Agronomist

Your field of dreams.

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Agronomist

Your field of dreams.

Photos: Mike Kerper; U.S. Department of Agriculture–Agricultural Research Service

Agronomists deal with interactions among plants, soils, and the environment. They use sophisticated research tools and techniques to develop new crop hybrids and varieties that grow more efficiently and are more beneficial to society. Soils specialists conduct research in everything from the very basic to applied issues of soil and water management and land use. Agronomists research ways to produce crops and turf, and ways to manage soils in the most environmentally friendly way. Agronomists can be found teaching, conducting business, and doing research in food production and environmentally oriented industries around the world.

Agronomists work for USDA, State Departments of Agriculture, the Soil Conservation Service, and as agriculturists in foreign countries. They work for banks; farm co-ops; seed, ag supply, and lawn care companies; and government agencies. Agronomists also are employed as weather forecasters, environmentalists, researchers, and teachers.

To be an agronomist, you should have an interest in science and environmental issues. A bachelor's degree is necessary to obtain a rewarding and productive job. In college you should enroll in agriculture, biology, chemistry, mathematics, physics, and statistics courses, as well as broad-based general education courses, including English and speech. You should enjoy working with people and should have a keen interest in applying science to practical feed and food production issues.

The high school college preparatory curriculum that includes biology, chemistry, physics, and mathematics will provide an excellent background. English, speech, and foreign language will strengthen your communication skills.

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Food, Agricultural and Natural Resources Careers

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Animal Nutritionist

Animal Nutritionist

Better food, better life.

Animal nutrition is a science that combines chemistry, physics, biochemistry, mathematics, animal behavior, economics, and food processing with animal production techniques. Animal nutritionists formulate diets for food, companion, and zoo animals. They work with mammals, birds, and fish. The diets they create must be nutritionally sound, good-tasting, and economical for the ages and types of animals that will use them.

Photos: Kathryn Elsesser-Luba

Animal nutritionists can teach the science and art of nutrition to students and conduct research in public universities or colleges, or they may work in the private sector. Corporate career activities range from serving clients on farms and ranches to conducting and supervising proprietary research to carrying out international marketing projects. Feed and pharmaceutical companies employ nutritionists.

To be an animal nutritionist you should be a curious person who is very interested in both animals and the sciences. Most animal scientists want to improve the quality of life for both people and animals. You must have a bachelor's degree for an entry-level position. For careers involving research and management you need a graduate degree.

In high school, take college preparatory courses in biology, chemistry, physics, mathematics, and communications. Leadership skills acquired in extracurricular activities are useful.

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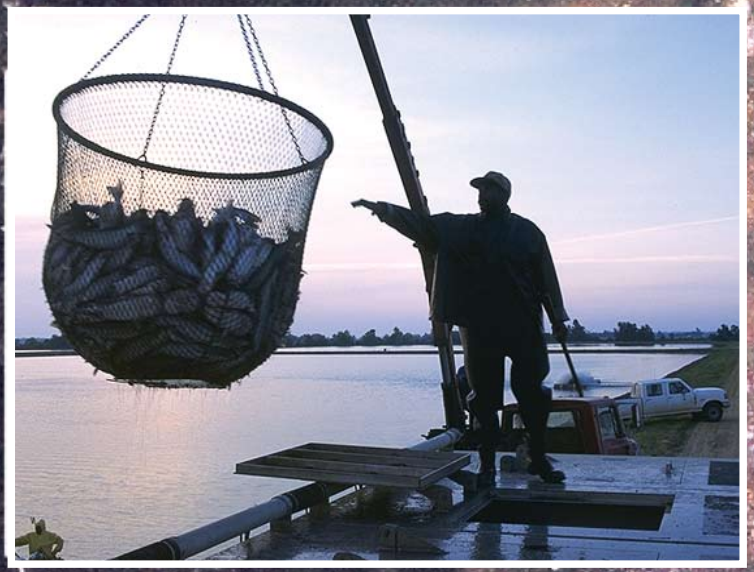
Aquaculturist

Make a big splash farming in water.



AQUACULTURIST

Make a big splash farming in water.

Photos: Kathryn Elsesser-Luba, U.S. Department of Agriculture-Agricultural Research Service

Aquaculturists raise a diverse array of aquatic plants and animals in controlled or semi-controlled settings. The goals of raising these organisms can be for production of food; for stocking public bodies of water, or public or home aquaria; or for biomedical applications. Regardless of your goal, in your first job you will probably stock production units (ponds or tanks), ensure adequate nutrition, monitor water quality, check for diseases, harvest plants or animals, and maintain equipment. If you become a manager, you will supervise workers, plan production schedules, purchase feed and equipment, and plan harvesting, processing, and marketing.

An aquaculturist can work for a corporation; an independent fish farmer; a city, county, state or federal government; or a biomedical research laboratory. Some large operations are vertically integrated and have their own feed mills and fish processing plants. Companies hire aquaculturists as technicians to test water quality or to examine fish for diseases. Feed companies and equipment manufacturers hire aquaculturists to market their products to fish farmers.

To be an aquaculturist you should be interested in agriculture, since aquaculture is a type of farming. An entry level position usually requires a high school education. Employees working on the pond bank need to know how to maintain and repair farm equipment. Managers of aquaculture operations often have college degrees, and need to understand water quality, nutrition, business, and economics.

In high school, take courses in the repair and maintenance of machinery and engines, welding, construction, and other shop classes. Accounting, marketing, and other business courses are also useful, as are basic courses in biology.

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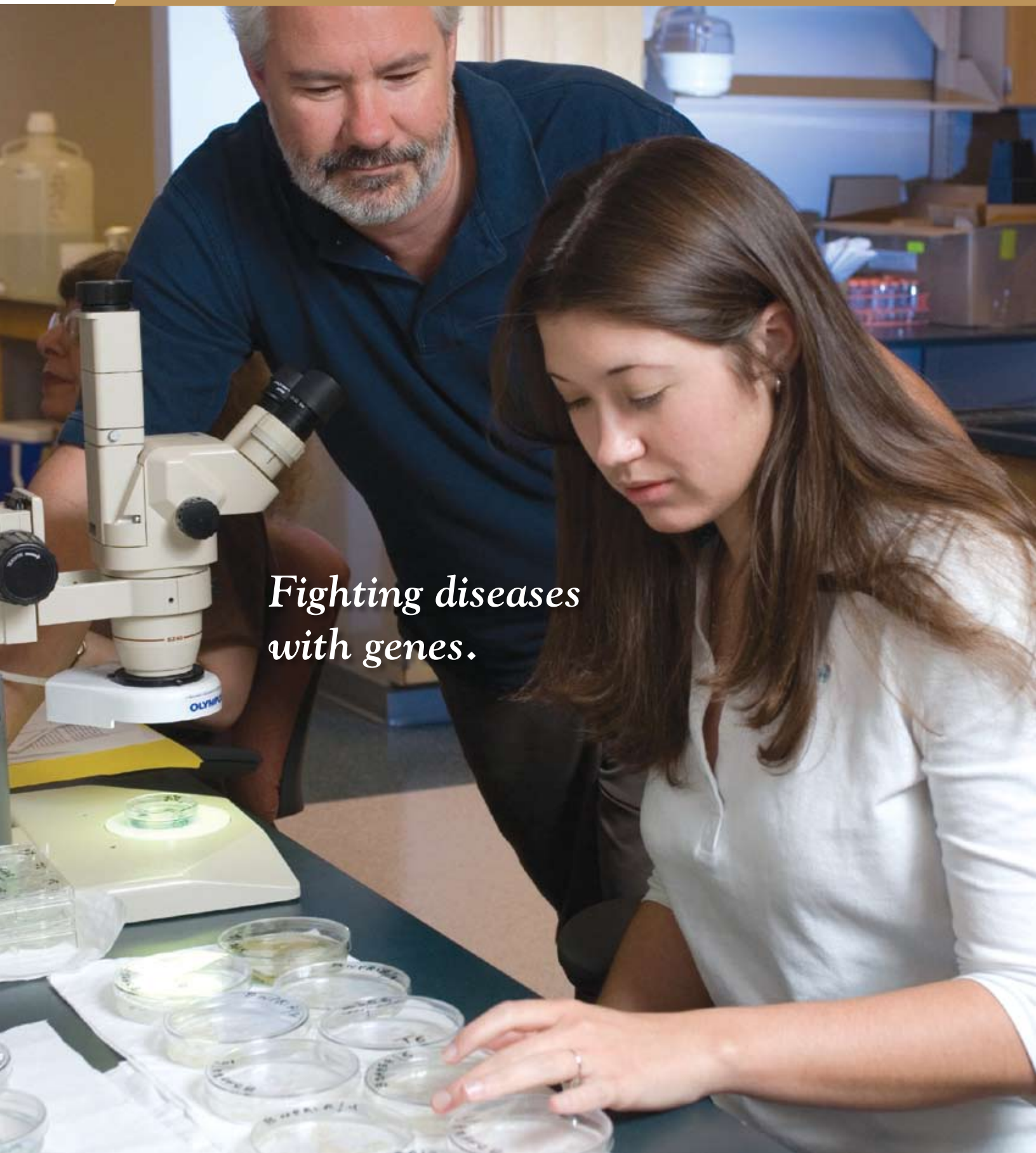
USDA Living Science

B

Biotechnologist



Fighting diseases with genes.

BIOTECHNOLOGIST

Fighting diseases with genes.

A biotechnologist understands biological processes and may use that knowledge to diagnose or treat a disease, develop a new drug, produce a crop plant that has higher yield, or improve a process for making a biofuel such as ethanol. In many cases, biotechnologists use a variety of ways to change the genetic information in DNA. Some look for new, individualized treatments for gene-based diseases of crops or livestock. Others focus on treatments for human diseases such as autism, heart disease, Alzheimer's, cancer, and autoimmune disorders.

Photo by Edwin Remsberg.

Biotechnologists can be researchers, technicians, or teachers. Universities, companies, nonprofit organizations, and government agencies hire them. With a bachelor's degree, you might find a job as a technician, biomedical policy analyst, medical affairs specialist, or community college instructor. With a doctorate, you may become a researcher in the biotechnology industry or for the government — or you may become a college professor.

To be a biotechnologist you need a bachelor's degree in a life science discipline like biology, biochemistry, genetics, or microbiology, with an emphasis on molecular biology. You should take courses in chemistry, biochemistry, mathematics, and computer science. It is also important to get research or analytical experience. For many positions, especially if you want to lead research, you will need a graduate degree and, possibly, post-doctoral experience.

In high school, take college preparatory courses in biology, chemistry, physics, and mathematics. English and communication classes are also important. Participate in science clubs and fairs. If possible, work in a laboratory during the summer.

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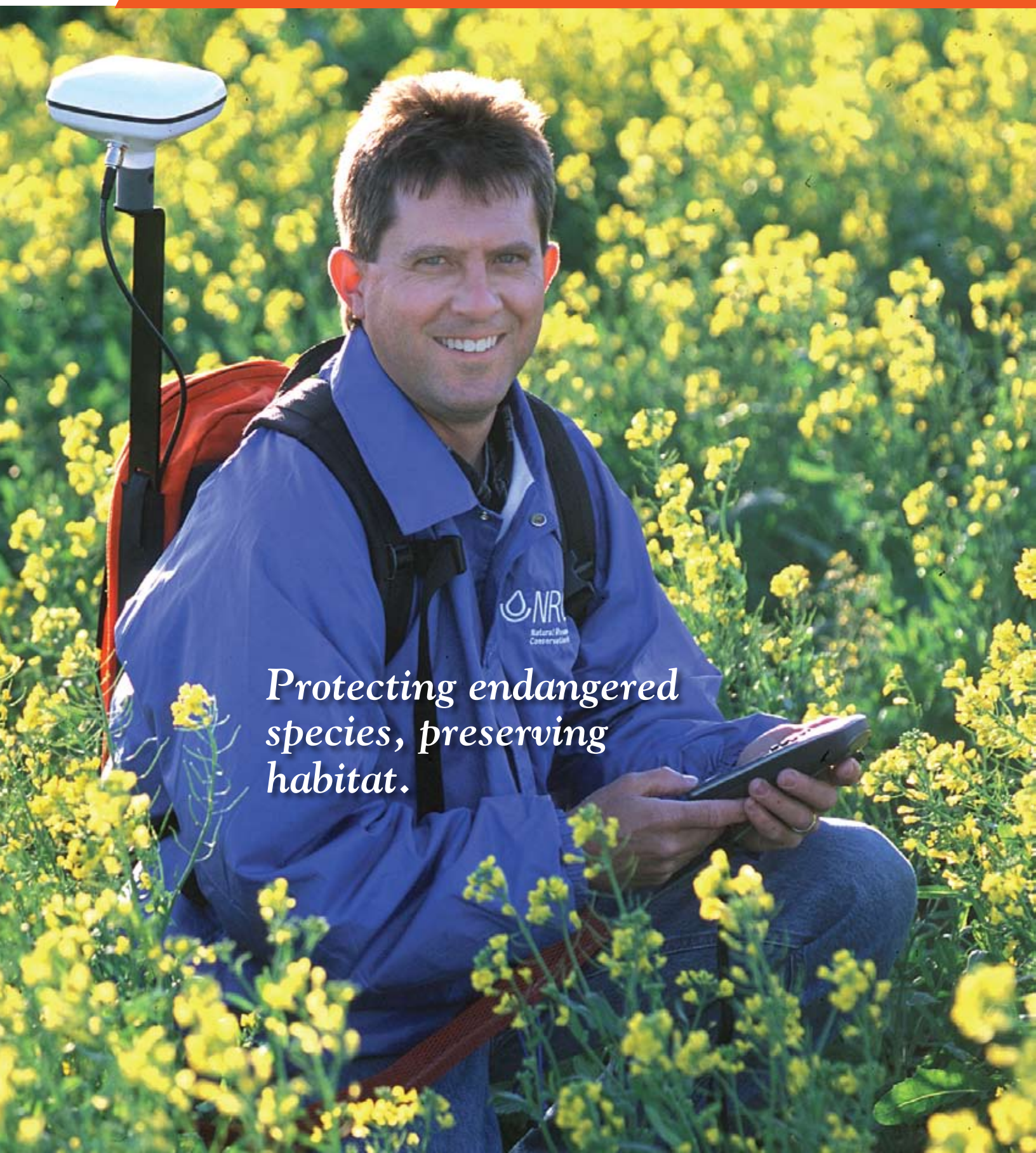
www.agriculture.purdue.edu/USDA/careers/

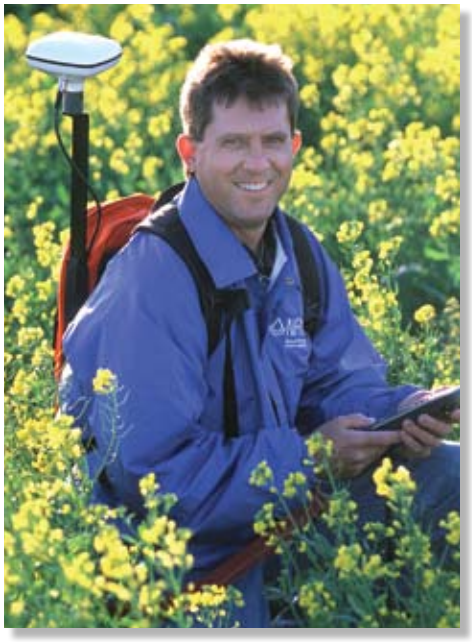
Conservation Biologist



Protecting endangered species, preserving habitat.

Conservation Biologist

Protecting endangered species, preserving habitat.



Conservation biology developed as a field in the 1980s, when people grew more and more concerned about species extinction and worldwide loss of natural habitats. Conservation biologists work to slow or reverse these trends. They study rare and endangered species, because they want those plants and animals to recover so that they no longer need special protection. Conservation biologists also help protect and manage whole ecosystems, since many native habitats in the world have shrunk to tiny fragments of their former range. Some of the most famous restoration projects in the United States, such as reintroducing gray wolves to Yellowstone National Park, were designed and conducted by conservation biologists. Many students are drawn to the field because they want to work outdoors with rare or charismatic species. However, almost all conservation biologists also work with the public, especially with people whose lives are affected by efforts to protect endangered species or habitats.

Conservation biologists work in federal and state government agencies, and in nonprofit organizations interested in protecting natural resources. Some work with captive animal populations in zoos and wild animal parks. More and more are working with environmental consulting firms: companies hired by agencies and businesses to help them meet government regulations or to do an environmental impact analysis and to write the grants necessary to get funding or permits. Successful conservation biologists have the expertise to analyze the field situation, design a conservation strategy that meets the needs of the business, and communicate the strategy.

To be a conservation biologist, you need a college education and practical experience in the field. You need courses in biology, chemistry, ecology, genetics, and resource management. Since most conservation problems involve the public, you also need courses in English, communication, statistics, economics, and public policy. Public speaking and writing skills are valuable assets. Many positions now require computer knowledge, especially with geographic information systems (GIS); some positions require people with advanced computer modeling skills.

In high school, take as much math, chemistry, physics, biology, and English as possible. Look for opportunities to work with parks, government agencies, or nonprofit groups in internships or volunteer positions to gain practical experience and network connections. Experience writing for high school publications, leading meetings, and working in teams are definite assets.

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Entomologist

Study what bugs us!

Entomologist

Study what bugs us!

An entomologist is a broadly trained and educated professional in a discipline that touches almost every aspect of our daily lives. Career opportunities are numerous and varied, so if you are interested in science and ready for a challenge, entomology is the career for you. As an entomologist, you can use your natural curiosity and enthusiasm to help solve some of the world's toughest problems. Entomologists are needed worldwide to help farmers and ranchers produce crops and livestock more efficiently by using sound pest management strategies; to produce information about endangered species, fragile ecosystems and our environment; and to help prevent the spread of serious diseases in plants and animals.

Photos: U.S. Department of Agriculture-Agricultural Research Service, Mike Kerper

You can find entomologists in professions such as medicine, law, pharmacology, veterinary medicine, teaching, and research; in many aspects of agribusiness; in private pursuits such as consulting; and working for local, state, federal, or international agencies.

In college, a major in entomology is the best preparation for you; however, a well-rounded biological sciences program would be excellent preparation for graduate work. As an undergraduate you will take courses in biology, agriculture, chemistry/biochemistry, mathematics, and statistics, as well as computer science, English, history, and the humanities. As a graduate student you will get experience in taxonomy, physiology, morphology, behavior, and pest management.

In high school take a college preparatory curriculum and include as many science-based courses as possible.

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USDA Living Science

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Environmental Scientist

Your future's out there.

Environmental Scientist

Your future's out there.

Photo: U.S. Department of Agriculture–Agricultural Research Service

Many environmental scientists protect the environment through jobs in solid and hazardous waste management, land use, and air or water quality. Their understanding of biology, chemistry, and physics helps them assess environmental quality and find ways to protect air, water, and land.

Environmental scientists work for natural resources and environmental protection departments. Federal agencies like the Environmental Protection Agency and the Natural Resources Conservation Service hire environmental scientists. Private environmental consulting firms, environmental laboratories, and corporations which discharge waste in the air, in water, or on land also hire environmental scientists to monitor discharges, assess environmental quality, and assure compliance with state and federal laws regulating pollution.

To be an environmental scientist, you need a bachelor's degree. You can major in soil science, water resources, meteorology, or environmental economics and policy. Some universities offer more specific majors, like groundwater management, water chemistry, air resources, water and wastewater treatment. All majors include courses in chemistry and biology. Other courses you take vary with your major. Examples include: Solid and Hazardous Waste Management, Development of Environmental Impact Statements, Geographical Information Systems, Water Chemistry and Analysis, Pollution Ecology, Hydrogeology, and Advanced Techniques in Environmental Analysis. Often environmental scientists earn graduate degrees.

In high school, take mathematics, biology, chemistry, physics, and computer science. Communication courses, both written and oral, are also important.

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Food, Agricultural and Natural Resources Careers

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Fisheries Scientist

A catchy career.

Fisheries Scientist

A catchy career.

Photos: Mike Kerper; Tom Campbell

Fisheries scientists come from many different backgrounds, but all are dedicated to effective management, use, and conservation of aquatic plants and animals. As researchers, managers, administrators, or educators, they use their expertise in biology, ecology, statistics, genetics, economics, policy and administration, and law to protect and enhance recreational, commercial, and aquacultural fisheries resources.

Fisheries scientists can hold research or management positions dealing with species or habitat evaluation. They can be federal biologists monitoring commercial harvests of fishes, crabs, shrimps, or oysters, or state biologists studying sportfish populations. Some work as disease specialists at federal fish hatcheries, aquatic resource specialists for environmental consulting firms, or production managers for private aquaculture facilities.

To be a fisheries scientist, you should earn a bachelor's degree in fisheries science, biology, or zoology. You may need a master's degree in a fisheries program. Your education should include courses in aquatic ecology, vertebrate and invertebrate biology, zoology, chemistry, mathematics, statistics, and microbiology, as well as courses in communications, sociology, economics, and administration.

In high school, take courses that emphasize biology, chemistry, mathematics, computer science, writing, and speaking.

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Food, Agricultural and Natural Resources Careers

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Florist

It's a bloomin' business.

Florist

It's a bloomin' business.

Photo: Mike Kerper

A flower shop employee processes incoming flowers, designs floral arrangements, works with customers, and delivers flowers. Those in management positions develop advertising programs, determine what products they will sell, create display themes, and supervise employees. Managers conduct sales interviews to secure wedding, commercial, and special events accounts. Managers also make financial decisions based on their businesses' financial records and goals.

You'll find most employment opportunities in traditional retail florist businesses, which are still the backbone of the flower industry. A typical business is small and hires staff for designing and sales. Larger businesses hire managers to operate branch stores or to act as department managers in single large stores. Many florists start their own small businesses. Supermarkets, wholesale florists, large hotels, and resorts also hire florists.

Most successful florists like business, people, and design. Formal training isn't necessary for entry level positions. But to compete for owner or manager positions in today's market, you need a college degree. You should take courses in floral design, personnel, selling, finance, management, marketing, and foliage plants. Work experience is not just important, it is necessary for upper-level positions.

To be a florist, take art, math, botany, accounting, and communications courses in high school. You can also gain valuable experience by working for a florist during holidays when sales are brisk.

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Food, Agricultural and Natural Resources Careers

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Food Process Engineer

Engineering for food quality and safety.

Food Process Engineer

Engineering for food quality and safety.

Food process engineers (FPEs) research and develop new and existing products and processes. They also design processing, handling, and packaging equipment. When they are hired as project engineers, they supervise the design, construction, installation, and start-up of processes. As plant engineers they keep factories running smoothly. Some FPEs manage or supervisor other workers, work in technical sales and service, act as specialized consultants, and market products.

Photo: Purdue University Center for Instructional Service

Food process engineers work in food, chemical, biochemical, and pharmaceutical industries. Some work in government or educational institutions. FPEs work with processors, equipment suppliers, design and consulting firms, and ingredient suppliers.

Typically, engineers are curious about how things work. They enjoy solving problems. To be successful as a food process engineer, you must like math and science, especially chemistry and biology. The four-year FPE program includes calculus, chemistry, biology, physics, engineering science and design classes, and a sprinkling of liberal arts electives. In five years you can earn either a dual degree in biochemistry and food process engineering or a dual degree in pharmaceutical sciences and food process engineering.

In high school, develop as strong a background as possible in mathematics (especially calculus) and science (chemistry and biology). A basic understanding of computer programming would be beneficial, though not mandatory.

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Food Scientist

A job in good taste (and color and texture and nutrition).

Food Scientist

A job in good taste (and color and texture and nutrition).

Food scientists preserve our food supply by assuring its flavor, color, texture, nutritional quality, and safety. They use their knowledge of chemistry, biochemistry, microbiology, and engineering to convert grain, livestock, fruit, and vegetables into new food products. Food scientists work as production supervisors, quality assurance specialists, product developers, and managers of processing plants.

Photos: Kathryn Elsesser-Luba, U.S. Department of Agriculture-Agricultural Research Service

Food scientist work for food processing companies, food equipment and ingredient suppliers, and government agencies. They conduct food research and act as trouble-shooters in solving problems. They are sales and marketing representatives and consumer educators. Food scientists in local, state, and national government hold jobs as food inspectors, researchers, and laboratory workers. Others develop government regulations to safeguard our food.

To be a food scientist you should earn a bachelor's degree in food science. You will take courses such as biology, business, chemistry, engineering, management, mathematics, microbiology, physics, and statistics, as well as classes in food science. With more education (graduate level) or experience you could go on to work in food chemistry, food microbiology, or food processing and engineering.

In high school, take mathematics, biology, chemistry, physics, and computer science. Communications courses are also important.

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Food, Agricultural and Natural Resources Careers

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Food Safety Specialist

Food Safety Specialist

Keeping our Food Safe.

Photo by Peggy Greb.

Food safety specialists preserve our food supply by assuring that it is wholesome, sound, and safe. They use their knowledge of food protection principles, food science, bacteriology, microbiology, and Hazard Analysis Critical Control Point (HACCP) theory. They understand and apply federal, state, and local laws, rules, and regulations governing food protection. They can work independently and are good observers who can think on their feet. They also are adept at working with others to solve problems.

Food safety specialists work for food services, hotels, resorts, restaurants, and government agencies. They conduct inspections and investigations of food products, and of storage and preparation facilities. They consult with the food industry and potential new businesses, and they train local health department food protection personnel.

To be a food safety specialist you should earn a bachelor's degree in food science. You will take courses such as bacteriology, biology, business, chemistry, epidemiology, food technology, management, mathematics, microbiology, physics, and statistics, as well as classes in food science. You will need to understand HACCP theory and how to apply it. You also must understand federal, state, and local laws, rules, and regulations that govern food protection.

In high school, be sure to develop a strong background in math and science. Take mathematics, biology, chemistry, physics, and computer science. Communications courses are also important.

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Forester

Keepers of the forest.

Forester

Keepers of the forest.

Photos: U.S. Department of Agriculture–Photography Center (Bob Nichols)

Foresters may spend one day in the laboratory and the next in the field. Some days they speak with executives in board rooms and other days they talk with tree farmers. Therefore, foresters must be highly trained technically, but they must also be good communicators. They must see themselves as stewards of forest resources and must be able to convince others that forests are vital to the welfare of humanity.

Our forests are owned and managed by a wide range of individuals, private organizations, and public agencies. Foresters may manage timberlands for private industry or may scout out and buy wood from other landowners for their companies. Some foresters are private consultants who advise landowners on the multiple-use management of their timberlands. Many work in management, administration, or research for public agencies such as the U.S. Forest Service.

Foresters have long-range views on environmental issues. They should be able to visualize a forest's development over many years. They must understand natural history and forest ecology. Basic college courses you should take to become a forester include: biology, chemistry, physics, mathematics, engineering, economics, communications, and computer science. You will also take professional courses in forest biology, forest resource measurement, forest management, and forest policy and administration. There are over forty accredited forestry programs in the United States.

In high school, take four years each of mathematics and English. Also take courses in biology, chemistry, and physics.

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Horticulturist

Creating food, medicine, and pleasure from plants.

Horticulturist

Creating food, medicine, and pleasure from plants.

The Latin words *hortus* (garden plant) and *cultura* (culture) together form horticulture, classically defined as the culture of garden plants.

But today horticulture is more than garden plant culture. Horticulturists work in crop production; plant propagation; plant breeding; genetic engineering; plant physiology; plant biochemistry; landscape design, installation, construction, and maintenance; and storage, processing, and transit (of fruits, berries, nuts, vegetables, flowers, trees, shrubs, and turf). They improve crop yield, quality, nutritional value, and resistance to insects, diseases, and environmental stresses. They make plants more adaptable to different climates and soils and better fit for food uses or processes. And they grow and improve plants used for medicines or spices.

Horticulturists can work in industry, government, or educational institutions. They can be cropping systems engineers, wholesale or retail business managers, plant specialists in the landscaping industry, propagators and tissue culture specialists (fruit, vegetables, ornamentals, and turf), crop inspectors, crop production advisors, extension specialists, plant breeders, research scientists, and educators. You'll find horticulturists in offices, laboratories, greenhouses, and out in production or research fields.

In college take courses in biology, chemistry, mathematics, genetics, physiology, statistics, computer science, landscape design and construction, and communications to complement plant science and horticulture coursework. Plant science and horticulture courses include plant materials, plant propagation, tissue culture, crop production, post harvest handling, plant breeding, crop nutrition, entomology, plant pathology, economics, and business. For many careers you must have a master's or doctoral degree.

In high school take basic courses in rhetoric and speech communications, mathematics, chemistry, biology, and computer sciences.

Photos: Kathryn Elsesser-Luba, U.S. Department of Agriculture-Agricultural Research Service

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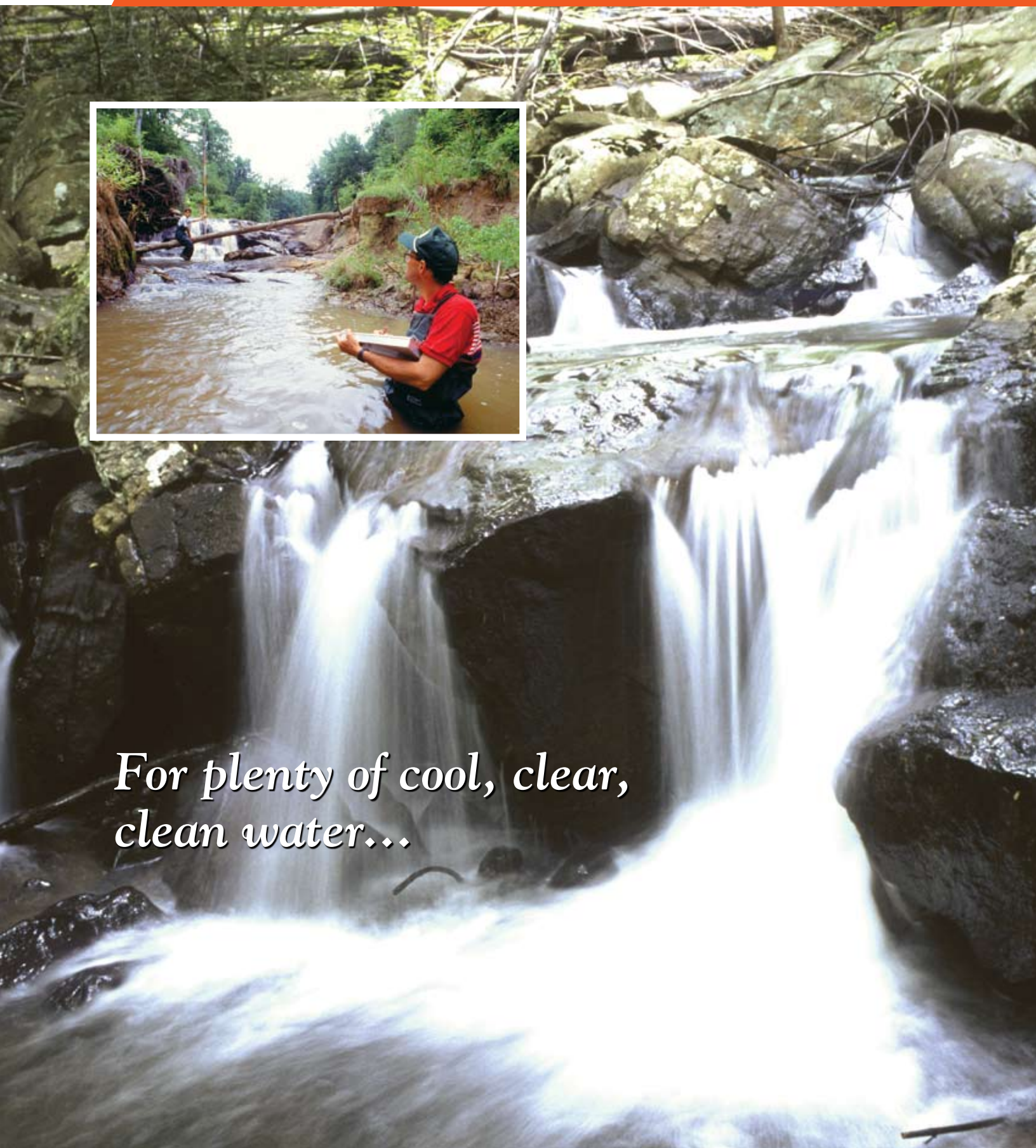
Hydrologist



For plenty of cool, clear, clean water…

Hydrologist

For plenty of cool, clear, clean water...

Photos: Mike Kerper, U.S. Department of Agriculture–Agricultural Research Service

Hydrologists help assess and protect our water supplies and water quality. Hydrologists concerned with water supplies manage surface and ground water to avoid problems caused by floods, droughts, population growth, and the impact of human activities. Hydrologists working on water quality problems deal with the chemical, physical, biological, and radiological properties of water we use for drinking, irrigation, industrial cooling, or swimming. They also help assess how land use affects water quality, and they help develop strategies to reduce the impact of land use and land-use change on water quality.

Hydrologists work for both public and private groups. The federal agencies which manage our natural resources all hire hydrologists. These agencies include the Geological Survey, National Weather Service, Bureau of Land Management, Bureau of Indian Affairs, Bureau of Land Reclamation, Natural Resources Conservation Service, and Forest Service. State agencies and watershed associations dealing with natural resources also employ hydrologists. Those state agencies include departments of natural resources and departments of environmental management. Many hydrologists work for private consulting firms concerned with sustainable production as state and federal regulations are becoming more environmentally friendly.

To be a hydrologist, you should appreciate natural resources and enjoy working with people. Your college coursework should include natural resource economics, policy, and law; math through calculus; engineering hydrology; natural resources management; soil and water conservation engineering; fluid mechanics; meteorology; soils; geology; forest and range management; physical and organic chemistry; microbiology; statistics; computer science; speech; and technical writing.

In high school take mathematics (algebra, trig, and calculus), physics, biology, and chemistry. It helps to get experience with leadership skills, natural resources, and public speaking through organizations like 4-H, FFA, or scouting.

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Logging Engineer

Logging Engineer

Timmm...berrr!

Logging engineers help design timber transportation and harvesting systems, supervise timber harvests, and ensure protection of soil, water, and other natural resources during logging. Logging engineers work with people, highly technical machines and computers, and natural resources. They are problem solvers.

Photos: Purdue University Agricultural Communication, Kathryn Elsesser-Luba

Logging engineers can work for private logging and forestry companies or government forestry agencies. Equipment manufacturers employ them. Companies that hire logging engineers include both small firms operated by families or partners and large regional, national, or multinational corporations. Some logging engineers work as private consultants.

To be a logging engineer, you should be a problem solver who is interested in natural resources. Take college courses in biology, forest management, soils, watershed management, machine design, engineering, and planning. Also, learn to use computers to solve forestry problems.

In high school, take mathematics, biology, chemistry, physics, and computer science courses. Communication skills are very important. Experience working outdoors and with machines is helpful.

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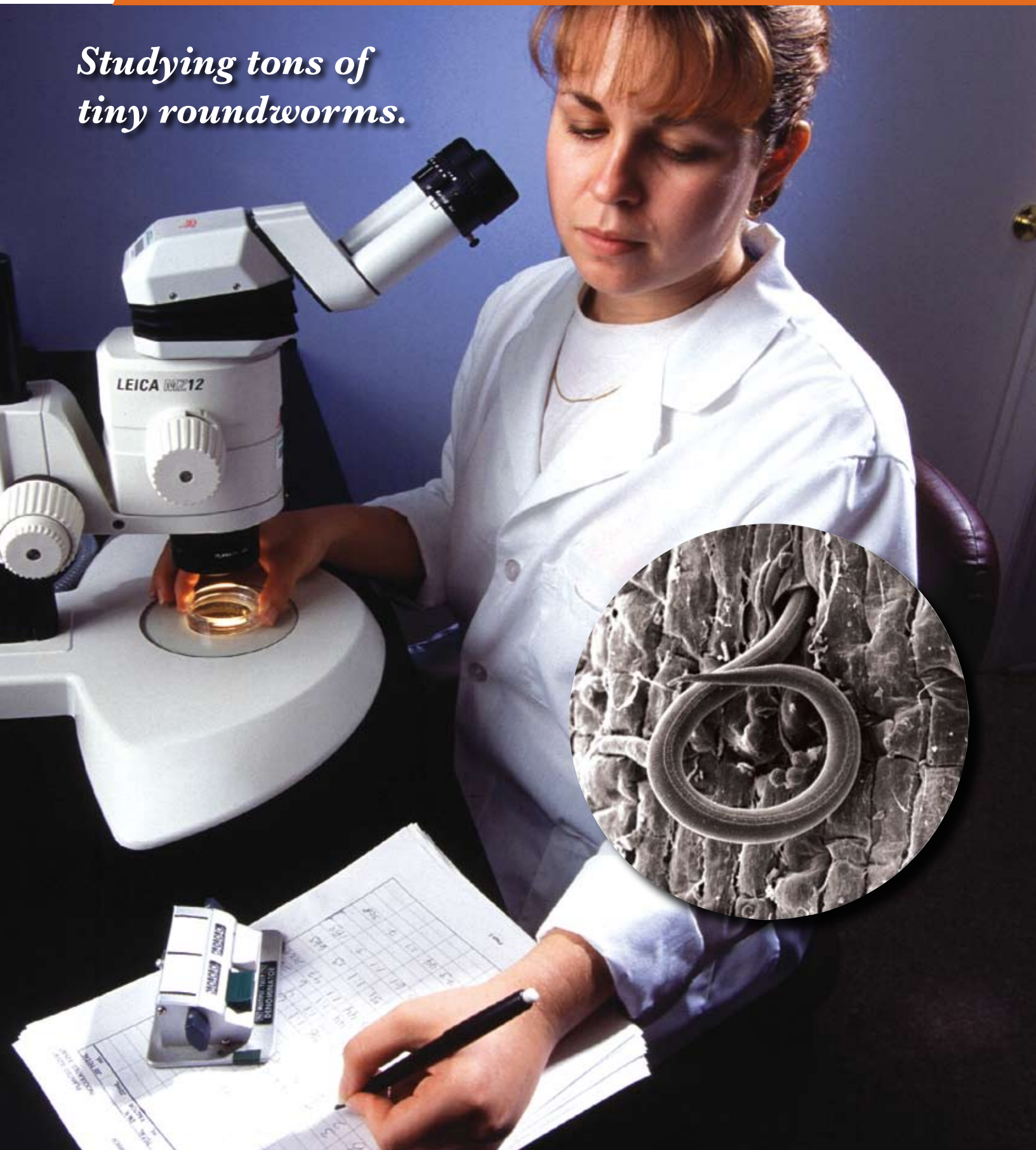
Nematologist

Studying tons of tiny roundworms.



Nematologist

Studying tons of tiny roundworms.

Photo by Scott Bauer.

Nematodes are found everywhere: in soil from both poles to the tropics, in bodies of insects, and in humans and all domesticated and wild animals. Teeming millions of these roundworms live on ocean bottoms and forest floors. Most are small and microscopic. Some have been model systems for the study of genetics and of breakthrough research in molecular biology and molecular mechanisms. Many nematologists who work with these roundworms are interested in plant and animal agriculture, or in soil or water ecology, but others specialize in basic research in molecular biology.

Nematologists are employed by universities as teachers, researchers, and extension specialists. Government agencies employ nematologists, as does private industry. Nematologists might work on basic or applied research in university, government, or commercial laboratories. They may work as agricultural scientists concerned with crop pest management, or in sales or as a consultant in the private sector.

A college degree in a biological science is good preparation for further training in nematology, which usually requires study at the graduate level, especially for a career in teaching or research. Alternatively, a college graduate might be trained by private industry for some specific job related to nematology. College courses in biology, molecular biology, mathematics, statistics, chemistry, physics, and English are often good preparation for a career as a nematologist.

In high school, take a broad college preparatory curriculum that includes English, math, physics, chemistry, and biology. Seize any opportunity to participate in lab and fieldwork to evaluate your aptitude and preferences.

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Food, Agricultural and Natural Resources Careers

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Nutritionist/Dietitian

Because you are what you eat.

Nutritionist/Dietitian

Because you are what you eat.

Photos: Mike Kerper; U.S. Department of Agriculture–Agricultural Research Service

Nutritionists/dietitians help people look and feel well by making the connection between food, nutrition, and health. They can be healthcare workers, researchers, managers or educators. Dietitians are part of the healthcare team with doctors, nurses, or therapists to speed patients' recoveries. A nutritionist/dietitian is responsible for medical nutrition therapy for disease conditions, such as diabetes and kidney disease and preventative healthcare issues such as weight loss, cholesterol reduction and other diet-related concerns. Some nutritionist/dietitians counsel families, the elderly, pregnant women, children, and the disabled, while others direct experiments to find alternative foods or diet recommendations.

Nutritionists/dietitians can work in healthcare institutions, schools, cafeterias, restaurants, daycare centers, health and recreation clubs, government agencies, and food and pharmaceutical companies. Some teach in colleges, universities, or community or technical schools.

To be a nutritionist/dietitian you must enjoy working with people and have a strong interest in food and nutrition. You should be able to work independently to identify and solve problems. In college, your course of study will include biology, anatomy, and chemistry. Math, English, sociology, psychology, and business courses are also important. If you want to become a registered dietitian, you must complete an undergraduate American Dietetic Association accredited academic program and supervised practical experience, then pass the Registration Examination for Dietitians.

In high school, follow a college preparatory program. Take as many science and mathematics courses as possible; two years of chemistry is beneficial. Also take English and communications courses.

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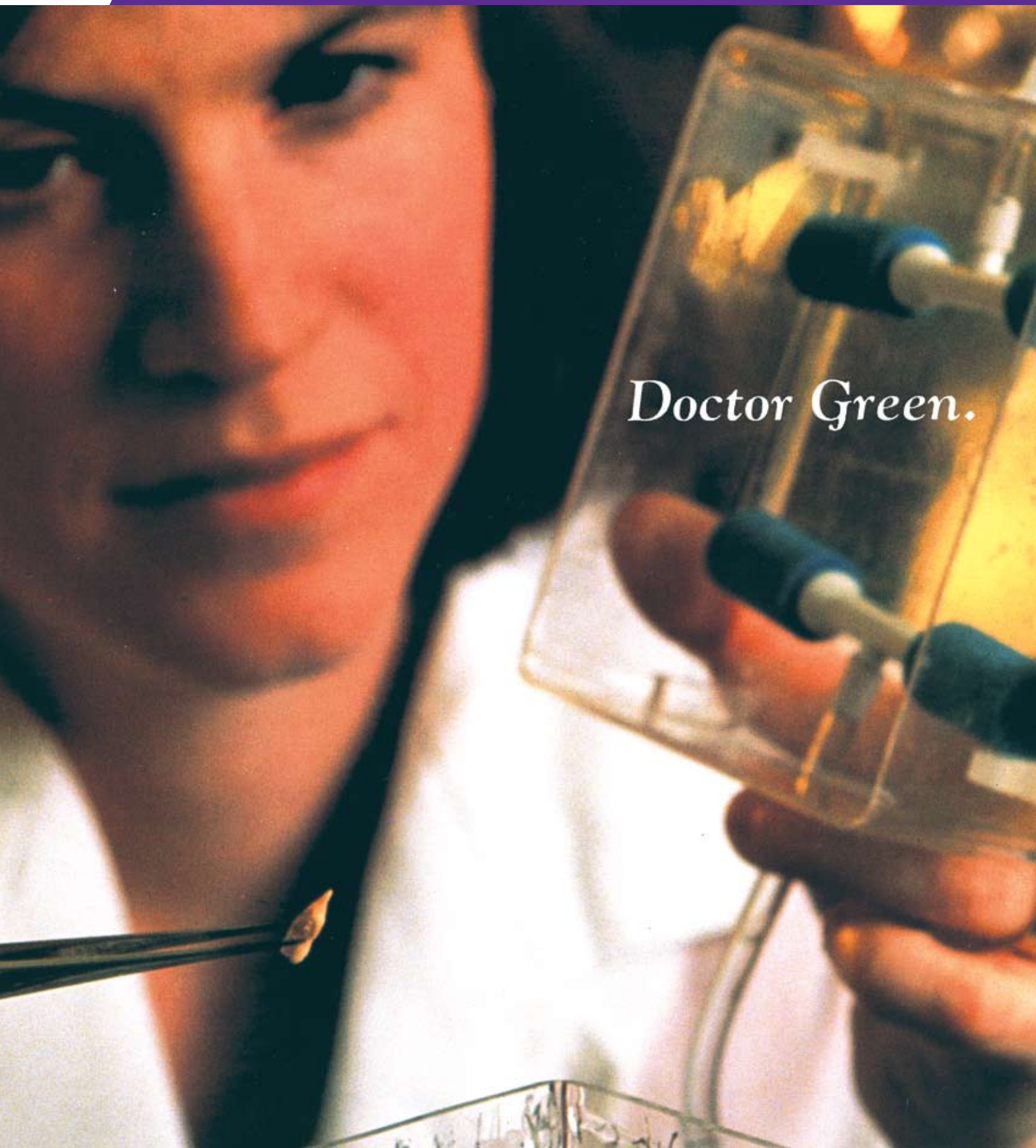
Plant Pathologist



Plant Pathologist

Doctor Green.

Photo: U.S. Department of Agriculture-Agricultural Research Service

Plant pathologists deal with the symptoms, causes, damage, spread, and control of plant diseases. They can specialize in mycology, bacteriology, virology, nematology, physiology, genetics, molecular and cellular biology, epidemiology, biotechnology, or biochemistry. They study disease processes and look for genetic, biological, chemical, or cultural controls for diseases of the plants we use for food and fiber.

Plant pathologists are university research scientists, teachers, and research technicians. Some work as extension plant pathologists with the Cooperative Extension Service. Government agencies such as the U.S. Department of Agriculture and U.S. Forest Service hire plant pathologists as research scientists and technicians. Plant pathologists also work for companies that develop chemical and biological control products, companies that introduce new varieties of pest-resistant plants, and companies that provide disease control services.

To be a plant pathologist, you need a bachelor's degree in a biological science (preferably plant-oriented) and a master's degree in plant pathology. To be a research scientist, you need a doctoral degree in plant pathology or a related discipline (see the first paragraph).

In high school, take courses in biology, English, chemistry, physics, math, and computer sciences.

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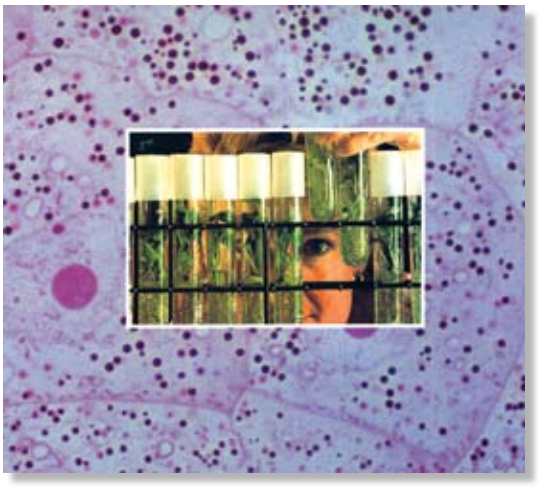
Plant Physiologist

What makes plants work?

Plant Physiologist

What makes plants work?



Photos: Craig Lending/Brian Larkin, U.S. Department of Agriculture-Agricultural Research Service

Plant physiologists study the physical, chemical, and biological functions of living plants. They study whole plants, as well as plant cells, molecules, and genes. Plant physiologists often work as members of multidisciplinary teams composed of molecular and cell biologists, biochemists and geneticists, with the broad objective of understanding the function of genes in plants. Recently, advances in the powerful techniques and approaches of molecular biology have made it possible to dissect and understand the role of particular genes. Plant physiologists study the effect of those genes on plant growth, flowering, and seed yield. They also carry out experiments to reveal how plants respond to pathogens and insect pests or to environmental stresses like drought, salinity, pollutants, and high and low temperatures.

Probably because plant physiology is a basic science, most plant physiologists work in academic institutions where they both teach and conduct research. Some are employed by federal and state agencies. A few work full-time for, or as consultants to, industrial and other organizations that have agricultural or related biological interests.

To be a plant physiologist you need to understand botany, chemistry, biology, and mathematics. You must know how to write and communicate well. Because plant physiologists support scientists in other disciplines, they need to know about enzymology, meteorology, horticulture, economics, philosophy and the human condition, politics, history, and how to teach. Plant physiologists must be willing to relocate and must continue their education.

In high school, take mathematics, chemistry, biology, and botany. Develop strong writing and communication skills. Be persistent, inquisitive, and eager to learn, discuss, and accept new ideas. Try working part time in a laboratory.

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Plant Geneticist

Plant Geneticist

Orchestrating plant genes, improving plants.

Plant geneticists fall into many categories. Some try to understand how genes work (functional genomics) or where genes are (structural genomics), or they follow the flow of genes between and within populations to understand forces of evolution (population genetics). Some plant geneticists are plant breeders (quantitative genetics) who produce superior plants through selective breeding. Molecular plant geneticists track down genes to discover their functions and identify genes useful for creating improved plants. Their goal is to improve the production and quality of food and fiber. The genes they identify can be used in different ways, sometimes to create traits completely new to the species and other times to enhance traits that plants already have.

Plant geneticists work with all plant species important for commercial agricultural production. Plants they work with include, for example, maize, wheat, soybeans, tomatoes, grapes, and trees. Private corporations hire plant geneticists to develop such things as new seeds and new varieties of fruit trees, vegetables, grains, and trees. State universities, and state and federal agencies hire plant geneticists in research, teaching, extension, and regulatory positions.

To be a plant geneticist, earn a bachelor's degree in biochemistry, agronomy, plant science, horticulture, forestry, or biology. Genetics draws heavily from mathematics, biology, statistics, biochemistry, microbiology, and chemistry, so those courses are important. Graduate degrees can lead you to more sophisticated research and development positions.

In high school, take as many courses in math, science, and English as possible. Also, take courses in computer science and communications.

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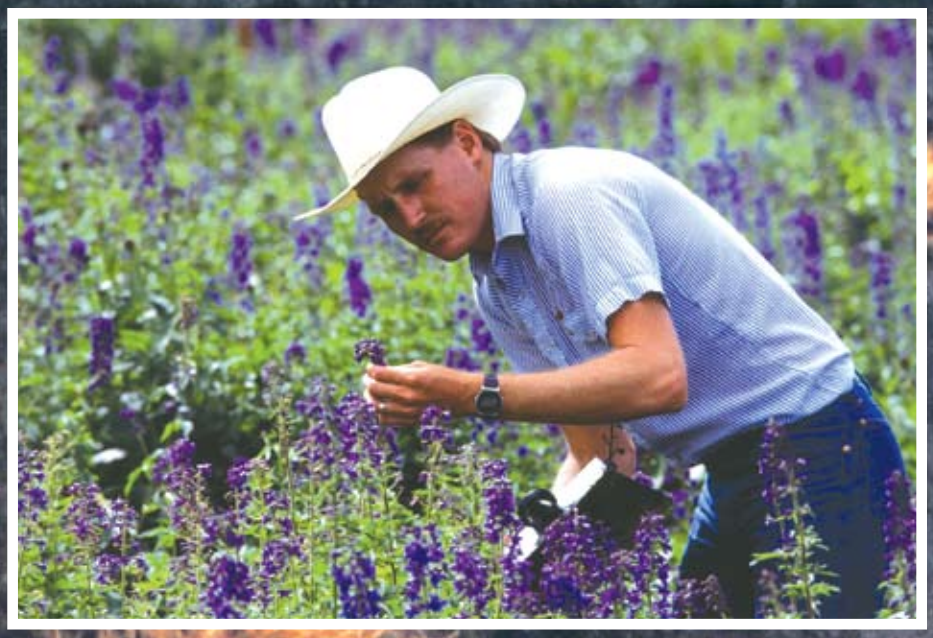
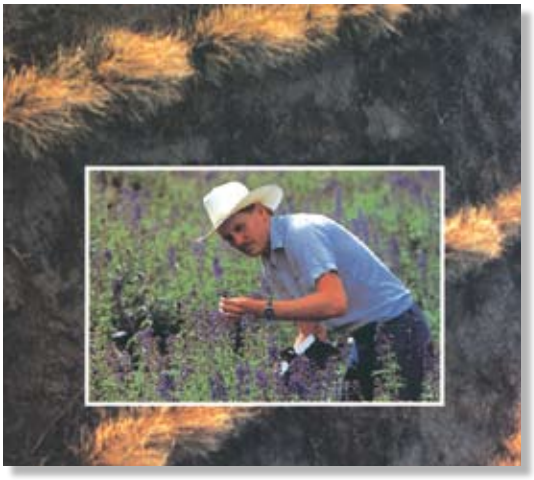
Range Manager



Homes on the range—for plants, animals, and people.

Range Manager

Homes on the range—for plants, animals, and people.



Photos: U.S. Department of Agriculture-Agricultural Research Service

Range managers care for our country's vast rangelands. From those lands, they produce a sustained yield of such things as plants for forage, wildlife for aesthetics and hunting, red meat, and clean water.

Range managers work for federal and state agencies, colleges and universities, private industry, environmental groups and on foreign assignments. Some range managers work for federal or state agencies, planning and directing public and private land use. Others are researchers, teachers, and extension agents with colleges and universities. Private industries hire range managers as ranch or land managers, agricultural product sales and service representatives, land reclamation specialists, and environmental consultants.

To be a range manager you need a bachelor's degree in range science, management, natural resource management, or ecology. Take courses in range science, agronomy, animal sciences, biology, botany, chemistry, ecology, economics, forestry, hydrology, natural resource management, recreation, soils, statistics, and wildlife. You need a graduate degree if you plan to do research or to teach, and if you want to advance in some fields.

In high school, take courses in biology, chemistry, speech, English, math, and zoology. Experience in agriculture (4-H and FFA) is desirable.

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Remote Sensing Specialist

Sky Sci.

Remote Sensing Specialist

Sky Sci.

Photos: Laboratory for Applications of Remote Sensing - Purdue University, U.S. Department of Agriculture-Agricultural Research Service

Remote sensing specialists interpret and analyze many types of aerial photographs and satellite images. They may use color infrared photos to map forest types or areas of irrigated cropland, or to determine areas of insect or disease infestation in forests or croplands. They use thermal infrared scanners to locate and monitor forest fires and to define areas of thermal pollution in rivers and lakes. They use computers to analyze satellite scanner data and create maps of land cover and changes in land use (like deforestation).

Many state agencies and federal agencies such as the U.S. Forest Service, Geological Survey, Environmental Protection Agency, Fish and Wildlife Service, National Park Service, Bureau of Indian Affairs, Bureau of Land Management, Corps of Engineers, and Defense Mapping Agency hire remote sensing specialists. Many commercial companies also hire remote sensing specialists to analyze data and to produce maps and other products for themselves or for government agencies with whom they have contracted.

Remote sensing specialists are usually people who enjoy working with maps and computers. Most have earned college degrees in disciplines such as geography, forestry, civil engineering, geology, wildlife management, or agronomy, and then have specialized in remote sensing. Today most remote sensing specialists also have taken coursework in Geographic Information Systems (G.I.S.).

In high school take courses in math, statistics, computer science, physics, chemistry, and perhaps mechanical drawing and art, as well as any courses involving communication skills such as English, speech, journalism, and debate.

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Renewable Energy Specialist

Harnessing green power.

Renewable Energy Specialist

Harnessing green power.

Photo by Peggy Greb.

A renewable energy specialist helps ensure that we can meet the world's energy needs in the future. Creating energy from the wind, biomass crops, agricultural residues, municipal wastes, or solar energy requires that the specialists forecast the advent of new technologies and always stay current on relevant public policies at the local, state, and federal levels. Successful renewable energy specialists interact with public and private sector groups. They communicate with engineers, government officials, businesses of all sizes, and the general public. They often act as intermediaries between divergent groups and bring groups together through networking. Renewable energy specialists assess studies on emerging technologies, understand environmental impacts of energy production, transfer their understanding to practical business strategies, and communicate though a variety of means, including public presentations.

Renewable energy specialists often work for engineering design firms, utility companies, universities, government agencies, or nonprofit organizations. They also work as private consultants. They must be able to balance financial analysis with a visionary approach to alternative energy production. These specialists are committed to understanding environmental issues, supply chain management and constraints, and capital investment.

To be a renewable energy specialist, a background in math and science is recommended. It's helpful to take additional courses in economics, agriculture, environmental engineering, speech, communications, computer science, and political science. For most positions, a bachelor's degree with experience is recommended. For a government or private consulting position, a master's or doctoral degree is required.

In high school, take biological and physical science classes such as chemistry, biology, and ecology; all of the sciences are very helpful. Also take math, economics, speech, and social sciences.

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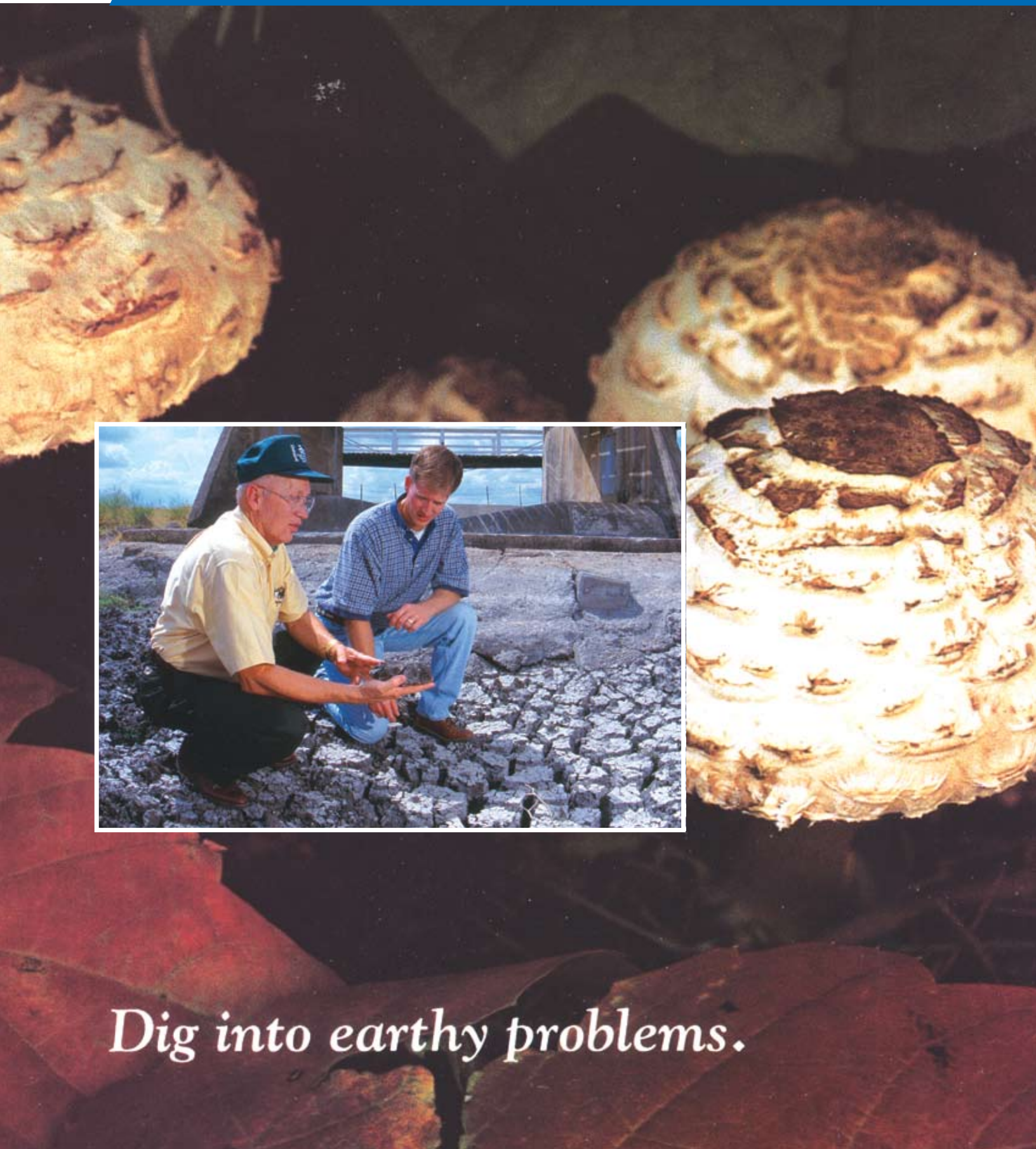
Soil Scientist



Dig into earthy problems.

Soil Scientist

Dig into earthy problems.

Photos: Kathryn elsesser-Luba, U.S. Department of Agriculture-Agricultural Research Service

Soil scientists map and classify soils and provide interpretations for land planners and managers. They conduct research on soil degradation or erosion, or on movement of substances such as nutrients and pesticides through the soil profile. Sometimes they identify problems such as wetness and erosion that limit soil use. Often they write soil descriptions and prepare maps and information about soils.

Universities, private industries, USDA agencies, chemical companies, state and county governments, and environmental consulting firms all hire soil scientists.

To be a soil scientist you need a college degree in soil science or a related biological, physical, or earth science. People who become soil scientists usually like working out-of-doors and studying the sciences, especially physics, chemistry, geology, environmental science, and biology.

In high school take college preparatory courses in physics, biology, mathematics, and chemistry. Communications courses are also helpful. Take courses in earth science, environmental science, agriculture, or geology if they are offered. Try to get practical experience in these areas.

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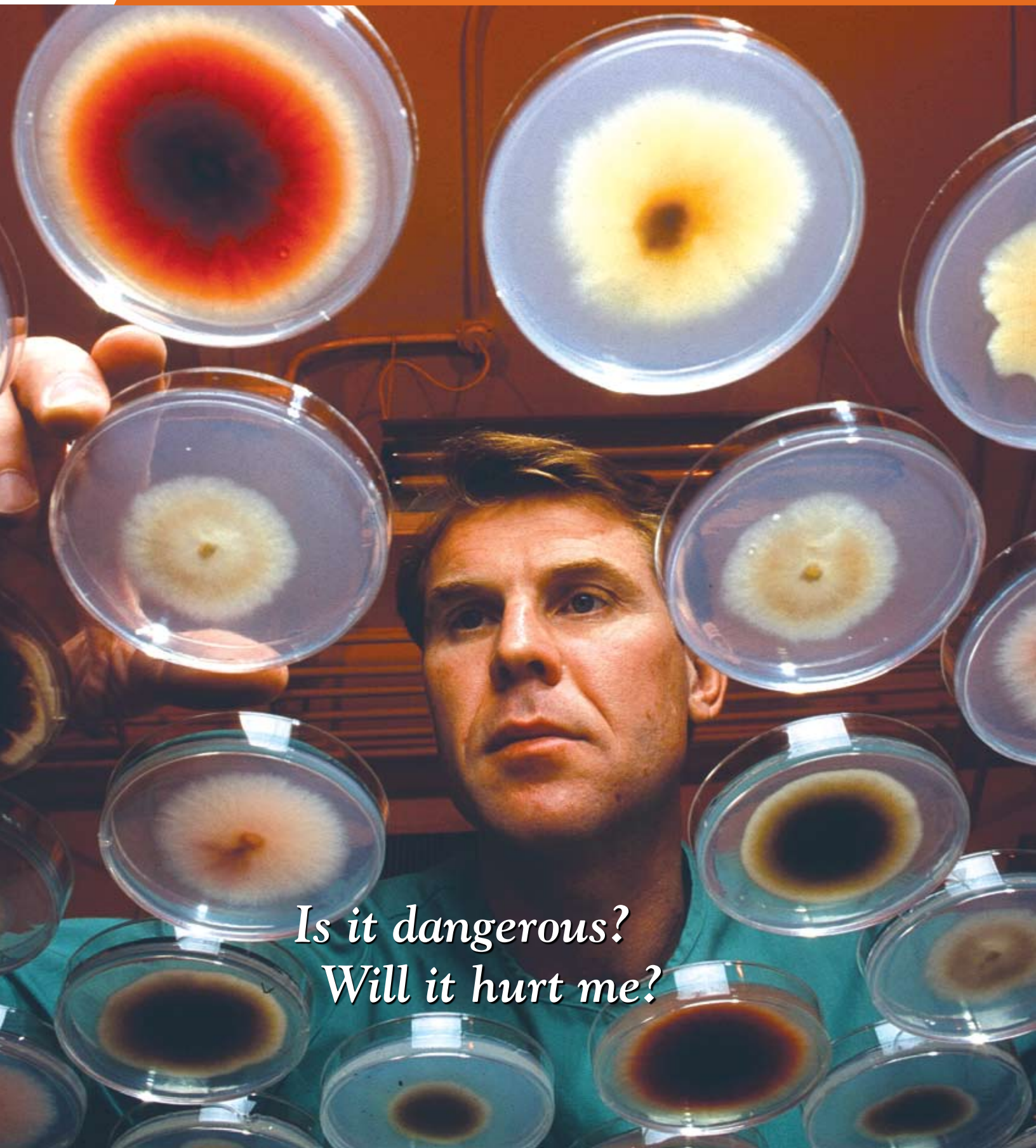
TOXICOLOGIST



Is it dangerous?
Will it hurt me?

TOXICOLOGIST

Is it dangerous? Will it hurt me?

Toxicologists study the effects of potentially harmful chemicals on people, animals, and the environment. They use their knowledge of biology, chemistry, and the environment to devise strategies to reduce or control exposure to these chemicals.

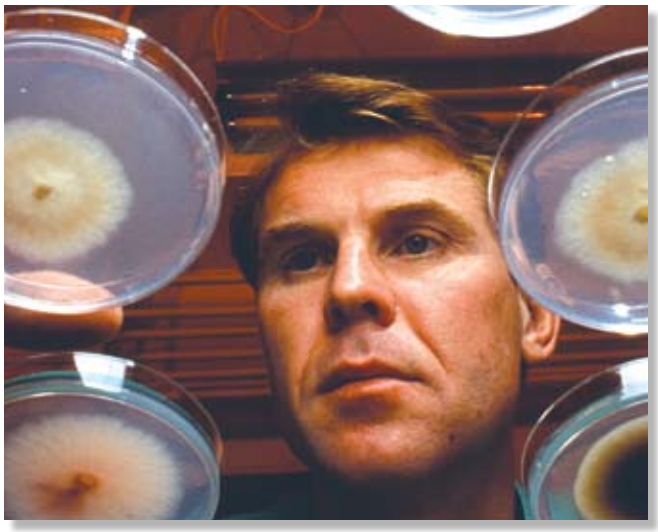


Photo: U.S. Department of Agriculture-Agricultural Research Service

Colleges and universities, government agencies, and industries employ toxicologists. Toxicologists who work for colleges or universities conduct research and teach. Those employed by the government or industry make sure that chemicals we use are safe and effective. Veterinarians trained in toxicology work in animal health diagnostic laboratories, while physicians and pharmacists with toxicology training work in human hospitals or poison control centers.

To be a toxicologist you need at least two years of study beyond a bachelor of science or medical degree (DVM or MD). Most toxicologists have doctoral degrees. Some earn undergraduate degrees in biology, chemistry, or environmental science. Others graduate with degrees in veterinary medicine, human medicine, or pharmacy. Graduate training in toxicology includes coursework in pharmacology, biochemistry, analytical chemistry, and environmental science, as well as toxicology.

In high school, you should take as much biology, chemistry, mathematics, and environmental science as possible. Also, you should develop strong writing, communication, and computer skills.

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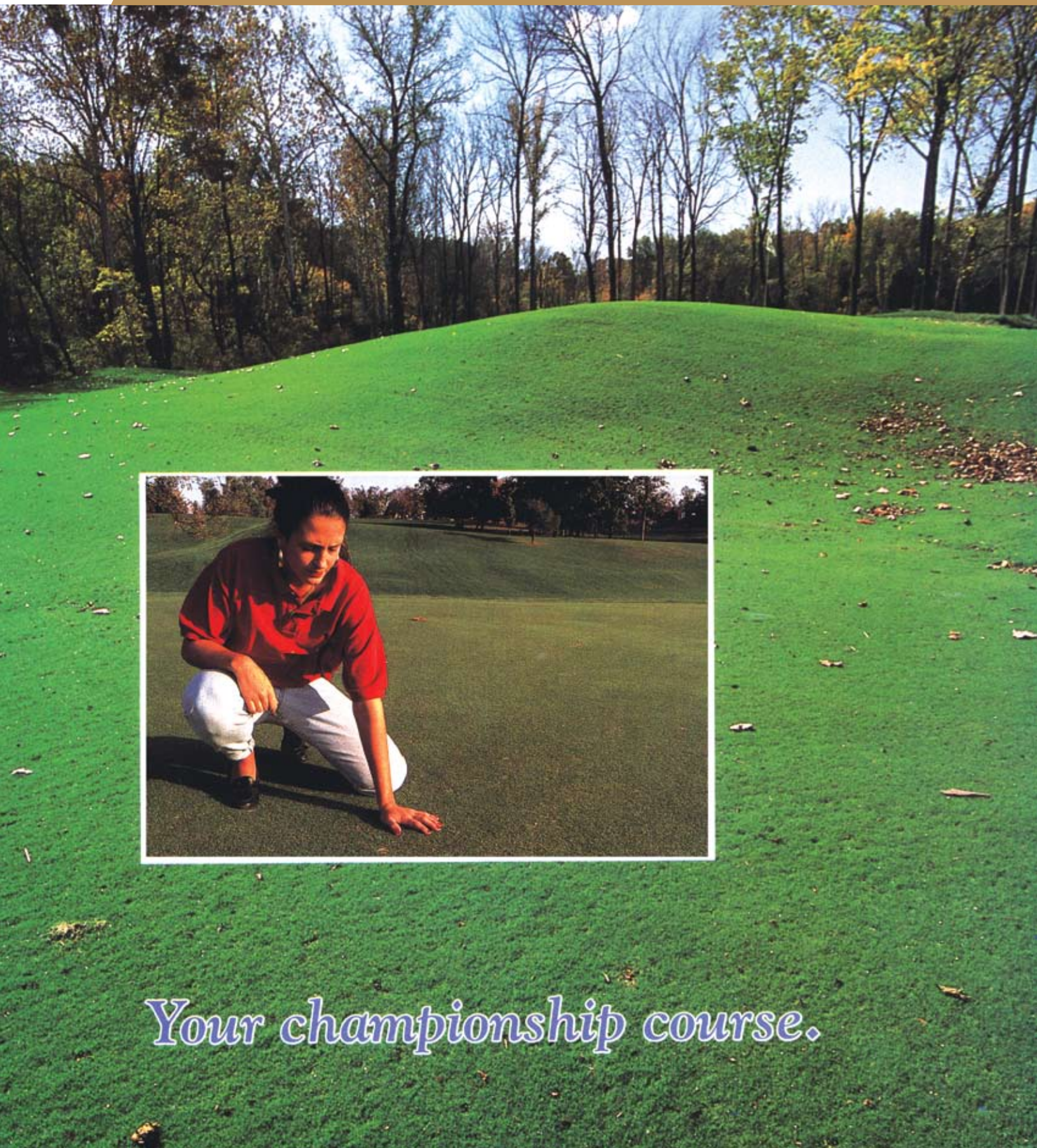
Turf Scientist



Your championship course.

Turf Scientist

Your championship course.

Photos: Kathryn Elsesser-Luba, David Umberger

Turf scientists must be skilled in science, business, and personnel management. In their first jobs, they often work outside caring for lawns, golf courses, park sites, athletic fields, or grounds around corporation headquarters. They use their scientific knowledge to maintain turf, as well as to operate computer-controlled irrigation equipment and highly technical machines. As turf scientists advance in their careers, they become coordinators, managers, or assistant or branch managers in corporations. In these positions, they still must rely on their scientific expertise to make good purchasing decisions and to explain tasks to their employees, but much of their time is spent creating and managing budgets, coordinating projects, and managing an organization with numerous employees.

Turf scientists can be golf course superintendents, turf managers for sports stadiums, park managers, grounds managers for corporate headquarters, sod producers, lawn care professionals, sales representatives for companies that produce turf care products, researchers, or teachers in colleges and universities.

To be a turf scientist, you need a college education. Take courses such as turf management, soil fertility, weed science, plant pathology, entomology, and horticulture. You should also take courses in chemistry, algebra and calculus, accounting, management, business and technical writing, and communications to improve your business and people skills.

In high school, take as much biology, chemistry, English, mathematics, and physics as possible. Other extremely helpful courses include public speaking, Spanish, and computer science.

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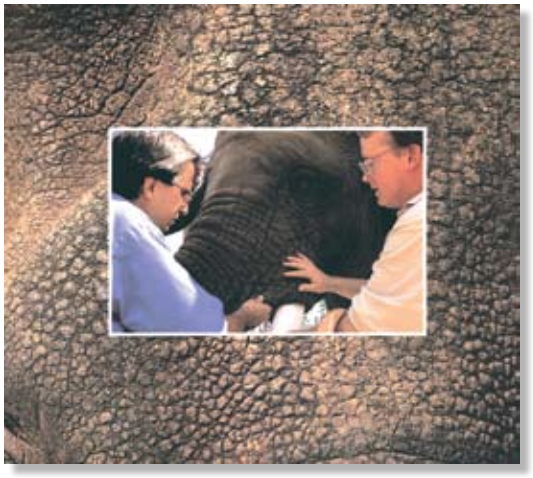
Veterinarian

Healthy creatures great and small.

Veterinarian

Healthy creatures great and small.



Photos: Kathryn Elsesser-Luba

Most veterinarians work in private practices where they diagnose, treat, and help prevent disease and disabilities in animals. The D.V.M. (Doctor of Veterinary Medicine) degree, however, opens up many career choices. Veterinarians can be practitioners, researchers, public servants, administrators, and teachers. They may work with one or more species of animal, or with additional training, in a clinical specialty such as cardiology, surgery, or neurology. Veterinarians safeguard human health by controlling diseases that can spread from animals to humans.

Veterinarians can start their own businesses or work with others in group practices. Some work for nutrition and pharmaceutical companies. Others do research or enforce regulations for state and federal government agencies. Some join the military, while others work as researchers, teachers, and clinicians in academic institutions. Some veterinarians get involved in international work. Others work at racetracks, zoos, and breeding farms.

To become a veterinarian, you need at least seven years of education beyond high school. You must complete at least three years in an accredited college or university undergraduate program before starting your four-year professional curriculum.

In high school, take college preparatory courses. These include four years of mathematics, science (with special emphasis on chemistry and physics), English, and social sciences. Work with as many different types of animals as you can on farms, in veterinary practices, in zoos, with the Society for the Prevention of Cruelty to Animals, and elsewhere to help you decide if veterinary medicine is for you.

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Virologist

Turning tiny invaders into tools.

VIROLOGIST

Turning tiny invaders into tools.

Virologists study the structure of viruses. They work to learn how viruses' genetic material can be packaged in very small particles and how they can infect all living things. Virologists ask how viruses interact with cells. They develop strategies to interfere with the stages of virus replication. Virologists can discover new viruses or identify viruses causing epidemics in plants or animals.

Photo by Stephen Ausmus.

Virologists can work as researchers or technicians with plants, animals, or other living creatures at universities, companies, and government agencies. They can modify viruses so that they can be used as tools, such as delivery vehicles for vaccines to prevent disease, or they can develop new crop plants that are resistant to viral infection. They can be teachers, scientific advisors, or epidemiologists who monitor virus outbreaks throughout the world.

To be a virologist, you need a bachelor's degree in a life science discipline such as microbiology, biochemistry, plant pathology, or genetics. You should take courses in biochemistry, molecular biology, computer science, and mathematics. It is important for you to get research experience during an internship or while taking courses.

In high school, take college preparatory courses in biology, chemistry, physics, and mathematics. Participate in science fairs and science clubs and, if possible, work in a laboratory during the summer.

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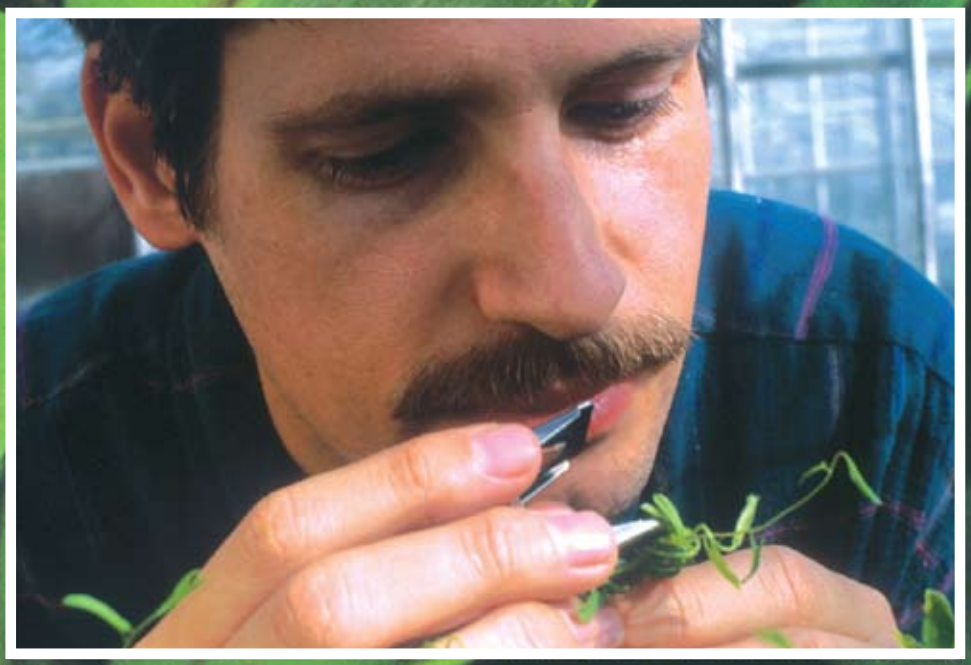
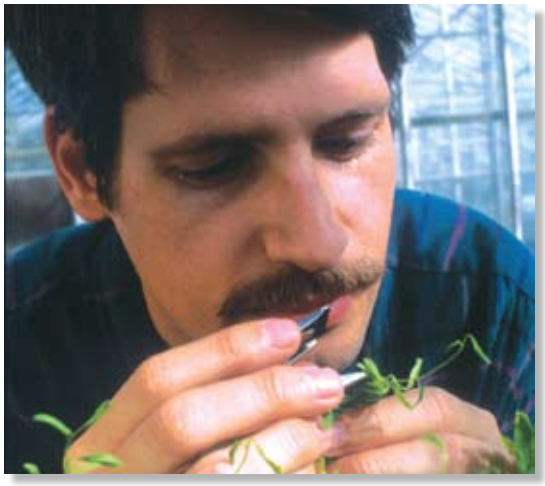
Weed Scientist

Eliminating the competition.



Weed Scientist

Eliminating the competition.



Photos: Mike Kerper

A degree in weed science can lead to a career in a number of fields.

Weed scientists teach, perform research, and work in extension at universities. Some work for state and federal agencies conducting research, enforcing weed laws, and developing regulations for biological and chemical control agents. Weed scientists also work for agricultural chemical firms in research, development, sales, marketing, and regulation. Some work in research, development, or regulation for private research firms. Others diagnose problems in the field or establish weed management systems for private crop management or consulting companies.

To work as a weed scientist in a greenhouse or in the field, you should be interested in weed science (including taxonomy and plant ecology), soil science, and agriculture. You will need a bachelor's degree in a field such as agronomy, horticulture, range science, or soil science. For a laboratory research career you will need a degree in chemistry, biochemistry, or plant physiology. You may need a graduate degree for some positions. To work in business, you should have an interest in sales, marketing, or economics, and a bachelor's degree in business with emphasis on agribusiness or agricultural economics. You may need an M.B.A.

In high school, take chemistry, biology, math (algebra, trigonometry), speech, environmental studies (ecology), computer use, English grammar, technical writing, and typing. Summer experience in weed science will give you valuable background and insight.

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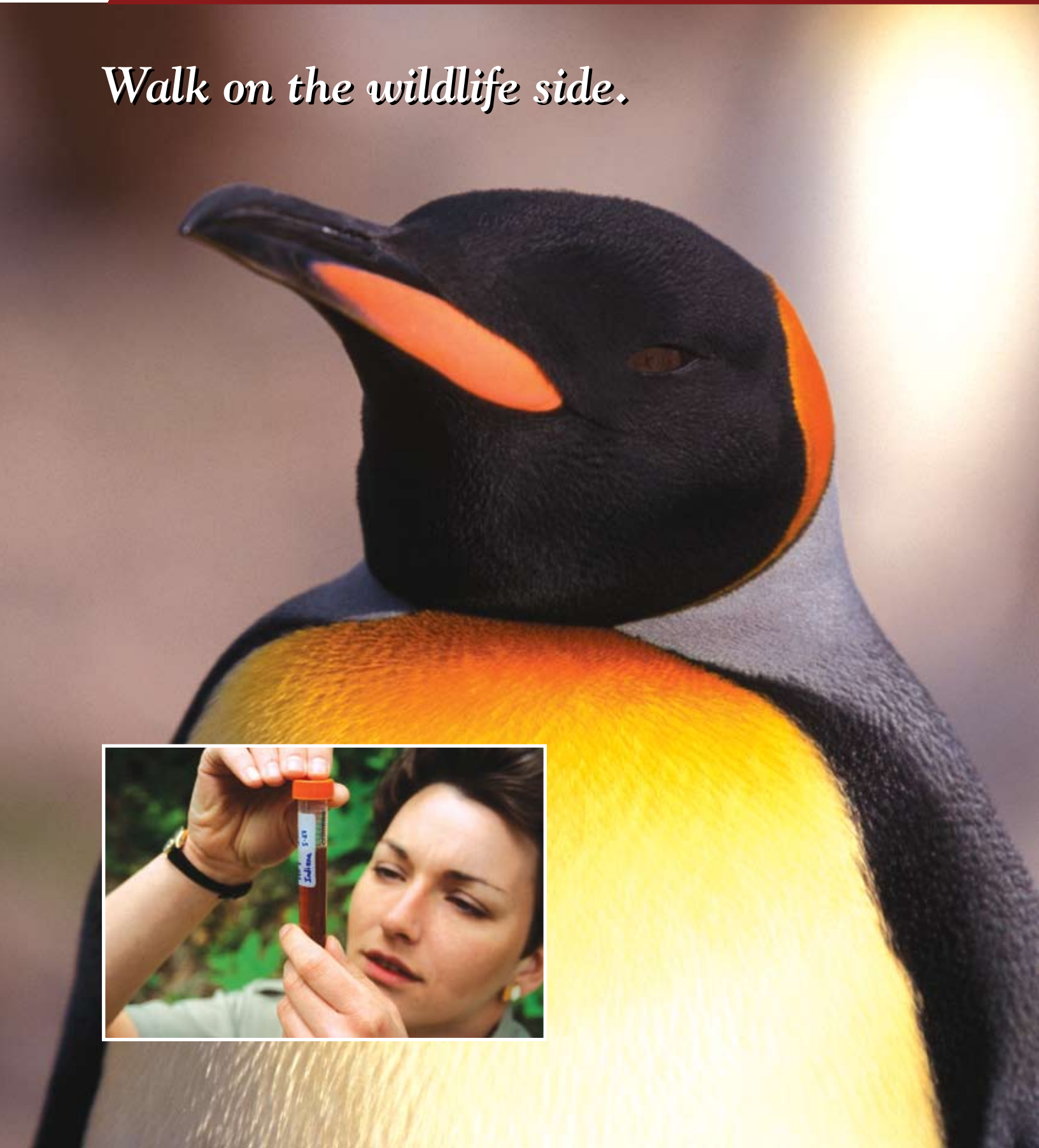
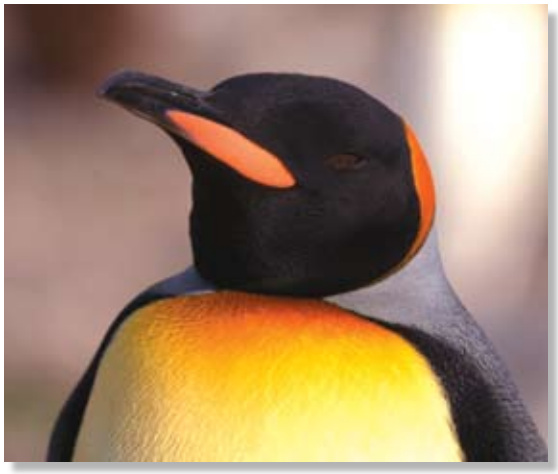
Wildlife Biologist

Walk on the wildlife side.



Wildlife Biologist

Walk on the wildlife side.



Photos: Charles K. Elsesser, Kathryn Elsesser-Luba

Wildlife biologists do research that helps us better manage our natural resources. They may specialize in fields such as physiology, genetics, ecology, behavior, disease, nutrition, population dynamics, land use, and pollution. They are curious, patient, and persistent. While they enjoy working out-of-doors with wildlife, much of their job involves interactions with people. They collect, analyze, and interpret facts objectively and skillfully, and they can report them clearly to other people.

Traditionally, most wildlife positions were civil service jobs with state, provincial, or federal agencies. Many other opportunities are now available. Some city, town, and county agencies hire wildlife management specialists, and many parks hire them for wildlife interpretation (for example, leading nature walks). Universities and colleges offering wildlife curriculums hire wildlife professionals with advanced degrees to teach and do research. After the enactment of the National Environmental Policy Act of 1969, environmental and other consulting firms began employing more wildlife specialists to produce environmental impact statements and other planning documents. Private employment with large firms dealing in timber, ranching, mining, energy production, paper production, and chemical production is also increasing. Each year opportunities increase in community nature or conservation centers, zoos, and a growing number of private and public conservation-related organizations around the world.

To be a wildlife biologist, you need a college education. Since most wildlife resources and conservation problems relate to people, you need courses in English, history, geography, statistics, and economics, as well as in physical and biological sciences. Communication skills, especially speaking skills, must be part of your training.

In high school take as much math, physics, English, chemistry, and biology as possible. If you can, get experience working with committees, conducting meetings, and writing for high school publications.

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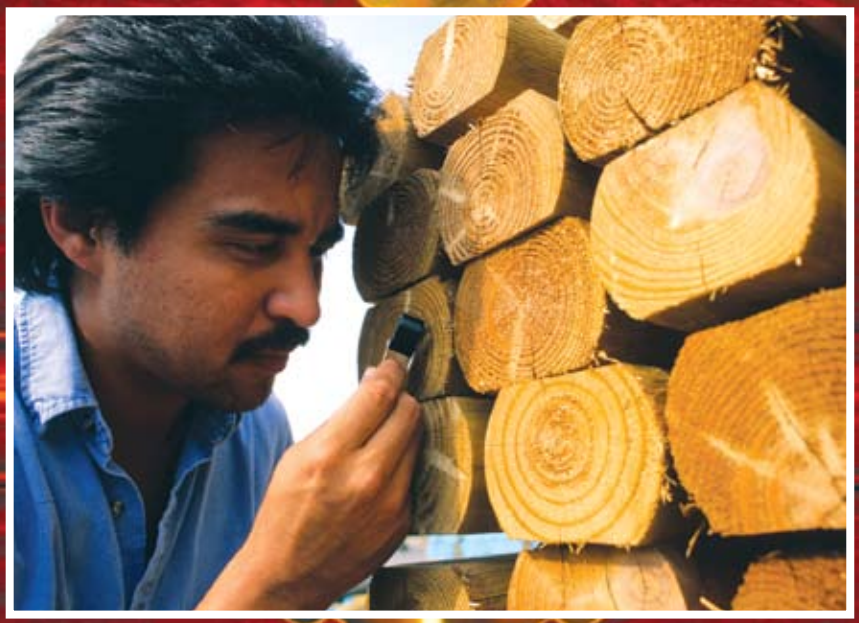
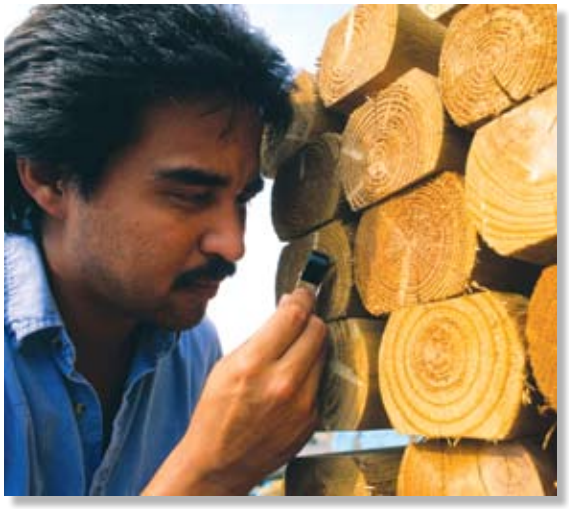
Wood Scientist

Structure and style from a renewable resource.



Wood Scientist

Structure and style from a renewable resource.



Photos: Kathryn Elsesser-Luba

Wood scientists and technologists expertly convert wood to wood products—a process that takes very little energy. And wood is a renewable resource. Wood scientists can work in manufacturing, marketing, technical service, or research.

Wood scientists and technologists in manufacturing can work in product or process development, quality control, production control, engineering, or management. Those in marketing can work in sales, management of accounts, retail management, market research analysis, or product-market management. Wood scientists and technologists in technical service positions make operations more efficient for the chemical companies, machinery manufacturers, wood products manufacturers, government agencies and laboratories, state and federal extension services, or industrial associations who hire them. Wood scientists and technologists can be researchers for large wood products manufacturers, universities, state agencies, associations, or federal agencies or laboratories.

To be a wood scientist, you need a bachelor's degree in wood science and technology (sometimes called forest products or wood utilization). In college, take courses in chemistry, physics, mathematics, economics, wood anatomy, wood structure, production management, product manufacture, wood design, statistics, marketing, and business administration. Graduate level education is valuable for all wood scientists and technologists. It is normally required for research positions.

In high school, take mathematics, chemistry, physics, biology, and computer sciences. To develop your communication skills, take courses in both speaking and English composition.

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