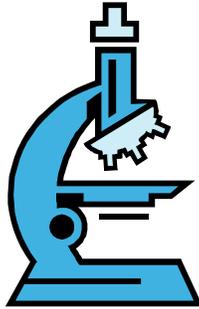


# “What Can I do With a Major in...Biology?”

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## Facts About a Biology Degree

- A biology degree offers much flexibility
- There is a wide variety of specialized fields in the biological sciences with new fields still emerging
- A biology degree allows you to choose a career path suited to your personality and preferred lifestyle (ex: indoor vs. outdoor work, independent vs. team player, public vs. private sector, etc.)
- Biologists can choose from the entire living world what to focus on as well as the setting in which they work
- Biology majors can use their undergraduate degree as a stepping stone to graduate work and then careers in university education, medicine, law, and advanced research

## Skills Possessed by Biology Majors

- Organizational skills
- Critical thinking, analytical and problem solving skills
- Laboratory teamwork skills
- Laboratory technique skills
- Skills in verbal and written communication
- Technical report writing skills
- Manual dexterity skills
- Precision, thoroughness, and detail attentiveness skills

*From the University of Manitoba's Student Counseling and Career Center website.*

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# *Possible Job Titles for Biology Majors*

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## Genetic Counselor

Genetic counselors work as members of a health care team, providing information and support to families who have members with birth defects or genetic disorders and to families who may be at risk for a variety of inherited conditions. They identify families at risk, investigate the problem present in the family, interpret information about the disorder, analyze inheritance patterns and risks of recurrence and review available options with the family.

## Audiologists

Audiologists work with people who have hearing, balance, and related ear problems. They examine individuals of all ages and identify those with the symptoms of hearing loss and other auditory, balance, and related sensory and neural problems. They then assess the nature and extent of the problems and help the individuals manage them. Using audiometers, computers, and other testing devices, they measure the loudness at which a person begins to hear sounds, the ability to distinguish between sounds, and the impact of hearing loss on an individual's daily life. In addition, audiologists use computer equipment to evaluate and diagnose balance disorders. Audiologists interpret these results and may coordinate them with medical, educational, and psychological information to make a diagnosis and determine a course of treatment.

## Forensic Scientist

The forensic sciences form a vital part of the entire justice and regulatory system. Some of the different divisions, or disciplines, of forensic science have become identified primarily with law enforcement — an image enhanced by television and movies. This is misleading because forensic scientists are involved in all aspects of criminal cases, and the results of their work may serve either the defense or the prosecution. The forensic scientist's goal is the evenhanded use of all available information to determine the *facts* and, subsequently, the *truth*.

The forensic scientist's role in the civil justice arena is expanding. Issues range from questions of the validity of a signature on a will, to a claim of product liability, to questions of whether a corporation is complying with environmental laws, and the protection of constitutionally guaranteed individual rights.

## Botany Educators

Botany Educators provide knowledge and insight about plants, plant biology, and the ecological roles of plants. This specialty includes teaching in schools, museums, and botanical gardens, development of educational materials, and science writing.

## Physiologists

*Physiologists* study life functions of plants and animals, both in the whole organism and at the cellular or molecular level, under normal and abnormal conditions. Physiologists often specialize in functions such as growth, reproduction, photosynthesis, respiration, or movement, or in the physiology of a certain area or system of the organism.

## Zoologists and Wildlife Biologists

*Zoologists and wildlife biologists* study animals and wildlife—their origin, behavior, diseases, and life processes. Some experiment with live animals in controlled or natural surroundings, while others dissect dead animals to study their structure. Zoologists and wildlife biologists also may collect and analyze biological data to determine the environmental effects of current and potential uses of land and water areas. Zoologists usually are identified by the animal group they study—ornithologists study birds, for example, mammalogists study mammals, herpetologists study reptiles, and ichthyologists study fish.

## Microbiologists

*Microbiologists* investigate the growth and characteristics of microscopic organisms such as bacteria, algae, or fungi. Most microbiologists specialize in environmental, food, agricultural, or industrial microbiology; virology (the study of viruses); immunology (the study of mechanisms that fight infections); or bioinformatics (the use of computers to handle or characterize biological information, usually at the molecular level). Many microbiologists use biotechnology to advance knowledge of cell reproduction and human disease.

## Ecologists

*Ecologists* investigate the relationships among organisms and between organisms and their environments, examining the effects of population size, pollutants, rainfall, temperature, and altitude. Using knowledge of various scientific disciplines, ecologists may collect, study, and report data on the quality of air, food, soil, and water.

## Peace Corps

Biology students may wish to apply their science background and obtain real world experience by volunteering for the Peace Corps en route to various careers. These opportunities could include working on forestry in Honduras, fisheries in Zambia, and on environmental education in South East Asia. A number of graduate programs are linked to the Peace Corps. The application process should begin early in the fall of your senior year.

## Biotechnology

Today, biotechnology is used in four major industrial areas: crop production and agriculture, environmental uses, non-food use of plants (such as biofuels) and healthcare. For the most part, when people hear the word "biotechnology"--or "biotech" for short-- they think of its applications in medicine. Biotechnology companies have created new vaccines and therapies for diseases such as diabetes, cancer, autoimmune disorders and HIV/AIDS.

Biotech companies focused on healthcare applications contain all the major departments of conventional pharmaceutical companies: R&D, operations, quality control, clinical research, business development and finance and administration. In fact, the top 10 biotech companies are essentially mid-cap pharmaceutical companies. Each department houses several functional groups, or specific, logically related areas of activity.

As you think about a career in the biotech industry, it's useful to identify the general area(s) where your primary interests and aptitudes lie. Let's take a look at the different departments in a biopharma company.

### Research and development

Because biotech is a research-intensive industry, there are many jobs in R&D. At companies such as Genetech, scientists participate in the drug research process from beginning to end. They often work in interdisciplinary teams. Biotechnology firms are always looking for talented researchers to fill their labs. The demand for researchers has increased, but supply hasn't. To have access to talented staff, some biotech firms have moved closer to places where these researchers live. For example, in 2005 Schering-Plough and Amgen announced plans to expand their R&D facilities in Cambridge, Mass., a major hub for biotech and pharmaceutical firms.

### Clinical Research

Once a drug candidate is identified as a potentially viable treatment in R&D, the clinical research department takes over and becomes responsible for shepherding the drug through the FDA approval process. The clinical research function sets up and manages the clinical trials needed to determine a drug's safety and effectiveness or "efficacy." The regulatory affairs function ensures that all FDA reporting requirements are completed and submitted in a timely manner. Finally, the medical affairs/drug information function is responsible for overseeing all the information related to a drug candidate.

### Operations

The operations department is responsible for making commercial quantities of a candidate drug available. Once a promising drug candidate has been identified, the process/product development function determines how to "scale up" quantities of a product to make enough available for clinical trials, since laboratory-size quantities are usually very small. When a product successfully emerges from clinical trials, the manufacturing and production function creates the final product -- complete with packaging and labeling -- that we see on shelves in pharmacies and drugstores.

Also housed under the operations umbrella is the environmental health and safety function, which assesses the environmental impact of a potential product.

## Finance and Administration

The finance and administration department contains these two functional areas as well as information systems and legal. All activities relating to the financial management of the company, its legal relationships to investors, creditors, employees and government regulators are housed in this department. The company-wide computer systems--separate from computing specifically directed at analyzing research data-- are also managed here.

## Business Development

The business development group is typically responsible for identifying prospective new alliance partners and managing existing alliances. The marketing function studies markets, identifies target customer bases, and sets pricing and promotion strategy. The sales function actually meets with potential customers in the field -- usually specialist physicians in targeted areas of specialization (e.g., cardiologists, endocrinologists, urologists, etc.)

## Project Management

Finally, many biotech companies also have a separate project management department, which is responsible for ensuring that work requiring the collaboration of several internal departments is discharged smoothly and efficiently. This department oversees special projects that don't naturally fit into any of the traditional formal functions but that require cross-functional collaboration. Unlike general managers, who work on companies' overall operations, project managers tend to focus on specific projects. A project manager might help launch products, develop marketing programs, run annual sales meetings or manage clinical trials. Some universities and organizations--such as Massachusetts Biotechnology Council, the UC San Diego Extension and the University of Washington Extension--now offer certificate programs in biotech project management.

## Discovery research

The biotech industry is still in its infancy. As a result, most jobs in biotech companies, especially the smaller ones, are in discovery research. Discovery researchers can range from protein chemists to geneticists to biochemists to many other disciplines in the life sciences. There are jobs at all levels. With a Bachelor's, you can get an entry-level job as a research associate and work for several years, tough, though you will need an advanced degree for more senior jobs. Most responsible positions, however, require a PhD. You can definitely break into the industry after undergraduate studies. Entry-level research positions will get your feet wet and give you a chance to experience the culture of research first-hand before committing yourself to advanced studies. The salary range for a research associate is from \$40,000 to \$70,000. The scientist job is the more senior researcher position in R&D. For the scientist track, the salary range is typically \$60,000-\$130,000. Scientific managers can earn salaries in the range of \$100,000 up to more than \$175,000.

## Animal science specialists

Instead of using chemicals the way traditional pharmaceutical chemists do, discovery research scientists use cells, which have to be obtained from animals, cultivated, separated and utilized in special facilities. Discovery researchers rely on veterinarians and other animal science specialists. They grow cultures, make and purify DNA, and help conduct the earliest phases of testing, when a drug's safety is determined via animal testing.

## Bioinformatics

Since nearly all experimental setups are computerized and reams of data are generated with each experiment, the results of biotech experiments are analyzed by specialists who straddle the fence between the biological sciences and information technology. These data analysts are called bioinformatics professionals and comprise some of the most sought-after employees in the industry. They help discovery researchers identify those molecular structures that have the most favorable response profile, and thus the most promising drug candidates.

Bioinformatics has three realms of activity: you can create databases to store and manage large biological data sets, you can develop algorithms and statistics to determine the relationships among the components of these datasets or you can use these tools to either analyze or interpret biological data - e.g., DNA, RNA or protein sequences, protein structures, gene expression profiles or biochemical pathways. The salary range for bioinformatics is from about \$60,000 to \$100,000.

## Field Sales

A position in field sales is the entry-level job in the sales function. The main purpose of the field sales force is to promote the company's products to customers - typically solo or small-practice groups of physicians - within an assigned geographic territory. Reps are carefully selected, trained rigorously, and equipped with detailed product information. They should know their products inside out and work hard to understand the medical science on which those products are based. Within field sales are two areas, territory sales and specialty sales.

## Aquatic Scientists

### Ocean Scientists

Ocean scientists investigate how the oceans work. They usually have a graduate degree in oceanography with a bachelor's degree in one of the fundamental science fields such as biology, physics, chemistry and biology.

### Ocean Engineers

Ocean engineers perform the usual tasks of any engineer - such as designing a structure for example - but they deal with specific issues related to that structure and the environment in the sea. For example, an ocean engineer might design supports for oil well drilling equipment that would stand on the ocean floor. They would have to take into account information about ocean currents and the force the

currents would exert on the structure, plus saltwater corrosion, or marine life interference and other similar elements.

### Ocean Technicians

Ocean technicians are responsible for equipment calibration and preparation, measurements, sampling at sea, instrument maintenance and repair, and data processing. Ocean technicians usually have a bachelor's degree, although some may be successful at finding work with two-year associate's degrees.

### Physical Oceanographers

Physical oceanographers study currents, waves, and motion and the interaction of light, radar, heat, sound and wind with the sea. They are also interested in the interaction between the ocean and atmosphere and the relationship between the sea, weather and climate.

### Chemical Oceanographers

Chemical Oceanographers study chemical compounds and the many chemical interactions that occur in the ocean and on the ocean floor.

### Biological Oceanographers

Biological oceanographers are interested in describing the diverse life-forms in the sea, their population densities, and their natural environment. They try to understand how these plants and animals exist in interrelationships with other sea life and substances and also focus on the impact of human intervention on the oceanic environment.

## Careers in Medicine

### Pediatricians

A pediatrician is concerned with the physical, emotional, and social health of children from birth to young adulthood. Care encompasses a broad spectrum of health services ranging from preventive health care to the diagnosis and treatment of acute and chronic diseases.

### Anesthesiologist

An anesthesiologist is trained to provide pain relief and maintenance, or restoration of a stable condition during and immediately following an operation, an obstetric or diagnostic procedure. The anesthesiologist assesses the risk of the patient's condition prior to, during and after surgery. They provide medical management and consultation in pain management and critical care medicine.

### Neurologist

A neurologist specializes in the diagnosis and treatment of all types of disease or impaired function of the brain, spinal cord, peripheral nerves, muscles, and

autonomic nervous system, as well as the blood vessels that relate to these structures.

## Radiologist

A radiologist diagnoses and treats diseases utilizing radiologic imaging procedures in adults and children. Physicians practicing in the field of radiology most often specialize in diagnostic radiology, radiation oncology, or radiological physics. A diagnostic radiologist utilizes x-ray, radionuclides, ultrasound, and electromagnetic radiation to diagnose and treat disease. A radiation oncologist deals with the therapeutic applications of radiant energy and its modifiers and the study and management of disease, especially malignant tumors. A radiological physicist deals with the diagnostic and therapeutic applications of roentgen rays, gamma rays from sealed sources, ultrasonic radiation, and radio-frequency radiation, as well as the equipment associated with their production and use, including radiation safety.

\*\*\* These are just a few sample descriptions. Other careers in medicine may include the following:

Allergy and Immunology	Orthopedic Surgery
Anesthesiology	Otolaryngology
Colon and Rectal Surgery	Pathology
Dermatology	Pediatrics
Emergency Medicine	Physical Medicine and Rehabilitation
Family Medicine	Plastic Surgery
Internal Medicine	Preventive Medicine
Medical Genetics	Psychiatry
Neurological Surgery	Radiation Oncology
Neurology	Radiology
Nuclear Medicine	Surgery
Obstetrics and Gynecology	Thoracic Surgery
Ophthalmology	Urology

\*The content was adopted from the following websites: <http://www.emporia.edu/biosci/carebiol.htm>, <http://www.bls.gov>, <http://www.aamc.org/students/cim>, <http://www.vault.com>

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# Career Resources for Biology Majors

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## Specific Resources

**American Association for the Advancement of Science:** <http://www.aaas.org/>

**American Institute of Biological Sciences:** <http://www.aibs.org/careers/index.html>

**BioMed Careers:** <http://careers.the-scientist.com/>

**Biotechnology Industry Organization:** <http://www.bio.org/>

**Career Guide for Biology Majors:** <http://www.bio.com/jobs/browse.jhtml>

**Medzilla:** <http://www.medzilla.com/>

**OneScience:** <http://www.onescience.com/>

**The Microbiology Information Portal:** <http://www.microbes.info/resources/>

**Top Bio Jobs:** <http://www.topbiojobs.com/>

## General Resources

**\*CareerSearch:** <http://www.careersearch.net/Hofstra>  
(username-hofstra, password-career)

**Occupational Outlook Handbook:** <http://www.bls.gov/oco>

**Riley Guide:** <http://www.rileyguide.com>

**\*Spotlight On Careers:** <http://www.spotlightoncareers.org>  
(username-lacn, password-holland)

**\*Vault:** [http://www.vault.com/cb/careerlib/careerlib\\_main.jsp?parrefer=6123](http://www.vault.com/cb/careerlib/careerlib_main.jsp?parrefer=6123)  
(You will be prompted for your Novell username and password)

\*These websites require you sign in using a username and password.

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