

PHYSICS

Physics is a major branch of the physical sciences and involves the study of matter and energy.

"Nothing in life is to be feared. It is only to be understood." Marie Curie

"No amount of experimentation can ever prove me right; a single experiment can prove me wrong." Albert Einstein

TYPICAL SKILLS

Ability to organize/analyze scientific data
Ability to operate computers
Ability to make critical observations

Aptitude for details
Ability to conduct/explain scientific research
Proficiency in problem solving

Investigation	Communication	Computational	Technical
▲ Define research problems	▲ Develop & write research proposals	▲ Measure distances/relationships	▲ Design equipment
▲ Develop research models	▲ Review scientific literature	▲ Perform calculations	▲ Identify/classify materials
▲ Establish hypotheses	▲ Summarize research findings	▲ Mathematical modeling	▲ Observe data
▲ Gather/analyze data	▲ Inform, explain, instruct	▲ Maintain records	▲ Establish experimental designs
▲ Evaluate ideas	▲ Prepare technical reports	▲ Utilize math formulas	▲ Use instruments
▲ See relationships among factors	▲ Draw meaningful conclusions		

TYPICAL JOBS LIST

The following are actual job titles of people who have graduated with an undergraduate degree in Physics although some of these positions may require education beyond a bachelors.

AGRICULTURAL SCIENTIST

Conducts basic research or uses applied science to improve agricultural yield, quality or production by finding better ways to grow, manage, protect, harvest, ship, store, market and process crops and livestock. Areas of specialization include animal science, breeding, genetics, biochemistry, biotechnology, plant pathology, plant physiology, agronomy, crop science, soil science, weed science, horticulture, entomology, forestry, aquaculture, education or communication. Many focus on single commodity, problem, organism etc.

AIR TRAFFIC CONTROL SPECIALIST

Provides weather reports, in-flight assistance, obstruction information and aircraft sequencing to ensure safe, orderly, efficient flow of air traffic both in the air and on the ground.

COMPUTER ENGINEER

Researches, designs, develops, tests and assists in the manufacture of computer hardware (computer chips, circuit boards, modems, printers, embedded systems, optical character recognition devices, display devices etc.), software (programs for operating systems, network distribution, compilers), other computer-related equipment, computer components or complete computer systems.

COMPUTER PROGRAMMER

Writes, tests and maintains the detailed programs (software) that list in logical order the steps computers must execute to perform their functions. Applications programmer (specializes in business, engineering or science) does original design work of new programs or modifies/updates existing programs. Systems programmer develops, installs and maintains software that controls and manages computer hardware enabling it to run applications efficiently.

ENVIRONMENTAL HEALTH SPECIALIST

Specializes in managing environmental factors that affect the health of the public and the environment: food production, handling and protection; solid/hazardous waste management; air, water and soil quality protection, vector control, infectious diseases, etc. Provides inspections, investigations, consultations and technical assistance to both public and private sectors to prevent and/or control environmental and occupational hazards to the public's health.

FOOD SCIENTIST/TECHNOLOGIST

Applies principles of engineering, chemistry, microbiology and other sciences to developing, processing and packaging all types of food and beverage products. Responsible for food safety, taste, appearance and nutrition. Most work in industry, developing new and improving existing products.

GEOLOGIST

Studies and interprets the history, structure and composition of the earth and its climate.

HYDROGEOLOGIST

Studies the occurrence, movement, quality and properties of groundwater (water below the surface of the earth). May specialize in geologic analysis of subsurface water supply, land use planning or environmental work--preventing pollution, cleaning up contamination, planning for hazardous waste disposal etc.

INDUSTRIAL HYGIENIST

Protects health of employees and the community through implementation of advances in industrial hygiene management. Responsibilities include anticipation, recognition, evaluation and control of health, chemical, physical and environmental stress factors in or from the workplace that may result in injury, illness, impairment or affect the health of workers or members of the community.

LABORATORY TECHNICIAN

Performs experiments and tests in laboratory or in the field. Sets up, operates, and maintains lab instruments. Develops and adapts procedures. Interprets data and develops conclusions. Areas of specialization include chemistry, biology, biotechnology, materials science, geology, physics, engineering, meteorology, environmental and agricultural sciences. May work in quality control, environmental monitoring and cleanup, or research/process development.

LASER/ELECTRO-OPTICS TECHNICIAN

Assembles, tests, operates, repairs and maintains lasers and electro-optic systems. May specialize in fiber optics, industrial or medical applications or holography. Provides technical support in research, design and development or may work in sales, installation, production or field service.

MATHEMATICIAN

Solves or directs the solution of problems using higher mathematics. Pure or theoretical mathematicians conduct research to discover, create and develop new mathematical principles or new relationships between existing principles. Applied mathematicians develop and use mathematical principles and methods (including algorithms) to find solutions to practical problems in science, business, engineering, industry etc.

MECHANICAL ENGINEER

Designs, develops and manufactures machines that produce, transmit, use or save energy, e.g., production machinery, ground/air/space vehicles, robots, heating/refrigeration/air conditioning units, environmental control equipment and power plants. May work in research, design, development, testing, production operations, maintenance, sales or management.

METALLURGICAL ENGINEER

Uses principles of physics, chemistry, engineering and economics to recover metals from ores, improve metallic alloys, predict the behavior of metal and develop manufacturing processes to convert metals and metallic alloys into usable products.

METEOROLOGIST

Uses observations and knowledge of mathematics and physical sciences to study atmosphere. Two major specializations: may work in applications/operations forecasting occurrence and movement of weather features (clouds, temperature, rain, snow etc.) or theoretical/research studying atmosphere's properties and behavior including its' climate.

NUCLEAR MEDICINE TECHNOLOGIST

Prepares and administers radiopharmaceuticals to patients and performs imaging procedures used in the diagnosis, management, treatment and prevention of various disorders. Provides images, data analysis and patient information to physician for diagnostic interpretation.

OCCUPATIONAL SAFETY PROFESSIONAL

Evaluates and implements preventative measures to reduce injury, illness and general losses associated with health, safety and environment. Develops measures for controlling workplace hazards and limiting property loss, and advises management on necessary corrections. Monitors operating procedures, materials, machines and conditions at worksites to determine risks of injury, occupational disease and damage to property and equipment.

OCEANOGRAPHER

Applies multidisciplinary scientific knowledge to the understanding of the ocean, its movement, its interaction with the atmosphere and climate, life within it and the solid Earth beneath it. Provides the public, government and industry with historic, economic and ecological perspectives on the impact of ocean dynamics on resources, coastlines, defense, weather, climate etc.

OPTOMETRIST

A doctor of optometry who examines, diagnoses, treats and manages diseases and disorders of the eye, visual system and associated structures. Prescribes medications, contact lenses, glasses and optical aids.

PHYSICIST

Researches the physical laws of nature, structure and behavior of matter, generation of energy and interaction of matter and energy. Applies knowledge to solving complex technical problems or developing new products in a wide range of applications. May focus on theoretical, computational or experimental physics. Specializations include condensed matter, plasma, nuclear or particle physics, molecular and atomic structure, fluid mechanics, biophysics, electricity, magnetism, optics, acoustics, thermal physics, astrophysics, materials science, medical physics etc.

SYSTEMS ANALYST

Designs scientific, engineering and business systems through the use of analytic, diagramming and documentation tools such as HIPO charts, logic diagrams, decision trees, pseudo code and CASE (Computer Assisted Software Engineering) tools. Analyzes problems and devises information-based solutions. May design entirely new systems, including both hardware and software, or add a single new software application to harness more of the computer's power.

TEACHER: SCIENCE/MATH

Instructs middle or junior high school students in physical and life sciences or mathematics. Instructs high school students in areas such as biology, chemistry, physics, earth and space sciences, algebra, geometry, trigonometry, calculus, discrete mathematics, probability, statistics and computer science.

TECHNICAL WRITER/COMMUNICATOR

Creates instructional/reference materials for users of technical and scientific products, especially for the computer, telecommunications, and consumer electronics industries. Materials include manuals, online help systems, online documentation, screen messages and prompts. Many create Web documents, architect corporate intranets, and design instructional content for distance education.

HIRING ORGANIZATIONS

Acoustics firms
Atomic/Nuclear laboratories
Educational institutions
Electronics firms
Engineering firms
Environmental agencies
Government agencies/Laboratories
Lighting industry
Manufacturing/Processing firms

Meteorology/Atmospheric groups
Military (Civilian and Armed Forces)
Nuclear plants
Patent law firms
Petroleum companies
Professional journals
Research firms
Technical journals
Technical libraries

PROFESSIONAL ORGANIZATION/ASSOCIATIONS

Acoustical Society of America
2 Huntington Quadrangle, Suite 1NO1
Melville, NY 11797-4502
(516) 576-2360 fax: (516) 576-2377
<http://asa.aip.org>
email: asa@aip.org

American Association of Physics Teachers
One Physics Ellipse
College Park, MD 20740-3845
(301) 209-3311 fax: (301) 209-0845
www.aapt.org
email: aapt-exec@aapt.org

American Association of Physicists in Medicine
One Physics Ellipse
College Park, MD 20740-3846
(301) 209-3350 fax: (301) 209-0862
www.aapm.org
email: aapm@aapm.org

American Astronomical Society
2000 Florida Avenue NW, Suite 400
Washington, DC 20009-1231
(202) 328-2010 fax: (202) 234-2560
www.aas.org
email: aas@aas.org

American Crystallographic Association
PO Box 96, Ellicott Station
Buffalo, NY 14205-0096
(716) 856-9600 ext. 379 fax: (716) 852-4846
www.hwi.buffalo.edu/ACA/
email: aca@hwi.buffalo.edu

American Geophysical Union
2000 Florida Avenue, NW
Washington, DC 20009-1277
(202) 462-6900 fax: (202) 328-0566
www.agu.org
email: service@agu.org

American Institute of Physics
One Physics Ellipse
College Park, MD 20740-3843
(301) 209-3100 fax: (301) 209-0843
www.aip.org
email: aipinfo@aip.org

American Physical Society
One Physics Ellipse
College Park, MD 20740-3844
(301) 209-3200 fax: (301) 209-0865
www.aps.org

Optical Society of America
2010 Massachusetts Avenue, NW
Washington, DC 20036-1023
223-8130 fax: (202) 223-1096
www.osa.org
email: info@oso.org

The Materials Research Society
506 Keystone Drive
Warrendale, PA 15086-7573
(724) 779-3003 fax: (724) 779-8313
www.mrs.org
email: info@mrs.org

The Society of Rheology
American Institute of Physics
500 Sunnyside Blvd.
Woodbury, NY 11797
(516) 576-2403 fax: (516) 576-2223
www.rheology.org/sor/
email: albertco@umche.maine.edu

WEBSITES: JOB INFO

Physics and Astronomy Online www.physlink.com

American Institute of Physics Career Services <http://www.aip.org/careersvc/>

American Physical Society Careers/Employment Information
<http://www.aps.org/jobs/index.html>

Physics Jobs On-Line <http://physicsweb.org/TIPTOP/FORUM/JOBS/>

Health Physics Employment Opportunities - also links to industry's web sites
<http://www.radix.net/~gregsackett/jobs.htm>

Association of Science-Technology Centers - job listings
<http://www.astc.org/profdev/jobs/jobs.htm>

Jobs in physics, astronomy and other fields <http://www.phys-astro.sonoma.edu/people/faculty/tenn/Jobs.html>

MonsterTRAK <http://www.monstertrak.com>

Jobs in Optics <http://www.optics.org>

Jobs in Science <http://recruit.sciencemag.org/jobsearch.dtl>

Positions in High Energy Physics <http://www.hep.net/employment/list-jobs.html>

Jobs in education:

School jobs <http://www.school-jobs.net>

K-12 Job Search <http://www.k12JobSearch.com>
Education America Network <http://www.educationamerica.net/>

WEBSITES: CAREER INFO

Physicists and Astronomers (Occupational Outlook Handbook, 1996-97)
<http://stats.bls.gov/oco/ocos052.htm>

Careers with Physics <http://careers.iop.org>; www.sckans.edu/~gangwere/careers.html

Physics Careers www.cap.ca/careers

Get a Physics Degree and See the World www.physics.adelaide.edu.au/jobs/jobs.html

American Institute of Physics Weekly News <http://newton.ex.ac.uk/aip/>

*Career Converter <http://6steps.monster.com/step1/careerconverter>

*Career Fields <http://career.berkeley.edu/Infolab/CareerFields.stm>

*UTK <http://career.utk.edu/majors/majors/asp>

*Resources http://guide.symplicity.com/resources/profession_index_a_z.php

*<http://www.bw.edu/career/programs/wcidwami>

*KSU <http://www.ksu.edu/acic/career/careerbymajor.html>

*NCSU <http://www.ncsu.edu/career/students/major.htm>

*Delaware <http://www.udel.edu/CSC/mrk.html>

PROFESSIONAL ASSOCIATION/ORGANIZATIONS

American Institute of Physics <http://www.aip.org>

American Astronomical Society www.aas.org

National Aeronautics and Space Administration
<http://www.nasa.gov>

American Physical Society <http://www.aps.org/>

Institute of Physics <http://www.iop.org/>

The Geophysical Union <http://www.agu.org/>

American Meteorological Society <http://www.ametsoc.org/AMS/index.html>

MISCELLANEOUS

The Network of Student Physics Societies <http://nexus.iop.org>

The Internet Pilot to Physics <http://physicsweb.org>

Physics Central - brought to you by the American Physical Society
<http://www.physicscentral.com/>

UNIVERSITY OF LOUISVILLE DEPARTMENT OF PHYSICS

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102 c Natural Sciences Bldg
502-852-6790

Undergraduate Program Director:

Professor Shudun Liu
204 Natural Sciences Bldg
502-852-0920

Brief History of the Department

The Department of Physics at the University of Louisville has existed in several forms over many years. We know that classes in Physics have been offered here since at least the first decade of the 20th century. At that time, the classes were offered downtown. In 1925, Physics classes moved from the second floor of a "barn" near the corner of 2nd and Broadway to the Belknap Campus. During the first half of the 20th century, two Physics Departments developed independently: one in the Speed School and one in the "University proper." These departments eventually merged to form the department we know today.

PROGRAMS OF STUDY

The Department of Physics is part of the College of Arts & Sciences at UofL. For undergraduates, we offer the BS and BA degrees and a Minor in Physics. The BS and BA are described here in full, with program requirements taken directly from the University Catalog. We also include brief descriptions of our graduate degrees for your information. Of particular interest in this area may be the "new" 5-year plan for obtaining a BS and MS in Physics.

Note that credit requirements given are the minimum required for the degree. There is no penalty for getting more credits, up to 60 in the major field of study. Over 60 credits in the field the hours no longer count toward the degree. We do encourage you to take more than the required number of credit hours in Physics - this is where University electives can be used.

Professional Organizations

Most academic disciplines have affiliated professional organizations. The professional organizations help promote the discipline, maintain the integrity of the discipline, and coordinate efforts in the academic area to some degree. Membership in these organizations carries many benefits. Students often can get memberships at greatly reduced rates.

AIP

The American Institute of Physics (AIP) is the umbrella organization for Physics in the United States. AIP is not a member society - that is, no one becomes a member of the AIP directly, though they may *work* for AIP - but it oversees a number of member societies. It also publishes journals, provides career services for Physicists, and advances the field to the public and politicians. Find the American Institute of Physics online at www.aip.org.

APS

The American Physical Society (APS) is the main member society of the AIP. It consists of over 40,000 members. Members can optionally choose to belong to any of 14 divisions in APS, 6 fora, 9 topical groups, or 8 regional sections. APS publishes some of the most distinguished scientific journals in the world, including the *Physical Reviews*. APS conducts major meetings and conferences each year. The APS March and April meetings are especially known for their high turnout (thousands of Physicists per meeting).

AAPT

The American Association of Physics Teachers (AAPT) is another member society under the umbrella of the AIP. AAPT is for those who teach Physics or are interested in the teaching of Physics. AAPT publishes the journals *American Journal of Physics* and *The Physics Teacher*. AAPT also sponsors several meetings and/or conferences each year, including an April meeting joint with the APS.

KAPT

The Kentucky Association of Physics Teachers (KAPT) is one section of the AAPT.

The Society of Physics Students

The Society of Physics Students (SPS) is a professional physics association explicitly designed for students. It exists to help students transform themselves into contributing members of the professional community. Typically the SPS engages in outreach, educational, social, and community service activities to encourage students to develop communication skills, leadership experience, and a personal network of contacts. The SPS regularly makes scholarships and research opportunities available to students. Student researchers may receive support from the SPS to travel to present their scholarly work at professional meetings as well. Typical activities include inviting guest speakers in to talk about research or physics related topics, taking trips to educational sites, such as national laboratories, offering tutoring to students, judging local science fairs, and many more. Students generally find SPS activities very rewarding and entertaining. SPS also spends a lot of time having pure fun by sponsoring picnics, movie marathons, and intramural sports teams.

SPS Membership, through collegiate chapters, is open to anyone interested in physics.

Membership has, in recent years, ranged from 10 to 50 people, both graduate and undergraduate, from many different areas of study. Besides physics majors, our members include majors in chemistry, computer science, engineering, geology, mathematics, medicine, and other fields. Approximately 100 students are on our local email distribution list at any given time.

Membership dues are 10.00 per semester locally and 20.00 per year nationally. You can join SPS at either or both the local and national level. The University of Louisville chapter of SPS meets once every week (usually Fridays at noon) in the physics department. Please visit our website (see link on department homepage) for more information. You may register for the national Society of Physics Students organization

ΣΠΣ - The Physics Honors Society

SPS grew out of the $\Sigma\Pi\Sigma$ Honors Society, but now $\Sigma\Pi\Sigma$ is the honors branch of SPS. Sigma Pi Sigma membership is open to undergraduate and graduate students as well as faculty members. In general, a candidate for membership must be in the upper one-third of their class in general scholarship to meet the minimum requirements for admission. The candidate must also have completed at least three semesters of full-time college work and at least three semester courses in physics.

The Physics Learning Center

The Physics Learning Center (PLC), located in rooms 132, 134, and 136 of the Natural Sciences Building, offers students a supportive, but informal, environment to sit and study with a group or alone. An upperclassman in Physics is almost always present for on-the-spot tutoring and help with homework problems. Other things you may find useful in the PLC are: various science texts that may help with studying, physics periodicals to read while taking a break from homework, and marker-boards to sketch out thoughts and discuss problems with others. It is also a great place to review for upcoming exams with a few classmates. The PLC is designed to encourage you to become a successful student, so use it to your advantage!