Wright Scholar Research Assistant

CAREER DESCRIPTIONS

Depending upon the particular job assignment, students should be prepared to conduct experiments, compile data, apply modeling and simulation, and use computers while learning the basics of research. Students should possess excellent math, science, and communications skills. Below are general descriptions of science and engineering career fields. Position openings are dependent upon participating mentors and their requirements.

Aerospace Engineers

Conduct wind tunnel tests, design and analyze aircraft structures, take data from a flight test, build and test engines or rocket motors, and use computers to predict the aerodynamic behavior of a new aircraft or engine design. Other areas include designing flight control systems to make airplanes easier and safer to fly, predicting the performance characteristics (such as maximum range and maneuverability) of aircraft and missiles, or creating flight simulators for training.

Behavioral Scientists

Systematically investigate and analyze human behavior through experiments and observations in natural environments. Of particular interest is researching the performance of both cognitive and physical abilities. Example areas of study are attention, perception, sensation, task complexity, temperature, and toxic hazard. As with any science, the behavioral scientist has to maintain an awareness of what other researchers have done and are doing through literature research and conference attendance. Armed with this understanding, the scientist's goal is to provide revolutionary capabilities for human cognition, response, survival, and endurance.

Biologists/Microbiologists

Biologists study life, specifically organisms and their relationship to their environment. Generally speaking, biologists study humans, animals, plants and microbes to gain a better understanding of how the body and nature work, and how external factors may influence each organism. Biologists that perform *fundamental* research seek to understand what mechanisms control the functions of living organisms. Biologists involved in *applied* research try to develop or improve processes in areas such as medicine and industry.

Microbiologists study microorganisms such as bacteria, viruses, algae, fungi, and some types of parasites. They gain understanding in how these organisms live, grow, and interact with their environments through laboratory assays, analysis, monitoring, and identifying microbial cultures and samples. Microbiologists can also investigate new drugs using computer software and clinical trials.

Biomedical Engineers

Carry out a wide range of laboratory tests to support physicians. Research interests focus on physiological performance, injury potential in extreme conditions, physiologic or cognitive monitoring, and non-invasive health/performance monitoring to include characterization of human response and injury criteria with an emphasis on cervical and lumbar spine injuries for both acute and chronic exposures. Testing and simulations concentrate on development and validation of advanced performance models. Biomedical engineers work to develop novel tools and metrics for accessing medical parameters, cognitive states, and injury potential in extreme environments.

Chemical Engineers

Conduct basic and applied research and manage industrial operations to help solve chemical processing problems and help industry use its resources effectively. They work in biotechnology, energy resource development, catalysis, conservation of materials, exotic metals, synthetic and organic materials, pharmaceuticals, plastics, synthetic fibers, food processing, waste treatment, pollution control, and biomedical industries. Challenges some chemical engineers will face include a decreasing oil supply, increased demands for energy and raw material, development of new plastics that work safely for artificial human organs, and processes that use genetically engineered organisms to produce valuable materials or to clean up toxic wastes.

Chemists/Biochemists

Chemists work in a wide range of industries on problems such as reducing the pollution from automobile and jet engine exhausts, manufacturing and designing explosives, finding new sources of energy, locating new oil deposits, helping to solve problems of industrial waste, and developing new materials with desirable properties such as new jet fuels and rocket propellants. Chemists rely heavily on advanced instrumental techniques such as chromatography, mass spectrometry, laser spectroscopy, x-ray diffraction, magnetic resonance spectroscopy, and surface analysis, using computers for control and data processing in each of these areas.

Biochemists are concerned with the chemical and physiochemical processes that occur within living organisms. They study DNA, proteins, cell parts, and expressions of genes, as well as isolate/analyze/synthesize different biomarkers of health and performance. Research includes constructing sensors that utilize the unique properties of nucleic acids and nanoparticles and understanding the community ecology of the microbes associated with humans.

Computer Engineers/Computer Scientists

Computer Engineers design, develop, and manage systems that process, store, and convey information. These systems include personal computers, workstations, mainframe computers, computer networks, and all of their various components. Computer engineers also design and develop embedded digital systems for use within products such as aircraft, automobiles, communication switching systems, biomedical instruments, industrial robots, and household appliances. Because digital systems usually include both hardware and software, a computer

engineer typically has the hardware background of an electrical engineer and the software background of a computer scientist. Computer engineers can choose to specialize in areas such as very large scale integrated systems design, embedded systems, electronic design automation, and networks and communications.

Computer Scientists typically work on the theoretical (or software) side of computer systems, as opposed to the hardware side that computer engineers mainly focus on (although they do overlap). Although computer scientists can also focus their work and research on specific areas (such as algorithm and data structure development and design, software engineering, information theory, database theory, computational complexity theory, numerical analysis, programming language theory, computer graphics, and computer vision), their foundation is the theoretical study of computing from which these other fields derive.

Electrical Engineers

Design, develop, and operate systems that generate and use electrical waveforms. This includes power generation and distribution systems for aircraft and spacecraft, data processing and control, and instrumentation systems. Computers and digital circuits have become an integral part of these systems. Electrical engineers are also concerned with the devices that make up such systems: transistors, integrated circuits, antennas, computer memory devices, and fusion plasma confinement devices.

Materials Scientists

Solve problems by developing and applying knowledge of materials. Over the past ten years, increasing knowledge of materials has revolutionized how they are used. Advanced ceramics, for example, may replace metals in high-temperature applications such as internal combustion engines and jet engines. New oxide superconductors have been developed that present no resistance to the flow of electricity at temperatures well above those used just a few years ago. Other materials open up new possibilities for computer chips, super alloys, and combinations of materials for use in aircraft and spacecraft. Students who enjoyed chemistry in high school should definitely explore career opportunities in materials science.

Mechanical Engineers

Deal with the design, analysis, testing, production, and utilization of all types of mechanical systems. This includes research involving thermal management, gas and turbine engines that are more efficient and affordable, improved structures, and vibrational analysis. They are also involved in solving problems brought about by ever-increasing demands from a growing world population. For example, mechanical engineers are looking for ways to control air pollution from auto and jet engine combustion products as well as thermal pollution from power plants (nuclear or fossil-fueled); studying noise pollution and how to suppress it; and developing urban vehicles for efficient, safe, pollution-free transportation. The diversity within the mechanical engineering curriculum gives graduates a breadth of career opportunities. While the traditional stereotype of mechanical engineering careers is mechanical design, graduates can also consider opportunities in product safety, sales, marketing, and management.

Physicists/Mathematicians

Use mathematics to analyze and predict how things in our physical world behave. A physicist uses these findings to develop devices and instruments. Because the field of physics is broad and complex, a physicist tends to specialize in one particular area - nuclear, particle, plasma, and astrophysics are just a few. Most physicists have a doctorate. An individual with strong math and statistical skills often does well in this field. Computer knowledge is also important because much of a physicist's work involves research.