

NOT INVENTED HERE

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When James E. West was 8 years old, he propped himself on his bed's brass footboard one afternoon and stretched to plug the cord of a radio he had repaired into a ceiling outlet. It was one of his first experiments. Mr. West's hand sealed to the light socket as 120 volts of electricity shimmied through his body, freezing him in place until his brother knocked him from the footboard and onto the floor.

Like more storied inventors who preceded him, he was quickly hooked on the juice—even as he lay shivering from that first encounter. “I became fascinated by electricity after that, just completely fascinated,” recalled Mr. West, now 74 and an award-winning research professor at Johns Hopkins University. “I needed to learn everything I could about it.”

Over the past several decades, he has secured 50 domestic and more than 200 foreign patents on inventions relating to his pioneering explorations of electrically charged materials and recording devices. According to the National Inventors Hall of Fame, an organization in Akron, Ohio, that counts Mr. West among its inductees, about 90 percent of all microphones used today in devices like cellphones, acoustic equipment and toys derive from electronic transducers that he helped to develop in the early 1960's.

Inventors have always held a special place in American history and business lore, embodying innovation and economic progress in a country that has long prized individual creativity and the power of great ideas. In recent decades, tinkerers and researchers have given society microchips, personal computers, the Internet, balloon catheters, bar codes, fiber optics, e-mail systems, hearing aids, air bags and automated teller machines, among a bevy of other devices.



James E. West (Marty Katz/The New York Times)

Mr. West stands firmly in this tradition—a tradition that he said may soon be upended. He fears that corporate and public nurturing of inventors and scientific research is faltering and that America will pay a serious economic and intellectual penalty for this lapse.

A larger pool of Mr. West's colleagues echoes his concerns. “The scientific and technical building blocks of our economic leadership are eroding at a time when many other nations are gathering strength,” the National Academy of Sciences observed in a report released last month. “Although many people assume that the United States will always be a world leader in science and technology, this may not continue to be the case inasmuch as great minds and ideas exist throughout the world. We fear the abruptness with which a lead in science and technology can be lost—and the difficulty of recovering a lead once lost, if indeed it can

be regained at all.”

A committee of leading scientists, corporate executives and educators oversaw the drafting of the report, entitled *Rising Above the Gathering Storm: Energizing and Employing America for a Brighter Economic Future*. To spur American innovation, it recommends enhanced math and science education in grade school and high school, a more hospitable environment for scientific research and training at the college and graduate levels, an increase in federal funds for basic scientific research and a mix of tax incentives and other measures to foster high-paying jobs in groundbreaking industries. The report cites China and India among a number of economically promising countries that may be poised to usurp America's leadership in innovation and job growth.

“For the first time in generations, the nation's children could face poorer prospects than their parents and grandparents did,” the report said. “We owe our current prosperity, security and good health to the investments of past generations, and we are obliged to renew those commitments.”

The Industrial Research Institute, an organization in Arlington, Va., that represents some of the nation's largest corporations, is also concerned that the academic and financial support for scientific innovation is lagging in the United States. The group's most recent data indicate that from 1986 to 2001, China, Taiwan, South Korea and Japan all awarded more doctoral degrees in science and engineering than did the United States. Between 1991 and 2003, research and development spending in America trailed that of China, Singapore, South Korea and Taiwan—in China's case by billions of dollars.

Mr. West's personal journey has involved overcoming school segregation and racism, a reading disability

and the downsizing of Bell Labs, the legendary New Jersey research center where he once worked, and he fantasizes about a day when children hold inventors and scientists in higher esteem than hip-hop stars and professional athletes.

"We need to bring the view back in this country that we're willing to make investments for the future because everything that's in the cellphone and the iPod today was known 20 years ago," he said. "I think scientists and inventors are a very peculiar breed in that we're not in it for the money—we're in it for the knowledge."

It all begins with a tingle of curiosity. "If I had a screwdriver and a pair of pliers, anything that could be opened was in danger," Mr. West recalled of his childhood. "I had this need to know what was inside."

That need links Mr. West to a rich tradition in American life and civilization. Benjamin Franklin, his kite lofted into the sky to coax electricity from the clouds, is the totemic American inventor whose financial acumen gave him time to ponder and then spout a series of inventions that included a stove, catheter, glass harmonica, bifocals and, of course, the lightning rod—which he declined to patent so it would be freely available to the public.

No less a figure than Abraham Lincoln regarded the patent system, and the protections it offered for what he called the "fire of genius," as one of history's signature achievements. Shortly after President Lincoln's death, Thomas Alva Edison filed a patent for his first invention, an electric vote recorder. Edison became widely heralded not only as the creator of a longer-lasting light bulb and the phonograph but also as the inventor of the invention factory.

When the conglomerate that eventually became General Electric began buying out Mr. Edison's operations in the 1890's, it represented the beginning of the corporate absorption of the inventive act. "Edison marks the end of the individual inventor and the pre-corporate phase of invention," said Randall E. Stross, a contributor to *The New York Times* who is also working on an Edison biography titled *The Wizard*,

which Crown Publishing plans to release in 2007.

In 1932, a year after Edison died, corporations secured more patents than individuals for the first time, and a year later the Census Bureau eliminated "inventor" as a job class, according to *Technology Review*, a trade publication. During the golden era of corporate research and development that followed Edison's death, G.E., DuPont, AT&T and eventually Lockheed, Eli Lilly, Intel and other corporate giants came to dominate innovation. And as that happened, some tensions arose between corporations and independent inventors and researchers.

While tipping their hats to the scores of breakthroughs that have emerged from corporate labs, inventors also say they are concerned that bottom-line pressures at many companies may cause pure research to be eclipsed by innovation tied to rapid commercialization—leading to routine refinements of existing products rather than to breathtaking advances.

A tug of war has emerged between individual inventors and corporations over proposed legislative changes in patent laws, with the inventors arguing that possible revisions would benefit the business giants. Corporations have argued that the system is equitable but flawed. Dean Kamen, an inventor whose creations include the wearable insulin pump and the Segway transporter, recently testified before Congress, calling for changes in the patent system that also preserve protections for individual inventors.

Despite those tussles, Mr. Stross says he believes that recent technological advancements have helped to move innovation out of the corporate sphere and to "give the lone inventor access to inexpensive tools and resources to once again be master of one's own lab."

Robert S. Langer, a research scientist at the Massachusetts Institute of Technology and a biotechnology pioneer, says that he shares the concerns raised in the National Academy of Sciences report but that he remains confident about the country's prospects. "While I think we can always do better, I am optimistic about the spirit of innovation in this country,"

he said. "I think we hold a lead, but no lead is unassailable."

For Mr. West, whose career has spanned stretches in creative havens like Bell Labs, inventing has meant brainstorming sessions with fellow tinkerers and long hours walking the corridors of his own mind. "I spend a great deal of the hours that I'm awake within myself," he said. "You never want to stop doing it, especially when it's a pleasure. It's vital to my existence and I couldn't live if I wasn't an inventor."

Ilene Busch-Vishniac, a Johns Hopkins professor and inventor who has collaborated with Mr. West for more than two decades, most recently on acoustical research, called him the quintessential explorer. "For an inventor to be successful they have to think outside of the box and propose things that are wildly different," she said. "Secondly, you need to be able to figure out how to do the tests that evaluate whether something is plausible. Jim is great at both of those things, but especially at figuring out the tests."

Mr. West began testing his limits at an early age, defying his family's wishes that he become a dentist and setting his sights on a doctorate in physics. To dissuade him, his father introduced him to other African-American friends with doctorates—all of whom had failed to land university posts and held blue-collar jobs instead. Still, Mr. West pressed on, coached by a series of mentors, memorizing text and numbers to mask his reading problems, building on his mathematical gifts and eventually enrolling as an undergraduate in physics at Temple University.

After a summer internship at Bell Labs, he invented a pair of headphones; enthralled by his lab work, he decided to forgo his physics studies and to stay on at Bell Labs, where he developed microphone technologies and explored a range of interests in acoustics. When Bell Labs became part of Lucent after AT&T reorganized, the scope of its research operations shifted, and Mr. West eventually moved on as well. At Ms. Busch-Vishniac's invitation, he joined Johns Hopkins in 2000.

Although he walks with a slight limp caused by a series of lower back

surgeries, Mr. West looks much younger than his age. Like all inspired inventors whose fertile imaginations make them both researchers and artists, Mr. West also still manages to bring a Zen-like focus to his endeavors. "If I'm concerned about what an electron does in an amorphous mass then I become an electron," he allowed. "I try to have that picture in my mind and to behave like an electron, looking at the problem in all its dimensions and scales."

He and Ms. Busch-Vishniac are currently analyzing solutions to noise problems in hospitals, and they are mentoring two local high school students and a Johns Hopkins graduate student who have joined their team as young inventors. The graduate student, Emily Nalven, 22, said she decided to join Mr. West after taking classes with him.

"Even on the days he didn't lecture, he came to class, sat in the front row, took notes and spent his time after class answering student questions," she said in an e-mail message. "One day, I asked him something about sound waves and he answered my question, then came back the next day with an even more detailed explanation to ensure that I truly understood." The seeds of future inventions are sown in these kinds of interactions, but the possible erosion of fertile academic and financial soil in America concerns Mr. West and many others in science.

"The inventiveness of individuals depends on the context, including sociopolitical, economic, cultural and institutional factors," said Merton C. Flemings, a professor emeritus at M.I.T. who holds 28 patents and oversees the Lemelson-M.I.T. Program for inventors. "We remain one of the most inventive countries in the world. But all the signs suggest that we won't retain that pre-eminence much longer. The future is very bleak, I'm afraid."

Mr. Flemings said that private and public capital was not being adequately funneled to the kinds of projects and people that foster invention. The study of science is not valued in enough homes, he observed, and science education in grade school and high school is sorely lacking.

But quantitative goals, he said, are not enough. Singapore posts high national scores in mathematics, he said, but does not have a reputation for churning out new inventions. In fact, he added, researchers from Singapore have studied school systems in America to try to glean the source of something ineffable and not really quantifiable: creativity.

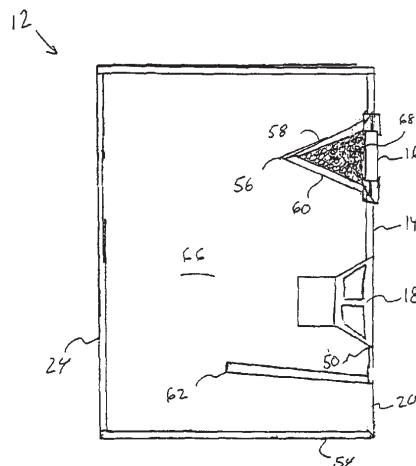
"In addition to openness, tolerance is essential in an inventive modern society," a report sponsored by the Lemelson-M.I.T. Program said last year. "Creative people, whether artists or inventive engineers, are often nonconformists and rebels. Indeed, invention itself can be perceived as an act of rebellion against the status quo."

Those who keep an eye on corporate behavior say they think that sober-minded risk taking—and the support of daring research for research's sake—also needs to be on the strategic menus of more companies. "When inventors work independently, the invention itself is seen as an opportunity, whereas in the corporate world accidents are seen as failures," said Peter Arnell, a marketing consultant who coaches companies about innovation. "When people exist outside of the corporate model and have vision and passion, then accidents and getting lost are beautiful things."

6,870,942

43.38.Tj LOUDSPEAKER FOR LINE ARRAY SOUND SYSTEM

Curtis H. Graber, Woodburn, Indiana
22 March 2005 (Class 381/349); filed 3 September 2003



A two-way line array system is described. A ported enclosure 24 that can be trapezoidal in section contains a conventional low-frequency unit 18 and a planar transducer 16. Many, including the manufacturers of line array systems that are similar, if not identical, to the described invention, may be interested in how this invention may not only fail to be novel, but how it may also fail to be a non-obvious, or even obvious, improvement over the prior art.—NAS

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Nathan Myhrvold, part of Microsoft's early brain trust and the former head of its heavily endowed research arm, founded Intellectual Ventures, a fund that he says spends "millions of dollars" annually to support individual inventors in long-term projects. Mr. Myhrvold started his fund about five years ago after he retired from Microsoft; he now backs about 20 inventors in such fields as nanotechnology, optics, computing, biotechnology and medical devices.

"As far as we know, we're the only people who are doing this—which means we're either incredibly smart or incredibly dumb," Mr. Myhrvold said. "There's a network of venture capitalists for start-ups that have created thousands and thousands of businesses, but very little for inventors."

Mr. Myhrvold says that most public and academic grants are for investigating well-defined research problems—and not for backing, as he does, "an invention before it exists." His staff of about 50 people files about 25 patent applications a month on behalf of inventors and his fund. He and his staff also help inventors refine ideas, pay for their time and labor and share ownership stakes in projects with them.

"We all love the goose that lays the golden eggs but somehow we've forgotten about the goose," Mr. Myhrvold said. "This decade I'm hoping will be the decade of the invention."

Whether or not a new inventive age is coming in America, Mr. West says he plans to continue doing what he's always done. He and Ms. Busch-Vishniac debate, regularly and vociferously, the merits of their respective ideas. But both say their debates are authentic exchanges of viewpoints, not games of one-upmanship.

"You can't have a big ego and be a great inventor," Mr. West said. "You constantly have to be listening and evaluating."

Even though he is halfway through his eighth decade, he is pursuing other new projects—collaborating with a colleague at Georgia Tech, for example, to explore improved methods of teleconferencing. Inventing, he says, is the intellectual bicycle that he rides each day.

Looking back over the years, Mr. West says he has often gone down the wrong intellectual path. But, he says, that's just how inventors do their thing.

"I think I've had more failures than successes, but I don't see the failures as mistakes because I always learned something from those experiences," Mr. West said. "I see them as having not achieved the initial goal, nothing more than that." **AT**

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