to think there is something about their culture that's especially conducive to innovation—the open geography and frontier spirit; a flexible economy with limited interference by government; the Protestant work ethic; an immigrant workforce, constantly renewed by the next generation of talent from around the world. Other countries can perhaps emulate some of these traits, but none can replicate the creative cocktail that is America.

That might be true today. But could it be that American achievements reflect the past more than predicting the future? It's important to remember that many of the metrics that place the United States so far ahead are actually lagging indicators. Nobel Prizes tend to be given to scientists in their 70s, toward the end of their productive lives. What's happening among scientists in their 30s? Who's making the discoveries today that will receive Nobel Prizes four decades from now?

I'd always viewed the rankings that routinely show America on top as authoritative. But they may be misleading. Most traditional competitiveness studies use polls—of CEOs, scientists, investors—as a key part of their measurements. The World Economic Forum report, for example, relies upon surveys for almost two thirds of its data. But two studies of global innovation have been released this year, both comprehensive, and both relying entirely on government statistics and other hard data: one produced by the Boston Consulting Group, the other by the Information Technology & Innovation Foundation. In both, the United States does considerably worse, coming in eighth in the BCG study and sixth in the ITIF one.

Thomas Edison
(1847–1931)
Lightbulb, phonograph

Henry Ford
(1863–1947)
Assembly line

George Washington Carver (c. 1864–1943)
Crop rotation

Orville (1871–1948) and **Wilbur** (1867–1912) **Wright**
Airplane

Willis Carrier
(1876–1950)
Air conditioning

Like a star that still looks bright in the farthest reaches of the universe but has burned out at the core, America's reputation is stronger than the hard data warrant. For example, the World Economic Forum surveys say America is the globe's top recipient of venture capital and third-biggest spender on corporate research, but the actual data put it fifth in both categories. Most striking, the ITIF rankings show that, in recent years, the United States has made the *least* progress of the 39 countries analyzed in improving its innovation capacity and internal competitiveness. The measures are standard, ranging from government research spending, where the United States does well, to the corporate tax rate, where it does extremely poorly.

Part of the slippage is due to the fact that other countries—from Singapore and South Korea to Canada and Sweden—are actively changing their laws and systems to make themselves more competitive. The United States didn't raise its corporate tax rate; others lowered theirs. But the United States is falling far behind in one key resource: human capital. Whether measured by the percentage of kids with high-school diplomas or performance on standardized tests, America is not producing the kinds of workers needed in a knowledge-based economy. Let's be clear. Even properly measured, the United States does well. But the halo is fading. The wide gap between the United States and the rest of the world is closing.

In some ways America's once dominant position was an aberration. The country's technological triumphs rested on three tidal waves that all began in the late 1930s. The first was the wave of destruction that wrecked virtually every other country, and certainly every other economic competitor, during World War II. Germany, France, and Britain were devastated, their cities laid to waste, their industries in ruins, their universities boarded up. Coupled with World War I and the Great Depression, the effects of this "30-year war" went well beyond physical destruction. Political, economic, and social systems were overwhelmed by angry workers, populists, fascists, and communists. The result: by the late 1940s, most of Europe was still rationing food, rebuilding its cities, bridges, and roads, and coming to terms with new political systems. The United States was in a very different position, and in the realms of technology and economics did not really have a serious rival for a generation.

The second tidal wave, related to the first, was the generation of immigrants who left Europe and populated American universities, research centers, and think tanks. You cannot exaggerate the dividends this paid to the United States. In the 1930s Germany was the world's leading nation in scientific research, much of it done by German Jews. Despite immigration restrictions, 100,000 Jews entered the United States in the 1930s. By the 1950s, the American research and technology system—universities, centers, companies—had become a magnet for enterprising, scientifically minded people around the world. When immigration restrictions were relaxed in 1965, there began another great wave of immigration, and this time bright Indians and Chinese, often scientifically trained, made their way to America.

The third tidal wave was massive government funding. Beginning in the Great Depression but accelerating dramatically during World War II, the federal government began showering money on research and development, and channeled most of it through universities—a brilliant innovation that has endured as an American model.

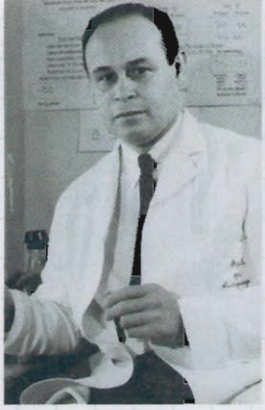
The wide gap between the U.S. and the rest of the world is closing.

After World War II, the Cold War drove this funding to new highs, so that by the 1950s, the United States was spending 3 percent of GDP on R&D, which amounted to a majority of the total spending on science on the planet.

Government funding of basic research has been astonishingly pro-

FROM LEFT: BETTMANN-CORBIS, UNDERWOOD & UNDERWOOD—CORBIS, FRANCES BENJAMIN JOHNSTON—LIBRARY OF CONGRESS-SCIENCE FACTION-CORBIS, UNDERWOOD & UNDERWOOD—CORBIS, BETTMANN-CORBIS

Albert Einstein
(1879–1955)
Theory of relativity



Charles Richard Drew
(1904–50)
Blood bank

J. Robert Oppenheimer
(1904–67)
Atomic bomb

Jonas Salk
(1914–95)
Polio vaccine

Marion Donovan
(1917–98)
Disposable diapers

ductive. Over the past five decades it has led to the development of the Internet, lasers, global positioning satellites, magnetic resonance imaging, DNA sequencing, and hundreds of other technologies. Even when government was not the inventor, it was often the facilitator. One example: semiconductors. As a study by the Breakthrough Institute notes, after the microchip was invented in 1958 by an engineer at Texas Instruments, "the federal government bought virtually every microchip firms could produce." This was particularly true of the Air Force, which needed chips to guide the new Minuteman II missiles, and NASA, which required advanced chips for the on-board guidance computers on its Saturn rockets. "NASA bought so many [microchips] that manufacturers were able to achieve huge improvements in the production process—so much so, in fact, that the price of the Apollo microchip fell from $1,000 per unit to between $20 and $30 per unit in the span of a couple years."

With the end of the Cold War, Americans stopped worrying about the Soviet threat, and funding for R&D plummeted.

Over the past two decades, the three great waves that carried America to the heights of innovation have started to ebb. Obviously, the rest of the world is not in ruins—quite the contrary. Other countries are growing rapidly and hoping to rise up the value chain. China has declared that 60 percent of its GDP will be related to science and technology within two decades. More pertinent right now is Europe, which is peaceful, prosperous, and productive. The continent's unity might be limited in the geopolitical realm, but European nations have come together to spend lavishly on signature scientific projects. Consider the Large Hadron Collider, primarily a European enterprise, which cost more than $5 billion. It is the successor to the U.S.-based Superconducting Super Collider, which was shut down in the early 1990s by the House of Representatives after 14 miles of tunnel had been constructed at a cost of $2 billion.

And then there is the challenge from Asia. The numbers are small, but the trend is clear. Pharmaceutical research—dominated by America today—is succumbing to the same dynamics that drove T-shirt manufacturing and electronics production overseas. "In 2006, 5.5 percent of all global pharmaceutical patent applications named one inventor or more located in India, and 8.4 percent named one or more located in China," according to a report by the Kauffman Foundation. This was a fourfold increase from 1995, and corresponds to a surge in drug demand in emerging markets—from 13 percent of global industry sales growth in 2001 to 27 percent in 2006.

With the end of the Cold War, Americans stopped worrying about the Soviet threat and, as a result, R&D funding for applied science plummeted, dropping 40 percent in the 1990s. It has picked up since then, but the government's share of overall R&D spending remains near its all-time low. And while corporations still spend on R&D, they do not fund the kind of basic research that leads to breakthroughs.

America's decline is most evident in the one realm of high technology where the U.S. government has, until recently, seemed most uninterested: energy. The three most important areas where current technology could yield big results are solar, wind, and battery production (the latter because the energy has to be stored somewhere). According to the investment bank Lazard Frères, the world's largest wind-turbine manufacturer (by revenue) is a U.S. company: General Electric. But the other nine companies among the top 10 are scattered around the world, including Germany (Nordex), Denmark (Vestas), India (Suzlon), and Spain (Acciona).

The situation in solar is similar: U.S. companies take up two slots on the top-10 list (First Solar at No. 2, and Sun-

FROM LEFT: UNDERWOOD & UNDERWOOD—CORBIS; ALFRED EISENSTAEDT—TIME LIFE PICTURES/GETTY IMAGES; BETTMANN/CORBIS (2); FRAN COLLIN

Stephanie Kwolek (1923–)
Kevlar

James Watson (1928–)
Structure of DNA

Arthur Fry (1931–)
Post-its

Sergey Brin (1973–) and **Larry Page** (1973–)
Google

Ed Moses (1949–)
Nuclear fusion (see page 42)

FROM LEFT: JENNIFER CORBETT—NEWS JOURNAL-AP; BETTMANN-CORBIS; EZIO PETERSEN—UPI-NEWSCOM; MICHAEL GRECCO—GETTY IMAGES; JEFF CHIU—AP

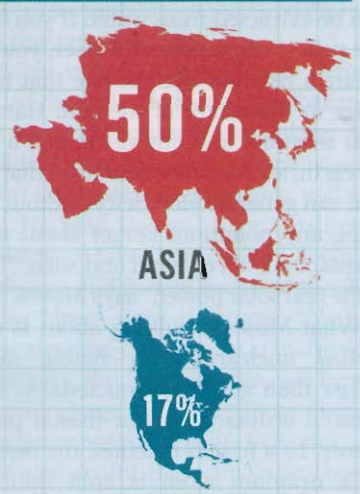
Power at No. 7), but Japan and China both occupy three slots. What's more, Gary Pisano and Willy Shih, professors at Harvard Business School, argue that although the United States still produces about 14 percent of the world's photovoltaic cells, "it no longer is a significant player in crystalline silicon-based solar panels, the prevailing technology."

Eight of the world's top 10 battery manufacturers are headquartered in Japan. Only one—Johnson Controls—is based in the United States. (China's BYD is the other.) The lithium-ion battery in the much-touted Chevy Volt will be manufactured in South Korea. The next evolution in battery technology is large-scale storage—the kind that would hold the electricity generated by solar or wind power so it can be put to use at night or when the wind's not blowing. The leader in this area is also a Japanese company, NGK Insulators, which makes highly efficient sodium-sulfur ("molten salt") batteries.

The rise of the rest also undercuts the other great advantage that the United States has had: being a magnet for the best and the brightest from around the world. While there is no good way to measure this yet, it would seem obvious that as opportunities increase in China, India, and other developing countries, fewer scientists will want to or need to uproot themselves from their country and culture in order to make a better living. In the early 1980s about 75 percent of all the graduates of the Indian Institutes of Technology ended up in the United States. In recent years fewer than 10 percent have been America-bound.

American culture is open and innovative. But it was powerfully shaped and enhanced by a series of government policies. Silicon Valley did not arise in a vacuum. It grew in the 1950s in a state that had created the world's best public-education system (from kindergarten through Ph.D. programs), a superb infrastructure, and a business-friendly environment that attracted defense and engineering industries. Today California builds prisons, but not college campuses. In 1976 it spent 18 percent of its budget on education; that figure now is about 10 percent. The state is permanently bankrupt, saved only by massive, continual borrowing. Are these the foundations for future scientific achievement?

Percentage of U.S. venture capitalists who say they'll increase their investments in:



SOURCE: NVCA AND DELOITTE TOUCHE

We cannot stop the world from rising and doing better at innovation, nor should we want to do so: the rise of the rest is a powerful, positive phenomenon for everyone. But America must adapt to it, not watch quietly as a spectator.

For the past three decades, funding for science research has slipped, the education system has continued to decline, and immigration policy has become less and less rational. Tax and regulatory policies have been made with more thought to domestic special interests than America's long-term competition.

We have hoped it would all work out, and for a while it did. The seed capital from past decades was strong enough to carry us for decades. We got talent from abroad to mask the erosion at home. We used financial engineering to substitute for the real thing. We borrowed to the hilt and sold each other our homes in an ascending spiral that made us all feel rich. And we kicked all the real problems we face down the road, hoping that someone else would solve them. This too has become part of American culture, a culture that desperately needs to change if we are to preserve American innovation and rekindle the real American Dream.

NEXT ▶
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BY DANIEL LYONS