



MichiganTech

Department of

Biological Sciences

Careers in Biological Sciences

Career opportunities abound in
research, education, and industry.

Careers in the Biological Sciences

This is an exciting time to be a biologist. Whether your interest is at the molecular level, the organismal level, or the global environmental level, there are careers waiting for intelligent, enthusiastic people. Research biologists work in government labs, universities, and private industry. Others enter the always-challenging field of clinical medicine. Educators in biology may find employment at any level from secondary education through university graduate education. Following are some of the more popular biology careers.

Human Biology Careers

Clinical medicine—Biology forms the core of clinical medicine. The demand continues to be high for all health professionals, including physician, dentist, veterinarian, pharmacist, optometrist, chiropractor, podiatrist, physical therapist, occupational therapist, physician's assistant, speech pathologist, audiologist, and the hundreds of other clinical careers. If you want to pursue a career in clinical medicine, you will most likely choose Michigan Tech's Pre-Health Professions Concentration, although students from all concentrations are eligible to apply to these professional programs.

Clinical laboratory sciences (also called Medical Technology)—*Clinical laboratory scientists* are medically oriented biological scientists who perform and develop laboratory test procedures in areas such as hematology, bacteriology, parasitology, mycology, blood bank, immunology, urinalysis, and biochemistry. They are employed by physicians, clinics, health maintenance organizations, and medical research facilities. There are several options in this discipline from which to choose.

Cytotechnologists evaluate prepared microscope slides to detect changes in body tissues and individual cells that may be important in the early diagnosis of cancer and other diseases. They may perform normal as well as abnormal cell identification in samples of tissues from the female reproductive tract (Pap smears), the respiratory tract, the digestive tract, the urinary tract, and other body systems.

Histotechnologists prepare tissue specimens of human and animal origin for diagnostic, research, or

teaching purposes. Their work includes performing histochemical as well as fluorescent and enzyme-labeled antibody staining techniques, preparing materials for examination by brightfield and electron microscopy, and processing tissues for use with DNA analysis.

Forensic biology—Forensic biologists work in the criminal justice system to investigate crime scenes or evidence found at crime scenes. Students interested in this exciting career could choose a clinical laboratory science major or a biology major with the pre-health professions option, the microbiology option, or the molecular biology option.

Sports medicine—Sports medicine is an umbrella term for any health profession where the concentration is on the injuries and ailments suffered by athletes. To work in this field you will need an advanced degree in some area of clinical medicine (see above), with a specialty in the unique health problems of athletes.

Exercise physiology—Exercise physiologists study the human body and its response to the stress of athletic performance. Their findings have relevance not only for athletes but for anyone undergoing vigorous physical activity, such as construction workers, agricultural workers, or military personnel. If you are interested in this field you could choose either the general biology concentration or the pre-health professions concentration. Graduate school is a must for this field.

Genetic counselling—A genetic counselor works in consultation with physicians to help families evaluate concerns regarding their genetic history (e.g., familial history of diabetes or heart disease) and to discuss the options open to them. A strong background in genetics can be obtained through the general biology concentration or the biochemistry/molecular biology concentration. A strong background in humanities and social sciences is also required.

Public health—While physicians deal with the health of the individual, public health officers are concerned with the health of the population. Through both research and teaching, public health officers assess the health dangers facing communities and attempt to eliminate those dangers or alert the public on how to avoid them. The threat of bio-terrorism has made this a particularly important profession. A background in human biology and microbiology can lead to graduate programs in public health. A public health officer would need an MD to be the medical

director or a MS in public health administration (MPHA) to be the health officer for a local health department.

Public health administration—This career combines a biology or nursing degree with a minor in management. You will need a master's in Public Health Administration for management positions. The RN/LPN works in various programs (WIC, EPSDT, Health Promotion, Disease Control, Reproductive Health) at provider and manager level.

Epidemiology—An epidemiologist serves at the county, state, and federal level to resolve outbreaks of infectious diseases and to evaluate conditions that contribute to chronic diseases. To enter this field you will need to combine your degree in biology with a minor in mathematics (statistics). A strong chemistry background is helpful.

Registered sanitarian—These specialists serve at the county, state, and federal level to evaluate food and water safety. They perform site inspections and evaluate situations—sometimes in conjunction with the epidemiologist or disease control specialist—to prevent or control outbreaks of diseases.

Laboratory science—Laboratory scientists serve at the large county (rarely), state, or federal level to inspect and protect water and/or food quality. They also work in disease control, clinical laboratory, and disease screening. Depending on area of concentration, earn a bachelor's degree in biology and/or chemistry. An advanced degree is essential for managerial level appointments.

Environmentally Related Careers

Ecology/environmental biology—Ecologists try to understand the relationships between organisms and between organisms and their physical environment. The work of an ecologist can include research in the outdoors, in a laboratory, or on a computer (e.g., computer simulation). Employment opportunities exist in state and federal agencies and universities, as well as in private industry as environmental consultants. Students interested in a career in this field should consider the ecology option.

Natural history—A naturalist may be employed by a governmental agency (e.g., National Park Service) or by private organizations such as zoos, preserves, or natural museums. A naturalist would be considered a source of general knowledge about the





biotic life of a region or an authority on a specific aspect of the natural world. If you are interested in this field, choose the ecology or the plant science concentration.

Botany—Botanists work in the lab or the field. They search for new pharmaceutical plants, new foods, or endangered species. They work as genetic engineers, plant pathologists, ecological consultants, naturalists, park rangers, horticulturists, physiologists, explorers, researchers, food specialists, or in a host of other careers. If this sounds interesting to you, consider the plant sciences concentration.

Fisheries biology— Fisheries biologists conduct and assist in assessments of sport, non-game, exotic, and endangered fish populations, stocking and hatchery programs, and habitat enhancement. Fisheries biologists are often employed by state (Department of Natural Resources), federal (Fish and Wildlife, National Park, and Forest Services), and tribal agencies. Most positions require field work in or on water, along with interaction with the public. If you are interested in this field, you could choose either the general biology concentration or the ecology concentration.

Wildlife biology—Like fish biologists, wildlife biologists are employed by state, federal, or tribal agencies to work on population assessments of sport, non-game, exotic, and endangered species of birds, mammals, reptiles, and insects. Many wildlife biologists are involved in management of game animals, which requires in-depth knowledge of habitat and food needs of the organism. Most positions require field work and interaction with the public. If you are interested in this field, you could choose either the general biology concentration or the ecology concentration.

Environmental consulting— Environmental consultants are employed by private firms or organizations. Their work is varied and includes laboratory tests on potential environmental effects of a compound, field surveys, and the compilation and synthesis of literature reviews on an environmental issue. If you are interested in this field, choose either the general biology concentration or the ecology concentration.

Education Careers

High school instruction—Students who wish to earn secondary teacher certification in biology should enroll in the secondary teaching certification concentration. Certification is available through both the biological sciences and clinical laboratory sciences degrees.

University instruction—University faculty are involved in teaching, research, consulting, and community service. Students who wish to enter an academic field will need at least a master's degree, and most positions will require a PhD. All fields of biology can lead to a professorial position, and students interested in this area should choose the concentration which most appeals to them.

Microbiology Careers

Medical or veterinary microbiology—These microbiologists work with physicians, dentists, and medical researchers to study the interactions between microorganisms and humans to determine how and why diseases occur. Clinical microbiologists perform laboratory tests to provide physicians with information needed for diagnosis and treatment.

Environmental microbiology—These professionals are generally involved in testing water sources for contamination. They perform bioremediation on sites that are very contaminated. They also try to control the spread of pathogens.

Industrial microbiology—These scientists are concerned with the development of new products, of new methods to preserve food and pharmaceuticals, and of quality standards for microorganisms. Industrial microbiologists may also investigate the genetics and biochemical techniques for creating microorganisms with desired traits.

Agricultural microbiology—These microbiologists work with the effects of microorganisms on crops, soil, insects, and ruminants. They work to increase crop yield and develop superior products.

Food microbiology— These specialists work on the elimination and prevention of contamination by

food-borne pathogens, new sanitation practices, isolation and identification methodology for pathogens in food products, and/or quality control procedures for the production and processing industries.

Biochemistry/Molecular Biology Careers

Toxicology—Toxicologists investigate the mechanisms by which toxic substances produce their effects. Some may also work in industry where they evaluate the safety of new drugs, food products, cosmetics, or other chemicals. Graduate education is important for a career in toxicology. Our concentrations in microbiology and biochemistry/molecular biology provide a strong background for students wishing to enter this career.

Pharmacology—Pharmacology is the research side of the drug industry. Pharmacologists develop and test drugs for use in treating almost any type of ailment. A strong background in biochemistry and molecular biology is essential. Graduate education is recommended. Our concentration in biochemistry/molecular biology provides a strong background for students wishing to enter this career.

Molecular biology—These professionals study the nature and means by which genes are expressed and controlled. Many are employed in agricultural, pharmaceutical, medical, and research institutes and universities worldwide. Our concentration in biochemistry/molecular biology provides the strong background needed to enter this field.

Bioinformatics—Specialists in this discipline use computing technologies to study the biochemical expression of genes. Individuals pursuing this career are strong in both bioinformatics and biochemistry. Employment opportunities exist in agriculture, medicine, drug discovery and development companies, research institutes, and universities. The BS in bioinformatics prepares students to enter these careers.

Biochemistry—Biochemists study a wide variety of organisms, cellular phenomena, and interactions at the molecular level. They are employed in a wide sector of research, product development, and testing companies, as well as universities and research institutes. The concentration in molecular biology/biochemistry prepares graduates for entry into this career.



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