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Getting an Idea

Imagine living in 1900. You would know about the lightbulb and the steamship. You could see fireworks shows and ride in a train. You could use a safety pin, invented in 1849, a cash register, invented in 1883, and a zipper, invented in 1893. But you would have to wait three years to see the Wright Brothers fly their airplane, ten years to listen to a radio broadcast, fifty-one years before you and your family could watch a black-and-white television, seventy-seven years to use a personal computer, and eighty-nine years to play a video game. Boy, things have changed—thanks to inventions.

All inventions begin with an idea. An inventor looks at an everyday problem and creates a solution. Inventors think about new ways to do things, and some of those inventors are kids.

Even before 1900, kids were inventing things. Here are two examples.

- In 1864, when he was fifteen years old, George Westinghouse worked in his father's factory, where he experimented with ways to improve steam engines. Four years later he gained a patent for a rotary steam engine.
- In 1850, twelve-year-old Mattie Knight of New Hampshire, a girl who was always using her tools to make playthings for her brothers, witnessed an accident at a cotton mill where her brothers worked. A piece of machinery broke off and injured one of the workers. In response, she invented a safety device that the mill owner used to prevent similar accidents. Over her lifetime, Mattie gained twenty-seven patents.

Inventor's Tip

"To get ideas, look at the problems in your life and try to figure out how they could be fixed."

—Krysta Morlan, inventor of the Waterbike

Inventions are new, and they are not obvious. In other words, not just anyone can dream up inventions. When people see an invention, they might say, "Wow, that's great! I've never seen that before. Maybe I could use it."

Some revolutionary inventions, such as the lightbulb, the radio, engines that power trains or automobiles, or the telephone, completely change the way we do things. Others, such as inline skates, the ballpoint pen, or binoculars, improve certain aspects of our lives.

Inventions take many forms. An invention can be an item with no moving parts, like a pencil. It can be a machine, such as an elevator, or a new variety of plant—for example, a tomato. It can be a design for something, such as a chair, or a new concept, like an ice cream cone. It can also be a process, a series of steps. The steps can lead to the production of a drug to fight cancer or other illnesses or to the recipe for a new kind of salad dressing. A process can even be the series of steps to play a game or program a computer.

Inventions that improve on existing inventions are called innovations. The bicycle, for example, is an old idea. Ancient Chinese drawings show two-wheeled vehicles. An Egyptian obelisk is carved with a hieroglyph of a man on a bar mounted on two wheels. When the modern bicycle was invented in 1790, it didn't have pedals. People moved the vehicle by pushing it with their feet. In 1839, when modern pedals were invented, bicycles became much more popular, but riding on wheels made only of metal was a bit rough. With the invention of air-filled tires in 1888, bikes became much more comfortable. Since then, there have been many more innovations in bicycles. Even as you read this, items that we use every day are being improved—everything from televisions and washing machines to tennis racquets and car engines.

Look for a Problem to Solve

What can you invent? How can you come up with ideas that lead to an invention? Thinking of ideas for an invention can be an everyday activity. All year long, we do things over and over again. We eat, sleep, do our chores, go to school, play sports, care for others, listen to music, use the computer, go to the store, talk on the phone, and send messages via computer. Each of our activities is an area that can benefit from inventions. In 1860, the future Sierra Club founder, John Muir, at age seventeen, invented a study desk that automatically turned the pages of a book. Muir displayed his well-crafted invention that year at the Wisconsin State Agricultural Fair.

You will most likely have ideas for inventions that solve problems in your daily life. You're an expert on your chores and on things your family likes or hates to do. You know what works well or doesn't, what's fun or hard. If you live on a farm, you're more likely than a city kid would be to invent something to help with farm chores. If you ride a bike or play soccer, football, or basketball, you may think of inventions related to sports. Kids who are crazy about music or computers usually focus their creativity on those areas. If your parents work in advertising, as plumbers or chemists, in construction, or at any other type of job, you probably know more than you

Brainstorming

Brainstorming is one way to come up with ideas for inventions. Brainstorming means to engage in organized, shared problem solving. You get together with your friends or classmates, pick a topic, and then throw out ideas about it: for example, ideas on how to simplify your chores or make it easier to carry things, or you could think up ideas for a new game. Even though brainstorming is defined as a shared activity, you can also brainstorm by yourself, even while you're involved in other things.

Throw out any idea, even if it sounds really crazy. A few decades ago, a kid was brainstorming and thought of an idea for a remote-controlled vacuum cleaner. It sounded impossible then, but today it exists. Let the ideas fly. Brainstorm about sports, toys, computers, the environment, or community problems. Think of things that concern your family or other families. Throw out ideas as soon as you think of them, then let more ideas come. Let one idea lead to another. Eventually, some of these ideas won't seem so crazy after all. Be sure to jot down all of the ideas in a log or a journal.

realize about these fields. Take advantage of the knowledge that's available in your own house or community.

When inventors look at the world around them and see a problem, they think about how to solve it. For example, Marion Donovan invented the first disposable diaper in 1951. You know the problem that this solved! No more washing dirty diapers. So, be aware of people's problems or needs when you think of ideas for inventions.

If you're like most kids, you'd like your chores to be easier. Think about these activities and the tools you use to perform them. Almost anything around the house can be improved—brooms, rakes, dishwashing sponges, book bags, shovels, or scissors. The list goes on and on.

Inventor's Tip

"Look for something to help out with everyday chores. I had to pick up gumballs every day, so I thought, Surely, there's an easier way."

—Lindsey Clement, 2001 inductee into the National Gallery for America's Young Inventors for the Gumball Machine

Break Problems into Smaller Parts

Problems can often be broken down into separate parts. The whole idea of feeding a pet or polishing the floor may seem like a hassle. You may not like anything about it, but what do you focus on to make it better? Think about it. What exactly is the most annoying aspect of feeding the dog, the cat, or the bird? Or of cleaning the floor? Is it that you don't like having to do it every day? Or that your dog or cat nudges you when you try to put food in the bowl? Maybe you don't like cleaning up afterward?

KIDS INVENTING!

The Edible Pet Spoon

Suzanna Goodin was a first-grader at Hydro Elementary School in Hydro, Oklahoma, in 1987. She didn't like feeding her cats, Cinnamon and Ginger. The cat food stuck to the spoon and was hard to get off. When her twin brother, Sam, told her he was trying to invent something to enter in the Weekly Reader Invention Contest, she thought, What if I invent a spoon that I don't have to wash? What if I could make a spoon the cats could eat? She talked to her mom about it, then made a small spoon out of dough, and baked it. For her invention of the Edible Pet Spoon, Suzanna won the Grand Prize of the Weekly Reader Invention Contest in 1987. (This contest no longer exists, but many other contests have taken its place.) ■

Think about which part of an activity or a job is really the problem. Is the task boring, or does it take too long? Think of how you can make it go more quickly or make it fun. Is something too heavy to carry or too hard to reach? Focus on what might make it easier to carry or reach. Is it too messy? Think of ways to protect yourself from the mess or devise a cleaner way to do the same job. If you look at what annoys you most about the problem, you can focus on finding a specific solution.

KIDS INVENTING!

Sit and Go

Have you ever had to wheel your suitcase for a long distance and you just wanted to sit down for a minute? Well, Renee Steinberg, of Brooklyn, New York, decided to do something about that. She invented Sit and Go, a folding chair attached to a rolling suitcase. It's a seat for travelers. She was a 2004 National Finalist in the Craftsman/NSTA Young Inventors Awards Program. ■

Renee Steinberg sits on her invention, the Sit and Go.

Grip Stick

Alyssa Zordan was a seventh-grader at Torrington Middle School in Torrington, Connecticut, when her science teacher, Mr. Fasciano, challenged her and her classmates to become inventors. Alyssa was thinking about the assignment when she noticed that her grandmother almost slipped as she walked with her cane up the steps to Alyssa's house. She also thought about how her brother's running shoes had spikes on the bottom so that he could get a good grip on the track as he ran. She put the two ideas together to create a retractable metal tube with spikes on the bottom that fit over a cane to help the elderly walk on ice. She called it the Grip Stick. She designed it, then her dad, a shop teacher, helped her build it. During the process she used a metal lathe and a milling machine, and her dad helped her with welding. "I just wanted to win the school contest," said Alyssa. And she did. She also won first place in the grade 6 through 8 division of the 2004 Craftsman/NSTA Young Inventors Awards Program. ■

THE CRAFTSMAN/NSTA YOUNG INVENTORS AWARDS PROGRAM, which began in 1996, challenges students in the United States and its territories in grades 2 through 8 to invent or modify a tool that makes life easier. It is designed to teach students the scientific principles of how tools operate, to introduce them to working with tools, and to enable them to develop practical solutions to everyday problems. Students must work independently to create and conceive their tool inventions, though they may have guidance from an adult. Each student documents his or her progress in an inventor's log and includes a diagram of the tool and a photograph of the student using the tool. The contest is sponsored by Craftsman, a Sears-exclusive tool brand, in conjunction with the National Science Teachers Association.

Think about Improving Something You Already Enjoy

Kids have all sorts of hobbies and interests. Think about your hobby or about the sport you play. In 1963, while in his junior high school wood shop class, eighth-grader Tom Sims thought of something he liked to do. He made a ski-board, attached straps, and headed for the snow. Eventually, he formed a company to manufacture it and helped to launch the sport of snowboarding.

Sports are a great area for invention. Think about what aspect of a sport is scary or unsafe or hard to do. Can you imagine something to make it easier or more fun? Or a safety device that would make it better?

The Trahan Torso Protector

At the Invent Iowa 2003 State Invention Convention, fourth-grader Kevin Trahan, of Dubuque, Iowa, submitted a life jacket–like vest that he called the Trahan Torso Protector. "A lot of kids are scared of the ball," said Kevin, "but with this,

they won't be." Kids playing baseball would wear his vest to protect their chests from balls that are hit or thrown at them. "If they wear it," said Kevin, "it doesn't interfere with their swing, and if a ball hits them right over the heart, they don't get hurt or die." ■

INVENT IOWA, coordinated by the Connie Belin & Jacqueline N. Blank International Center for Gifted Education and Talent Development, is an annual statewide invention program open to students in grades K through 12 who live in Iowa. Over thirty thousand students participate each year in the program, which began in 1987.

The Retractable Bicycle Fender

Kevin Sellars, of Huntington Beach, California, was a seventh-grader when he created the Retractable Bicycle Fender. Kevin knew that many kids who performed jumps and tricks didn't want fenders on their bikes. Yet Kevin had watched a bicyclist get a very muddy shirt after riding a bike with no fender through a puddle. Kevin worked with his godfather, Ben Viola, in Viola's machine shop to make a retractable fender. The four sections of Kevin's fender pull out when fully extended. He was a winner in the 2003 Invent America! Student Invention Contest. ■

INVENT AMERICA! is a nonprofit educational program of the United States Patent Model Foundation. The program, aimed at grades K through 8, was launched in 1987. Schools or families can purchase curriculum kits that include handbooks with step-by-step instructions for developing an invention project. Kits also include contest entry forms for the national Invent America! Student Invention Contest.

Music is an important part of many people's lives. Some people listen to music, and others play it. Some want to invent instruments that make new sounds. Many would like to make their instruments easier to play. Yet others turn their thoughts to inventing.

The Automated Page-Replacing Contrivance

When Christopher Cho, of East Setauket, New York, was in high school, he played the viola, studied at the Juilliard School of Music Pre-College division, won the viola concerto competition in 1995, and performed solo with the Juilliard Pre-College Symphony Orchestra. To make it easier to turn pages of music without interrupting his performances, Christopher invented the battery-powered Automated Page-Replacing Contrivance. When he pressed on a foot pedal, a spring turned and the top sheet of his music would drop, allowing him to see the next page and to keep playing.

He got the idea by watching how food snacks dropped in vending machines. He was a 1996 inductee into the National Gallery for America's Young Inventors. ■

The purpose of the **NATIONAL GALLERY FOR AMERICA'S YOUNG INVENTORS** is to preserve and promote great inventions produced by America's youths. Young people in grades K through 12 who have won a national contest, have gained a patent, or have a product that is being marketed are eligible to apply. Since 1996, six students have been inducted annually. Information about them and their inventions can be viewed at www.pafinc.com.

Let's not leave out toys. There's always room for more toys, and some kids are busy thinking up ideas for new ones.

KIDS INVENTING!

The Light Hand

Shahid Minipara, of San Francisco, came up with the idea of a toy that puts lights on the ends of your fingers, so he made a drawing of his idea and entered the drawing into Wild Planet Toys Inc.'s Kid Inventor Challenge. The company liked the idea, made it into a product called Light Hand, and sold it in stores across the country. On the package is a quote by Shahid: "It's cool to have lights at your fingertips, huh?" ■

Shahid Minipara wearing his invention, the Light Hand.

THE KID INVENTOR CHALLENGE, hosted by Wild Planet Toys Inc., is a contest open to kids age twelve and younger who live in the United States or Canada (excluding Quebec). Kids are asked to invent their own toys by drawing pictures of their toys and writing a brief description. Some kids who enter are selected to be toy consultants for a year. This means that they get lots of free toys and get to give their opinion on them. A select few kids have their ideas for toys made and sold by Wild Planet.

Boogie-2-Boogie

Four Southern California kids formed a team called the Wave Riders when they created Boogie-2-Boogie, a wave-riding board for two. It's fun but also safe for kids. Attached to the nose is a light that's controlled by a transmitter held by a parent on shore. If it's time for the kids to come out of the water, the parent keys the transmitter, which triggers a flashing red light. That alerts the wave-riding duo. The team included sisters Amy, 13, and Alyssa Hansen, 10, and their friends Nicholas Johnsen, 12, and his sister Kaycee, 10. They were the TOYchallenge 2004 winners. Hasbro, one of the sponsors, made action figures of the team members as prizes. ■

TOYCHALLENGE asks kids in grades 5 through 8 to form teams of three to eight members (at least half of each team must consist of girls) and work with an adult coach (eighteen years of age or older). They are asked to create an interactive toy or a game. The astronaut Sally Ride brought Smith College, Hasbro, Sigma Xi, and Sally Ride Science together to launch this challenge to encourage teenagers, especially girls, to be interested in science, math, and engineering.

Maybe computers are your favorite hobby. There are plenty of opportunities to invent things that relate to computers. In the mid-1960s, when computers were large machines used only in offices, thirteen-year-old Steve Wozniak of Sunnyvale, California, built his own computer, a machine that could play tic-tac-toe. He was interested in electronics and was later president of the electronics club at Homestead High School. For the next ten years, he continued building computers in his garage, and in 1977, he presented the Apple II, the personal computer that launched a technology revolution and brought computers to most homes. He was inducted into the National Inventors Hall of Fame in 2000. Other computer kids are following in his footsteps.

LZAC Lossless Data Compression

Allan Chu was in fifth grade when his parents gave him a graphing calculator for his algebra class. He learned how to program it by himself and created many games for it. When he went to Johns Hopkins University's Center for Talented Youth Summer Camp, he took the calculator along. Did he become popular? "My games did," said Allan, who continued with computer inventions as a student at Saratoga High School in Saratoga, California. After being frustrated by the slow pace of downloading files from the Web, he worked on ways to shrink file sizes that were sent over the Internet. He succeeded, thus was able to send e-mails faster, and won first place in the computer science category at the 2002 Intel Science and Engineering Fair. In 2003, Allan was inducted into the National Gallery for America's Young Inventors for his work on the

LZAC Lossless Data Compression, a new algorithm that is suitable for the Internet and handheld devices. (LZAC stands for Abraham Lempel and Jacob Ziv, the fathers of dictionary-based compression, and Allan Chu.) "It achieves the best compression ratio," says Allan, who has also gained two patents for his idea. "It's simple, fast, and economical in terms of memory." ■

THE INTEL INTERNATIONAL SCIENCE AND ENGINEERING FAIR (INTEL ISEF), founded by Science Service in 1950, is the world's largest precollege celebration of science. Held annually in May, Intel ISEF brings together more than thirteen hundred finalists from approximately forty nations in a different U.S. city each year to compete in fourteen categories for over $3 million in scholarships, internships, cash prizes, and science-themed trips. The top prize is the Intel Young Scientist Award, a $50,000 college scholarship.

Think about Solving a Community Problem

Some kids take part in team programs or competitions that challenge them to find solutions to community problems. Participants do research not only by reading books but also by interviewing experts and meeting with community leaders. Sometimes they create an invention to help solve the problem, though in most cases that is not a requirement of the competition. Kids have addressed a variety of community problems.

The Dust Storm Detector

The MVCS Blazers, from Mesilla Valley Christian School in Las Cruces, New Mexico, were aware of the problems caused by dust-churning windstorms in their state. Each year motorists are injured or killed as a result of these weather systems. So team members Seth Chavez, Alex Michel, Scott Miller, and Brian Patterson worked with their team adviser, Alan Fisher, to create a working prototype warning signal that would alert drivers to dust, snow, or heavy rain. The device uses a pen laser pointer beam that is interrupted by the dust particles and activates a relay that turns on a buzzer and light. It can be used to alert the highway patrol of the location of a dust storm. They won third place in the eCYBERMISSION competition in 2003. ■

eCYBERMISSION, an online competition sponsored by the U.S. Army, asks students to use technology to solve a community problem. The army launched this competition in response to a decrease in the number of students interested in science, math, and technology careers and in recognition of the fundamental importance of these careers to the national security and the global competitiveness of the United States.

The Allergen Scanner

The Allergen Scanner is a handheld scanner that can be used by consumers to read the ingredients in products and identify whether any allergens are present. It was invented by the Scanner Patrol team from Pottstown, Pennsylvania. The team was aware that 8 percent of children and 2 percent of adults in the United States have food allergies. It's hard to tell whether these items are in common foods because they go by so many different names on the ingredients list of packaged foods. "We hope to reduce the risk that people will unknowingly ingest an allergen," said team members Jodie Leyfert, Alyse Ameer, Alexa Tietjen, and Ryan McDevitt. The students worked with a coach, science teacher Kristen Haugen. To do their research, the team members consulted sources at the Food and Drug Administration (FDA) and experts in bar code and database technologies, along with studying the labels of hundreds of food items. Then they developed their own handheld scanner system to detect eight different allergens that go by close to a hundred different names, depending on the manufacturer. The team members tested the scanner on actual product labels, and it worked. In 2004, they won the $25,000 Christopher Columbus Foundation Community Grant to develop their scanner. ■

CHRISTOPHER COLUMBUS AWARDS is a program sponsored by the Christopher Columbus Foundation in cooperation with the National Science Foundation. The program focuses on middle school students, whom it calls the Innovation Generation, and its mission is to tap their creative problem-solving potential. With the help of an adult coach, sixth- through eighth-grade students work in teams of three or four; identify a community issue; do research and consult with experts, including scientists, businesspeople, and legislators; and use science and technology to develop an innovative solution to the problem.

Avalanche Search and Survey Helicopter

Snow conditions are a continual concern in Alaska. A team of students from Alaska's East Anchorage High School proposed a solution. The students won a 2004 InvenTeams grant and worked on their design of a low-cost prototype snow robot to collect data on evolving snow conditions in high-risk, human-used areas where avalanches most often occur. ■

INVENTEAMS is a national Lemelson-MIT program. Acknowledging that most of today's inventions are created by teams, this program asks students to identify a problem that they want to address with an invention and provides them with funding to develop a prototype.

The Land Mine Protector and the Cardio-Mate

Land mines that explode unexpectedly are the cause of death and mutilation in many places around the world. In 2003, a team from Cape Henry Collegiate School in Virginia Beach, Virginia, won first place in the grades 7 through 9 category of the ExploraVision Awards for envisioning a future technology. The team's idea was for the Land Mine Protector, an unmanned dinner-plate-size aircraft that uses the Global Positioning System (GPS), a neuron-timing device, and sound waves to detect and destroy land mines without risk to human life. Another team, from Santa Rosa, California, envisioned the Cardio-Mate, a device that could be inserted in a coronary artery to detect heart failure and apply remedies, both medicinal and electronic. It could also alert health-care personnel using a miniaturized GPS. Check out the Web pages of both teams at www.exploravision.org and look under "Past Winners." ■

EXPLORAVISION AWARDS, a competition sponsored by Toshiba and the National Science Teachers Association, which is open to students in grades K through 12 in the United States and Canada, asks entrants to study a present technology and envision its future. Its goal is to motivate students to think about their role in the future and to use creativity while applying their knowledge of science.

Think about the Needs of Others

Sometimes, if you can't think of an idea for an invention, you can focus on the needs of others, such as people close to home—a classmate, a friend, or even someone in your family.

The PaceMate

When Brandon A. Whale, of Pittsburgh, Pennsylvania, was eight years old, he was concerned about his mom, Danette Rocco, who had a pacemaker. On a regular basis, she had to send an EKG (electrocardiogram) to her doctors via the telephone. She wore special bracelets on each wrist that plugged into the phone. Electrodes in the bracelets detected her pulse. When she held a magnet up to her pacemaker, near her heart, the magnet would open up a switch in the pacemaker that allowed a transmission to be sent. Doctors could check whether the battery had power and how well her pacemaker was working.

The problem? "My mom has thin wrists," said Brandon, "and the bracelets were too big." The loose connection made it difficult for the sensors to detect her pulse. To compensate, his mom would hold her wrists against a table, pressing on the sensors.

INVENTION CONVENTION is a general term used by many schools and school districts for an invention lesson that culminates in an invention fair.

(Left) Brandon Whale at the 1998 induction of the National Gallery for America's Young Inventors, displaying parts of his invention, the PaceMate. (Above) Brandon showing his invention to Dr. Wilson Greatbatch, the inventor of the pacemaker.

When she had to lift her hand to place the magnet up to her pacemaker, the bracelet didn't have the correct pressure. "My brother, Spencer, and I would hold the bracelet on her wrist when we were home," he said, "but what if I wasn't home? I wanted to make it easier for her." He solved the pressure problem by replacing the metal band with a hand-sewn elastic band. Then he attacked a second problem: interference. "We live in a townhouse," said Brandon, "and we had to turn off our radios and TVs and ask our neighbors to turn off some of theirs to do the transmission." Through research, though, Brandon discovered that both water and electrolytes are good conductors of electricity.

So he soaked small pieces of sponges in Pedialyte, a beverage made of water and electrolytes. He placed the sponges between his mom's wrist and the bracelet, ran tests over the phone line, and checked with her doctors at the cardiac clinic about the transmissions. The improvement was marked. "After that," said Brandon, "all my mom had to do was tear open one of the Pedialyte-soaked sponges and use it when sending the transmission." Brandon called his invention the PaceMate. It was an outstanding project at the Invention Convention of his Pittsburgh elementary school. In 1998, when Brandon was inducted into the National Gallery for America's Young Inventors, Dr. Wilson Greatbatch, the inventor of the pacemaker, presented him with the award. ■

If you still can't think of an idea for an invention, ask other people about their problems or needs. See if some aspect of their lives causes difficulties for which you can imagine a solution.

KidKare Cars

After Brandon Whale invented the PaceMate, his younger brother, Spencer, a first-grader, wanted to be an inventor, too. He was stuck for an idea, but then he thought, "Why not ask kids who are in the hospital for long periods of time, kids with cancer or other diseases, about their problems and what they'd like to see invented?" So he and his mom made arrangements to visit Children's Hospital of Pittsburgh. "While I was there, I noticed these little kids riding around in little toy cars," said Spencer. "Their moms and the nurses were running behind pushing the IV poles. When the kids would speed up, the tubes got caught in the wheels. Sometimes the parents couldn't keep up," he said. "And I realized that the kids couldn't ride the cars if the nurses weren't available or their parents weren't there."

Inventor's Tip

"If you have an idea, stay with it, no matter how dumb you think it sounds. If it solves a problem and helps you, chances are it will do the same for any number of people."

—Austin Meggitt, 1999 inductee into the National Gallery for America's Young Inventors for the Glove and Battie Caddie

Spencer's idea? To make a toy car with an IV pole attached. First, he wanted to build a prototype, but unfortunately, he didn't have a toy car, an IV pole, or the money to buy them. He decided to enter only the idea for what he called "KidKare ride toys" into a monthly contest called Student Ideas for a Better America, which awards a $100 prize. He won! Although he was ready to spend his own money on buying a toy car, he received a nice surprise. The owner of Step 2 Ride Equipment in Streetsboro, Ohio, had read a newspaper article about Spencer's plan and pitched in by donating toy cars and a wagon.

The project was under way. Children's Hospital of Pittsburgh donated broken IV poles. Then, Spencer's grandmother got into the act. She worked at Duquesne Light Company, where several mechanics donated their free time to weld the IV poles onto the toy cars. Spencer decorated the IV poles with colored tape. The cars are now used at the Children's Hospital in Pittsburgh.

Winthrop-University Hospital in Mineola, New York, heard of the project and wanted some KidKare ride toys, too. The hospital invited Spencer to visit and arranged for six cars to be constructed as an Eagle Scout project under Spencer's supervision. "How cool is that?" said Maxine Andrade of the Cancer Center for Kids at the hospital. "Children are still children, even on chemotherapy. Parents have told me how much they appreciate these cars." In 2000, Spencer, at age eight, was inducted into the National Gallery for America's Young Inventors. ■

STUDENT IDEAS FOR A BETTER AMERICA is a monthly contest open to students (grades K through 8 and 9 through 12) sponsored by the Partnership for America's Future, a nonprofit organization that also sponsors the National Gallery for America's Young Inventors. Students are asked to think only of an idea, not to create a model, for a new product or an improvement on an existing product. The goal is to encourage the learning, insight, creativity, and workmanship of America's students and to demonstrate that valuable ideas can be created by America's youths.

Find an Idea through Research

Sometimes you can find the solution for a problem almost by accident. In 1970, Stephanie Kwolek, a research scientist at Du Pont, was experimenting with polymers when she created one that a technician was hesitant to spin into a fiber for fear it would clog the spinneret. Stephanie had her doubts as well but reviewed her work and convinced the technician to try. The spun fiber is now known as Kevlar. It is lightweight yet five times stronger than steel and is used to make airplanes, skis, bulletproof vests, and many other things.

You might be doing research on a subject when you read about a problem you think you can solve. Keep researching and start experimenting, and you may just have your invention.

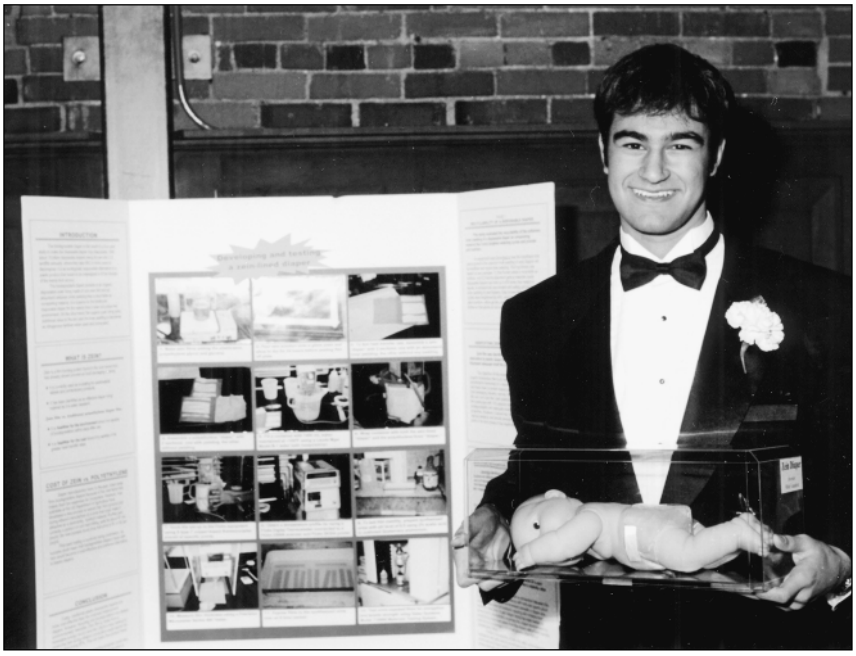
The Microelectrochemical Sensor and Plating System

Elina Onitskansky read an article about the economic difficulties that corporations face in trying to meet Environmental Protection Agency (EPA) standards regarding water pollution and the adverse effects it has on the environment. Elina, a student at Hathaway Brown School in Shaker Heights, Ohio, felt inspired to do something about it. Currently, the cost of water cleanup is huge, and detection involves complex technology that can't be run continuously. As part of her school's research program, Elina worked with mentor Dr. Chung Chiun Liu and other scientists in a lab at Case Western Reserve University, which specializes in sensor technology. She used the lab facilities to create her own sensor. It is about three-quarters of an inch in size, costs about $25, and will simultaneously detect six of the most common metallic ion water pollutants in real time. Then, her electroplating system will remove the offensive metals from the water, cleaning it up! She hopes that her sensors will be used in streams and pipes that lead away from factories. She was a semifinalist at the Siemens Westinghouse Competition in Math, Science & Technology and a 2001 inductee into the National Gallery for America's Young Inventors. ■

THE SIEMENS WESTINGHOUSE COMPETITION IN MATH, SCIENCE & TECHNOLOGY is open to high school students, either as individuals or in teams of two or three. Regional winners advance to the national competition in Washington, D.C. The competition is administered by the College Board and funded by the Siemens Foundation.

Biodegradable Disposable Diaper

When fourteen-year-old Rishi Vasudeva was trying to think of a science fair project for his ninth-grade biology class at Roswell High School in Roswell, Georgia, he happened to watch a diaper commercial on television. "I jokingly chose



Rishi Vasudeva with his display for a biodegradable disposable diaper.

diapers as my topic," said Rishi. Once he discovered that the water-repellent outer lining of disposable diapers takes more than four hundred years to degrade, he grew concerned. Billions of them are dumped yearly into landfills around the country. "My interest moved quickly away from it being simply a joke," he said. He spent the next four years developing a better diaper. An internship at the Department of Agriculture was part of his studies. He eventually started working with zein, a protein made from corn that is currently used as a coating for pills. He was able to create a film out of zein and other materials to serve as an outer lining for diapers. His zein-lined diaper degrades in about thirty days and is seven times cooler than others on the shelves. Rishi was a regional finalist in the Siemens Westinghouse Competition in Math, Science & Technology in 2000. In 2001, Rishi was inducted into the National Gallery for America's Young Inventors and was a finalist in the Intel Science Talent Search. ■

THE INTEL SCIENCE TALENT SEARCH (STS), often called the "junior Nobel Prize," was created in 1942. Each year, forty finalists (taken from three hundred semifinalists and more than fifteen hundred applicants) come to Washington, D.C., to participate in the Science Talent Institute. There they present their work to the media and the general public at the National Academy of Sciences and are judged on their scientific knowledge as they compete for the top prize—a $100,000 college scholarship.

The Effect of Neem Oil on Mosquitoes

Peter Borden was living in Fort Myers, Florida, where mosquitoes are a public health threat. "I like going outside," said Peter, "and in Florida in the summer, especially at night, you can get eaten alive." The seventh-grader at Canterbury School decided to research the topic of mosquitoes and discovered that the insecticide cities used to control them is very toxic. Peter wanted to find a safer alternative and under the guidance of his science teacher, Dr. Betsy Glass, arranged to conduct experiments in a county mosquito lab. He started experimenting with the oil of the neem tree, a biodegradable, environmentally friendly substance used to kill some insects, including mosquitoes. "He discovered the proper concentration of neem oil to place in a water-filled beaker that could be used to kill all the mosquitoes," said Glass, "but not be harmful to humans or other beneficial organisms." Peter was a 2003 finalist in the Discovery Channel Young Scientist Challenge. ■

THE DISCOVERY CHANNEL YOUNG SCIENTIST CHALLENGE was launched by Discovery Communications, Inc., in partnership with Science Service, to nurture the next generation of American scientists at a critical age when interest in science begins to decline. More than sixty thousand middle school students from around the country enter science projects in one of the science and engineering fairs affiliated with Science Service; then, six thousand of them are nominated by their fair directors to enter their projects in the Discovery Channel Young Scientist Challenge, a program that does not require but sometimes results in inventions.

Find a Use for Something You Discover

As you work on a project, you may discover things or come to realizations that surprise you. In 1968, Dr. Spencer Silver, a scientist at the 3M Company, was trying to develop a strong adhesive but created a weak one instead. He added it to paper, but since it wasn't very strong, he didn't think much about it. He shared some of the paper with his friend, Art Fry, who used the paper to mark the pages in his hymnal while singing in the church choir. He liked that the paper could easily stick on, then peel off again—and that's how the Post-it was invented.

Knowing what to do with a discovery is an important part of the inventing process. A talented inventor will see possibilities that others don't. One young inventor made a discovery, then was prompted to find a use for it—an invention.

Fenugreek-Treated Paper

Kavita Shukla, of Maryland, was in middle school when she started her research on fenugreek, an Indian herb used to spice food.

It was on trips to India to visit her grandparents that she first learned about the spice from her grandmother, who gave Kavita a drink of water mixed with a bit of fenugreek powder after Kavita drank some tap water. "The tap water in India is often contaminated with bacteria," said Kavita. "When I didn't get sick, I became curious."

After returning home, she began to do some experiments on fenugreek, which began quite simply and became more complicated as she continued her research in high school. Kavita's first step was to gather samples of polluted water from her backyard and from bacteria-infested ponds. In the kitchen, she added various concentrations of gold-colored fenugreek powder. When Kavita checked on the water samples, they didn't look like water mixed with fenugreek powder. Instead, the fenugreek powder formed clumps in the water. To remove the bacteria and the fenugreek, she could just scoop out the clump.

"It was very impressive," said Kavita. Then she accidentally left one of the pond water samples alone for a few weeks. The next time she looked at it, she saw that the bacteria had not grown in the sample. It happened to be the sample that contained fenugreek powder. "That's what gave me the idea to start doing bacterial and fungal growth experiments," said Kavita.

Then, one day her mom came home from shopping with a package of strawberries. "Most of the strawberries were rotten," said Kavita, who then wondered whether fenugreek mixed with water could be sprayed on strawberries at the farm or once they were packaged. Would that inhibit bacterial or fungal growth and keep them fresh?

Kavita Shukla, the inventor of Fenugreek-Treated Paper, in the lab.

She mixed water and fenugreek, put it in a spray bottle, and sprayed the mixture on the good strawberries. "The spray was very effective. It slowed down the rotting process," she said, "and the strawberries tasted better." Next, Kavita wondered if fenugreek could be used as a packaging material for food. She needed to prove her idea, so she set up three experiments with paper towels. First, she soaked a paper towel with a mixture of fenugreek and water, let it dry, and set some strawberries on it. Then, she soaked another paper towel in detergent mixed with water, let it dry, and set strawberries on it as well. Finally, to see the

difference between what would happen with the treated paper towel and the nontreated paper towel, she set out an ordinary paper towel and put strawberries on it.

Kavita waited and observed. Her fenugreek-treated paper towel kept the strawberries fresh much longer than the other paper towels did. What a discovery! A natural, nontoxic, biodegradable way to preserve food.

"It was very simple, and that's why it is so useful," said Kavita. "It can be used very easily in third-world countries." She was granted a patent for her fenugreek-treated paper in the spring of 2002. Several companies have approached her about using her process. "I want to make sure," she added, "that it's able to reach all the people who would benefit from this invention, especially those in third-world countries." In 2001, she was inducted into the National Gallery for America's Young Inventors. She has won numerous awards and was also the recipient of the Lemelson-MIT High School Invention Apprenticeship in 2002. ■

Is Your Idea an Invention?

You think you have a great idea for an invention. Okay, you've got one more step: find out whether anyone else has thought of the idea. Ask your family and your classmates whether they've ever heard of or seen a product like your invention. Ask your neighbors. Visit a store that handles products similar to yours, and inspect the shelves for anything that resembles your idea. Ask clerks whether they know of any products like yours. Find magazines or catalogues with ads showing products in the same category as your idea (that is, toy, sport, kitchen, or household magazines). Then check the Internet. Use a search engine such as Google and type in search words that describe your idea for an invention. Lots of stores, supply houses, catalogues, and magazines have Web sites that feature products. What were the results of your search?

If you haven't found anything like your product on the market, great! If you find something similar, don't get discouraged. Many inventions are very much like another invention except for a small change. That's what *new* means. Examine the product. Think about how your idea is different and how you can improve on the existing product.

Inventor's Tip

"The biggest thing is to find a good problem. For a contest, you want something that everybody can relate to, so that right when they see it, they say, 'That's a great idea.'"

—Charles Johnson, national champion, 1996 Invent America! Student Invention Contest for the Train Detecting Device

Activities

1. Brainstorm Ideas for Inventions

   Brainstorming means to engage in organized shared problem solving. Many inventors, old and young, brainstorm to think of ideas. No criticism is allowed. Crazy ideas are encouraged. To get started, pick a subject, then throw out any ideas you have about it. For example,

- Think of all the things you do every day or on holidays or weekends. Then, think about any problems, things that bug you about doing them, or ways to make them better.
- Think about all the tools or utensils you use in an ordinary day—fork, knife, toothbrush, shovel, broom, scissors, and so on. What would make them easier to use? Or better?
- Go from room to room in your house. Brainstorm ideas as you look at items in the kitchen, the bathroom, the den, the bedroom, and so on. Could you use an ordinary item for a new purpose? Or make it out of a different material?
- Combine two or more existing objects to create a new one—for example, a fork and a spoon.
- Pick any invention that you have in your home or classroom. Envision an improvement for it twenty years in the future. (Note: If you like this activity, you might be interested in the ExploraVision Competition. Check out www.exploravision.com for more information.)

2. Do a Survey

   Inventing with a specific person or need in mind is often a good idea. Ask others what they need. Even if another person thinks of the idea, the real problem is making a model of the idea and proving that it can work. That's your job. Use the following questions to start. Then, add your own questions to the survey.

   Chores

   a. Which household activities do you hate to do?
   b. What is it about them that you don't like?
   c. What would make them easier?

   Sports

   a. What is your favorite leisure activity or sport?
   b. Do you have any problems in doing the activity? For example, are you too hot or too cold, do you fall down or run into things?
   c. What would make the activity easier, safer, or more fun?

   There are lots of other categories to do surveys about. Make up a survey about an area that interests you.

3. List Some Problems and Solutions

   Chores: Kids and adults have to do chores around the house or in the yard. List some of your chores and the problems that come up when you do them. Can you think of ways to make these chores easier?

Common Chores	What problems come up in doing these chores?	What would make the chores easier to do?	Any invention ideas?

People's Needs: Think about people and their needs when looking for ideas. Use this table to list some problems experienced by different types of people.

Kinds of people	What problems do they face?	What would help them with these problems?	Any invention ideas?
Babies			
Toddlers			
Kids who play sports			
Physically impaired people			
Older people			

A Better World: How can you help make the world a better place with an invention? Use this table to list problems experienced all over the world, and think about ways to solve them.

Issue	What are the problems?	What would make the situation better?	Any invention ideas?
Environment			
Safety			
Natural disasters			