



National Science Resources Center

THE NATIONAL ACADEMIES  Smithsonian Institution



20 Scientists Who Have Helped Shape Our World

One hundred years ago, in 1905, the greatest scientific mind of the 20th century wondered what would happen if one were to move away from a clock at the speed of light. Albert Einstein deduced that the clock would appear to stop, with time forever frozen at the moment of departure. From a question that few could imagine even asking, Einstein developed the theory of general relativity, expressed by the equation $E=mc^2$, and changed the way we see our world as part of the larger universe.*

Fifty years ago, in 1955, physician Jonas Salk and a team of researchers at the University of Pittsburgh released the first vaccine against the crippling disease polio. The Salk vaccine, which was developed from “killed” polio virus, and the later Sabin polio vaccine, which was developed from a live but weakened virus, virtually eliminated the disease where they have remained in use. Dr. Salk declined to patent his vaccine, forsaking direct personal gain, but he did use his newfound fame to further his research interests.

Twenty years ago, in 1985, the National Science Resources Center (NSRC), an organization of the Smithsonian Institution and the National Academies, was founded to help improve the quality of science learning and teaching. As we celebrate our 20th year of working with school districts to improve science education programs, we also celebrate the work of 20 singular scientists.

Each of these scientists has changed our world—some in subtle ways, some heroically. Some are well known for their achievements; some are largely unknown outside of their chosen fields. Most continue their work today, but even those who have passed on continue to influence the work of contemporary scientists. None could have accomplished what they did without the sense of wonder, the self-discipline, or the persistence that fuel scientific discovery. All provide examples for today’s students who have an interest in a career in science.

1. Richard Alley, Geologist—Tracking Climate Change

Some people tell time by looking at a clock. Richard Alley, professor of geosciences at Penn State University in State College, Pennsylvania, looks at ice.

Because Penn State doesn’t have permanent ice cover, Dr. Alley has spent much of his time in Greenland, Antarctica, Alaska, and the National Ice Core Laboratory in Denver, Colorado. He works in these cold places because his research focuses on abrupt climate change, glaciers, ice sheet collapse, and sea level change.

Dr. Alley’s research is especially important now because many scientists believe that human activities are changing the Earth’s climate. These scientists think that gases released by factories and cars are trapping heat near the Earth’s surface. As a result, they say, the Earth is becoming warmer and the weather less predictable.

What does this have to do with ice? As snow piles up on an ice sheet, it squeezes the snow beneath until the air spaces are pinched off to make bubbles. Scientists determine the age of the ice, often by counting tree-ring-like annual layers, and then analyze the composition of the air in those bubbles. The research tells us that Nature is capable of big, fast changes; past climate

* The year 2005 has been designated The Year of Physics in honor of the pioneering papers that Albert Einstein published in 1905. Events throughout the year will highlight the vitality of physics and its importance in the new millennium.

changes have been far more abrupt than the gradual warming that we have been experiencing during recent years.

When he's not working in the ice, Dr. Alley coaches youth soccer, and plays soccer as well.

For more information: <http://www.geosc.psu.edu/people/faculty/personalpages/ralley/>

2. Tim Berners-Lee, Computer Scientist—Inventor of the World Wide Web

A computer program originally written to help a scientist keep track of his colleagues and projects has morphed in less than a quarter of a century to the information-sharing system known as the World Wide Web. The program was the brainchild of Englishman Tim Berners-Lee, who in 1980 was working in a temporary job at CERN, the European Particle Physics Laboratory in Geneva, Switzerland.

Berners-Lee called his program "Enquire" because it allowed him to ask questions about—and get answers to—the work of his colleagues. Enquire is based on hypertext, a format that allows a computer user to move instantly between documents. The platform for hypertext is the Internet, a network of computer networks that was originally established for the exchange of scientific information. Enquire allowed scientists to explore documents within the Internet regardless of the format of the document.

Eventually, other Web browsers were developed and the Web became far more than a medium for scientific exchange. But Berners-Lee has worked to keep it open, nonproprietary, and free. In 1994, he founded the World Wide Web consortium at the Massachusetts Institute of Technology's Laboratory for Computer Science and since then has served as the consortium's director.

For more information: <http://www.w3.org/People/Berners-Lee/>

3. Norman Borlaug, Plant Scientist—"Father of the Green Revolution"

Some people win the Nobel Peace Prize for stopping wars. Norman Borlaug won the prize for feeding people—or more accurately, for helping people learn how to feed themselves. While others were wringing their hands about the world's population "explosion," Dr. Borlaug did something about it.

Born on a farm in Iowa, Dr. Borlaug studied forestry and plant diseases in college. He conducted research on plant diseases before directing the Cooperative Wheat Research and Production Program in Mexico from the mid-1940s until 1979. Under this program, Dr. Borlaug and his team developed many high-yielding, sturdy varieties of wheat varieties that also were resistant to disease.

Developing the improved wheat varieties was not enough for Dr. Borlaug. He then arranged to help countries plant the new wheat on vast acreages of land, especially in India, Pakistan, Mexico and other Latin American countries, the Middle East, and China. The results of Dr. Borlaug's work are encouraging: India, for example, harvests six times more wheat today than it did only 40 years ago. This increase in wheat production in poor countries has been called the "Green Revolution." It has been written about Dr. Borlaug that he has saved more lives than anyone else who ever lived. For his scientific achievements, Dr. Borlaug was awarded the 1970 Nobel Peace Prize.

Today, at age 90, Dr. Borlaug remains active in science as a distinguished professor of international agriculture at Texas A&M University, President of Sasakawa Africa Association, and senior consultant to the director general of the International Maize and Wheat Improvement Center in Mexico. He was elected to the National Academy of Sciences in 1968.

For more information: <http://www.nobelprize.org/peace/laureates/1970/borlaug-bio.html>

4. Linda Buck, Molecular Biologist—Detecting and Understanding Odors

Ever wonder why some smells make us happy, hungry, or bring back memories? Some odors, or pheromones, even initiate behaviors or physiological effects in mammals. What's going on in the brain when your nose smells something? Dr. Linda Buck wanted to know, and her desire to understand has led her to a career studying how odors are detected in the nose and then translated as perceptions in the brain.

Born in Seattle, Washington, Dr. Buck holds a Ph.D. from the University of Texas Southwestern Medical Center at Dallas, in Immunology. She has focused her work on molecular biology—all the better to understand those molecules entering our noses! Dr. Buck's work on the organization of

the olfactory system won her the Nobel Prize in 2004. She has been a member of the National Academy of Sciences since 2003.

During an interview held after winning the Nobel Prize, Dr. Buck advised students whose wish may be to win a Nobel Prize in the future. "What I always tell my students is that it's important to do something, to study something that fascinates you. Pick a problem that you're extremely interested in.... You want to do something that you're obsessed with, that you just have to understand, because that's where the joy comes from. That also, I think, is where the great discoveries come from, for people are really trying to try to figure out things that they don't understand." (BBC news article)

For more information: <http://www.hhmi.org/research/investigators/buck.html>;
<http://myprofile.cos.com/lbuck>

5. Dr. Benjamin Carson, Pediatric neurosurgeon—Saving Children

As a child growing up in extreme poverty in Detroit, Benjamin Carson was at the bottom of his class. He thought he could not learn. But when he was in fifth grade, his mother demanded that he watch less television and read more books. By the following year, he was at the top of his class.

After graduating with honors from high school, he studied psychology at Yale and attended medical school at the University of Michigan. Dr. Carson completed his residency in neurosurgery (neurosurgery involves the body's nerves, brain, or spinal cord) at one of the world's foremost teaching hospitals, The Johns Hopkins Hospital in Baltimore, Maryland, and became director of Pediatric Neurosurgery there in 1984 at the age of 33.

In 1987, Dr. Carson led a 70-member surgical team in a 28-hour operation to separate a pair of conjoined twins—also known as Siamese twins—who were joined at the back of their heads. The operation was the first in which both twins survived. Dr. Carson has since performed other operations to separate conjoined twins and has pioneered other surgical procedures on infants and unborn children.

A sought-after motivational speaker and author, Dr. Carson also enjoys listening to the music of his wife and three sons, who compose the Carson Four, an accomplished string quartet.

For more information: <http://www.hopkinsmedicine.org/stlm/carson.html>

6. Rachel Carson, Science Writer and Environmentalist (1907–1964)—“Silent Spring”

Born in May of 1907, Rachel Carson had a rugged upbringing in a simple farmhouse outside the western Pennsylvania river town of Springdale. She credited her mother with introducing her to the world of nature that became her lifelong passion.

Carson entered Pennsylvania College for Women (now Chatham College) in 1925 and graduated with honors in 1929 earning a scholarship to continue her studies at Johns Hopkins, University in Baltimore, MD. In 1932 she earned an M.A. in Zoology from John Hopkins University. After completing her education, Carson joined the U. S. Bureau of Fisheries as the writer of a radio show entitled "Romance Under the Waters," in which she was able to explore life under the seas and bring it to listeners. In 1936, after being the first woman to take and pass the civil service test, the Bureau of Fisheries hired her as a full-time junior biologist, and over the next 15 years, she rose in the ranks until she was the chief editor of all publications for the U.S. Fish and Wildlife Service.

During the 1940s, Carson began to write books on her observations of life under the sea, a world as yet unknown to the majority of people. She resigned from her government position in 1952 in order to devote all her time to writing. The idea for her most famous book, *Silent Spring*, emerged, and she began writing it in 1957. It was published in 1962, and influenced President Kennedy, who had read it, to call for testing of the chemicals mentioned in the book. Carson has been called the mother of the modern environmental movement.

For more information: <http://www.rachelcarson.org/>

7. George Washington Carver, Inventor/Chemist (1861–1943)—Saving Agriculture in the South

George Washington Carver, the son of a slave, helped revolutionize the agricultural economy of the South. Forced by the social mores of his time, Carver graduated from Iowa State Agricultural

College (now Iowa State University), where he earned a bachelor's degree in agricultural science in 1894 and a master of science degree in 1896.

Carver went to Alabama in 1896 to direct the newly organized department of agriculture at the Tuskegee Institute. He devoted his time to research projects that demonstrated how farmers could improve their economic situation. He encouraged farmers to switch from continuous cultivation of cotton to the soil-enriching crops peanuts and soybeans. Carver ultimately developed 300 derivative products from peanuts—among them cheese, milk, coffee, flour, ink, dyes, plastics, wood stains, soap, linoleum, medicinal oils, and cosmetics—and 118 from sweet potatoes, including flour, vinegar, molasses, rubber, ink, a synthetic rubber, and postage stamp glue.

Carver's efforts finally helped liberate the South from its excessive dependence on cotton. His great desire in later life was simply to serve humanity; his work, which began for the sake of the poorest of the black sharecroppers, paved the way for a better life for the entire South. By 1940, largely as a result of Carver's work, the peanut had become one of the six leading crops throughout the United States and, in the South, the second cash crop (after cotton). A few years before his death, Carver donated his life savings to the establishment of the Carver Research Foundation at Tuskegee for continuing research in agriculture.

For more information: Rackham Holt, George Washington Carver: An American Biography, rev. ed. (1963); Linda O. McMurry, George Washington Carver, Scientist and Symbol (1981).

8. Eugenie Clark, Marine Biologist—"The Shark Lady"

A world-renowned ichthyologist (a scientist who studies fish) and authority on sharks who is popularly known as the "Shark Lady," Dr. Clark is a Senior Research Scientist and Professor Emerita in the Department of Biology at the University of Maryland at College Park, where she joined the faculty in 1968. She was a research assistant at Scripps Institution of Oceanography, at the New York Zoological Society, and at the American Museum of Natural History in New York. She continues her research at the Mote Marine Labs, a leading center for shark research in Sarasota, Florida.

Dr. Clark's latest research projects concern the behavior of tropical sand fishes and deep sea sharks. These studies have been featured in 12 articles she has written for *National Geographic* magazine; in all, she has authored three books and more than 160 scientific and popular articles, and she has conducted 71 deep submersible dives.

Dr. Clark has served as a consultant and/or narrator, co-director, or principal in 24 half-hour or one-hour television specials in the United States, Australia, England, Egypt, Israel, Japan, and Mexico. "The Sharks", a National Geographic special (1982), holds the highest Nielson rating on PBS. "Naturewatch: Ras Mohammed National Marine Park" (1985) received the Best Film Award at the Wildscreen International Film Festival. "The Great Sharks," released in May 1993, was the first IMAX film on sharks.

For more information: <http://www.sharklady.com/>.

9. Francis Harry Compton Crick, Biologist (1916–2004)—"The Secret of Life"

Along with American collaborator James Watson, English scientist Francis Crick discovered the double-helix structure of deoxyribonucleic acid—DNA—the material that carries life's hereditary information. Like most scientific discoveries, this one built upon the work of others, including Maurice Wilkins, with whom Crick and Watson shared the Nobel Prize for physiology/medicine in 1962. Other research pathfinders were Rosalind Franklin, whose research ended in 1958 with her early death from cancer, and Linus Pauling. And like many scientific discoveries, this one spawned later discoveries and practical applications, including biotechnology.

Crick was something of a scientific jack-of-all-trades. His early physics studies were interrupted by World War II, when he served as a scientist working on magnetic and acoustic mines. Following the war, he studied biology and organic chemistry. His relationship with Watson began in 1951, and within three years the two had proposed the double-helical structure of DNA.

Crick's adherence to the scientific method was legendary. Upon Crick's death in 2004, Watson said that "Crick held no truck with truths arrived at by religious revelation as opposed to observation and experimentation."

For more information: <http://nobelprize.org/medicine/laureates/1962/crick-bio.html>;
<http://www.time.com/time/time100/scientist/profile/watsoncrick.html>

10. Sylvia Earle, Marine Scientist and Explorer—"Her Deepness"

Sylvia Earle's 60-plus diving expeditions have kept her underwater for more than 7,000 hours—better than ten months in all. Interested in all facets of the ocean environment, Dr. Earle has studied organisms as diverse as aquatic plant life, sperm whales, and coral reefs. Her work has earned acclaim as *Time* magazine's first "hero for the planet" and recognition by the Library of Congress as a Living Legend. She has been called "Her Deepness" for the world's deepest solo dive (nearly two-thirds of a mile beneath the surface—a depth previously reached only by submarine), and has earned induction into the National Women's Hall of Fame and the Women Divers Hall of Fame.

Dr. Earle has led or participated in several milestone projects, including the Sustainable Seas Expeditions, a five-year project for the National Geographic Society; the Victorian National Parks Association (Australia) for establishment of marine national parks and protection of the Great Barrier Reef; and studies of the effects of the 1989 *Exxon Valdez* oil spill in Alaska.

A prolific author of several scientific and children's books and more than 100 scientific papers, Dr. Earle has also collaborated on underwater documentary films.

Dr. Earle is a past member of the National Science Resources Center's National Advisory Board.

For more information: http://www.nationalgeographic.com/council/eir/bio_earle.html;
<http://literati.net/Earle/>

11. Stephen Hawking, Physicist—Beyond Black Holes

Born on the 300th anniversary of Galileo's death, Stephen Hawking has come to be thought of as the greatest mind in physics since Albert Einstein. With similar interests—discovering the deepest workings of the universe—he has been able to communicate arcane matters not just to other physicists but to the general public.

Until Hawking's work, it had always been thought that nothing could escape a black hole; Hawking suggested that under certain conditions, a black hole could emit subatomic particles, a phenomenon now known as Hawking Radiation. He continued working on the theory of the origin of the universe, and in doing so found ways to link relativity (gravity) with quantum mechanics (the inner workings of atoms). This contributed enormously to what physicists call Grand Unified Theory, a way of explaining, in one equation, all physical matter in the universe.

In 1988 Hawking wrote *A Brief History of Time: From the Big Bang to Black Holes*, explaining the evolution of his thinking about the cosmos for a general audience. The book became a best-seller and established his reputation as an accessible genius. Dr. Hawking wrote other popular articles and appeared in movies and television. He remains extremely busy, his work hardly slowed by Lou Gehrig's disease (amyotrophic lateral sclerosis, a disease that affects muscle control) for which he uses a wheelchair and speaks through a computer and voice synthesizer. "My goal is simple. It is complete understanding of the universe, why it is as it is and why it exists at all."

Hawking is an associate of the Smithsonian-Harvard Astrophysical Laboratory in Cambridge, Massachusetts, and a member of the National Academy of Sciences.

Adapted from a copyrighted article by WBGH on PBS Online. For more information:
<http://www.pbs.org/wnet/hawking/html/home.html>; <http://www.hawking.org.uk/>.

12. Ayanna Howard, Engineer—Robotics Pioneer

Some people watching the Bionic Woman television show in the 1970s daydreamed about *being* the next Bionic Woman. As a child, Dr. Ayanna Howard knew that she wanted to *build* the next Bionic Woman. As a result, Dr. Howard earned a B.S. in Computer Engineering from Brown University and an M.S. and Ph.D. in Electrical Engineering from the University of Southern California.

Dr. Howard's specialty is in robotics, artificial intelligence, and machine vision. Her work at NASA's Jet Propulsion Laboratory has helped to put robots on Mars to explore the planetary surface.

Dr. Howard also has a soft spot for kids. She founded the Pasadena Delta Academy, a non-profit program that finds mentors for young "at-risk" girls and encourages them to pursue careers in math and science. Dr. Howard also speaks to students around the world about the wonders of robotics, computers, and technology.

For more information: <http://telerobotics.jpl.nasa.gov/people/howard/>.

13. Shirley Ann Jackson, Physicist—Leadership for Science

Shirley Ann Jackson has become used to being in positions of leadership in science. She was the first African-American woman to earn a Ph.D. from the Massachusetts Institute of Technology (MIT), one of the first two to earn a doctorate in physics from any U.S. university, the first to chair the U.S. Nuclear Regulatory Commission (1995–99), the first to serve as president of a national research university (Rensselaer Polytechnic Institute in Troy, New York), and the first to be elected to the National Academy of Engineering. Her term as president of the American Association for the Advancement of Science (AAAS), the world's largest general scientific society, extended from February 2004 to February 2005. She chairs the AAAS Board in 2005.

Dr. Jackson brought a solid background in physics to these positions of leadership. Her original research interest was the study of subatomic particles found within atoms. These unstable particles can be studied in a particle accelerator, and her work in this area took her to key physics research laboratories in both the United States and Europe. Her current interests also include the electronic and optical properties of layered systems, nuclear science and technology, and risk assessment.

Dr. Jackson worked in the Theoretical Physics Department at AT&T Bell Laboratories and was concurrently a professor of physics at Rutgers University from 1976 until her appointment with the NRC in 1995.

Through numerous memberships and advisory positions, Dr. Jackson champions the role of science in the public arena and encourages the study and practice of science, particularly among women. She was elected to the National Academy of Engineering in 2001.

*For more information: <http://www.rpi.edu/president/profile.html>;
<http://www.aaas.org/ScienceTalk/jackson.shtml>*

14. Mae Jemison, Physician/Astronaut—Technology for All

Mae Jemison likes to travel, explore, and to help other people. While attending medical school she traveled to Cuba, Thailand, and Kenya, providing medical care to the people she met.

After earning her medical degree, she joined the Peace Corps and worked in west Africa. While there, she put her medical training to good use, working with the Centers for Disease Control to research vaccines. But Dr. Jemison wanted to travel and explore even more. After returning from the Peace Corps she began preparations to explore the universe. She took engineering classes and applied to NASA to become an astronaut. Eventually, she was accepted, becoming the first African-American female astronaut. She then traveled into space aboard the Shuttle *Endeavour*.

Dr. Jemison encourages other people of color to understand how technology can improve their lives, and to seek careers in science and engineering. She now teaches at Dartmouth College and is the founder of the Jemison Group, which seeks to improve healthcare in Africa, and The Dorothy Jemison Foundation for Excellence, named after her mother, which seeks to improve education with a special emphasis on science literacy.

Dr. Jemison was elected to the Institute of Medicine in 2001.

For more information: <http://www.maejemison.com/#>.

15. Leon Lederman, Physicist—Finding the Basic Building Blocks

How do you study something as small as an atom? Or as large as a star? Dr. Leon Lederman's work helped solve this conundrum. Leon Max Lederman, a first-generation American, was born in New York City to immigrants from Russia. He earned his B.S. in chemistry from the City College of New York in 1943. Following three years in the army during World War II, he earned his master's and Ph.D. in physics from Columbia University.

In the early 1960s, Dr. Lederman and his colleagues were studying neutrinos—particles that pass through everything in the universe. Dr. Lederman's team performed experiments using the first-ever neutrino beam—leading other scientists to use these particles in research. This

methodology and the discoveries it allowed won Lederman and his partners a Nobel Prize in Physics. Since Lederman and his colleagues paved the way, neutrinos have been used as a way of studying everything from the structure of the atomic nucleus to the energy from an exploding star, or supernova.

Dr. Lederman has been a member of the National Academy of Sciences since 1965. He is a past member of the National Science Resources Center's National Advisory Board.

For more information: <http://nobelprize.org/physics/laureates/1988/lederman-autobio.html>.

16. David Levy, Astronomer—Finding Comets

Sometimes, the path to a career in science is an unexpected one. The route that Canadian David Levy has taken in astronomy began with a childhood interest in the stars, a common denominator among astronomers. Levy's formal education, however, was not astronomy but English, in which he earned an M.A. in 1979. He is currently working on his Ph.D. at the Hebrew University in Jerusalem, Israel.

Levy has combined his interests in language and the stars by authoring 12 books on astronomy. His work has earned him four honorary doctorate degrees.

A dedicated backyard astronomer, Levy has discovered eight comets from his home in Vail, Arizona. He has also collaborated with Gene and Carolyn Shoemaker to discover 13 additional comets at the Mount Palomar Observatory in California. His best-known discovery was Comet Shoemaker-Levy 9, which crashed famously into the planet Jupiter in 1994. That collision, the first sighting of a comet crashing into a planet, had a force hundreds of millions greater than the force of an atomic bomb.

Levy has become an ambassador of astronomy to the world. In addition to writing books, he hosts a radio program, "Let's Talk Stars;" is Parade Magazine's science editor; has written an Emmy-winning television documentary, "Three Minutes to Impact;" and writes the monthly column "Star Trails" in *Sky and Telescope* magazine; and is adjunct scientist and member of the Senior Advisory Board for the University of Arizona's Flandrau Science Center.

For more information: <http://www.jarnac.org/>.

17. Michael Martinez, Forensic Scientist—Interpreting Trace Evidence

If there's no such thing as a perfect crime, it's because of people like Michael Martinez. Martinez is a forensic scientist and technical leader in charge of the Trace Evidence Section at the Bexar County Criminal Investigation Laboratory in San Antonio, Texas. He is active in several forensic organizations and developed the accredited academic degree program in Forensic Science for San Antonio College. He has a Master of Science Degree in Forensic Science (MSFS) and an extensive array of specialty training.

Martinez provides forensic services in criminal investigation cases for law enforcement agencies in several states, U.S. government agencies, and the Cayman Islands.

Specific areas of expertise include microscopic characteristics and comparisons of natural fibers, synthetic fibers, human hair and animal hair identification, primer gunshot residue (P-GSR) analysis, GSR distance determination and gunpowder identification, identification of high- and low-explosive residues, post-blast investigation and collection of evidence, physical match identification, forensic glass analysis and comparison, digital photography and general crime scene processing.

For further information: <http://www.forensicevidence.net>.

18. Burt Rutan, Aircraft Designer—Flying Into Space

Space travel had always been done on government spacecraft until Burt Rutan came along. In the fall of 2004, Rutan's company, Scaled Composites, was the first private venture to send a spaceship more than 100 kilometers—62 miles—above the surface of the Earth.

The Scaled Composites spacecraft, *SpaceShipOne*, exceeded that altitude twice within a two-week span. On October 4, 2004, the 47th anniversary of the launch of the Soviet satellite Sputnik, *SpaceShipOne* climbed to nearly 70 miles above Earth.

Rutan, the creative force behind the historic flight, began designing airplane models from scratch while still in elementary school. After graduating from California Polytechnic Institute, he

worked as an engineer for the Air Force before starting his own company. Although he later sold the company, he has remained as its CEO.

Before the success of *SpaceShipOne*, Rutan's company's biggest success was the airplane *Voyager*, which flew nonstop around the world—a voyage of nearly 25,000 miles—in just over nine days. *Voyager* is now on display at the Smithsonian Institution's Air and Space Museum, and beginning in August 2005 *SpaceShipOne* will be on permanent display in the museum's Milestones of Flight Gallery. Rutan was elected to the National Academy of Engineering in 1989.

For more information: <http://www.scaled.com/projects/tierone/>

19. Stephanie Scierka, Research Chemist—Tools for Fighting Natural and Manmade Hazards

Stephanie Scierka is a surface analytical chemist with the National Institute of Standards and Technology, an agency of the U.S. Commerce Department's Technology Administration. Dr. Scierka studies how certain compounds affect the surfaces of other compounds. Her work is useful for purposes as diverse as making a better sunscreen and fighting biological or chemical terrorism.

Of particular interest to Dr. Scierka is titanium dioxide, or TiO_2 , a metal oxide that she studies in a powder form. TiO_2 is now being used to make certain sunscreens. And because it can cause some products like plastics, paper, and sealants to decompose, she is exploring TiO_2 's use in destroying airborne chemical or biological substances, whether they are used in attacks by terrorists or present naturally as allergens. Dr. Scierka's research could help develop the next important disease- and allergy-fighting tools for our society.

One of Dr. Scierka's favorite activities outside of the lab is running. She ran track at college in Ohio and has run in 10K races in places such as Pittsburgh (where she earned her Ph.D in analytical chemistry) and Maryland (where she lives now).

For more information: <http://www2.bfrl.nist.gov/profiles/profiles.asp?lastname=scierka>.

20. Roger Sperry, Neurobiologist (1913–94)—Understanding the Brain

What we know about the functions of the brain is due in large part to the work of neurobiologist Roger Sperry.

Before Dr. Sperry's work it was thought that the brain's nerve cells were generally organized, and that it took life experiences to organize the circuits. Dr. Sperry studied a patient whose corpus callosum, the nerve bundle connecting the two halves of the brain, was split due to epilepsy. The patient still had input from one side of the brain to the other through the optic nerve, which crosses over—the right eye's visual input going to the left hemisphere of the brain and vice-versa.

By providing visual stimulation to only one eye at a time, Dr. Sperry was able to track what the patient saw, whether he knew he had seen anything at all, and how the patient verbalized what he had seen. His studies showed that neuron function is largely determined at birth, and that rather than being randomly located, function is localized in certain brain areas. For instance, in almost all people, the left hemisphere of the brain is the seat of language while the right hemisphere controls spatial skills. Furthermore, Dr. Sperry's studies showed that the hemispheres can operate almost independently of each other.

Dr. Sperry's work helped chart a map of the brain and opened new areas of psychological and philosophical questioning. He was elected to the National Academy of Sciences in 1960. In 1981, he was awarded the Nobel Prize for his work.

For more information: <http://nobelprize.org/medicine/laureates/1981/sperry-autobio.html>.