

InDemand

Connecting today's students with the careers of tomorrow

Issue 5



$$E = mc^2$$



$$a^2 + b^2 = c^2$$

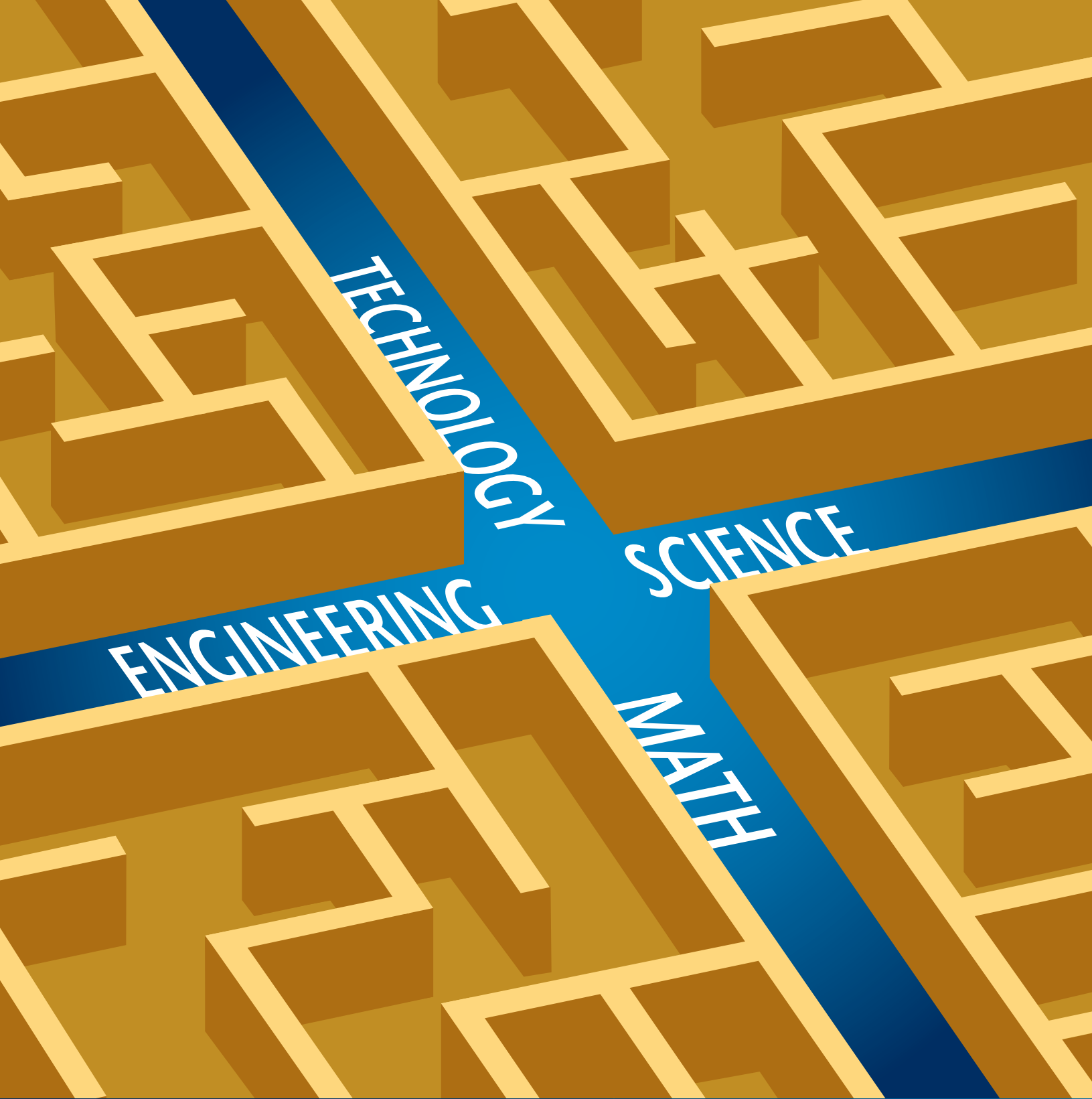
$$\pi = \frac{c}{d}$$

$$\frac{d}{dx} \int_a^x f(s) ds = f(x)$$



Control Your Career

Science and math skills are the hot links to innovation and entrepreneurship



CAREER VOYAGES

Providing clear paths to your dream job.

Career Voyages provides information about career options that can help you choose your future and find education and training opportunities needed to get there.

Visit [CareerVoyages.gov](https://www.CareerVoyages.gov) to find links to job descriptions and job listings in your community.

Dear Student:

Do you find yourself unsure of how to answer the question: *What do I want to do with my life?* Or have you already picked a career? However you answer these questions, the good news is that one of life's greatest journeys is open to you in the world of work.



Assistant Secretary
of Labor Emily
Stover DeRocco
helps workers build
successful careers.

The gateway to a successful future is not so much knowing your intended career path today but in keeping an open and curious mind about the information you are learning *now* in your classes and how it relates to potential career opportunities for you in the *future*—whether you enter the work force after high school, college or advanced studies.

This issue of *InDemand* illustrates how math and science skills are key to entering multiple career paths in most high-growth industries. These opportunities are available to analytical students as well as creative students; to students who prefer to work on teams and those who prefer to work alone; to students who are interested in the environment, computers, geography, statistics and/or chemistry, to name only a few fields. These opportunities can be found in incredibly diverse industries, such as biotechnology, health care, advanced manufacturing, aerospace, retail and more.

I'm Emily Stover DeRocco, Assistant Secretary of Labor for Employment and Training, and I run the federal agency that helps American workers find rewarding jobs and get the education and training they need to succeed. Since you will soon become an important part of our nation's work force, the U.S. Dept. of Labor's Employment and Training

Administration wants you to have this publication, *InDemand—Careers in Science ♦ Technology ♦ Engineering ♦ Mathematics*. It will let you know about many different career paths (including starting your own business) so that you can build your own successful future.

This magazine talks about what you need to learn and do to land that first great job or even a lifelong, rewarding career. Whether you want to be a graphic designer ... pharmaceutical engineer ... sound technician ... or astronomer, there are lots of careers in science, technology, engineering and mathematics that pay well.

This magazine is packed with great information. Please read it and share what you find with your parents, teachers and your school or guidance counselor. They can help you find the right college or university to prepare you for a career in whatever field suits you or find the right apprentice program to gain skills and job experience in that field!

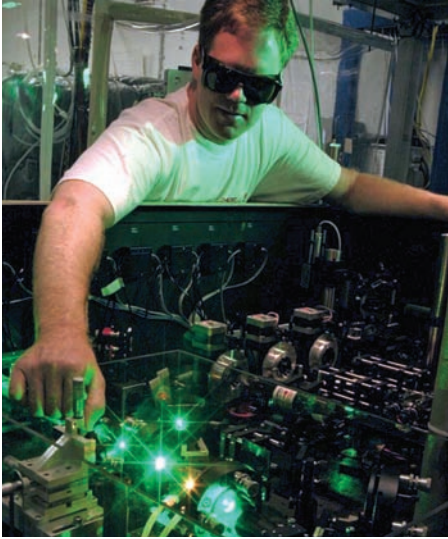
So what's *InDemand*? You are! Your knowledge ... your curiosity ... and your skills are all *InDemand*—and so are the many high-growth jobs that you will discover more about in this publication.

A handwritten signature in black ink that reads "Emily Stover DeRocco".

Emily Stover DeRocco
Assistant Secretary of Labor



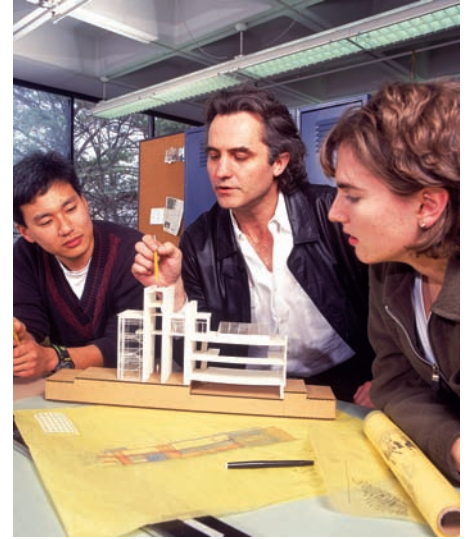
Contents



4 POWER UP!
 Science, technology, engineering and math drive the innovation necessary to keep America at the forefront of emerging technologies and the competitive global economy.



7 YOU CAN DO THAT WITH A SCIENCE OR MATH DEGREE?
 These critical skills are the foundation for imaginative, risk-taking entrepreneurship and successful, rewarding careers.



10 TAKING SCIENCE AND MATH IN TOTALLY NEW DIRECTIONS
 What's a student's best strategy for pursuing a career in science, technology, engineering or math?

13 STEM Career Profiles

All kinds of people are joining these growing fields in so many different ways, and they have an impressive array of jobs from which to choose. Young people in 20 different careers tell you why.

- | | |
|----------------------------------|---|
| 14 AIR-TRAFFIC CONTROLLER | 19 MECHANICAL ENGINEERING INTERN |
| 15 CAD TECHNICIAN | 20 NATURALIST |
| COMPUTER FORENSICS SPECIALIST | PHARMACEUTICAL ENGINEER |
| 16 COST ESTIMATOR | 21 PROCESS ENGINEER |
| DIRECTOR | RESEARCH LAB TECHNICIAN |
| 17 ELECTRICAL ENGINEER | 22 SCIENCE TEACHER |
| FORESTRY TECHNICIAN | SOUND ENGINEER |
| 18 GRAPHIC DESIGNER | 23 STATISTICIAN |
| LAND SURVEYOR | VIDEO-GAME DESIGNER |



Careers in STEM

Science • Technology • Engineering • Math



24 START YOUR OWN (AD)VENTURE!

Young people are some of the savviest users of technology and they have creative minds for solving problems using science, technology, engineering and math skills. It's no surprise that many innovators in these fields get started when they're teens!



26 FUN FACTS Why can't astronauts burp in space? What is so scientific about snowboards? What makes a roller coaster run? Take our fun, fact-filled tour of science, technology, engineering and math to see how they turn up in everyday life, from cell phones and bowling balls to finding gold in the ocean!

28 RESOURCE GUIDE How to contact organizations that can help you find out more about science, technology, engineering and math careers.

30 ENCOURAGE TOMORROW'S PROBLEM-SOLVERS Even if you don't know where to start exploring your options in science, technology, engineering and math careers, adults can help point the way and show you some fun ways to explore different fields and careers.



ON THE COVER: Illustration by Steve Lyons
Mastering science and math skills will help put you in the driver's seat for tomorrow's world of high-paying, high-tech jobs.

U.S. Department of Labor

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InDemand

Careers in STEM

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POWER UP!

Thank the scientists, technologists, engineers and mathematicians who make it happen

by Lisa Schnirring

Natural disasters. Global warming. Cancer. World hunger. Homeland security. Chances are, if a teacher asked you to list some of the biggest problems facing the world today, one or more of these issues would quickly come to mind. Finding solutions isn't easy, but it can be rewarding. Around the world, innovators are constantly chipping away at all of these problems and making great strides.

Ocean sensors and global positioning systems can help people escape killer tsunamis. New fuel formulas can make cars cheaper to operate while providing us with cleaner air. Gene therapy may someday terminate cancer. New hybrid grains will feed more people. Better personal identification devices can make American borders more secure.

The world is filled with problems—and opportunities. There's plenty of work to be done for well-trained entrepreneurs. And that same spirit of innovation can also help create better-tasting pizza and smaller cell phones, new ways to shop for the latest fashions and more realistic video games.

What sparks innovation

That's a four-part answer: science, technology, engineering and math (STEM). Most new developments that make the world a better place in which to live involve one or more of these fields. Sometimes they involve all four!

When you listen to a portable music player, consider the expertise that went into the device. Electronic engineers devised inner workings that are small enough to comfortably carry. Employees with high-tech skills and tools tested the products to make sure they are safe and reliable. Materials engineers formulated cases that are tough and picked color pigments that are appealing to the consumer. Mathematicians created financial projections that told the

Make a connection to a great and rewarding career or start your own innovative business by building on your science and math skills.

company what young people want in a music player and how much they would be willing to pay for it.

Innovation benefits America

Some of the fastest-growing jobs in America, such as biotechnology and nanotechnology, need workers who know a lot about science, technology, engineering and math. New products not only make our country a technology front-runner but also ensure that it's a top contender in a tough, competitive global economy.

Creating new and better products and solving some of today's most perplexing problems have a healthy ripple effect that you can feel on a personal level. Innovation creates good-paying jobs that are in high demand. Not only that, all of these fields have a built-in feature that makes them fascinating and rewarding: Science and technology are constantly changing, so the work is never dull. Let's take a closer look at STEM.

Science promotes understanding

Science helps us understand and make use of phenomena that happen in the physical world, from astronomy to zoology. In the study of cancer, for example, cell biologists map out how good cells go bad. Some of the best new developments occur when experts in different specialties team up. You've got entomologists who know everything about mosquitoes working with chemists to develop more effective bug repellents. Or you have astronomers working with geophysicists to map the surface of Mars.

Botanists can tell you why a rose smells so good, and a meteorologist can tell you if it's going to rain on Tuesday.

Some scientists say they were drawn to their particular field through interests or hobbies they had when they were younger. What are some of the things about the natural world that fascinate you? Can you see yourself becoming an expert in any of them? Have you taken a variety of science courses in high school?

Technology's useful tools

Technology harnesses physical and mental capabilities to achieve a particular end. It can be as simple as making a hammer or as complex as developing artificial intelligence. In business, computer programmers have devised secure ways for customers to make online purchases. You have people who are savvy with sound effects teaming up with those who have mastered visual effects to make movies like *King Kong*.

A computer forensics expert can track down who hacked into a sensitive database, and a graphic artist can design an eye-popping Web page that can help launch a new business. Sometimes people who enjoy using a certain technology decide to make it their career. What are some of your favorite gadgets? Can you picture yourself inventing something new and better? Have you taken any technology education classes in high school?

Engineering advances

In a nutshell, engineering is using the knowledge of science, technology and math to develop a useful new object or process. Chemical engineers can devise ways to decrease some of the adverse side effects of heart medication. Civil engineers are working with environmental engineers to protect the city of New Orleans from the next major hurricane. Automotive engineers are working with safety engineers to design cars that reduce the injuries people sustain in accidents.

A traffic engineer can plan how to



KEEPING AMERICA STRONG

Science, Technology, Engineering and Math (STEM) in government

Our government needs new workers in science, technology, engineering and math to provide services for its people and to protect the country and its resources. Are you interested? Exciting opportunities in government can be found in all states and U.S. territories. Job sites range from computer network facilities to the inside of a submarine. For these high-demand areas—science, technology, engineering and math—wages are great, the jobs have good benefits, and opportunities for advancement are favorable. Another nice thing about federal jobs is the rewarding feeling you get from serving your country.

Every day, scientists like this botanist work hard to make our lives better by expanding the boundaries of human knowledge.

prevent traffic jams, and a mechanical engineer can design a robot. People who are good at figuring things out and fixing things tend to make good engineers. Can you think of something that you fixed that you're proud of? Can you picture yourself getting paid to make them work? Have you participated in any pre-engineering programs while in high school?

Math makes sense

Math is all about calculating, using logic and measuring. It also involves the study of shapes and the motions of physical objects. A mathematician can determine the trajectory of a long-range missile. A statistician can predict how severely a drought will affect the local economy. Some math majors work in the textile industry creating equations for mixing coloring dyes. Actuaries help businesses calculate the risks and benefits of decisions such as introducing new products or acquiring new divisions.

By their very nature, mathematicians are excellent problem-solvers, and their services are needed. Have you considered all your math options in high school?

Putting it all together

Whenever you use something that makes your life easier or more fun, think of all the scientists, technologists, engineers and mathematicians that made it happen.

And if you feel a strong connection to a hobby, an interest or a gadget, why not climb aboard and make it even better? America needs you to be an innovator!

Seek your career options in STEM today. 



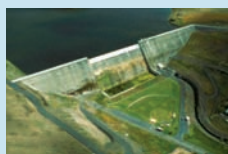
SCIENCE. The number of people who work in science for the government is huge. There are agronomists at the U.S. Department of Agriculture who research plant diseases to protect farmers' crops and the country's food supply. Ecologists work for the Environmental Protection

Agency to examine the effects of pesticides and other chemicals on local drinking water. Forestry technicians keep watch over U.S. properties, monitor for fires and ensure that our lands are safe for animals to live and people to enjoy. Chemists working at the Food and Drug Administration review applications for new medications to make sure the drugs' benefits outweigh any possible side effects. Geologists working at the Bureau of Mines keep inventories of valuable resources and ensure that companies adhere to sound mining practices to better preserve our natural resources.



TECHNOLOGY. All divisions of the U.S. government depend on information technology workers to keep their computer systems working and to develop new ways to keep track of and share information with other departments. Think of how important technology is for allowing

the Central Intelligence Agency to do its important work for national security. Social Security network administrators help keep key computer systems running, which among other things, helps older people receive their checks every month. Some of the biggest technology projects in the world are built and maintained by the U.S. government, from supercomputers to satellites.



ENGINEERING. This field is so important to the U.S. government that there's a department that bears its name: the U.S. Army Corps of Engineers, which designs and constructs dams, military installations and other large federal projects. But there are several other areas of

government that also depend on engineers. For example, engineers at the Department of Energy build and maintain hydropower plants, research clean energy systems and undertake projects in nuclear physics. All branches of the armed services depend on engineers for their role in developing and modifying aircraft, tanks, weapons and other battle equipment.



MATH. Can you imagine the vast amount of data and statistics used by the many branches of government? The mission of the Internal Revenue Service, of course, is to collect and count tax money. Mathematicians project the money it will collect so that other government

departments can plan their yearly budgets. The Department of Commerce has mathematicians that make projections about the economy. Many scientists, technical specialists and engineers in government agencies work closely with mathematicians, from the space program to bridge-building projects. STEM opportunities are almost limitless in the federal government. Tour the U.S. government job Web site at www.usajobs.gov.

PHOTOS: TOP LEFT: GETTY IMAGES; RIGHT FROM TOP: USFWS, NASA AND USACE

You can do *that* with a SCIENCE or MATH degree?

By Housley Carr

There is great news if you have a talent in science, technology, engineering or math! Some of the most interesting, high-paying jobs out there are the ones that require minds like yours. High technology drives our economy, innovation drives high tech, and people trained in science and math drive innovation. And technology goes way beyond the obvious high-tech industries like computers. We're talking everything from alternative energy to biotech to making skateboards.

Advances in technology depend more than anything else on skilled teams of scientists, engineers and mathematicians eyeballing a problem. They ask each other questions: "How do we make this better?" and "What if we tried this?" Together, they come up with ideas that keep their businesses a critical step ahead of the competition.

The wild science and math jobs out there

You probably think you have a good idea of what's involved in careers that depend on science and math. Maybe you know someone's dad who is a civil engineer and designs bridges. Or you may have an

aunt who's a scientist at a drug company.

But these jobs are just the tip of the iceberg.

For instance, are you a math wiz? You may want to think about a career on Wall Street. Big investment banks are looking for mathematicians who can develop new algorithm-based strategies for buying and selling stocks.

Technology-based careers pop up in all sorts of unexpected places. For example, check out the jobs being

advertised online by some of your favorite brands, like Nissan, Oakley and Timberland. Researchers, designers, engineers—all kinds of interesting work is being done by people with science and math education ... and experience.

"Most students don't end up doing what they expected at first," says Chris Bell, associate dean at Oregon State University's College of Engineering, Corvallis. "They may start out as technicians or engineers, but a lot of them end up in management, medicine or law." Many attend graduate business school, too.

Bell recommends staying open-minded and flexible. Try to work on your social skills as much as your geometry and biology. "Good communication is vital, because science- and math-related careers are all about working as part of a team," he says.



The floor of the stock exchange is chaotic, but teamwork and great math skills pay off big time.

Just this once, think small—very small

Teamwork is especially key in nanotechnology. Apple put

PAYCHECKS

The pay scale for jobs in science, technology, engineering and math varies widely. Here is a sampling of what some interesting professionals are paid, based on an occupation handbook published by the U.S. Department of Labor.

POSITION	MEDIAN* SALARY IN U.S.
Accountant	\$51,000
Actuaries	\$76,000
Aerospace Engineer	\$79,000
Air-Traffic Controller	\$102,000
Anthropologist	\$44,000
Architect	\$61,000
Astronomer	\$97,000
Biological Scientist	\$69,000
Biomedical Engineer	\$68,000
Broadband Technician	\$47,000
Chemist	\$63,000
Computer Programmer	\$63,000
Computer Forensics Specialist	\$85,000
Computer Systems Analyst	\$67,000
Cost Estimator	\$70,000
Economist	\$73,000
Electrical Engineer	\$76,000
Environmental Engineer	\$71,000
Financial Analyst	\$62,000
Forestry Technician	\$25,000
Geoscientist	\$69,000
Graphic Designer	\$38,000
Industrial (CAD) Designer	\$52,000
Lab Technician	\$31,000
Land Surveyor	\$43,000
Mathematician	\$81,000
Materials Engineer	\$67,000
Mechanical Engineer	\$66,000
Meteorologist	\$70,000
Naturalist	\$52,000
Network Administrator	\$58,000
Nuclear Engineer	\$85,000
Pharmaceutical Engineer	\$77,000
Physicist	\$88,000
Science Teacher	\$44,000
Sound Technician	\$38,000
Statistician	\$57,000
Urban Planner	\$54,000
Video-Game Designer	\$49,000

*Median salary refers to the salary halfway between the highest and lowest salaries. Source: U.S. Department of Labor, Bureau of Labor Statistics. www.bls.gov/oco/home.htm



For additional information on STEM careers and salaries, check out the Department of Labor Bureau of Labor Statistics, www.bls.gov/oco, or Career Voyages, www.careervoyages.gov.

nanotechnology to work to create the iPod and made it familiar to millions of Americans. But you probably don't know that nanotechnology has the potential to change the way we do things as much as computers did a generation ago.

Basically, nanotechnology is all about taking things down to their microscopic level. Need a powerful computer or video camera small enough to sit on a dime? A new, energy-absorbing metal to make small cars much safer? How about a "nanomedicine" specially designed—molecule by molecule—to beat cancer cells at their own game?

If smart people like you get involved, it *will* be possible. "Nanotechnology will affect everything," says Rosalyn Berne, an associate professor of science, technology and society at the University of Virginia's School of Engineering and Applied Science in Charlottesville.

The way Berne sees it, as nanotechnology evolves, we will see all kinds of engineers, scientists and mathematicians working together in teams that will look at problems in totally new ways and come up with incredible solutions.

Where will nanotechnology lead? "We really don't know yet," says Berne. But it definitely will be an exciting journey—one you should be on board for!

It's not really a career—it's a journey

"One thing that's really different [in science, technology, engineering and math careers] from a few years ago is the mobility in the job market," says Bart Sinclair, associate dean at Rice University's George R. Brown School of Engineering, Houston. "It used to be there was a good chance you would stay with the company that hired you just out of college. Now, the norm is three or four or five major career shifts" during your working career. "You may still be working for the same company, but you may be doing something totally different," Sinclair says.

The most important thing to take from what Sinclair and the others say is


that education matters, whether you are headed for a job in science, technology, engineering or math—or a mix of all of them.

Employers respect whatever effort you make to obtain education and training beyond high school. If that's a technology certificate or an associate's degree from a community college, that's great. If you have the money and the ability to go for a four-year degree in math, science or engineering, that's awesome, too.

In general, starting salaries match up with how much schooling you complete. Graduate from a community college and you may find yourself earning from the low thirties to the low forties to start. A Bachelor of Science or an engineering degree from a four-year college will probably start anywhere from the mid-forties to the upper fifties.

And remember: Whether you get a two-year degree or a four-year diploma, keep thinking about continuing your education once you graduate, either full time or while you are on the job. Odds are, your employer will chip in some of the cost or maybe even provide a free ride. Bosses really value workers who pursue lifelong learning.

In today's global economy, the demand for people with advanced degrees in science, technology, engineering and math will continue to grow, and there is no reason in the world why someone who starts out with an associate's degree can't eventually end up with a master's degree or Ph.D. Success stories happen every day. Be one.

As for feeling good about what you do, just think about what science- and math-trained people do: develop medical breakthroughs, come up with new plastics based on corn, not oil, and reduce hunger in the Third World. If there's a chance to do that and make a good living, why not go for it? 

The journey into space, which requires unbelievable teamwork, began with the long history of science and mathematics.



Taking SCIENCE and MATH in totally new directions

By Housley Carr

Okay. You're open to the idea of a career in science, technology, engineering or math. But what would the road map from here to there look like? What courses should you take in high school? What extracurricular activities should you become involved in? And what does your career map look like in college and beyond? Like any long-range plan, it's easier to think about—and do something about—the things that are going on right now. For instance, your high school courses.

A strong foundation in math and science is “very important” for students starting college, says Richard Grimsley, associate vice president at Project Lead the Way (www.pltw.org), a group that tries to get students thinking about careers in engineering technology.

“You should be taking math and science courses every year in high school,” says Grimsley. Work your way to pre-calculus or calculus, plus physics and chemistry. And if your school is one of the forward-thinking ones that offer introductory engineering courses, think seriously about taking those, too.

Smart people have fun

You don't need to be what you may think of as the math/science stereotype to do this. “The mindset is that the engineering student is the nerd, but that's just not the

case,” Grimsley says. What colleges, businesses and government want most are graduates who are well-rounded. So if you like French, take French. The same goes for music or history or creative writing or extracurricular activities.

“The idea that [engineers, scientists



Robotics competitions, in which teams of high school students design, assemble and test a robot, are very popular.

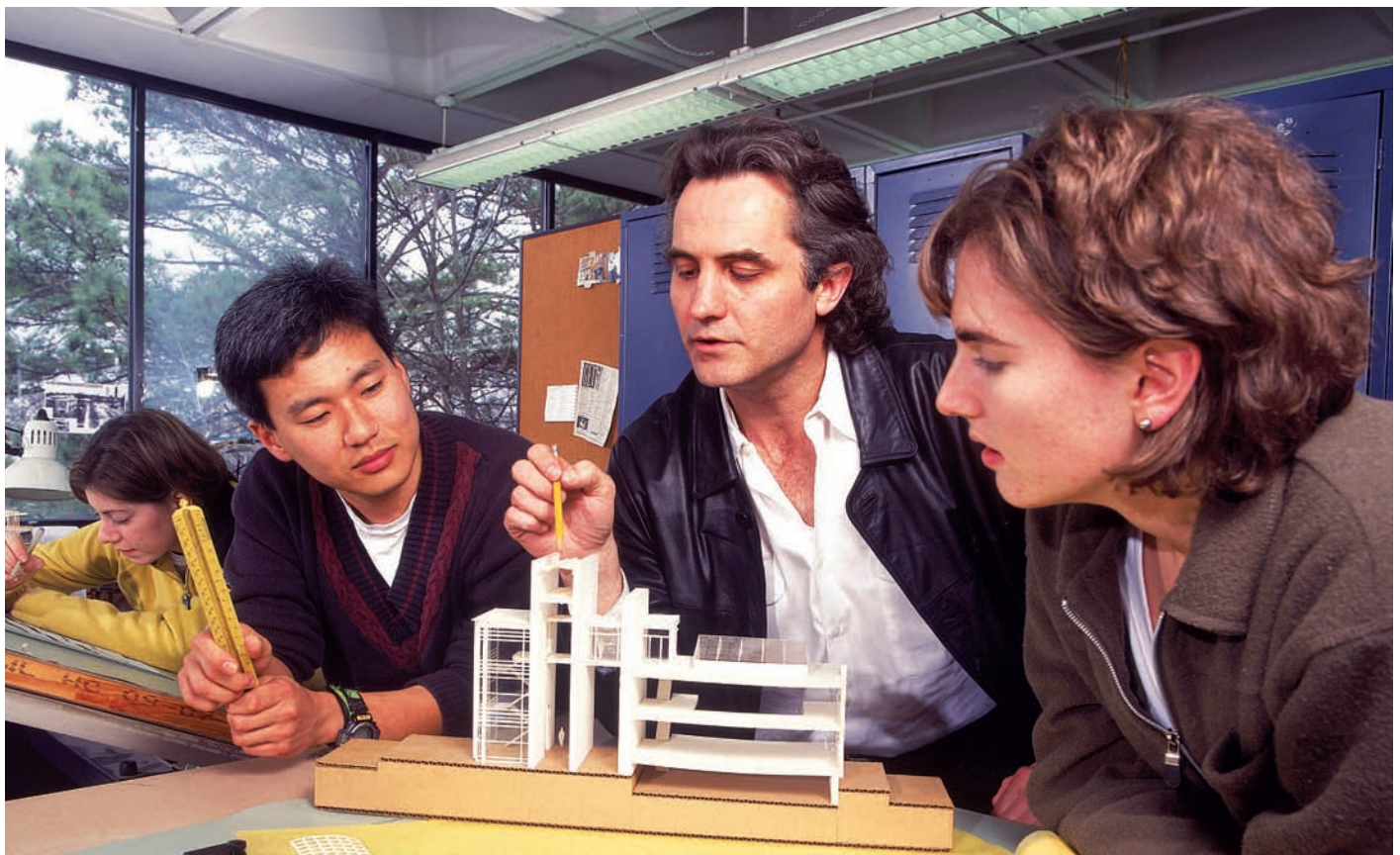
and mathematicians] do their work sitting alone in a lab or an office isn't true at all,” says Yvonne Pelham, educational outreach program manager at the Institute of Electrical and Electronics Engineers. In fact, careers in technology are “all about teamwork,” Pelham says. One way to prepare is to get involved in after-school activities. Both Pelham and Grimsley say you can gain teamwork skills in sports, band or working on the school newspaper. And if you want to join a math or science group, even better!

Try being in charge

“Try to work toward a leadership role” in whatever extracurricular activity you become involved in, says Pelham.

“Someone will be leading the teams” you work on in your science or math career, so why not you? If you learn leadership skills in high school—like keeping the team on track and encouraging everyone to contribute—you will find them useful in college and in the workplace.

Summer internships are a good idea, because they let you take a peek inside different careers you may want to pursue. Lots of places offer exploratory opportunities, especially to students interested in careers that involve science, technology, engineering and math. How do you find them? Do a Google search or check with your guidance or school counselor and with colleges, businesses and government agencies in your area.



Teamwork and imagination can help solve many of today's problems and are best built on a solid foundation of science, technology, engineering and math skills.

For instance, the Young Scholars Program at the University of California's Davis campus is a six-week summertime gig for up to 40 high school sophomores and juniors. Students are exposed to the world of original research in the natural sciences, with emphases on biological, environmental and agricultural sciences.

Another program, sponsored by Illinois State University, Normal, and Allstate Insurance, is aimed at high-schoolers who are African-American, Hispanic or Native American. The name is a mouthful: Minority High School Scholars Actuarial Academy for Mathematics-Actuarial Science Careers. But the bottom line is simple—a week of brain-challenging math work that may prove your particular brain is well suited for actuary work (an actuary calculates risk for insurance companies).

Charting your course

The Junior Achievement Student Center (www.studentcenter.ja.org) sees two basic

paths that you can take in college: the science/math path or the engineering/technology path—but they can easily overlap each other. Students who take the science/math path “tend to have strong interests in mathematics, life sciences, physical sciences and social sciences,” reports Junior Achievement. “They apply problem-solving to relate science to real-world scenarios that include such topics as space, humans, animals and Earth.” Science and math makes anthropologists, chemists, nutritionists, zoologists, architects and pilots.

And the engineering/technology route? Those who take it “tend to have strong interests in subjects like mathematics, engineering and space sciences, as well as a firm grasp on the latest advances and breakthroughs in technology,” notes Junior Achievement. Some of the occupations associated with engineering and technology are automotive, industrial or nuclear engineers, sound and quality-control technicians or furniture designers.

This wide range of jobs means you can start right where you are. For example, while a four-year degree is

MINORITIES CAN ENERGIZE THE STEM WORLD

Science and technology careers offer many opportunities, yet women and minorities continue to be underrepresented, particularly Hispanics and African-Americans. While the percentage of minorities in math, engineering and technology has increased significantly in recent years, we still have a long way to go. The good news is that there is a lot being done to encourage minorities to explore the exciting opportunities available with careers in science, technology, engineering and math.


Many outreach programs, such as Society of Hispanic Professional Engineers (SHPS), National Society of Black Engineers (NSBE), Society of Women Engineers (SWE), Women in Technology, Building Engineering and Science Talent (BEST) and Hispanic Engineer National Achievement Award Corporation (HENAAC), motivate and educate female and minority students to pursue careers in STEM fields.

absolutely necessary, you can still get your foot in the door with an associate's degree or coursework at a community college. If you show promise, your employer might invest in your continuing education!

If you're sure, and if you're not

If you have a pretty good idea of where you want to end up—maybe as a doctor or an aerospace engineer—it makes sense to take the college courses that will steer you toward medical school or working for a defense contractor.

If you're not so sure, don't worry. You can start out with a variety of science, technology, engineering and math introductory courses. Go with your gut about what you like best, then take higher and higher levels in that specialty. "There is a wide variety of jobs out there for engineers and others with science and math education," says Ralph Mobley, director of career services at Georgia Tech. "It's a very exciting time."

Remember this: Don't let your plans get in the way of opportunities. Be flexible and open. A solid education in science, technology, engineering or math will open many doors. As Pelham says, "I started out planning to be a civil engineer, but I switched to environmental engineering technology because of my interest in the environment," she says. "Then I got involved in computer work" for a major telecommunications company. Which door will you open? 

VIDEO GAMES CAN BE EDUCATIONAL!

There are lots of Web sites about science and math careers. One—www.tryengineering.org—provides challenging games such as designing a parachute that's strong and light enough to land a rover on Mars. One section gives you a chance to ask questions that you wonder about but are not sure who to ask.



Could your parachute deliver a critical load from Earth to Mars?

EDUCATIONAL STEPPING STONES

Career paths can vary greatly, and there is no one right way.

IN HIGH SCHOOL

- ◆ Take math, science and technology courses
- ◆ Join school science and math clubs
- ◆ Participate in science and math contests
- ◆ Participate in some of the many internship opportunities available locally for high school students
- ◆ Participate in other science- and math- related extracurricular activities available at your school
- ◆ Participate in cooperative education programs for high school students (high school credits for paid work experience)

CHOOSE AN EDUCATION PATH AFTER HIGH SCHOOL

- ◆ Enroll in certificate programs, which vary in length from just a few months up to two years.
- ◆ Earn a two year associate's degree
- ◆ Take part in internship programs
- ◆ Earn a bachelor's degree

EXAMPLES OF CAREERS REQUIRING CERTIFICATE PROGRAMS

Drafter
CAD Operator
Computer Operators

page 15



EXAMPLES OF CAREERS REQUIRING A TWO-YEAR ASSOCIATE'S DEGREE

Computer Forensics Specialist
Lab Assistant
Graphic Designer
Cost Estimator
Land Surveyor

page 18



EXAMPLES OF CAREERS REQUIRING A BACHELOR'S DEGREE

Science Teacher
All types of Engineers
Microbiologist
Computer Scientist

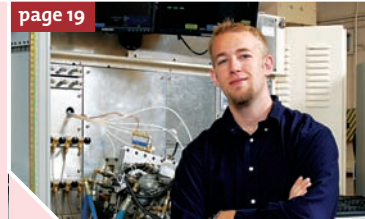
page 22



EXAMPLES OF CAREERS REQUIRING A MASTER'S DEGREE

Scientist
Engineer
Many engineers pursue an MBA after they finish their bachelor's degree.

page 19



EXAMPLES OF CAREERS REQUIRING A Ph.D. DEGREE

Astronomer
Engineer
Physicist
Research Scientist
Chemist
Statistician
Engineering Professor

page 23



There is something for everyone with an interest in

SCIENCE ❖ TECHNOLOGY ENGINEERING ❖ MATH

Job titles range so broadly that you are only limited by your imagination

Accountant ❖ Aerospace Engineer ❖ **AIR TRAFFIC CONTROLLER** ❖ Architect

Astronaut ❖ **ASTRONOMER** ❖ Biologist ❖ Biomedical Engineer ❖ Botanist ❖ **CAD TECHNICIAN**

Cartographer ❖ Chemical Engineer ❖ Chemist ❖ Civil Engineer ❖ **COMPUTER FORENSICS SPECIALIST**

Computer Programmer ❖ **COST ESTIMATOR** ❖ Database Administrator ❖ **DIRECTOR**

Ecologist ❖ Economist ❖ **ELECTRICAL ENGINEER** ❖ Environmental Engineer

FORESTRY TECHNICIAN ❖ Geologist ❖ Geothermal Engineer ❖ **GRAPHIC DESIGNER**

Industrial Engineer ❖ **LAND SURVEYOR** ❖ Manufacturing Engineer ❖ Marine Scientist

Materials Engineer ❖ Mathematician ❖ Math Teacher ❖ **MECHANICAL ENGINEER** ❖ Metallurgist

Meteorologist ❖ Microbiologist ❖ **NATURALIST** ❖ Network Administrator ❖ Nuclear Engineer

Nutritionist ❖ Oceanographer ❖ Ornithologist ❖ Paleontologist

PHARMACEUTICAL ENGINEER ❖ Physicist ❖ Plastics Engineer ❖ **PROCESS ENGINEER**

Project Manager ❖ Radio/TV Broadcast Engineer ❖ **RESEARCH LAB TECHNICIAN**

Safety Engineer ❖ **SCIENCE TEACHER** ❖ **SOUND ENGINEER** ❖ **STATISTICIAN** ❖ Technical Writer

Textile Engineer ❖ Toxicologist ❖ **VIDEO-GAME DESIGNER** ❖ Zoologist

The possibilities are endless for careers in science, technology, engineering and math. There is something for everyone, from analytical (statistician), to creative (video-game designer), to high tech (computer forensics specialist) to research (lab technician). Science, technology, engineering and math careers offer many kinds of work environments. You can work outdoors, in an office environment, in a research lab, or negotiate deals in a conference room.

You can work for a large firm or small start-ups or even explore your own entrepreneurial opportunities. We have detailed 20 popular career paths in science, technology, engineering and math on the following pages and, hopefully, answer some of your questions. What do the people who have these jobs do? Why are these jobs important? What type of training and education do you need to get these jobs? Maybe these stories can help you decide, "Is this job for me?"





Ronnie Coursey, 30

Federal Aviation Administration (FAA), Indianapolis, Ind.

Air-Traffic Controller



COLLEGE: U.S. Army Aviation Academy, Ft. Rucker, Ala.

HIGH SCHOOL: West End High School, Walnut Grove, Ala.

Q: What is a typical day like at your job?

A: The typical day begins with information briefings on air-space conditions, weather, traffic flow control and equipment status. Then I receive a position-specific briefing before assuming control of a sector. A controller ensures that all aircraft are separated and controlled in a safe, orderly and expeditious manner. Air-traffic controllers are limited to two hours at a time on each position. We rotate control positions often and receive a new briefing each time.

Q: What kind of training and education did you need to get this job?

A: I received most of my basic air-traffic training in the U.S. Army. Also, the math and science courses I took in high school were essential.

Q: What do you like most about your job?

A: No two days are alike. Air traffic is very dynamic, because the number and types of aircraft, weather, turbulence and destinations are always changing. This job never gets boring!

Q: How did you get interested in your job?

A: I joined the Army because I wanted to have the opportunity to train for a good career and receive educational benefits while serving my country. I looked for a career that was fun, challenging and offered good pay in a civilian life, and I found it.

PHOTOS: TOP: BOB HOWER; BOTTOM: DENIS FINNIN/AMNH



COLLEGE: University of Pennsylvania, Philadelphia, Pa.

HIGH SCHOOL: Business Careers High School, San Antonio, Texas

Q: How did you get interested in your field?

A: I started to become interested in astrophysics when I was in high school, thinking about the big questions: How did the galaxy form? Are there other galaxies like ours? Are we special? After thinking about these questions for awhile, I realized that I could actually go into a field that tries to answer these questions.

Q: What do you do on a typical day?

A: During the summer, I meet with one or two students every day to help them with their research projects. Sometimes I reduce data from a telescope to turn it into something usable. I also use programming to generate graphics of stars or to compare data sets. And about four times a year, I travel to a telescope facility to spend time observing data sent from the telescope to the computer. I'm an observational astronomer, and my research focuses on low-mass stars and brown dwarfs—starlike objects that gradually cool instead of staying the same brightness over millions of years, like our sun.

Q: What kind of training and education did you need to obtain your job?

A: I have a Ph.D. in physics, with a specialization in astronomy. I earned both my undergraduate and my graduate degrees from the University of Pennsylvania.



Kelle Cruz, Ph.D., 28

American Museum of Natural History, New York, N.Y.

Astronomer





Mike Bickford, 22

HWS Consulting Group, Omaha, Neb.

Computer-Aided Design (CAD) Technician

COLLEGE: ITT Technical Institute, Omaha, Neb.
HIGH SCHOOL: Corning High School, Corning, Iowa

Q: What do you do?

A: I use AutoCAD, which is a computer-aided design software that is used to produce drawings and designs. I work primarily with civil engineers, who are responsible for the design. Sometimes I convert paper drawings to 3-D images on the computer. My company specializes in land development, as well as mapping for public and private subdivisions.

Q: What kind of training and education did you need to get this job?

A: When I was a freshman in high school, I took a drafting class and really enjoyed it. After that, I continued taking drafting classes every year, because I knew that's what I wanted to do. Also, taking math classes was very helpful, and it laid the foundation for my advanced training. At ITT, I focused on CAD classes and learned to use various types of software to help me do my job. Once I got my associate's degree and started working at HWS, I learned more specific skills that apply to my day-to-day job.

Q: What do you like most about your job?

A: I like the fact that I am always learning and being challenged. For example, I am always learning new ways to use software to do my job better. Also, my work environment is very diverse, and I do not feel pinned down to one aspect of the job.

PHOTOS: BOTTOM: KRIS SURETTE/CHAMPLAIN COLLEGE



Nate Couture, 23

Information Systems Dept., Champlain College, Burlington, Vt.

Computer Forensics Specialist

COLLEGE: Champlain College, Burlington, Vt.
HIGH SCHOOL: Bellows Free Academy, St. Albans, Vt.

Q: What is a typical day like in your job?

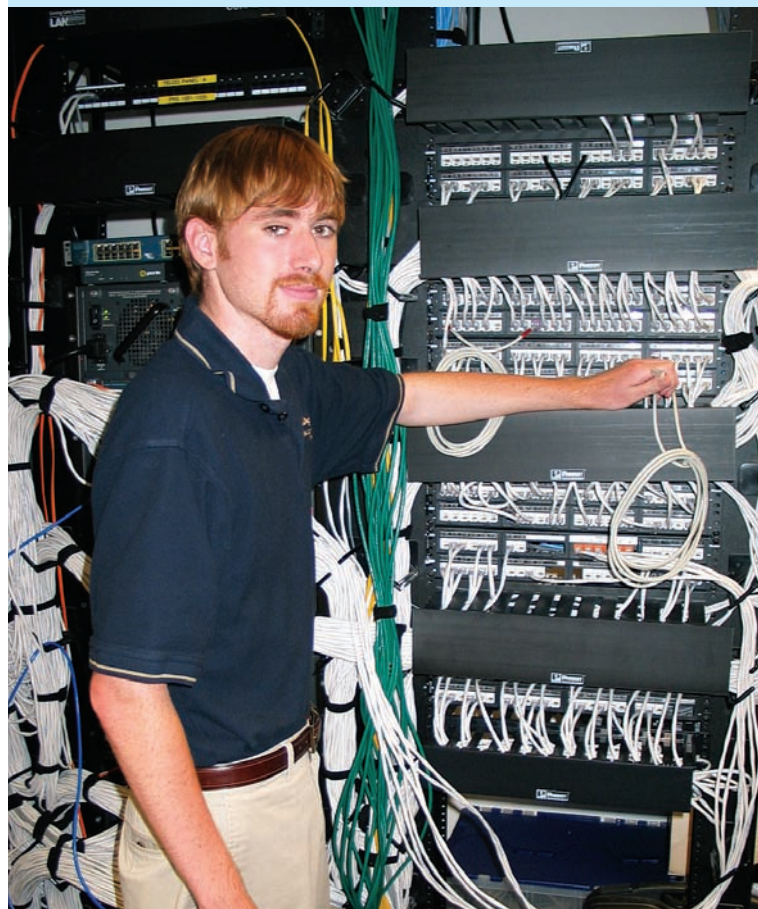
A: I don't have a typical day. When I'm wearing my network administrator hat, some of my duties include server maintenance and installation, network infrastructure administration and storage administration. As an IT security officer, I develop security policies, evaluate security concerns, monitor network weaknesses and attacks and implement new solutions to help protect the college.

Q: What kind of training and education did you need to get your job?

A: As a network administrator, I lean heavily on my associate's degree in computer networking. My bachelor's degree in digital forensics improved my skill set and allowed me to step into the role of IT security officer. I also did an internship with the Vermont State Police. As an intern, I maintained the computer forensic equipment, modified the evidence-collection database and conducted identity-theft research.

Q: Why is your job important?

A: Digital forensics and security are particularly important in the higher-education sector, where there is more of a philosophy toward openness and personal freedom than might be found in the corporate sector. My goal is to balance that philosophy with the goal of keeping the community safe from attacks on servers, worm outbreaks, Trojan infections and attempts to steal sensitive data.





Andrew Sumner, 27

Faithful + Gould, Boston, Mass.

Cost Estimator



COLLEGE: Leeds Metropolitan University, Leeds, England
HIGH SCHOOL: St Wilfrid's High School, Blackburn, England

Q: What do you do?

A: When a new building is being designed, I estimate how much it will cost to build. The information I use can vary from a few sketches to hundreds of drawings. My estimates help architects and owners keep the project within budget. If the project is over budget, I advise the client on the best ways to revise the design and save money.

Q: What kind of training and education did you need to get this job?

A: I earned a Bachelor of Science degree in quantity surveying. I also participated in an internship, which allowed me to work in the field and practice what I learned.

Q: What do you like most about your job?

A: I enjoy the variety of projects I work on. It is very rewarding to work with people who play a vital role in bringing a construction project from the drawing board to reality. I also take great pride whenever I drive through Boston and see many projects that I have worked on.

Q: How did you get interested in your job?

A: My father was a quantity surveyor, and I used to enjoy going through his drawings and trying to understand how the buildings went together. I used to think that it was similar to Legos. Later, I began to pursue the education that would help me get a job in this field.

COLLEGE: National Laboratory in Los Alamos, N.M.
Grambling State University, Grambling, La.
St. John's College, Annapolis, Md.
HIGH SCHOOL: Cleburne High School, Cleburne, Texas

Q: What do you do?

A: My organization's mission is to identify, secure, remove and/or facilitate the disposition of high-risk vulnerable nuclear and radiological materials around the world. In the past two years alone, it has removed more than eight nuclear bombs' worth of highly enriched uranium and has secured more than 400 radiological sites containing over 6 million curies, enough for 6,000 dirty bombs.

Q: How did you get interested in your job?

A: When I was in college, I found out about a federal government internship program at Los Alamos National Laboratory and signed up. I met my mentor, a physicist, and she encouraged me to explore this field. One of the biggest benefits of being a federal employee is that there are no limitations to where I can go and what I can do.

Q: What type of training and education did you need for this job?

A: The education I value most was my internship at Los Alamos National Laboratory. As an intern, I researched documents and developed reports on nuclear nonproliferation technology and safeguards for the Department of Energy. I also had the opportunity to monitor the development of nuclear-related technologies in other countries.

PHOTOS: TOP: FAITHFUL + GOULD; BOTTOM: JOHNS HOPKINS UNIVERSITY APPLIED PHYSICS LAB



Stephanie Martin, 24

Johns Hopkins University Applied Physics Lab, Laurel, Md.

Electrical Engineer





Nicole Nelson-Jean, 34

Office of Global Threat Reduction, Washington, D.C.

Director



COLLEGE: Virginia Polytechnic Institute and State University (Virginia Tech), Blacksburg, Va.

HIGH SCHOOL: Phoebus High School, Hampton, Va.

Q: What do you do?

A: I work in the field of electronic warfare, which is preserving the electromagnetic spectrum for friendly use while denying its use to the enemy. By jamming an enemy radar or communication system, you can prevent them from attacking friendly forces. On a typical day, I might research a target system, model a scenario to estimate effectiveness, conduct a field test, brief a group that will be using jammers, communicate with war fighters or write a report. I also travel extensively for field testing and conferences.

Q: What kind of training and education did you need to get this job?

A: I studied electrical engineering with an emphasis on communications systems. I also worked as an intern during college. Most of my training has been on the job. I have attended classes on electronic warfare, and I am currently working on my master's degree in electrical engineering by taking evening classes through Johns Hopkins University.

Q: What do you like most about your job?

A: I like the people I work with and traveling to new places. By far the greatest thing about my job is being able to see something I worked on help protect people and save lives.

PHOTOS: TOP: WALTER P. CALAHAN; BOTTOM: UNITED STATES DEPARTMENT OF AGRICULTURE



Jess Clark, Age 28

U.S. Dept. of Agriculture, Salt Lake City, Utah

Forestry Technician, Remote Sensing Agent

COLLEGE: Brigham Young University, Provo, Utah
HIGH SCHOOL: Spanish Fork High School, Spanish Fork, Utah

Q: What do you do?

A: I use remote sensing [satellite imagery] to create maps of wildfires showing the most severely burned areas and highlighting areas of greatest concern that could be affected by weather events after a fire. One of the biggest problems after a wildfire is the loss of natural vegetation in the area. The ground is more likely to erode during the next rainstorm, and people and their property may be in danger.

Q: What kind of training and education did you need to get this job?

A: I have a degree in geographic information systems (GIS) and a Master of Science in geography, with an emphasis on remote sensing. I also interned with the U.S. Forest Service while I was in college. That government internship turned into a full-time job after I graduated with my bachelor's degree. I worked on my master's degree while working full time.

Q: What do you like most about your job?

A: Mapping wildfires is exciting. I get to map fires all over the country and look at some pretty fascinating imagery. People in the field use my maps, which show the burn severity, to make fast decisions in emergency situations.

Q: How did you get interested in your job?

A: I loved geography in high school and was good on a computer. Remote sensing and GIS are perfect fits.





Nathan Gross, 27

Rocket Science + Design, Mason, Ohio

Graphic Designer

COLLEGE: Sinclair Community College, Dayton, Ohio
HIGH SCHOOL: Vandalia Butler High School, Vandalia, Ohio

Q: What do you do?

A: I design graphics that are displayed on products, such as bicycles. Before I start the design, I visit retail stores and browse through catalogs, magazines and the Internet for trends and ideas. I may sketch some ideas for graphics first, or, if I already have an idea in mind, I will start designing graphics on the computer. Once the design is complete, it is printed on a special film and applied directly to the bicycle. The bicycle can then be approved and shown to customers. If the customers decide to buy the bicycle for their stores, the files are shipped out for production.

Q: What kind of training and education did you need to get this job?

A: As a child, I was always into drawing and painting. I decided to take some computer-design and art classes in college, and when I discovered the world of graphic design, I finally realized what I was born to do. I learned the fundamentals of graphic design and how to use the current software that enables graphic designers do their jobs.

Q: What do you like most about your job?

A: The coolest thing about my job is being able to go to a retail store and see a product on the shelf that I helped create. Equally satisfying is that no two days are alike. Almost every day I get to start a new project that has the potential to be placed in front of a worldwide audience.



Sue Tsoi, 30

David Evans and Associates Inc., Portland, Ore.

Land Surveyor

COLLEGE: State University of New York, N. Y.
 Oregon Institute of Technology, Klamath Falls, Ore.
HIGH SCHOOL: St. John Villa Academy, Staten Island, N.Y.

Q: What is a typical day like in your job?

A: Each day varies, but it mostly involves talking with clients, researching and analyzing data, generating maps, writing legal descriptions, working on boundary resolution and managing projects.

Q: How did you get interested in your job?

A: In my junior year, our high school offered its first environmental science class, and that got me hooked on science. I started going to nature camps and decided to major in forestry. In college, I was required to take some land-surveying classes and decided to major in the field.

Q: What kind of training and education did you need to get this job?

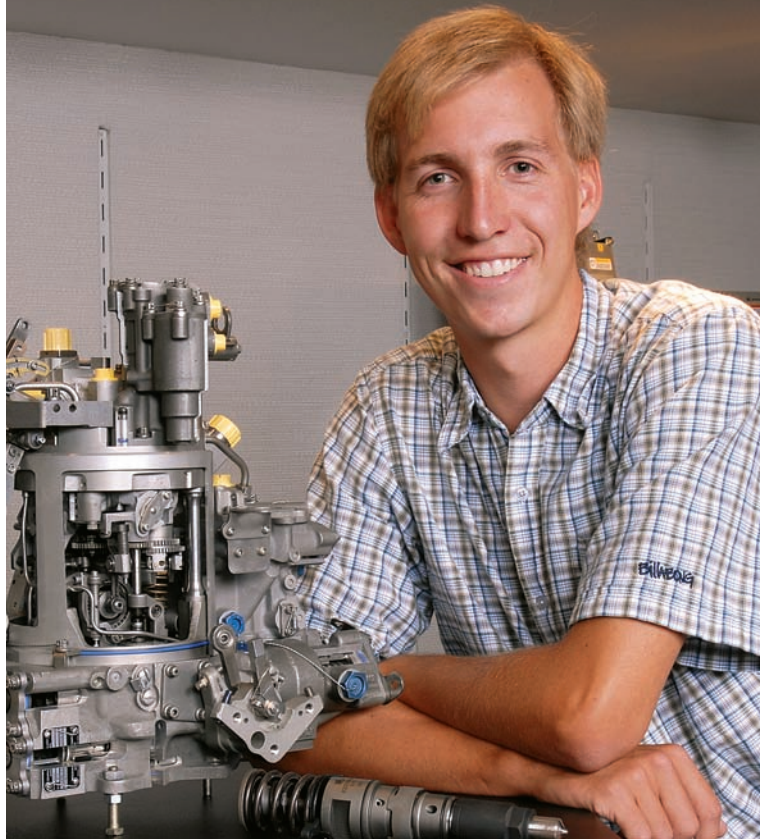
A: I took many science classes in college, such as botany, geology and soil science and received a degree in land surveying. After college, I worked for different surveying firms and earned my Land Surveying Intern certificate and my Professional Land Surveyor license.

Q: What do you like most about your job?

A: I enjoy working in a profession that is considered “behind the scenes.” Land surveyors are the first and last people working on a construction project.



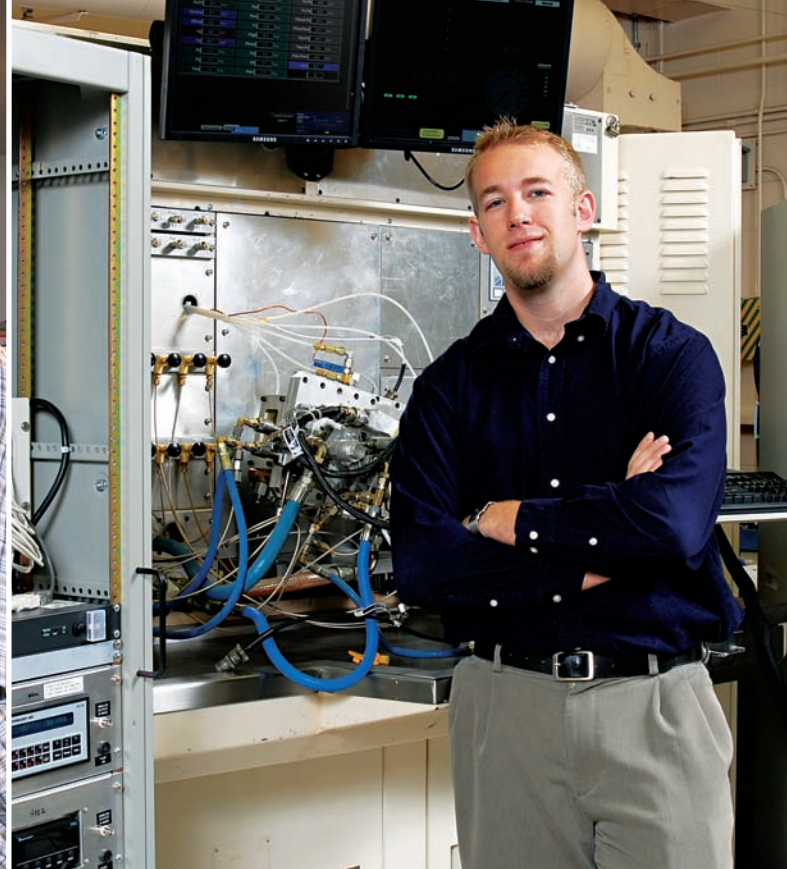
PHOTOS: TOP: ROCKET SCIENCE + DESIGN; BOTTOM: DAVID EVANS AND ASSOCIATES



Jay Plath, 22

Woodward Governor Company, Rockford, Ill.

Mechanical Engineering Intern



Ben Hunter, 25

Woodward Governor Company, Rockford, Ill.

Mechanical Engineer, Mentor



COLLEGE: Senior, University of Minnesota, Minneapolis, Minn.
HIGH SCHOOL: North Boone High School, Poplar Grove, Ill.

Q: What do you do?

A: I'm in my fourth year as a summer intern at Woodward. The company designs, manufactures and services energy control systems for aircraft and industrial engines and turbines. Over the years, the difficulty of the projects I'm working on has grown. On my current project, I am involved in everything from developing and running the tests to correcting failures and determining the project's progression.

Q: What is a typical day like?

A: I start the day by collecting test data. I run analysis on the data to make sure the units haven't failed. Also, on any given day, I go to meetings, work on test assemblies or work on calibrating the units we're preparing for testing.

Q: In your job, how do the areas of science and technology come into play?

A: There are so many levels of information. For example, you get to become a specialist in the different programs you use. Also, you use math in any sort of engineering. You don't have to be a math wiz, but you have to be strong in math.

Q: What high school classes have helped you most in your engineering training?

A: Physics was very helpful. That's where you start to apply the other things you've learned. You learn to solve problems, and in engineering, it's all about problem-solving.

COLLEGE: Illinois Institute of Technology, Chicago, Ill.
HIGH SCHOOL: Larimore High School, Larimore, N.D.

Q: What got you interested in mechanical engineering?

A: I began college majoring in aerospace engineering. I've always had a curiosity about how things worked and a love for airplanes. My dad is an air-traffic-control specialist, and my grandfather was a pilot for American Airlines, so aerospace is in the family. I decided to double-major in mechanical engineering, as well. It offered me opportunities that otherwise would not be available.

Q: What do you do for Woodward?

A: I am a product development engineer in Woodward's Aircraft Engine Systems Group. When a company decides to design a new jet turbine engine, we provide components that make that engine work. It's my job to take one of those components from concept, through design, to manufacture and finally testing and certification. I also mentor the on-the-job work experience of our engineering interns.

Q: What advice do you have for young people who are considering an engineering career?

A: Get involved with clubs for hands-on experience in different kinds of projects. Maybe your high school has a math or science club or even an engineering club. Of the high school classes, math is the most important. It provides the foundation for what you will study in college—courses on differential equations and thermodynamics.

PHOTOS: TOP LEFT AND RIGHT: JIM ORLANDO



Sonia Barker, 28

Bell Museum of Natural History, St. Paul, Minn.

Naturalist

COLLEGE: Gustavus Adolphus College, St. Peter, Minn.
University of Minnesota, Duluth
HIGH SCHOOL: St. Peter High School, St. Peter, Minn.

Q: What got you interested in being a naturalist?

A: I didn't even know what a naturalist was until I was a junior in college. The director of the arboretum at my college gave a special course on being a naturalist. I was into research biology at the time. Being a naturalist appealed to me because it didn't deal with just one tiny part of science—you get to learn about all of it.

Q: What do you do?

A: I work as a resident naturalist at an elementary school. My first responsibility is to take care of the animals. I feed them and clean their cages. Then the students come down to my area, which is called the Inquiry Zone. We start each class with a focus point. That could be an animal or an artifact that I bring from the Bell Museum of Natural History, my employer, who partnered with the school to make this job possible.

Q: What do you like most about your job?

A: I feel that even if I teach the same class 100 times, it's new every time, especially with younger kids. They have a fascination that catches me every time. Now that the kids know me, they bring things to my office. It could be something they found in their yard or maybe a bug that bit them. We get out books and discover what it is. They come and find out more, and it's great one-on-one time.

PHOTOS: TOP: LISA SCHIRRING; BOTTOM: ROBERT CARDIN

COLLEGE: University of California, Davis
HIGH SCHOOL: Bullard High School, Fresno, Calif.

Q: How did you get interested in your field?

A: At 18, when I decided to major in chemical engineering, I wasn't sure what I wanted to do when I got out of college. My decision to become a chemical engineer was influenced by the fact that my father is a chemistry teacher and my brother is an engineer.

Q: What do you do on a typical day?

A: I work closely with my team to obtain status updates on our projects, as well as make decisions on the path going forward. Most of my job has to do with interfacing with people, whether following up on projects with my team members or reporting to upper management. The projects that we do are either facility- or equipment-related. For instance, we might bring in new storage tanks for solvents used in the manufacture of drugs or install a new process hot-water system to aid in the cleaning of manufacturing equipment.

Q: What do you like most about your job?

A: The challenges. Being a project manager is not as easy as it might seem. I have to meet deadlines and budgets. It's a very fast-paced environment that keeps me motivated and brings out the best in me. No two projects are alike, so I'm never bored. I also like interacting with people, which allows me to develop close personal and professional relationships. That's what keeps me coming back every day.



Kristen Dezzani, 31

Johnson & Johnson, GPSG, West Vacaville, Calif.

Pharmaceutical Engineer





Catherine Andrae, 23

Techmer PM, Clinton, Tenn.

Process Engineer



COLLEGE: Georgia Institute of Technology, Atlanta, Ga.
HIGH SCHOOL: Evans High School, Evans, Ga.

Q: What do you do on a typical day?

A: My company manufactures custom color and additive masterbatches used in the production of plastics. Each day, I review incomplete tasks from the previous day. I talk to the supervisors, operators and mixers to evaluate the different products processed during the evening shift and weigh concerns, comments or suggestions. I participate in the facility-wide, walk-around meeting to keep up with the larger-scale concerns and projects. Lately, I also deal with reformulating several products to improve processing and reduce variation. Each day I review products and adjust the process settings to reflect optimal conditions.

Q: What kind of training and education did you need to get this job?

A: Polymer and fiber engineering was my major at Georgia Tech. I learned about polymer processing, completed hands-on lab experiments for colorants and additives, and mastered technical data about antioxidants, waxes and processing aids. I also completed three internships, which really drove home several key areas of knowledge I need to do my job.

Q: What do you like most about your job?

A: I really like the freedom I have to tackle problems, as well as the positive feedback I receive from the manufacturing floor when I improve a process or product.

COLLEGE: Colorado State University, Fort Collins, Colo.
HIGH SCHOOL: Lamar High School, Lamar, Colo.

Q: What do you do?

A: I test a variety of food and environmental samples to identify the presence of harmful food-borne bacteria like E. Coli. We test raw and cooked meat, dairy products, water and spices. We also validate our tests and results.

Q: What kind of training and education did you need to get this job?

A: I earned a degree in microbiology. I learned to perform experiments under carefully controlled conditions with the goal of minimizing contamination by bacteria. My degree helped me understand the science behind each test, and it gave me insight to problems that I may run across from time to time.

Q: What do you like most about your job?

A: The thing I like most about my job is that there is never a typical day. Due to our diverse clientele, we never know what types of samples we will receive and what specific tests we will be running.

Q: How did you get interested in your job?

A: The food microbiology class I took at the university really piqued my interest. It was very motivating to see a professor so passionate about her field. I am also interested in the life cycle of certain harmful bacteria, specifically E. Coli and its impact on the meat industry.



Garabed G. DomBourian, 23

Warren Analytical Laboratory, Greeley, Colo.

Research Lab Technician





Beth Heller, 29

Science teacher, Northeast Hamilton CSD, Blairsburg, Iowa

Science Teacher

COLLEGE: Luther College, Decorah, Iowa
HIGH SCHOOL: Northwood-Kensett, Northwood, Iowa

Q: What got you interested in becoming a science teacher?

A: The science teachers I had in school made learning science fun! We did all kinds of neat, hands-on activities, and I was inspired to do the same.

Q: What is a typical day like for you on the job?

A: Before the students arrive, I answer parent e-mails, grade papers, go over my lesson plans or set up labs. I also spend my early mornings attending faculty meetings and meeting with students who have homework questions. Each day, I teach six classes and supervise a study hall period.

Q: What do you like most about your job?

A: I really enjoy interacting with so many different students and teaching a variety of science subjects. I enjoy being able to watch the students grow up and mature. It amazes me how uniquely every person changes, including their interests.

Q: What can you tell aspiring students about preparing for a career as a science teacher?

A: Take as many different science classes as you can, especially physics and chemistry. A psychology course will help you understand how the brain works and how to present new topics to students. See if your school will allow you to become a teacher's assistant, tutor or mentor. These activities can give you an idea of what teaching is like. We need more good teachers!



Michael Eisenberg, 22

Freelancer, New York, N.Y.

Sound Engineer

COLLEGE: University of Michigan, Ann Arbor, Mich.
HIGH SCHOOL: Shawnee Mission East, Prairie Village, Kan.

Q: What do you do?

A: I am a freelance sound designer and engineer for theatrical and performing arts events. My typical day includes changing the sound engineering design to ensure that all elements of a production are smooth and making sure that the crew understands and executes my design.

Q: What kind of training and education did you need to get this job?

A: In high school and later in college, I took several courses in physics, calculus and electrical engineering. I use math almost everyday to make decisions, like where to locate the sound equipment to achieve the most efficient sound design while using the least number of microphones and preserving the sound quality.

Q: What do you like most about your job?

A: I enjoy being able to help enhance the performance experience of an audience. I'm always curious about the audience's likes and dislikes, and I want them to hear something different.

Q: How did you get interested in your job?

A: I became extremely interested in sound design and mixing in high school. The theater teachers at my school sparked my interest and gave me opportunities and an outlet to do something that I felt I could call my own.

PHOTOS: TOP: KRIS PEED





Greg Ridgeway, 33

RAND Corporation, Santa Monica, Calif.

Statistician



COLLEGE: California Polytechnic State University, San Luis Obispo, Calif.

University of Washington, Seattle, Wash.

HIGH SCHOOL: Amador Valley High School, Pleasanton, Calif.

Q: What is a typical day like at your job?

A: I work on public safety and justice issues and spend a lot of time analyzing data and writing reports. I travel around the country and meet with decision-makers to discuss how my analysis can help them make informed decisions.

Q: How did you get interested in your job?

A: One of my high school math classes focused on statistics. I learned that statistics was a blend of mathematics and computer science. I really liked that combination, and it seemed very practical, so I decided to major in statistics.

Q: What kind of training and education did you need to get this job?

A: I earned a doctorate degree in statistics. Along the way, I worked on safety issues at a mental hospital, analyzed wildlife biology data and improved my programming skills.

Q: What do you like most about your job?

A: I work with some of the best statisticians, economists and social scientists. We discuss important problems that our country faces, and we develop solutions to them. I enjoy developing statistical methods to solve these problems and using those solutions to develop effective policies.



COLLEGE: Purdue University, West Lafayette, Ind.

HIGH SCHOOL: Rensselaer Central High, Rensselaer, Ind.

Q: What is a typical day like at your job?

A: Checking e-mails, prepping for meetings, playing our games to give feedback, and contemplating how to integrate our games with our Web site!

Q: How did you train for your job?

A: In 1997, Brian Fiete (one of the other co-founders of PopCap) and I created a game while we were in college. We sold that game to what is now Pogo.com, and then we went to work for Sierra online. We worked there in various nongame development capacities before we quit to start PopCap Games.

Q: What do you like most about your job?

A: The fact that I get to work on great games like Bejeweled and Book Worm, and that the goal of the company is to only make the best! Furthermore, the casual-games side of the video-game industry is still emerging so that most of the firms in this field are small and relatively informal. It's still very much a "garage," or cottage, industry in many ways.

Q: How did you get interested in producing video games?

A: Playing lots of games! That's really the only way to get interested in game development. If you're in it for the money, you're in the wrong industry.

PHOTOS: TOP: WARREN ANALYTICAL LABORATORY; BOTTOM: RICK DAHMES



John Vehey, 28

PopCap Games Inc., Seattle, Wash.

Video-Game Designer



Start your own (ad)venture!

By Fran Howard

Are you a risk-taker? Would you rather be taking apart your computer than hanging out at the mall? If you answered “yes” to any of these questions, you may have what it takes to be an entrepreneur. Science, technology, engineering and math hold endless opportunities for creative risk-takers. Many talented young people are already making sizable incomes in these fields.

“An increasing number of young people are looking to start and operate their own businesses,” says Hank Kopcial, executive director of the Young Entrepreneur Foundation in Washington, D.C. In a recent survey, as many as 80% of high school students expressed an interest in starting and operating their own business. About 60% of the young entrepreneurs who receive scholarships from the foundation are technology-oriented, says Kopcial. Today’s young people have grown up with computers, electronics and the Internet. “That’s where they are comfortable,” he says.

Young entrepreneurs have always excelled in technology fields. In 1998, two doctorate students in computer science hunkered down in their Stanford University dormitory working on a new way to search the Internet. After changing the system’s name from BackRub to Google in 1998, founders Larry Page and Sergey Brin—while still in their twenties—launched their new

venture from a friend’s garage. Today, Google is the largest Internet search engine and has earned its two founders a net worth of almost \$13 billion apiece.

Kevin Rose is another ambitious young technology innovator who launched a popular new Web product when he was still in his twenties. In 2004 he started Digg.com, which allows users to vote for the news stories on the Web they think should appear on an online “front page.”

Many young Web entrepreneurs are driven by a desire to share something useful.

He started out with just \$1,000 from his personal savings, and hired a freelancer to create a prototype of the site. In less than two years, Digg.com surpassed 200,000 registered users. A recent magazine profile noted that Rose and other recent Web entrepreneurs have been successful not because they went into a venture hoping to become rich, but because they saw some-

thing that was useful for their own lives and shared it with their friends—and the popularity grew from there. YouTube and Facebook are two more examples of this tech business trend. The list of technology companies started by young entrepreneurs also includes veteran firms like Oracle and Hewlett-Packard, just to name a few.

In the engineering arena, a young Tom Brady developed a plastic bottle that could hold carbonated soft drinks. Later, he founded Plastic Technologies Inc. (PTI) in Holland, Ohio. Today, PTI is recognized worldwide as a leading supplier of technology and specialty manufacturing services to the plastic packaging industry. PTI employs many engineers and scientists who together hold 62 patents.

Many young people today see beginning their own businesses as the pathway to wealth. Joseph Pascaretta, 18, of

Rochester, Mich., is a good example. He and childhood friend Aaron Downen began a Web design company when they were 12 years old. “In 2002, the market for that changed. So we went into database integration,” says Pascaretta.

Pascaretta’s company, Alps Technology, purchased 3 million gigabytes (with a market value near \$3 mil-

lion) of database space and began offering its clients full-service database integration, including IT support, database space, software, consulting and hardware integration—something that, to Pascarella's knowledge, no other company is doing. Today, Alps Technology has 44 full-time employees and 323 cus-

round-the-clock tech support to its roughly 600 customers. Like Pascarella, Bradshaw, a freshman at the University of Washington, Seattle, plans to focus on business, with an emphasis on information technology. "Computers, technology, anything having to do with the Internet, have been passions of mine,"

"What's important about this is its patent-pending algorithms, which can differentiate between speeding on secondary roads and on highways," Fischer says. This feature is important because more fatal accidents occur on secondary roads. Once the young inventor decided on an algorithm he wanted to use, it took



tomers with annual contracts. "I've always liked business, and I've always liked managing," says Pascarella, a business major at the University of Michigan, Ann Arbor. "With the state of the economy being what it is, success is about what you do differently."

Elliot Bradshaw, 18, of Bellingham, Wash., started a Web hosting company called Incognito Networks when he was 15. This past year, he opened his own call center in Nasik, India. Now, three full-time employees half a world away allow Incognito Networks to provide

says Bradshaw, who has been working with computers forever.

Inventor Jon Fischer, 17, of Lunenburg, Mass., came up with his idea for Speed-Demon when he was only 15. The device, now in the prototype stage, is designed to alert parents if their teenager is speeding. It is a GPS data logger controlled by a microprocessor that is strapped to the dashboard of a car. Once the teen driver returns home, parents can remove a password-protected memory chip and plug it into their home computer to see if their teen was speeding.

another five months to fine-tune the system. Fischer is currently working on a wireless version of Speed-Demon that will alert parents via phone or e-mail at the exact time their teen is speeding.

The possibilities are endless for entrepreneurs entering the diverse fields of science, technology, engineering and math. These exciting fields generate new ideas every day. Like a science experiment in an incubator, many of these ideas grow into multimillion dollar endeavors, and so could your next brainchild! ♦♦

Fun Facts

About Science, Technology, Engineering and Math



7. The first computer mouse was called an “x-y position indicator.” It was patented by Doug Engelbart in 1970.

8. When the first computers were built during the early 1940s, workers often found moths and other bugs in both the hardware of the machines and in the programs that ran them. In 1947, engineers at Harvard University found a moth stuck in one of the components, so they taped the insect in their logbook and labeled it “first actual case of bug being found.” Soon afterward, the words *bug* and *debug* became a standard part of computer lingo.

1.

Astronauts can't burp in space because the lack of gravity prevents gas from separating liquid and solids in the stomach.

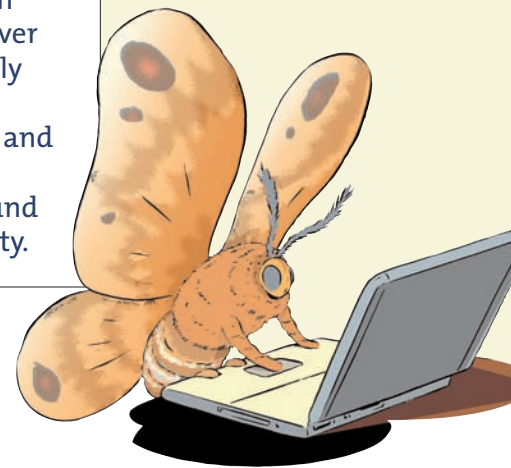


2. If you toss a penny 10,000 times, it would land heads about 4950 times—a little less than 50 percent. We know this from probability, which is the branch of math that deals with calculating the likelihood of a given event's occurrence.

3. The longest hand-launched paper airplane flight was 27.6 seconds on October 8, 1998 by American Ken Blackburn at the Georgia Dome in Atlanta.

4. Microsoft Chairman Bill Gates began programming computers when he was 13 years old.

5. The astronauts of the Apollo 8 mission were given special sterling-silver eggs filled with Silly Putty to carry into space to play with and to help keep tools from floating around while in zero gravity.



6.

There are 25 billion ounces of gold mixed into ocean water. But experts say it would cost too much to extract. The gold in ocean water is made when tectonic plates spread, cold water seeps down and meets hot rocks.



Did you know that melting ice cream was the inspiration behind the outboard motor? The idea was born one August day in 1900 when Ole Evinrude was rowing his boat to an island picnic spot and wished he had a faster way to get to his destination.



9. The first cell phone call was made in 1973 by its inventor, Martin Cooper. The phone weighed 2 pounds! Some of today's cell phones weigh only 3 1/2 ounces.

10. The cartoon character Dilbert is an electrical engineer. He's about 30 years old and works for an undisclosed high-tech company in Northern California. Dilbert's creator, Scott Adams, is a computer engineer.



12. Some new golf balls contain a radiofrequency identification chip that, with a hand-held device, helps you easily locate your ball.



13. You may not realize it when you're riding in one, but a roller coaster has no engine. The car is pulled to the top of the first hill at the beginning of the ride, but after that the coaster must complete the ride on its own with kinetic energy.

14. TV and film star Ashton Kutcher was a biochemical engineering major before he dropped out of the University of Iowa to pursue modeling.

15. Did you know "geocaching" is a new adventure sport that you can play with a global positioning system (GPS) device? It's like a high-tech treasure hunt.

16. The longest bolt of lightning ever recorded was 118 miles long. A lightning detection network reported the bolt, which occurred in the Dallas-Ft Worth area.

17. Snowboard design involves geometry, chemistry and biomechanics. Engineers are now using "smart" ceramics embedded in skis to reduce the vibration between the skis and the snow.

18.

A 16-pound bowling ball hits the lane with a force of over 2,000 pounds per square inch.



Resource Guide

Dozens of professional organizations, government Web sites and trade unions exist to help you learn more about careers in science, technology, engineering and math. Here is a sampling of some resources to get you started.

PROFESSIONAL AND INDUSTRY ORGANIZATIONS

Accreditation Board for Engineering and Technology
www.abet.org

Accrediting Commission of Career Schools and Colleges of Technology
www.accscct.org

ACE Mentor Program
www.acementor.org

Aerospace Industries Association of America
www.aia-aerospace.org

American Academy of Environmental Engineers
www.aee.net

American Association for the Advancement of Science
www.aaas.org

American Association for Artificial Intelligence
www.aaai.org

American Association of Nanotechnology
www.aanano.com

American Association of Petroleum Geologists
www.aapg.org

American Astronomical Society
www.aas.org

American Chemical Society
www.chemistry.org/

American Design Drafting Association
www.adda.org

American Indian Science and Engineering Society
www.aises.org

American Institute of Aeronautics and Astronautics
www.aiaa.org

American Institute of Biological Sciences
www.aibs.org

American Institute of Chemical Engineers
www.aiche.org

American Institute of Graphic Arts
www.aiga.org

American Institute of Mining, Metallurgical and Petroleum Engineers
www.aimeny.org

American Institute of Physics
www.aip.org

American Mathematical Society
www.ams.org

American Meteorological Society
www.ametsoc.org



American Society for Biochemistry and Molecular Biology
www.asbmb.org

American Society for Clinical Laboratory Scientists
www.ascls.org

American Society for Engineering Education
www.engineeringk12.org

American Society for Engineering Management
www.asem.org

American Society for Metals
www.asminternational.org

American Society for Microbiology
www.asm.org

American Society of Plant Biologist
www.aspb.org

American Society for Quality
www.asq.org

American Society of Agricultural and Biological Engineers
www.asabe.org

American Society of Certified Engineering Technicians
www.ascet.org

American Society of Civil Engineers
www.asce.org

American Society of Heating, Refrigeration and Air-Conditioning Engineers
www.ashrae.org

American Society of Mechanical Engineers
www.asme.org

American Society of Naturalists
www.amnat.org

American Society of Safety Engineers
www.asse.org

ASM International
www.asminternational.org

Association for Computing Machinery
www.acm.org

Association of Engineering Geologists
www.aeg-tx.org

Association for Women in Science and Engineering
www.awise.org

Association of Information Technology Professionals
www.aitp.org

Audio Engineering Society
www.aes.org

Biomedical Engineering Society
www.bmes.org

Board of Certified Safety Professionals
www.bcsp.org

Electronic Industries Alliance
www.eia.org

Environmental and Engineering Geophysical Society
www.eegs.org

Geological Society of America
www.geosociety.org

IEEE Computer Society
www.computer.org

Independent Electrical Contractors
www.ieci.org

Industrial Designers Society of America
www.idsa.org

Institute of Electrical and Electronics Engineers
www.ieee.org

Institute of Industrial Engineers
www.iienet.org

International Council on Systems Engineering
www.incose.org

Junior Engineering Technical Society
www.jets.org

Mathematical Association of America
www.maa.org

National Academy of Engineering
www.nae.edu

National Academy of Sciences
www.nas.edu

National Aeronautic Association
www.naa.aero

National Air-Traffic Controllers Association
www.natca.org

National Association of Manufacturers
www.nam.org

National Center for Integrated Systems Technology
www.ncist.ilstu.edu

National Center for Manufacturing Education
www.ncmeresource.org

National Council for Advanced Manufacturing
www.nacfam.org

National Council of Examiners for Engineering and Surveying
www.ncees.org

National Council of Teachers of Mathematics
www.nctm.org

National Institute for Certification in Engineering Technologies
www.nicet.org

National Science Teachers Association
www.nsta.org

National Society of Black Engineers
www.nsbe.org

National Society of Professional Engineers
www.nspe.org

Network Professional Association
www.npa.org

Semiconductor Industry Association
www.sia-online.org

Society for Biomaterials
www.biomaterials.org

Society for Conservation Biology
www.conbio.org

Society for Technical Communication
www.stc.org

Society of American Foresters
www.safnet.org

Society of Automotive Engineers
www.sae.org

Society of Cost Estimating and Analysis
www.sceaonline.org

Society of Exploration Geophysicists
www.seg.org

Society of Hispanic Professional Engineers
www.shpe.org

Society of Manufacturing Engineers
www.sme.org

Society of Petroleum Engineers
www.spe.org

Society of Physics Students
www.spsnational.org

Society of Plastics Engineers
info@4spe.org

Society of Plastics Industry
www.plasticsindustry.org

Society of Women Engineers
www.swe.org

GOVERNMENT AGENCIES

Federal Aviation Administration
www.faa.gov/education

Occupational Safety and Health Administration
www.osha.gov

National Aeronautics and Space Administration
www.nasa.gov

National Science Foundation
www.nsf.gov

U.S. Department of Energy
www.doe.gov

U.S. Department of Labor Employment and Training Administration
www.doleta.gov
www.careervoyages.gov

UNIONS

Air Line Pilots Association
www.alpa.org

American Federation of Teachers
www.aft.org

Communication Workers of America
www.cwa-union.org

International Association of Machinists and Aerospace Workers
www.iamaw.org

Society of Professional Engineering Employees in Aerospace
www.speea.org

NOTE: Web sites are constantly changing so you should always check by doing a web search.

Encourage Tomorrow's PROBLEM-SOLVERS

Parents, teachers and counselors can help students learn more about science, technology, engineering and math careers



Tips for Counselors...

Paths to exciting and rewarding science, technology, engineering and math careers might not be so obvious to students, especially to those who don't see themselves as math or technology wizards. Steering students toward these promising careers can be a tough sell for counselors.

Fortunately, there are many resources and work-based learning activities that counselors can use.

Open up students' potential

Sometimes a student may not see his or her potential for a career in science,

technology, engineering or math. Personality and aptitude tests are two ways students can start to see themselves in a new light. Maybe a student's creative streak could dovetail with the strategic problem-solving used by engineers, or perhaps another student's

knack for organizing makes him or her a good candidate for being a statistician or a computer programmer.

A good first step is to provide students with opportunities to take career inventory tests. One example is a career exploration program called ASVAB, which is a public service offered by the U.S. Department of Defense. It offers aptitude tests, interest inventories and career planning tools for both civilian and military careers. The Web site is www.asvabprogram.com.

SCIENCE. Since there are so many different settings for careers in science, asking students about the environments they enjoy may offer some clues to the occupation they'll enjoy. For example, research scientists typically work in labs, while marine biologists or forestry technicians spend lots of time outdoors.

TECHNOLOGY. Students who can't envision themselves in a technology career can sometimes be encouraged to use their hobbies and interests as inspiration. If they love music, perhaps a career as a sound technician might suit them well. Do they love video games? Perhaps they'd excel at creating flight simulators for military training.

ENGINEERING. Just about any student who enjoys solving problems may be a candidate for a career that supports or directly involves engineering, from computer-aided design (CAD) jobs that require a technical certificate or

job experience to more advanced degrees that enable students to become professional engineers in a variety of disciplines.

MATH. A good way for counselors to encourage students to consider math careers is to “get real”—walk students through examples of how math is used to solve real-world problems, such as predicting when a new bridge material may fail, strategizing how new products are marketed or calculating how many children will benefit from a new vaccine.

Educational options

Science, technology, engineering and math career pathways may include taking advanced high school courses, participating in internships, acquiring special certifications, a two-to-seven-year college education, or working in the government and private sector.

Work-based learning activities have always been championed for non-college-bound students but have been expanded to include all students. These efforts succeed when teachers are assigned to supervise students and strong ties are developed between schools and local businesses and industries.

Service learning projects, such as Habitat for Humanity, develop employment skills and encourage good citizenship. The National Service Learning Clearinghouse at www.servicelearning.org offers a wealth of ideas for projects and step-by-step instructions to implement them. Service learning benefits the entire community.

Cooperative education programs let students earn graduation credits for paid work experience. “Job shadowing” gives students opportunities to observe people at work for days at a time. Internships provide students with longer unpaid opportunities in the workplace. Career and technical education programs also give students the chance to gain on-the-job experience and practice their skills. ♦

IDEAS FOR TEACHERS...

A fun way to apply science, technology, engineering and math skills with your students is to participate in programs such as the West Point Bridge Design Contest. Teams design a virtual bridge and test its design capabilities. Free software is available on line at bridgecontest.usma.edu. Students ages 13 through grade 12 are eligible to compete for prizes. The contest was developed by the U.S. Military Academy at West Point and is sponsored by the American Society of Civil Engineers.

Another compelling way for teachers to bring science into the classroom is the “World of Motion” program, which was developed by the Society of Automotive Engineers. Each module usually takes eight weeks and can be incorporated in the science curriculum. Modules are available at www.sae.org/foundation/awim.

Another thing teachers can do is remind their students that replacement needs usually account for more job openings than the growth of new jobs. Most air-traffic-controller job openings, for example, are the result of the large number of controllers who will be eligible to retire over the next decade. The latest projections of all job openings for each state are available at www.projectionscentral.com.

Teachers can also encourage students to research and use the common terminology associated with occupations that interest them. Every career field develops its own professional language, which is called “jargon” by people outside the profession. Below are sample terms for some of the exciting occupations in this issue of *InDemand*. Challenge your students to find 10 additional terms for each occupation and then define each term.

Encourage the next generation of teachers

Most importantly, tell your students about the crucial role science, technology and math teachers play in inspiring the innovators of tomorrow. Share the reasons why you became a teacher. Many states with growing teacher shortages offer loan forgiveness programs, scholarships and tuition reimbursement programs.

Students need to know that they can pursue degrees in science, technology, engineering and math while completing a teacher license program. Many universities also have programs that will permit a student to become a teacher after completing a bachelor’s or master’s degree. Teacher-training programs also require students to spend time in public schools to determine if teaching is a valid career path for them.

OCCUPATION	SAMPLE TERMINOLOGY
Air-traffic Controller	Vertical spacing
Mechanical Engineer	Thermodynamics
CAD Technician	Axonometric
Materials Engineer	Polymeric biomaterials
Pharmaceutical Engineer	Toxicokinetics
Astronomer	Doppler shift
Forestry Technician	Timber cruising
Computer Forensics Specialist	Rootkit
Cost Estimator	Cost/performance indicator
Sound Technician	Digital audio
Video-game Designer	Graphic user interface (GUI)
Science Teacher	Rubric
Statistician	Confidence interval

DEAR PARENTS

Parents can begin encouraging their children to pursue science, technology, engineering and math careers by avoiding stereotypes and promoting good role models in these fields. Avoid teasing your children about “boy careers” and “girl careers.” Girls and boys should both be expected to succeed in math and science. Opportunities abound in all these careers for both women and men.

Encouraging more women and minority people to consider science, technology, engineering, and math careers is crucial, because these groups represent an untapped potential of bright young people that can help the United States compete in an evermore-competitive global marketplace.

There are several programs that help minority students explore these career fields such as the Hispanic Engineer National Achievement Award Corp., along with many good scholarship opportunities for those who select science and technology career paths.

Encourage your child not to overlook science, technology, engineering and math careers within government, at the local, state and federal levels. These jobs pay well and come with good benefits and opportunities for advancement.

Nearly all air-traffic controllers are employed by the Federal Aviation Administration (FAA), an agency of the federal government, and many of them start off in the military. Forest and conservation technicians working for federal and state governments compile data on the size, content and condition of tracts of forest. Computer forensic specialist positions are growing both in government and private companies.

Parents can also read about careers with their children, visit Web sites, schools and colleges, interview people in various fields and find a mentor. ❖

Q&A

What Career Is Right?

How do I know if my child has an aptitude for science-related careers?

Aptitude for science may take many forms. Some students are very curious about the way things work. Others like puzzles, riddles and challenges. People in science careers tend to be analytical and like to solve problems.

How do I know if my child has an interest in technology- or engineering-related careers?

Budding technicians and engineers often enjoy conducting experiments and building things. They may also enjoy taking things apart just to understand how they work. Interest inventories—tests that reflect your child’s passions and strengths—can suggest potential career paths and often are offered by schools. A word of caution here: These inventories are only valid if the people taking them answer the questions openly and honestly. Try to gauge if your child is taking the inventories seriously before putting too much stock in the test results.

The International Technology Education Association provides great information at www.iteaconnect.org/index.html. Students take technology courses more seriously when parents emphasize their importance at the same level as academic subjects. Praising your child’s construction of a bookshelf in middle school may be an important step in developing a famous architect like Frank Lloyd Wright or Maya Ying Lin.

How do I know if my child has an aptitude for math-related careers?

That is a difficult question, because many occupations use math skills. Occupations, however, may differ widely in the type and the frequency of math skills used. For example, cost estimators may be asked to review accounting reports, but this review may also be a small part of the total job. A pharmaceutical engineer may be required to scale up the production of medicines using proportions and ratios, but they may not have to use advanced geometry and calculus skills on a regular basis. Parents can foster math skill development by pointing out the use of math formulas, percentages and measurements in daily life.

SURF THE WEB

Parents will also find lots of career information at Career Voyages, www.careervoyages.com/parents-main.cfm.

This site provides access to:

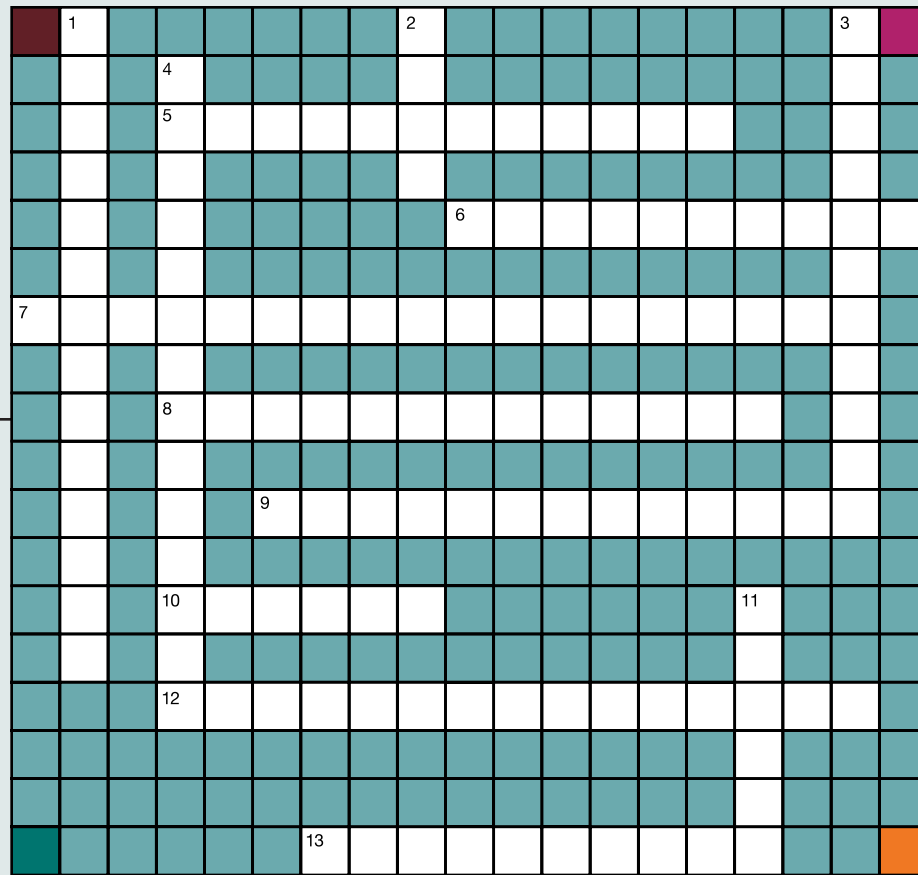
- ❖ Different types of careers.
- ❖ The knowledge and skills needed to enter these careers.
- ❖ Information about education and training opportunities needed to prepare for a chosen career.

Another good place to browse with your teen is the “Health Career” section of the U.S. Department of Labor Occupational Outlook Handbook (www.bls.gov/oco/cg/print/cgso35.htm).



STEM CROSSWORD

Science - Technology - Engineering - Math



8



11

13



You've read the magazine,
now test your knowledge!

ACROSS

5. A person who starts and runs his or her own business.
6. Adventure sport that is like a high tech scavenger hunt.
7. What sparks innovation?
8. A person who enhances a production for an audience through the use of sound design
9. Science promotes _____.
10. A student or a recent graduate undergoing supervised practical training to learn more about a particular career.

12. A person who develops logos to display on products such as bicycles, etc.
13. A person who studies galaxies.

DOWN

1. Another word for "very small".
2. Part of a land surveyor's job is to generate _____.
3. If you like to solve problems, you may be interested in a career in _____?
4. Industry term for satellite imagery?
11. A trusted counselor or teacher, especially in occupational settings.

Visit <http://www.careervoyages.gov/indemandmagazine-stem-games.cfm>
for the answers to this puzzle, plus information on the hottest jobs of tomorrow.