



BEAUTIFUL MINDS

The country's top leaders in business, government, and academia are joining forces to make science cool again—and they're determined to get girls in the game.

BY KIMBERLY OLSON

In the early 1950s, an eight-year-old girl began collecting bumblebees in the garden of her family's home in Washington, DC., by plucking flowers they'd flown into and dropping them into Mason jars. By midsummer, having

gathered dozens of live specimens, she proceeded to alter the bees' diets and expose them to varying amounts of light, carefully observing any behavioral changes. She discovered, for example, that changing their exposure to light altered their natural circadian cycle. As

she conducted her experiments, she studiously jotted her findings in a journal. "I liked being able to see empirical data and then make predictions about the future," she recalls. "I so thoroughly enjoyed it that I knew I was interested in doing something in the sciences."

In 1973, that young girl, Shirley Ann Jackson, would become the first African-American woman to receive a doctorate from MIT. A theoretical physicist, she has conducted pioneering research, blazing a trail in one of the most male-dominated fields in science.

In recent years, she has combined her science chops with tough, no-nonsense problem-solving skills to revamp major institutions. The first woman and first African-American to chair the U.S. Nuclear Regulatory Commission, under President Clinton, she launched a system that boosted the safety of the nation's nuclear power. She has also introduced sweeping changes at Rensselaer Polytechnic Institute, the nation's oldest technological university, where she has been president since 1999. In her first eight years, research grants awarded to Rensselaer shot up from \$37 million to \$80 million. Along the way, Dr. Jackson has garnered numerous awards, including the prestigious Vannevar Bush Award for lifetime achievement from the National Science Board.

Today, she and some of her colleagues are focused harnessing the creativity of the upcoming generation, who will make the scientific discoveries and technological innovations upon which our country's very future depends.

Closing the Gender Gap

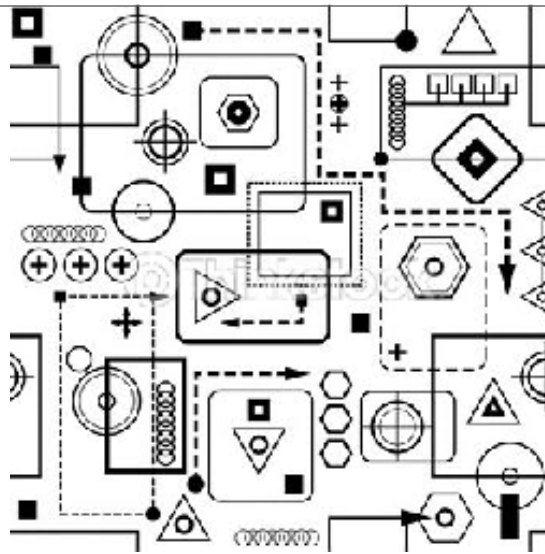
While a handful of women like Dr. Jackson have made their mark in fields like science and engineering, these endeavors have traditionally been dominated by men.

When Dr. Jackson arrived at MIT, for example, there were only 43 female students in her freshman class of about a thousand, and only five African-American students.

Progress has certainly been made since then, but it has been slow. Today, women still make up only 10 percent of engineers and less than 30 percent of mathematicians and computer scientists.

The good news: The opportunity is ripe for women to make gains, as organizations across the country are in desperate need of these skill sets.

They are actively seeking students who have been through Science, Technology, Engineering, and Mathematics (STEM) programs in high school and college, and are even using STEM training methods. And in their search for the best and the brightest, many are reaching out to young women—as well as people of color—in an effort to broaden the candidate pool.



A Looming Crisis

Fourth graders in the United States today perform above the international average in both math and science. But then something happens. Over the course of their schooling, they slip, ending below the international average by their final year of high school. That leaves experts wondering how many young Shirley Jacksons might fail to reach their potential.

Getting kids emotionally engaged is key. Jackson and her peers watched the world change on October 4, 1957,

when the Soviet Union launched a beach ball-sized satellite called Sputnik I into the heavens. As the Space Age officially began, President Eisenhower made scientific education a priority and created NASA—and a whole generation of kids got jazzed about science. The launch of Sputnik, research shows, helped prompt a 9 percent annual boost in college enrollment, churning out top thinkers in science, math, and engineering.

But as that generation prepares to retire, not enough young people are stepping in to fill their shoes. Over the last 20 years, the number of science- and technology-related jobs has grown by 4.2 percent per year, while the number of American-born workers in those fields has grown by only 1.5 percent annually.

The dearth of U.S. students getting degrees in fields like math, science, and engineering becomes even more serious when combined with the so-called American brain drain. “Most people don’t realize that 40 percent of the PhDs in this country working in science and engineering were born somewhere else,” Dr. Jackson says. “We’ve benefited from talent that’s come from abroad, but now, as their home countries’ economies are growing, there are opportunities for these folks back home, so there’s a global race for talent.”

As a result, the United States is facing what Dr. Jackson calls “a quiet crisis.” As the country confronts the full force of global competition, she says, we simply cannot be complacent. Our future depends on a having a workforce with STEM education and skills.

“About 50 percent of the GDP growth in the 50 or 60 years after World War II derived from discoveries and innovations coming out of scientific research and technological innovation, so from the point of view of economic growth and job creation, this is very important,” Dr. Jackson says. “You have great companies like Google, whose search engine depends upon advances in computer science. The GPS that we use in our cars comes from satellites being deployed. Our whole

DID YOU KNOW?

The most common degree held by Fortune 500 CEOs in the United States is not business, but engineering.

infrastructure—our bridges, roads, and transportation system—are engineering feats. And the modern medicine that has lengthened people's lives has come out of the work of science. Amazing advances have changed how we work, play, and protect ourselves, and it's some pretty cool stuff. Along the way, people have built great careers and had great fun, and some have created great wealth."

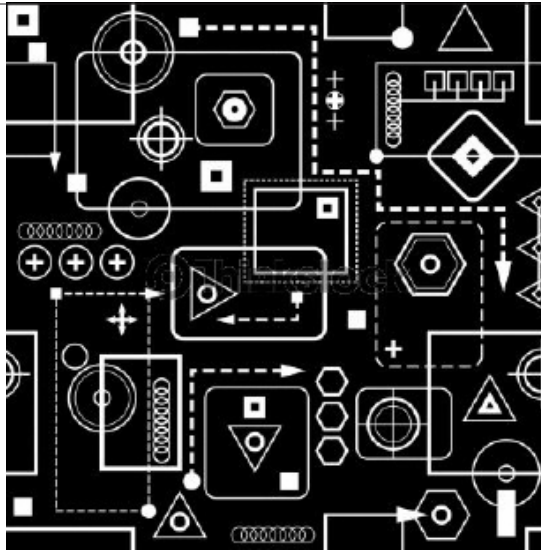
The STEM Solution

Teaching math and science in a way that spurs the kind of joy that Jackson felt while tending her bumblebees is crucial if we want young people to pursue careers in these fields.

The STEM program was originally an academic one, but it has now crossed over into the government and private industry because its principles are considered so critical to keeping the United States competitive in the global workplace. Today, leaders from every sector—CEOs and R&D directors, high school teachers and university professors, and heads of government agencies—have joined forces to advance STEM education.

The President's Council of Advisors on Science and Technology—an advisory group of 20 leading scientists and engineers, including Dr. Jackson—is investigating why so many young people, particularly young women and minorities, drop out of the pipeline that leads to high-paying careers in science and technology.

Experts say that diversifying these highly technical fields won't just help fill empty seats in the country's corporations and laboratories in the coming years. It can also bring



rich rewards to those who hire them.

"When you bring people who have actually lived a different life and put them together in this intellectual cauldron, then you get a lot of things out of it," Dr. Jackson says.

Organizations like NASA are especially interested in connecting with young people from all backgrounds who might have an interest in science. To that end, NASA has teamed up with the National Science Foundation to promote STEM education and

connect with tomorrow's astronauts and innovators.

"The explorers who will ultimately set foot on Mars are in grade school or day care now, so we want to get young folks interested in that early, and maintain that interest," says Linda Cureton, chief information officer at NASA. "We'll also continue to expand and develop the capacity of the International Space Station, and we're looking into planning a mission to an asteroid. One of our spacecraft, Dawn, is approaching one of the biggest ones in our solar system right now."

To get kids excited about such possibilities, the agency offers NASA Explorer Schools, a classroom-based program in which students in grades four through twelve explore the mysteries of space through a virtual website and activities based on actual NASA missions and research.

Teachers receive STEM instruction materials, and students get to toss questions at NASA experts in live online chats. Top students even earn a trip to NASA Kennedy Space Center, where they get a guided tour and learn about careers at NASA.

STEM CONNECTOR

Which high-tech companies have STEM programs? What kinds of internships are available at the national laboratories? Where are the great engineering and aerospace jobs—and what are the salaries?

On November 15, a new website called STEM Connector (www.STEMConnector.org) will launch, providing a one-stop resource for all things STEM. "We're spending billions of dollars on STEM, but we've never had organized access to the best programs," says Edie Fraser, a senior consultant with Diversified Search, the largest woman-owned diversity search

firm, and one of the site's organizers. "This website will connect everyone, so they know where to go."

STEM Connector will outline the initiatives of more than 2,600 STEM-related resources, including corporations, educational institutions, foundations, government agencies, states, and national laboratories and technology centers. Visitors will be able to click into any state and see who is doing what. The site will also include state-by-state "report cards" of STEM education status.

Fraser is especially excited about the measures that the STEM world is taking

to reach women. "The high-paying careers are in the STEM professions, and it's exciting to share the opportunities with young women," she says.

Meanwhile, another website, called MentorNet (www.mentornet.net), is helping mentors and protégés in engineering and science find each other. With a focus on diversity, the site matches students, postdocs, and early career researchers with mentors working in 70 different science, engineering, and technology fields. Since 1997, MentorNet has matched nearly 30,000 mentorship pairs.

Meanwhile, former astronaut Leland Melvin, associate administrator of NASA's Office of Education, has launched Inspiration Corps, a contingent of NASA employees who talk to students about how exciting a science career can be. "Leland's a former astronaut who also played for the NFL, and he's very charismatic," says Cureton. "It's speaking. It's mentoring. It's a public face."

NASA has also awarded grants totalling \$1.15 million to nine academic institutions, and offers other grants in specific topic areas. Because advanced robotics will help astronauts carry out some of their more difficult tasks, for example, NASA has issued a robotics grant to educate approximately 25,000 students over the next five years.

As NASA looks toward the future, it is very focused on diversifying its talent pool. "If we're going to do things like go beyond Earth orbit to find exoplanets that show possible signs of life, it's going to require the best minds," Cureton says. "We want to make sure that

we don't overlook the next Einstein because they're not a certain gender, or don't have a certain color skin, or they don't have the same thought process we do."

As a woman who studied mathematics, Cureton knows how important it is for young people to have role models who look like them. So NASA recently launched a website called Women at NASA that shares inspirational stories about the organization's female astronauts, flight crew, food scientists, and even a space suit designer.

The Department of Energy, as well, depends upon a continuous supply of master's- and PhD-level scientists and engineers. "We need to understand not only what the emerging energy technologies will be—biofuel, solar, and so on—but how to bring them to market, so we need a highly trained workforce," says Bill Valdez, acting director at the department. To spark kids' interest, the Department of Energy hosts the National Science Bowl, a prestigious Jeopardy-like competition in which 40,000 students from across the country answer science questions.

"At the postsecondary level, we have internship programs at DoE national laboratories that put about 4,000 undergraduate students side by side with world-class scientists working on exciting energy projects," Valdez says. "We also have a graduate fellowship program that supports students who are pursuing degrees in the specific areas that we're interested in."

Like NASA, the Department of Energy is seeking a diverse workforce. "According to the latest census statistics, we'll be a majority minority nation by 2041," says Valdez. "The department's scientific workforce has historically been 65 to 70 percent white male. As those folks retire, we need to have a much broader reach. We also recognize that having diversity of views and opinions is very important in a research environment."

Valdez, who jokes that he's an "honorary girl," cochairs a new mentoring program that matches female students in science, technology, and math with female employees at the department. "Currently, we have 26 mentor pairs, and it's just getting off the ground, but it's going great guns," he says.

The department also has a minority mentorship program, as well as a program called Faculty and Student Teams, which

brings students and faculty from underrepresented institutions in to do research.

Many top corporations also promote STEM education, from tech companies like Microsoft and Facebook, to biotech firms like Amgen, to food and beverage conglomerates like Kraft Foods.

Kraft needs various employees with science backgrounds—product developers, microbiologists, flavorists, and technology developers. "There's a wealth of talent within our nation's youth, but science careers aren't marketed the same way that other career paths are," says Alicia Thomas, senior director of Innovation Enablers and Research, and Development and Quality Training at Kraft. "On this front, we need to do a better job." So Kraft is active on high school and college campuses, where it educates students about career opportunities, mentors them, and recruits talent. Kraft also offers scholarships and apprenticeships to students in underserved groups.

Meanwhile, top universities are leading the way in STEM education. At Rensselaer Polytechnic Institute, for example, engineering students work closely with their counterparts in industry. Rensselaer also engages precollege students through its Lego Robotics program and summer science camps, bringing them into the world of engineering and science through fun and play. And the university has led a statewide initiative in New York called the Empire State Network—with support from the Gates Foundation, the AT&T Foundation, and others—to map strategies for creating after-school academies, special summer programs, and other options for talented students from underrepresented groups.

As technology advances and global competition intensifies, today's business leaders understand that we must engage our brightest young people—whoever they may be—and give them a clear pathway into the careers that will help the country remain a leading innovator as we move into the future.

"We have great global challenges in energy security, public health, sustainability, and rebuilding our infrastructure," Dr. Jackson says. "To become a successful scientist or engineer requires hard work, but it's also fun, because it's interesting. In these fields, one can have a real impact on the lives of other people. And that is a worthy goal." **DW**

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Kimberly Olson is DW's managing editor.

FROM THE TOP

The Obama administration has introduced several initiatives to improve STEM education. They range from investing \$80 million to add 100,000 world-class math and science teachers over the next decade, to launching Change the Equation—a CEO-led effort to improve STEM education—to rolling out a \$4.35 billion Race to the Top competition, in which states improve education to win funding dollars.

