

MOBILITY

REWALK

Call it an exoskeleton or a bionic suit, but for paraplegics, it's freedom. This innovative device, developed by a quadriplegic Israeli scientist, relies on **sensors that anticipate shifts in the user's balance** and translates them into movements like walking and standing. Already available in Europe, the suit had its prime-time debut on an episode of *Glee* and is being reviewed by the FDA for use in the U.S.

ReWalk is customized for each user and runs on batteries that power the suit for an entire day



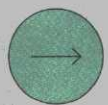
THE SPARK

A TIME/Qualcomm poll reveals a world of opinions about who inventors are, how they do their work and which countries used to be—and will be—the most inventive

OF

INVENTION

BY JEFFREY KLUGER



BE GRATEFUL YOU NEVER HAD to take a nap with Thomas Edison. It's not like Edison slept all that much; by his own account he was good for four, maybe five, hours a night, setting aside at least 18 per day for work. That made sense. If you're going to leave the world a list of inventions that includes the lightbulb, the movie camera, the cylinder phonograph, the disc phonograph, advanced fluoroscopy, a commercial stock ticker, a vote tabulator and more, you'd best put in a long day.

All the same, a man does need his rest, and Edison was not above the occasional catnap—provided it was not devoted solely to sleep. Like most people, he noticed that insights and brainstorming often occur at the edges

of sleep—when the border guard of the prefrontal cortex is going off duty and the more bohemian precincts like the occipital lobe, where imagery is processed, are free to play. But those insights can be fleeting, lost forever if the sleep that allowed them to exist in the first place overtakes you before you can wake up and write them down. So Edison would nap sitting up in a chair, with his arms draped over the sides and a steel ball in each hand. On the floor on either side of the chair was a metal pan. If he fell too deeply asleep, the balls would fall with a clatter, awakening him in time for him to rescue any useful thought before it flashed back into the cognitive vapor.

In his own way, Edison figured out how to beat the clock just a little,

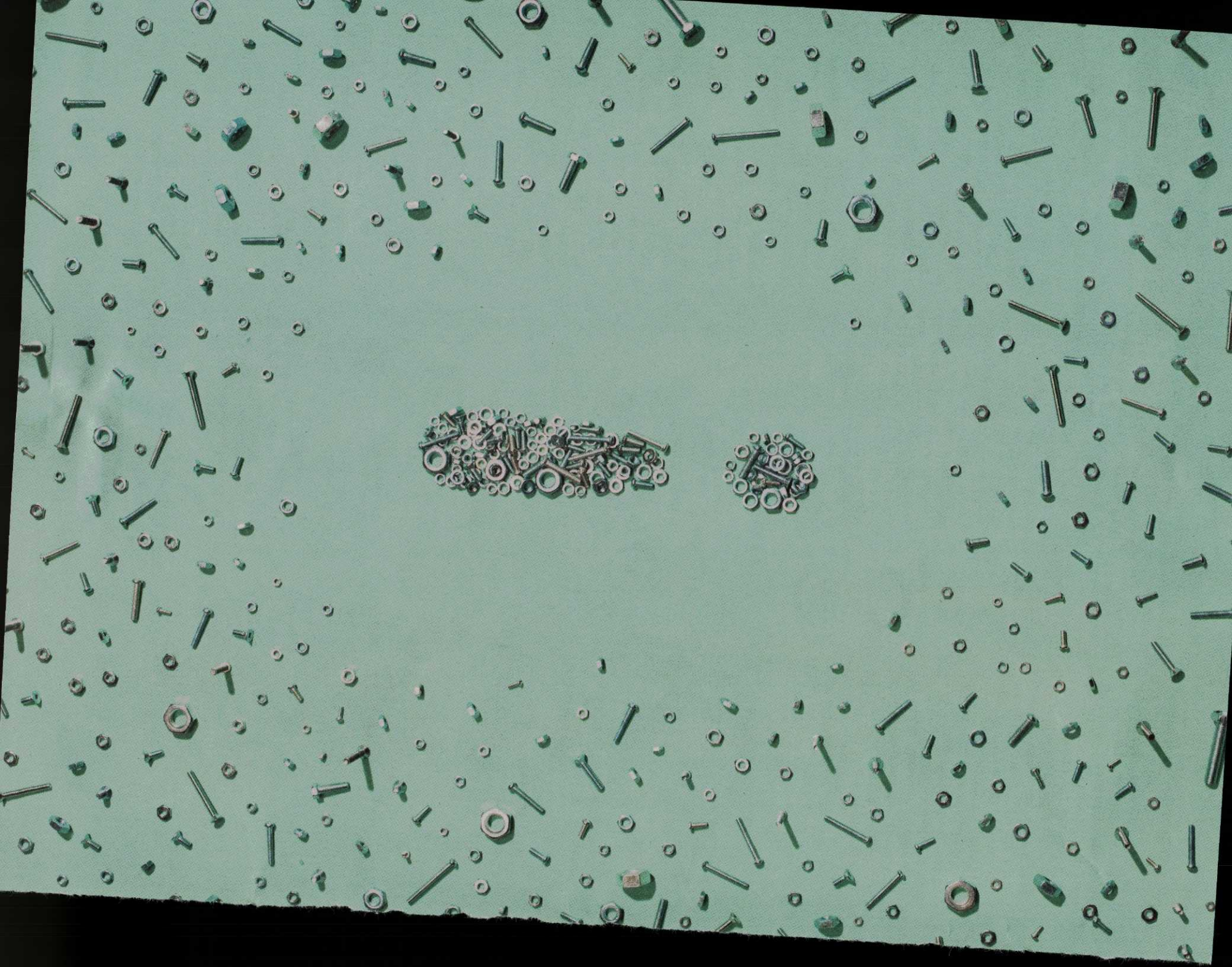
wringing a few more productive minutes out of days already packed with them. For his efforts, he is remembered by history not just as an inventor, or even as a great inventor, but as the very notion of inventiveness made flesh. The TIME Invention Poll, in cooperation with Qualcomm, asked more than 10,000 people in 17 countries to name as many inventors as they could, and Edison was the overwhelming favorite. Thomas Alva of tiny Milan, Ohio, was mentioned first 27% of the time. That number is more impressive than it seems: the laggards who finished second, third, fourth and fifth—at 9%, 5%, 4% and 3%—were Albert Einstein, Alexander Graham Bell, Leonardo da Vinci and Steve Jobs.

It's easy enough to recognize a

ABOUT THIS POLL THE TIME INVENTION POLL, IN COOPERATION WITH QUALCOMM, WAS A SURVEY OF 10,197 PEOPLE IN SEVEN MATURE MARKETS (SOUTH KOREA, THE U.S., GERMANY, SWEDEN, AUSTRALIA, THE U.K. AND SINGAPORE) AND 10 EMERGING MARKETS (SOUTH AFRICA, KENYA, RUSSIA, THE UNITED ARAB EMIRATES, CHINA, BRAZIL, TURKEY, INDIA, MEXICO AND INDONESIA).

Photo-illustration by Andrew B. Myers for TIME

Graphics by Arno Ghelfi for TIME



prolific inventor when we see one; if nothing else, just count the patents (Edison had 1,093). But it's far harder to define what the act of invention is—how it springs into being, how it visits some of us and not others, how an idea that seems so obvious after the invention has been conceived and built was so opaque, so elusive before. Inventiveness can hit when we're thinking about inventing, or it can come in sideways, flashing brilliantly on the periphery when we're focused on something else.

While that kind of comet strike makes for nice tale-telling (Newton's falling apple, Archimedes' rising bathwater, Philo Farnsworth's back-and-forth plow path, which gave him the idea for the scanning motion of the electron beam in a TV tube), invention is just as often the result of mere doggedness, even cussedness, grinding away at a problem until it finally yields. Jonas Salk invented the first successful polio vaccine, and you can follow exactly how he did it, step by step, experiment by experiment and year by year, in the 573 file boxes—spanning 316 linear ft. (96 m) and containing tens of thousands of documents—that make up his collection of personal papers at the University of California at San Diego. That ain't inspiration. That's sweat.

Mysterious too is not just the how of invention but the where. The U.S. is manifestly the most inventive country of the past century, a fact backed not only by the sheer number of innovations that have poured from American labs and minds (the airplane, the zipper, the personal computer, the telephone, the mass-market car, the Internet, the oil well, the motorcycle, the laser, the smoke detector) but also by popular opinion. Among poll respondents around the world, 36% called the past century the American century—at least when it comes to invention—nearly doubling second-place Japan's 19% and blowing the doors off Russia, the U.S.'s old Cold War rival, with its tiny 2%.

But what accounts for the U.S.'s success? Was it the simple arithmetic of land plus resources plus time? The bracing combination of town-hall democracy and all-in capitalism? The fact that a young country

begins the race lean and quick, without the traditions, institutions and other cultural harnesses that slow down the competition? And what about now, as the U.S. enters what often seems to be a cranky, complacent middle age and looks overseas at ancient cultures that have reinvented themselves—China, India, Korea, the 5,000-year-old new kids on the block? It's no coincidence that poll respondents saw China as the rising economic power of the 21st century, with the U.S. maintaining only a tiny lead in the global rankings—24% to 23%.

The TIME/Qualcomm poll is a deep-dive attempt to explore these and other issues, not only around the world and across cultures but across economic strata too. The 17 sampled countries are divided

ARE INVENTORS BORN OR MADE?



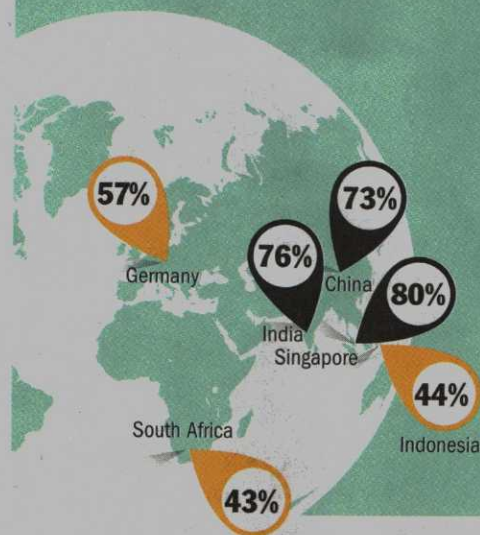
It would be nice to think we could all be great inventors, but history says otherwise. Still, there's wide agreement that inventiveness is a quality that can be learned.

Inventiveness can be learned
Inventiveness is inherited

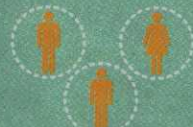


DOES IT TAKE A VILLAGE TO BE AN INVENTOR?

Solitary geniuses are nice, but there's power in a team. Culture seems to determine which one people see as more important.



A collective effort



An individual effort



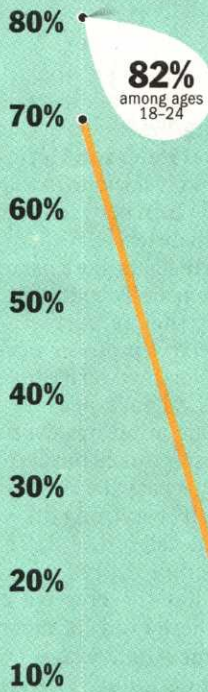
MODERN INVENTOR

Kelvin Doe

Doe had been making batteries and generators to power his Sierra Leone hometown since he was 11. At 16 he started a radio station that employed local teens. Next up for the 17-year-old whiz kid: a windmill to give his neighbors electricity.

into two silos: seven so-called mature markets (including the U.S., Germany, South Korea and Singapore) and 10 emerging markets (including Kenya, Russia, China, India, Mexico and the United Arab Emirates). The 10,197-strong sample group is sliced at another angle too, divided among 6,133 middle-income adults, 2,691 well-educated and high-income "broad elites" and 1,373 "business decisionmakers," people who run at least one department in a large company with over \$10 million in global sales.

All the subjects were asked the same set of questions: What is an inventor—or an invention, for that matter? Do you consider yourself an inventor? Are inventors born or made? What are the most important inventions of all time? Are



THE MOST USEFUL INVENTIONS OF ALL TIME

Would you call the rice cooker one of humanity's greatest creations? You might if your diet and very survival depended on it. Geography plays a big role in how we see an invention's importance, but globally, nothing beats the cell phone.

THE THREE MOST IMPORTANT INVENTIONS



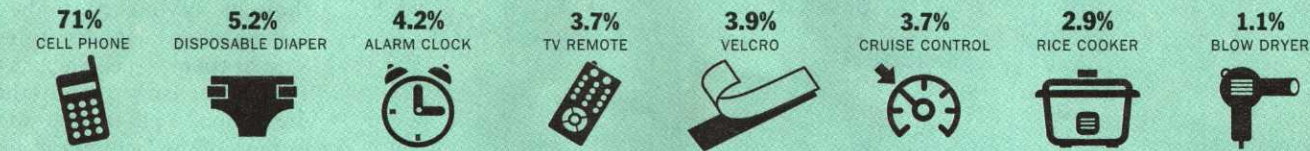
ELECTRICITY



THE INTERNET

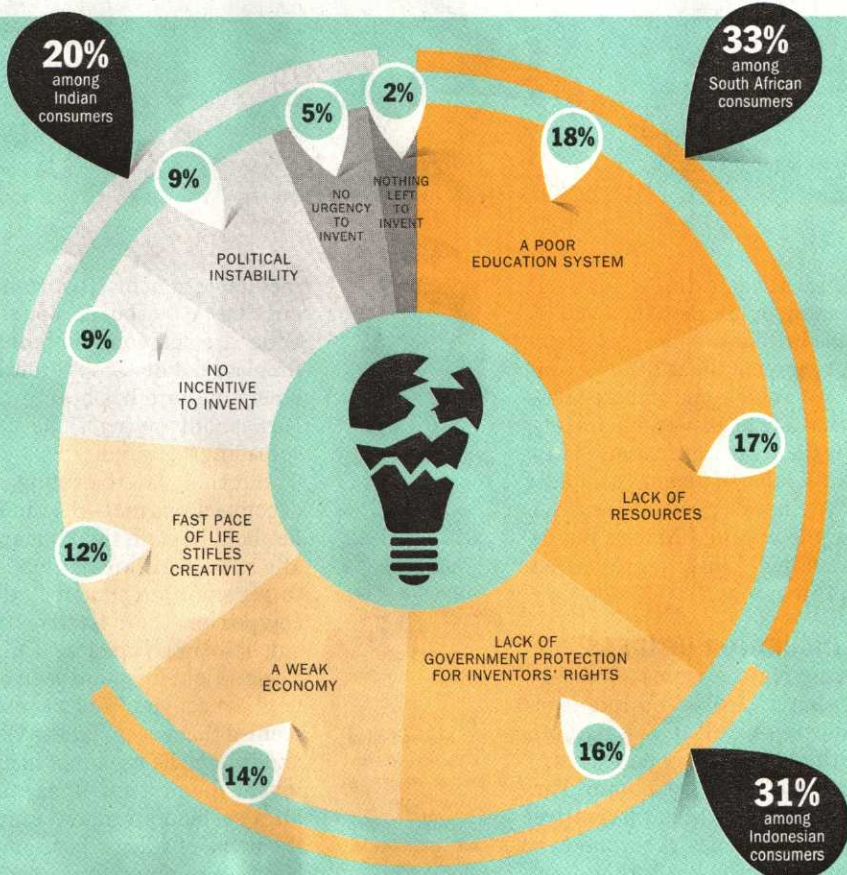


THE WHEEL



THE BARRIERS TO INVENTION

Not every creative mind actually gets to create, and where or how you live can make a big difference. Respondents saw a lot of potential obstacles in the path of inventors.



INVENTIONS IN NEED OF REINVENTION



13%
COMPUTER



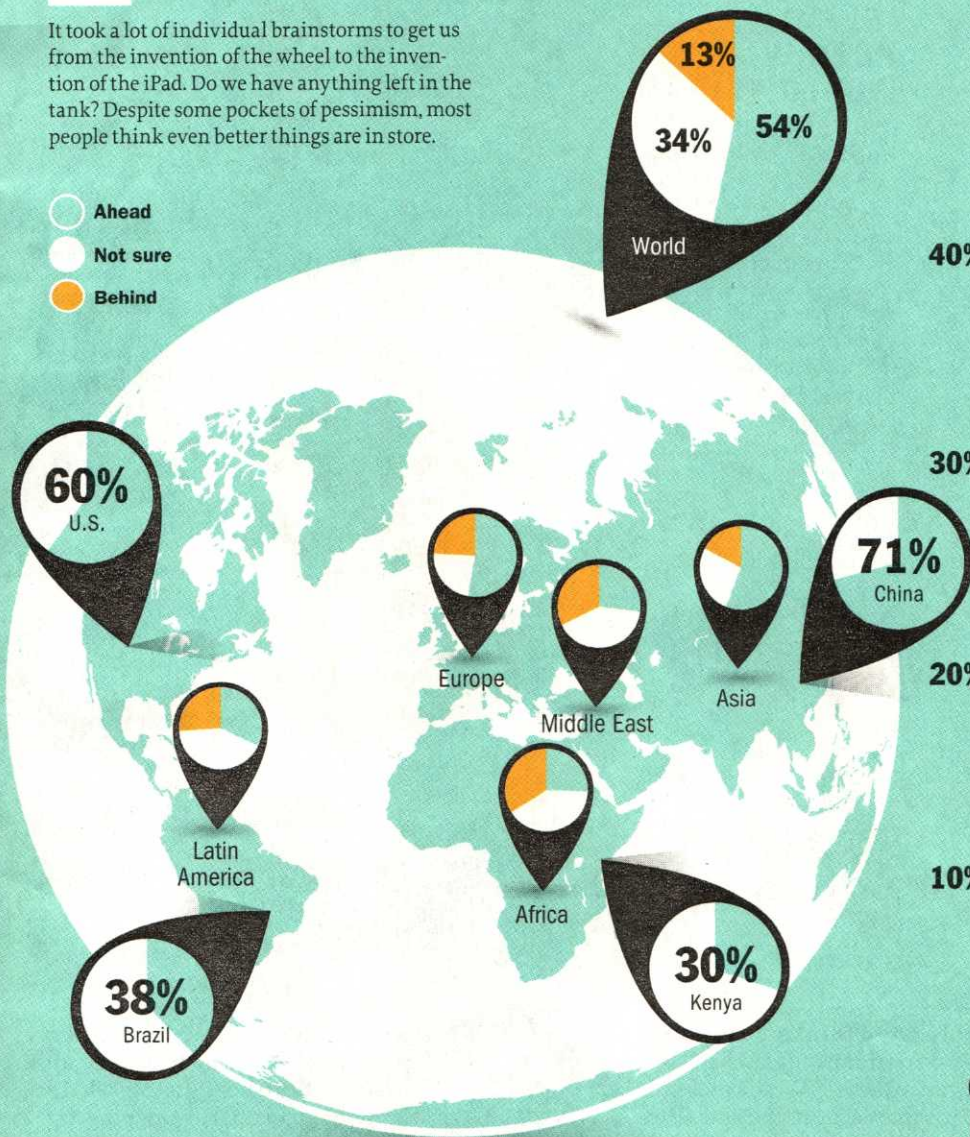
11%
CAR



8%
TELEPHONE

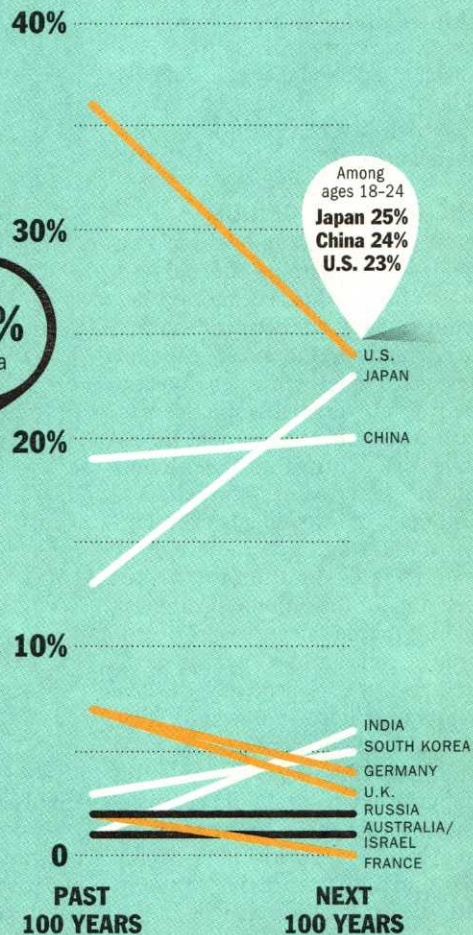
ARE HUMANITY'S MOST INVENTIVE DAYS BEHIND US OR AHEAD?

It took a lot of individual brainstormers to get us from the invention of the wheel to the invention of the iPad. Do we have anything left in the tank? Despite some pockets of pessimism, most people think even better things are in store.



COUNTRIES PRODUCING THE MOST IMPORTANT INVENTIONS

No one gets to be No. 1 forever, and as the U.S. is learning, there are plenty of contenders for the crown (hello, China and Japan). But respondents' ages can influence their answers.



THE POWER OF PATENTS: WHICH COUNTRIES DO THE BEST JOB OF KEEPING YOUR IDEA YOURS?

Laws that look out for inventors can go a long way toward keeping them happily at their workbenches. The U.S. leads the world on this score.



The most consistently high scores in the tricky could-I-be-an-inventor category were among the powerful business decisionmakers in emerging countries—72% in Indonesia, 67% in India, 62% in Brazil. That's not hard to understand. When you're a big player in an economy that's growing fast and has room to continue, you are probably already doing a lot of creating. It's the only way to survive. "The culture makes a big difference," says Notre Dame University's David Watson, a personality psychologist who studies creativity. "The extent to which inventiveness is encouraged is critical."

THE ROOTS OF GENIUS

THERE ARE DEEPER—AND FAR older—factors than the current state of its national economy that influence any one country's ability to be creative. A vibrant educational system complete with globally competitive universities would seem to be a threshold requirement for an inventive culture. But that's by no means what everybody believes. Only 32% of respondents in emerging nations and 23% in developed nations said education was a sine qua non for invention. The highest scorers in that category were Brazil, South Africa and Kenya, at 38%, 43% and 38%, respectively; the low scorers included Indonesia, South Korea and Singapore, at 20%, 19% and 18%. That seems precisely the opposite of what it should be, given that the last three countries have long histories of prioritizing education and the first three not so much. But the explanation may lie in the kinds of educational systems East Asia often fosters.

All but the most traditional Western schools encourage inquiry, independent work and open debate, particularly about such nonempirical subjects as social sciences, literature and politics. It's a messy way to learn, but it's the system we're used to. East Asian schools take a far harder, far tidier approach, stressing the muscle work of mastering large volumes of material and reproducing it from memory on frequent exams. Both methods provide kids with a fair enough education, but the Western model is widely thought to do a better job of also teaching them the

simple art of thinking creatively. "Consider how high schools are run," says Geoffrey West, a professor and past president at the Santa Fe Institute, which studies complex systems. "In China and elsewhere in the East, students remain in the same classroom at the same desk all day long, while their instructors rotate in one after another to teach their lessons." In the U.S., it's controlled chaos, with kids hurrying all day between classes—some of which they choose themselves. "That creates a certain disorder, a flexibility, sense of choice and even flakiness." For some students, West believes, that may help foster creative thought.

PROTECTING WHAT'S YOURS

PATENTS ARE ANOTHER WAY OF measuring a country's creativity. Much of the focus of West's recent

THE MOST INVENTIVE PERIOD WORLDWIDE

Computers, spacecraft and the Internet are fine, but don't sniff at the invention of agriculture or industry or medicine. Still, it's natural for people to be biased in favor of their own time, and with the digital revolution still raging, most folks say the best of times is now.



Globally
84%
say we live in an age of invention

2%



NEOLITHIC REVOLUTION
10,000–5000 B.C.

2%



CLASSICAL ANTIQUITY
700 B.C.–A.D. 400s

3%



RENAISSANCE
1300s–1600s

40%



DIGITAL REVOLUTION
1980s–PRESENT



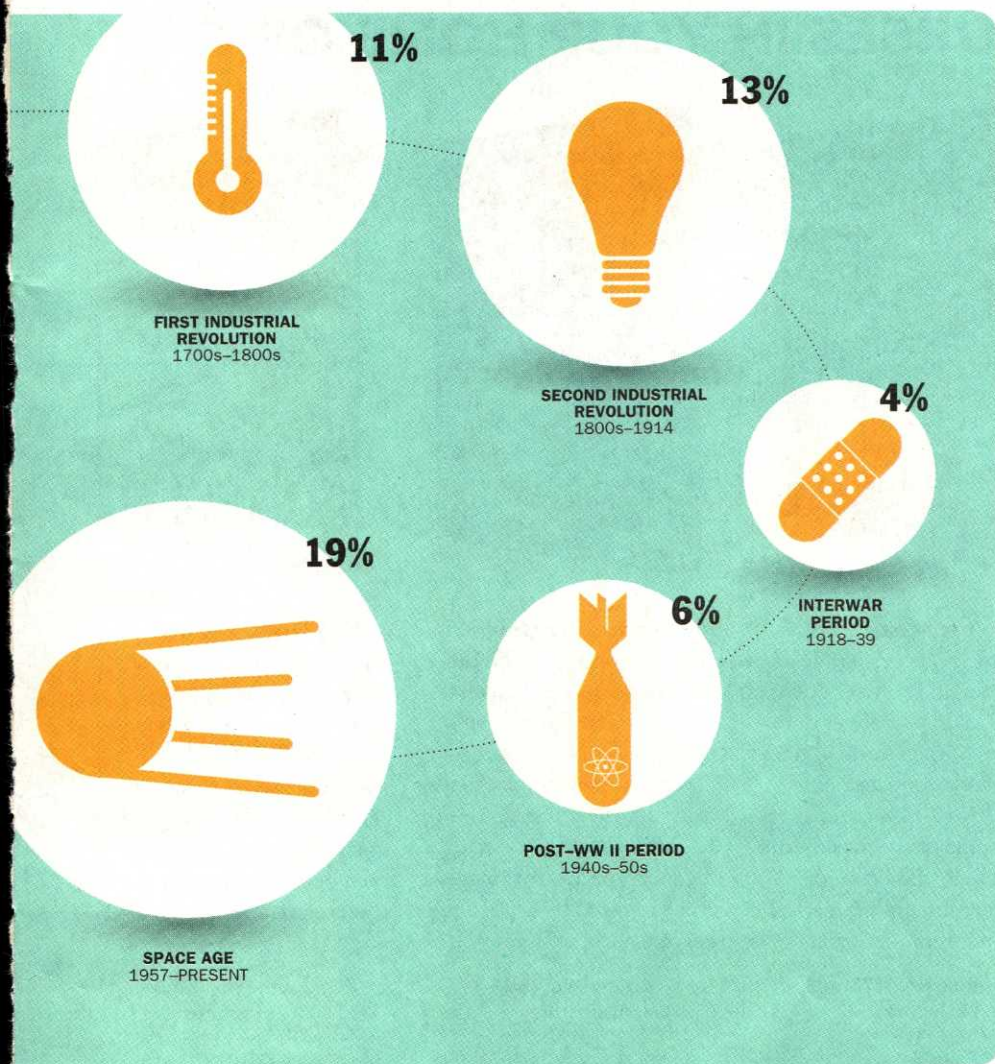
MODERN INVENTOR

Juan Sebastián Osorio

Infant breaths are so faint that monitors sometimes confuse them with heartbeats. So this Colombian researcher developed a prototype to detect baby breaths more accurately by measuring heart rate, electrical signals and oxygen levels.

work is on the dynamics of cities, particularly the way they scale up in size. Cities tend to grow in what's known as a superlinear progression. Every time a metropolitan area doubles in population, it more than doubles in other indicators of socioeconomic life—both good and bad. A city that's 100% bigger than it was, say, 50 years ago will see increases, on average, of up to 115% in wages, jobs and construction projects and also in communicable disease, crime and poverty. "This originates in the increase in social interactions," West says. "A major reason for the existence of cities is to bring people together to enhance the creation of artifacts, ideas and wealth—though that too can lead to problems and unintended consequences."

A 2004 study West conducted



with colleagues in Santa Fe and at Arizona State University showed that the superlinear rule holds for patents as well, with cities generating more patentable ideas per capita than less densely populated areas—and very large cities producing the most of all. This is especially so for cities that are big enough to have dedicated professional regions, like New York City's financial, theater and diamond districts. "People agglomerate in these places so they can talk to one another, learn what the person down the street knows," West says. "They may not be doing that consciously, but it's the buzz of the city they're participating in." It is also one reason so many other metro areas are spending millions of dollars trying to foster "innovation zones" inside their city limits. Proximity and competition seem to bring out the clever in us.



MODERN INVENTOR

Yu Zheng

A lead scientist at Microsoft Research Asia, Zheng came up with a way to analyze GPS data from more than 33,000 taxi drivers to find the best way to avoid gridlock. His new project, U-Air, predicts air quality around smoggy Beijing.

Patents are not merely indicators of creativity; they may also induce people to create in the first place, since they afford you the opportunity to keep what's yours—or at least to sell or license it as you choose. The TIME poll asked a number of questions about the patent system, and for so prosaic a subject, it yielded passionate responses. People in 14 of the 17 countries scored close to or well above 90% when asked if they were familiar with the idea of patents; only India (72%) the UAE (67%) and Kenya (42%) scored lower. There was similar accord (90% overall) that a robust patenting system is important in fostering inventiveness.

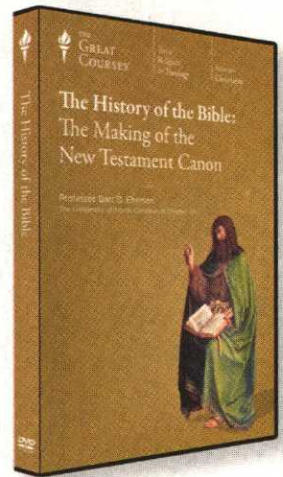
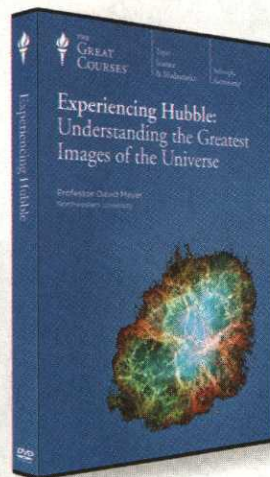
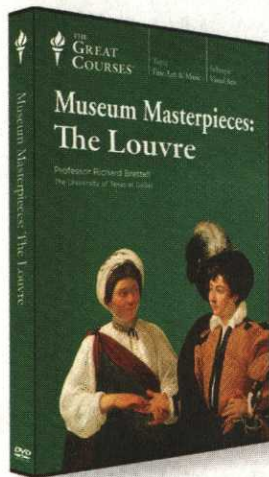
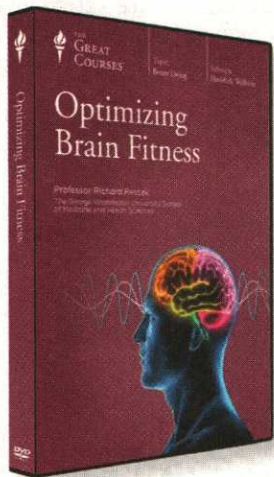
When respondents were asked which of the 17 countries in the poll did the best job of protecting intellectual rights, the U.S. won in a landslide, at 40%, with the next

best finisher, Germany, clocking in at just 10%. Respondents in none of the surveyed countries—not even in the U.S.—were satisfied with their own government's patent system, with 76% wanting even tighter protections. "It's one thing to have an idea, but to market it? Actualize it?" says Watson. "That's more likely to occur if your intellectual property is protected and you know you're going to realize some revenue."

Just how all that theoretical revenue will be realized in the years ahead is not clear. But as with so many things, bet on tech. Seventy-one percent of people polled said the cell phone was the most important invention in human history—something the unknown inventor of the wheel and first master of fire might dispute—and they believed that's more or less the wave of the future too. In both developed and emerging countries, electronics and computer hardware were seen as the likeliest sectors for big innovation (at 23% and 22%, respectively), with health care and pharmaceuticals coming next (21% and 13%). The energy sector, which gets little love in most polls, finished at a respectable 15% in developed economies and 11% in emerging ones—with respondents perhaps learning from the big play China is making in the clean-energy market. Most other sectors—including aerospace, transportation and, alas, education—finished in single digits.

Still, predicting innovation is almost always a game for fools. Twenty years ago, there was no practical Internet; now it runs the world. Sixty years ago, we had never heard of DNA; now that knowledge is a central driver of medical progress. We can quantify and systematize our world as much as we like. But our brains—where we make ingenious connections or we don't, where ideas flash like heat lightning and are gone just as quickly if we're not paying attention—are a different matter. We cannot order up inspiration, invent on a schedule. But we can be ready for ideas when they come to us, and we can build a world that makes that kind of preparedness likelier. The 21st century—the TIME poll suggests—is shaping up to be that world. —WITH REPORTING BY CHARLOTTE ALTER/NEW YORK ■

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