Economy, lack of engineers could hinder U.S. innovation

By Jon Swartz, USA TODAY

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BERKELEY, Calif. – The view from the Berkeley foothills offers breathtaking vistas of downtown San Francisco and the bay in between. But from this 200-acre parcel of eucalyptus and oak trees, you can also see the fuzzy outlines of the future.

From dozens of low-slung buildings and state-of-the art complexes, more than 2,700 scientists, researchers, faculty and students at the Lawrence Berkeley National Laboratory (LBL) are concocting the latest in renewable energy, nanomaterials and supercomputers.

LBL, one of 17 national laboratories, may be the most pre-eminent lab in a country built on the creation of the telephone, TV, microprocessor, nuclear power and the Internet. But tens of thousands of the brightest minds and deepest thinkers are tinkering and plotting at government-funded labs, tech companies, private incubators and, yes, garages, in the USA to come up with technology that will change the way Americans live, travel, communicate and are entertained.

It's here, where LBL is working on creating artificial photosynthesis (fuel from sunlight), longer battery life for electric cars and nanotechnology that lets homes adjust internal temperatures based on the weather, among other things.
"The possibilities are limitless," says invention legend Nolan Bushnell, founder of Atari and Chuck E. Cheese's Pizza-Time Theater chain.

"This should be the best time ever for innovation in the U.S.," says Curt Carlson, CEO of SRI International, a non-profit research institute. "We have an abundance of opportunity in energy, health care, IT, media — all of which are all in transition."

Yet, spurring even more innovation is at the heart of President Obama's $447 billion jobs plan, and a major undercurrent in legislation for immigration and trademarks.

Political progressives bemoan the lack of infrastructure that Big Works, such as the race to the moon or the interstate highway system in the U.S., create, claiming that the Industrial Revolution and the American Century are in history's rear-view mirror. Patent wars have stifled innovation for some tech firms, and a gasping economy has led to cutbacks in research and development at cash-strapped tech companies.

Despite America's knack for ingenuity, the forces of change face some heavy crosswinds. A wheezing economy, a dearth of college engineering students, sagging high school math and science scores, and sinking research-and-development investments have heightened concerns about the USA's ability to compete with rising powers China and India. By Goldman Sachs' estimate, the Chinese economy will overtake the U.S. economy by 2027 and almost double its size by 2050.

The federal government's support for R&D, as a share of the U.S. economy, has plummeted by nearly two-thirds since the 1960s, says Rep. Rush Holt, D-N.J., who has a doctoral degree in physics. The Congressional Research Service estimates the federal government provided $147 billion for R&D last year.

The push for more innovation is tightly intertwined with the digital economy and the country's ability to produce jobs while maintaining a competitive edge in world markets, Holt and others say. "Without large-scale funding, you don't get large telescopes, fusion-energy development and particle accelerators," Holt says.

Nowhere is that more telling than NASA. The space shuttle Discovery flew its last mission, and two final shuttle missions planned for this year were scrubbed. NASA faces "major challenges," space agency Inspector General Paul Martin told Congress in February.

The venture capital scene is much the same. After the 2000 dot-com meltdown, many venture capitalists now shy from early investments and insist on seeing commercial products before making later-stage investments. "Kind of discourages start-ups from pursuing bold ideas," says Paul Pluschkell, CEO of Spigit, a crowd-sourcing firm.

Lopsided ratio

How can the U.S. maintain its edge, or keep pace, when India and China graduate nearly 1 million engineering students annually, compared with 120,000 in the U.S.?

"Attracting the talents of the best and brightest from other countries can help prospects for American workers, because in an innovation economy, jobs often beget jobs," says Brad Smith, Microsoft executive vice president for legal and corporate affairs.

Many great minds in American innovation came from overseas. Immigrants such as Albert Einstein, who won a Nobel Prize; Alexander Graham Bell; Edward Teller, who invented the hydrogen bomb and was an early member of the Manhattan Project team; and the co-founders of Google, Yahoo and Tesla.

"The U.S. is the only country that has consistently attracted people with intellectual horsepower from around the world, and incorporated them," says India-born Arun Majumdar, director of the Advanced Research Projects Agency for the Department of Energy. "If we don't pursue that, we're shooting ourselves in the foot."

Globalization has put even greater pressure on lawmakers to ease restrictions for H1-B visas, which allow U.S. companies to hire foreign tech workers. The cap on such hires annually is 65,000, with another 20,000 for H-1Bs with advanced degrees.

"There is a global brain race, and the U.S. has been unilaterally disarming for years," says Paul Saffo, a longtime technology forecaster and part-time professor at Stanford University.

"Why are we keeping the smartest people in the world out of the U.S.?" Carlson asks, pointing out that half of Silicon Valley CEOs came from outside the U.S. And 40% of founders of the *Fortune* 500 are immigrants or the children of immigrants.

Where's Next Big Thing?

A festering innovation crisis is especially troubling in a country that became the world's top superpower because it was at the center of so many paradigm-shifting creations.

"Technology is a key element of our international competitiveness," says Justin Rattner, Intel's chief technology officer. "Global markets will be fought over who has the best technology and who is driving innovation the fastest and the hardest."

The idea men and women at Berkeley, Intel, Google, Facebook and elsewhere are a living testament that the USA is still a hotbed for innovation.

Many are loath to write off American ingenuity as dead. They argue it is alive and well. "We don't have big tech monuments because the revolutions are getting smaller," futurist Saffo says. "A new processor chip may cost $1 billion to build, but you may need a magnifying glass to see it.

"Seventy years ago, you had to drive to Hoover Dam to see a minor miracle," Saffo says. "Now, you take your iPhone out of your pocket."

Pocket miracles abound in tech labs from Berkeley to Boston, and in the minds of engineers and scientists. Expect these confections within the next few years:

•Batteries in electronic devices will get smaller, lighter and last 10 times longer than they do today. The range of electric cars will extend up to 300 miles from the current 100, based on research at LBL.

•A miniaturized version of Hewlett-Packard's flexible displays will fit on the wrist pads of soldiers so they can view maps and field manuals. The devices would also act as GPS for missing or injured soldiers.

•Intel's fireball, a stainless steel, baseball-size sphere, is being tested by firefighters in New York and Boston to determine the air quality of blazes and chemical spills. The sphere is shot into burning buildings to gauge what first responders can expect before they rush in.

•In five years, sensors in your phone, car, wallet and even your tweets will collect data that give scientists a real-time picture of your environment. A whole class of "citizen scientists" will emerge, using simple sensors that already exist to create massive data sets for research.

"The U.S. is still the cradle for innovation; most of it takes place here," Secretary of Energy Stephen Chu says.

Solutions on the horizon

The hand-wringing about the Next Big Thing(s) extends to longing for major public works projects that would be next to impossible to build today, given the limitations of government and the public's leery attitude about ambitious government projects, says PayPal co-founder Max Levchin and Facebook investor and board member Peter Thiel. "They would be considered crazy today," says Thiel, an investor in Seasteading, which

proposes to create permanent dwellings at sea. Thiel's foundation recently announced that 20 entrepreneurs under 20 years old were awarded grants of $100,000 to help advance innovative scientific and technical ideas that can't wait until college graduation.

Last month, the National Science Foundation created Innovation Corps, an incubator for 100 of its top teams of scientists to foster a "start-up culture."

Non-profit ConvergeUS, which aims to tackle childhood education and reading proficiency, is spearheaded by Twitter co-founder Biz Stone and Rey Ramsey, CEO of TechNet, a bipartisan political organization. "We need to portray life in tech as rewarding and fun," Stone says. "Young entrepreneurs have raised its visibility, but not enough."

Paradigm-shifting technology is all around us, argues Bill Gross, who has helped start 100 tech companies in the past 30 years. He says the emergence of tablet computers, while hardly earth-shattering, is an extension of mobile devices that — combined with cloud computing — has fundamentally changed the way people consume content, learn and communicate.

"It is not as visible as putting a man on the moon, but just as significant," Gross says. In the 1960s and '70s, a push for product quality in Japan put America at a competitive disadvantage, SRI's Carlson says. But the U.S. adapted to the market and better trained its workforce.

The same applies to the current economic climate, Obama said. "The economy is more (digitally) linked, with more opportunity," he said last month at a town hall meeting.

But unless America better trains its workforce, builds infrastructure, and invests in basic research and education, he said, it cannot effectively compete with China, India and others.

"This is not about winning some race but improving people's quality of life," Holt says, "as it has been throughout this country's history."

http://www.usatoday.com/tech/news/2011-11-09-tech-frontiers-innovation-economy.htm