Biological Scientists

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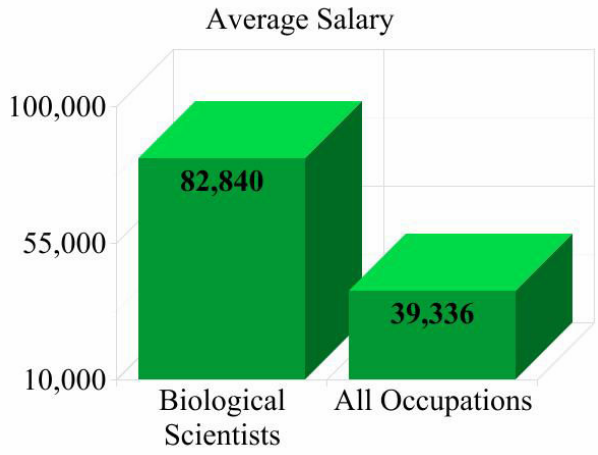
WHAT THEY DO

Biological scientists study living organisms and their relationship to the environment. They perform research to gain a better understanding of fundamental life processes and apply that understanding to developing new products or processes. Research can be broken down into two categories: basic and applied. Basic research is conducted without any intended aim; the goal is simply to expand on human knowledge. Applied research is directed towards solving a particular problem. Most biological scientists specialize in one area of biology, such as zoology (the study of animals) or microbiology (the study of microscopic organisms).

Basic research in biological sciences advances our knowledge of living organisms so that we can develop solutions to human health problems and improve the natural environment. These biological scientists mostly work in government, university, or private industry laboratories, often exploring new areas of research. Many expand on specialized research they started in graduate school.



Many biological scientists involved in basic research must submit grant proposals to obtain funding for their projects. Colleges and universities, private foundations, and Federal Government agencies, such as the National Institutes of Health and the National Science Foundation, contribute to the support of scientists whose research proposals are determined to be financially feasible and to have the potential to advance new ideas or processes.

Biological scientists who work in applied research or product development apply knowledge gained through basic research to develop new drugs, treatments, and medical diagnostic tests; increase crop yields; and develop new biofuels. They usually have less freedom than basic researchers do to choose the emphasis of their research, and they spend more time working on marketable treatments to meet the business goals of their employers.

Scientists usually conduct research in laboratories using a wide variety of other equipment. Some conduct experiments involving animals or plants. This is particularly true of botanists, physiologists, and zoologists. Some biological research also takes place outside the laboratory. For example, a botanist might do field research in tropical rain forests to see which plants grow there, or an ecologist might study how a forest area recovers after a fire. Some marine biologists also work outdoors, often on research vessels from which they study fish, plankton, or other marine organisms.

Swift advances in knowledge of genetics and organic molecules spurred growth in the field of biotechnology, transforming the industries in which biological scientists work. Biological scientists can now manipulate the genetic material of animals and plants, attempting to make organisms more productive or resistant to disease. Those working on various genome (chromosomes with their associated genes) projects isolate genes and determine their function. This work continues to lead to the discovery of genes associated with specific diseases and inherited health risks, such as sickle cell anemia. Advances in biotechnology have created research opportunities in almost all areas of biology, with commercial applications in areas such as medicine, agriculture, and environmental remediation.

EDUCATION REQUIRED

A Ph.D. is usually necessary for independent research, particularly in academia, as well as for advancement to administrative positions. A bachelor’s or master's degree is sufficient for some jobs in applied research, product development, management, or inspection; it also may be sufficient to work as a research technician or a teacher. Many with a bachelor's degree in biology enter medical, dental, veterinary, or other health profession schools, or find jobs as high school science teachers.

In addition to required courses in chemistry and biology, undergraduate biological science majors usually study allied disciplines such as mathematics, physics, engineering, and computer science. Computer courses are beneficial for modeling and simulating biological processes, operating some laboratory equipment, and performing research in the emerging field of bioinformatics. Those interested in studying the environment also should take courses in environmental studies and become familiar with applicable legislation and regulations.

Most colleges and universities offer bachelor's degrees in biological science, and many offer advanced degrees. Advanced degree programs often emphasize a subfield, such as microbiology or botany, but not all universities offer curricula in all subfields. Larger universities frequently have separate departments specializing in different areas of biological science. For example, a program in botany might cover agronomy, horticulture, or plant pathology. Advanced degree programs typically include classroom and fieldwork, laboratory research, and a thesis or dissertation. A master’s degree generally takes 2 years, and a doctoral degree 5-6 years of full-time study.

Biological Scientists - Continued

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OTHER USEFUL SKILLS

Biological scientists should be able to work independently or as part of a team and be able to communicate clearly and concisely, both orally and in writing. Those in private industry, especially those who aspire to management or administrative positions, should possess strong business and communication skills and be familiar with regulatory issues and marketing and management techniques. Those doing field research in remote areas must have physical stamina. Biological scientists also must have patience and self-discipline to conduct long and detailed research projects.

HOW TO ADVANCE

As they gain experience, biological scientists typically gain greater control over their research and may advance to become lead researchers directing a team of scientists and technicians. Some work as consultants to businesses or to government agencies. However, those dependent on research grants are still constrained by funding agencies, and may spend much of their time writing grant proposals. Others choose to move into managerial positions and become natural science managers. They may plan and administer programs for testing foods and drugs, for example, or direct activities at zoos or botanical gardens. Those who pursue management careers spend much of their time preparing budgets and schedules. Some leave biology for nontechnical managerial, administrative, or sales jobs.

WORK ENVIRONMENT

Most biologists spend their time in laboratories conducting research and in offices writing up results and keeping up with the latest research discoveries. Some biological scientists, particularly botanists, ecologists, and zoologists, do field studies that involve strenuous physical activity and primitive living conditions for extended periods of time. Biological scientists in the field may work in warm or cold climates, in all kinds of weather. Biological scientists usually are not exposed to unsafe or unhealthy conditions. Those who work with dangerous organisms or toxic substances in the laboratory must follow strict safety procedures to avoid contamination.

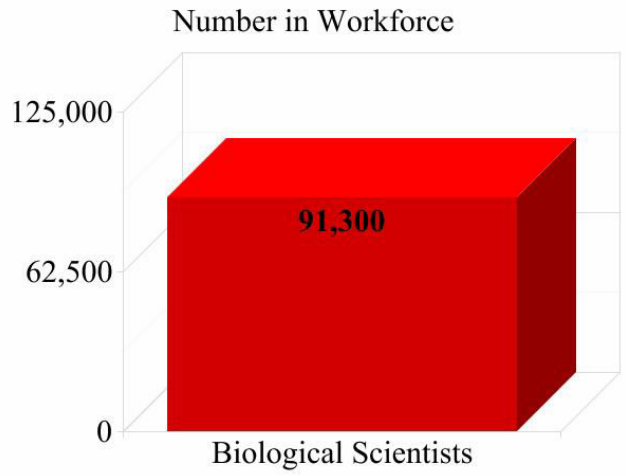
Many biological scientists, particularly those employed in academic settings, depend on grant money to support their research. They may be under pressure to meet deadlines and to conform to rigid grant-writing specifications when preparing proposals to seek new or extended funding.

Some researchers may be required to work odd hours in laboratories or other locations.

JOB GROWTH

Employment of biological scientists is projected to grow 21 percent over the 2008—18 decade, much faster than the average for all occupations, as biotechnological research and development continues to drive job growth. Biological scientists enjoyed very rapid employment gains over the past few decades—reflecting, in part, the growth of the biotechnology industry.

Employment growth will moderate somewhat as the biotechnology industry matures, with fewer new firms being founded and existing firms merging or being absorbed by larger biotechnology or pharmaceutical firms. However, much of the basic biological research done in recent years has resulted in new knowledge, including the isolation and identification of genes. Biological scientists will be needed to take this knowledge to the next stage, understanding how certain genes function within an entire organism, so that medical treatments can be developed to treat various diseases. Even pharmaceutical and other firms not solely engaged in biotechnology use biotechnology techniques extensively, spurring employment for biological scientists. For example, biological scientists are continuing to help farmers increase crop yields by pinpointing genes that can help crops, such as wheat, grow in more extreme climate conditions.



In addition, efforts to discover new and improved ways to clean up and preserve the environment will continue to add to job growth. More biological scientists will be needed to determine the environmental impact of industry and government actions and to prevent or correct environmental problems, such as the negative effects of pesticide use. Some biological scientists will find opportunities in environmental regulatory agencies, while others will use their expertise to advise lawmakers on legislation to save environmentally sensitive areas. New industrial applications of biotechnology, such as new methods for producing biofuels, also will spur demand for biological scientists.