Archaeology

What is an archaeologist?

An archaeologist is someone who has an unquenchable curiosity about past cultures and people: how they lived, what they ate, how they were organized socially and politically, what they made, and where they lived. Archaeologists are members of the larger field of anthropology, but unlike most anthropologists, archaeologists are concerned about past behaviors and lifeways. Like detectives, archaeologists piece together past lifeways by examining the evidence left behind in the ground, on the ground, in dry caves, and under the ocean. This evidence includes pottery, stone tools, the ruins of ancient buildings and ships, animal bones, trash, old garden plots, plant remains and pollen, and even the land form on which the ancient ruins are found.

In order to answer questions as simple as, "Where did the clay used to make this pot come from?" or as complicated as, "What caused empires to arise in Peru and Mexico, but not in North America?" Archaeologists collaborate with a number of other scientists including geologists, chemists, geomorphologists, architects, linguists, historians, biologists and other specialists.

What makes a good archaeologist?

A good archaeologist must be someone who is willing to be patient, exacting, attentive to detail, a good and thorough researcher, a good writer, a good public speaker, a good analyst, and a good synthesizer. Also important is the ability to work as a team member since many archaeologists collaborate with other specialists. A tolerance for rugged living and working conditions is necessary because most archaeological field work is often conducted in remote areas. The weather can be hot and humid, cold and wet, dry and hot; the terrain can be rugged or flat, and the vegetation dense as the jungle or sparse as the desert. Insects, plants, and animals can be trying and vicious in all of these environments.

Gila Cliff Dwellings National Monument

Most importantly, to be a good archaeologist, as with any career, you must be enthusiastic about your chosen career and be able to communicate your enthusiasm and love for your work to others.

What is life as an archaeologist like?

Exciting. Yes, there can be periods of boredom or tedium as you face the never-ending analysis of ceramic. There can also be periods of frustration when all your data appears to conflict. However, the joy of solving the puzzle, putting the last piece in place, or finishing the ceramic analysis is immense. There is also the excitement of meeting new people, going to new places, and participating in exciting, groundbreaking research.

As an archaeologist you have a variety of job possibilities including museum director, museum curator, professor, contract archaeologist, or owner of your own contract firm. A typical day can vary depending on the job you take, but there are many similarities. A university professor may spend the day lecturing, analyzing chipped stone or ceramics in the lab, attending meetings, supervising students, writing up the results of field work, or excavating a site. A museum director could spend the day doing similar things as the professor or have a public speaking engagement, develop new exhibits, or curate an exhibit (select the objects for display). A person working for a contract firm could spend the day writing up a report, analyzing artifacts in the lab, excavating a site or walking 10 to 15 miles as part of field survey crew locating archaeological sites. As the owner of a contract firm, you could spend the day acquiring contracts, writing grants, and making the payroll.

How do I become an archaeologist?

First you need to decide what type of job you might be interested in doing. In archaeology, the more education you have, the more responsibility and the higher-paying the job. For instance, if you have a bachelor's degree from a college in anthropology/archaeology, you can usually work as part of a field crew or lab crew surveying, excavating, and sorting. However, with just a

bachelor's degree you may not find yourself in charge of running the field crew, writing reports, or directing the analysis. With more education and experience, at the master's level (graduate school), you will be writing reports and directing the field crew or the lab work. You can also become a museum curator or teach archaeology as part of the curriculum at the primary and secondary school levels. To actually write the grant, develop the research design, and become a university professor or museum director, you should have a doctorate (Ph.D.) in anthropology.

Pot shards found at an archeology site at Bandelier National Monument

So, what do you take in school? It depends on what you want to do in archaeology. Start off in high school by taking as many courses as possible in math, science, computers, English, literature, and writing. Learning a second language such as Spanish is also helpful.

In college focus on gaining a broad understanding of the entire field of anthropology. All archaeologists obtain their degrees in anthropology in the U.S. so archaeologists are essentially cultural anthropologists. If you have decided not to go to graduate school, be sure to take courses in college that will benefit your chosen career. If you are interested in mapping, take geomorphology and cartography. If you are interested in computer applications in archaeology, take courses in geographic information systems and computer programming. If you are interested in museum work, take courses in museum operations and management and registration procedures. If you are interested in managing a contract firm, take courses in management and business. Develop your education plan based on the type of job you wish to have in archaeology.

What/where are the jobs?

There are private and nonprofit contract archaeology firms. There are university, college, and junior college academic positions. There are research positions at universities, colleges, museums, private foundations, and firms. There are a number of state and federal agencies that hire archaeologists to do environmental impact studies and archaeological assessments before authorizing building, logging, mining, or otherwise disturbing an area. These agencies include city governments, the Bureau of Land Management, the Army Corps of Engineers, the United States Forest Service, the National Park Service, state monuments, state land offices, and fish and wildlife departments.

Cynthia Ann Bettison
Museum Director/Archaeologist
Western New Mexico University Museum
Silver City, N.M.

For more information

The Archaeological Institute of America
53 Park Place
N.Y., N.Y. 10007

The American Anthropological Association
4350 North Fairfax Drive, Suite 640
Arlington, VA 22203-1621

The Society for American Archaeology
900 Second Street NE #12
Washington, D.C. 20002 USA
http://www.saa.org
http://www.saa.org/AboutArch/aboutarch.html

Passports in Time, the Department of Agriculture, United States Forest Service
Earthwatch Volunteers http://www.earthwatch.org/

Architecture

What is an architect?

It is difficult to present a detailed image of an architect because architecture allows, and to a certain extent encourages, diversity of individual expression. An architect is an organizer of space in both two and three dimensions. The manner in which she organizes space is a reflection of her training and personality. Some architects are loners and work best by themselves; some work better in groups, testing their ideas on each other. Some are more interested in the efficiency of a design; others are more interested in architecture as an art form. All are concerned with good architecture.

What makes a good architect?

Creativity is important to an architect, but equally important is an organizing mind. A good architect is a synthesizer. You must be able to combine many factors—the nature of the site, the clients' needs and desires, the available budget—judge their relative importance, and develop a satisfactory design. Then you must communicate your ideas to your client and to the contractors who will execute the design. You need not be a great artist, but you do need to be able to draw since drawings are the architect's means of communication. The kind of drawing you do as an architect can be learned, however, and a natural ability to draw, although helpful, is not necessary.

What is life as an architect like?

Life as an architect is challenging, and considerable creativity is necessary to satisfy both your clients' needs and your own standards. It can be frustrating when you cannot find a solution to a design problem. You must be flexible enough to drop an idea that does not work and approach the problem from a new and different angle. Nevertheless, the rewards become very tangible when a building that you designed becomes a pleasing addition to the environment and meets the client's needs.

On a typical day an architect will meet with current and prospective clients, execute drawings for current projects, supervise work being done by others, and act as a client's representative in dealing with local building contractors and inspectors. You may work on the design of one project at the same time you are completing working drawings (the drawings that describe in detail the complete construction of a building) for another project.

How do I become an architect?

You must pass a two-part licensing exam to become an architect. The examination is given nationwide but is administered individually by each state. Most states have reciprocal licensing agreements: once you are licensed you can be licensed in most other states without retaking the entire examination. To become eligible to take the exam, you need a college degree in architecture and three to four years' experience, depending on the type of degree you received. Experience is gained by working for more than one licensed architect during those three or four years. You will learn some skills in college and different ones while working for an architect; both sets of skills are necessary. If you do not complete the entire process, you can become an architectural draftsman. Competition for jobs will be tough, however, since you will compete with graduates of architectural schools for the same jobs. Another alternative is to become a professional renderer. Renderings are architectural illustrations that are often done of finished projects.

In high school take as many courses in mathematics as possible; this helps you later in your structural engineering courses. A basic background in the sciences, particularly physics, is also useful. Any drafting courses offered should be taken. Even if these are not architectural drafting courses, they at least acquaint you with some of the tools used in architecture. Once you are in college, in addition to taking architectural courses, studying art or art history would be worthwhile. Such courses are concerned with fundamentals of the design process, which art has in common with architecture. Since eventually you might have your own firm, consider taking introductory business courses. Related nonarchitectural courses such as surveying are also helpful. An architect is a generalist, and knowledge in any field can be put to use since architecture relates to nontechnical as well as technical aspects of society.

What/where are the jobs?

Although architectural jobs can be found in all areas of the country, the majority are in large metropolitan centers. Over half of the jobs in 1975 were located in only six states: California, New York, Illinois, Texas, Pennsylvania, and Ohio. Larger cities and areas with growing populations generally provide the best opportunities. In areas of growth there is a constant demand for new residential construction as well as the commercial development required to supply the needs of the increased population. The size of the city and the firm will have a great effect on the type of work you do. Many large firms specialize in particular building types such as hospitals, hotels, and shopping centers; such firms often design buildings that are located across the entire nation.

Toni Seidel
Architect (1984)
Miller and Associates
Albuquerque, NM

For more information

Free pamphlets, Career Alternatives and Career Profile Architect
are available from the

Publications Fulfillment Office of the American Institute of Architects (AIA)
1735 New York Ave. NW
Washington, DC 20006

The Status of Women in Architecture can be obtained from the Component Services Office of the AIA.

Astronomy/Astrophysics/Space Science

What is an astronomer?

Astronomers (as well as astrophysicists and space scientists) study objects and environments beyond the surface and atmosphere of Earth. What they learn often has implications for understanding how the earth came to be as it is. They may use telescopes, ground-based detectors, or satellites to gather data about the conditions of objects in space, or of space itself, from as far away as the most distant quasar (billions of light years away) to as nearby as the space in Earth's orbit (200 miles up). They apply the laws of nature, often assisted by numerical "models," or simulations programmed into a computer, to make sense of this data. They attempt to answer such questions as, "What is the age of the universe, and will it continue to expand forever? How was the distribution of elements that we find on Earth (including the atoms in our own bodies) produced? How did our solar system form? Do solar systems capable of supporting life exist around other stars? What is going on inside the stars and at the violent centers of galaxies? Can we predict when a star will explode as a supernova? Can we predict when the next asteroid or comet will pass near the earth or even impact the earth?"

Dr. Catherine (Caty) Pilachowski working in the console room of the Mayall 4-meter telescope at Kitt Peak National Observatory.

What makes a great astronomer?

A strong curiosity about nature is a prime characteristic of an astronomer, along with the ability to imagine and visualize conditions much different than those of everyday experience. The universe presents us with examples of phenomena occurring at the extremes (both high and low) of pressure, temperature, density, and gravity that we cannot reproduce (at least not easily!) in laboratories on Earth. Since technology is progressing so rapidly, it is important for you to be versatile. You must be willing to learn quickly and explore new ways of doing your work. Since your discoveries are much more useful to others when they are communicated, good writing and speaking skills are essential. It also helps immensely to be patient and persistent and to be organized enough to work on several projects at once, as many projects will take years to complete. You should also enjoy working with others; many projects are done in teams.

What is life as an astronomer like?

One of the best aspects of being an astronomer is the variety of tasks that astronomers do each day. Most astronomers have quite a bit of freedom in planning their own research projects and approaches.

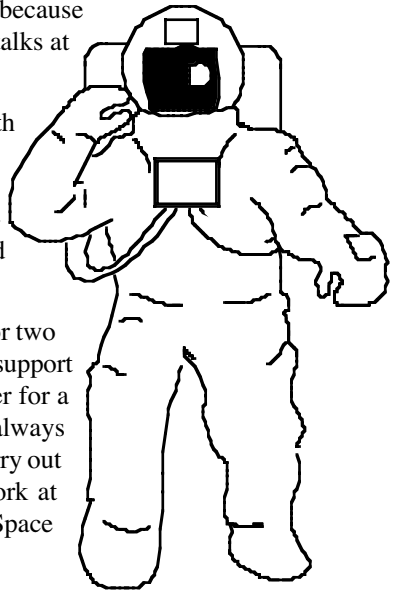
The tasks could be preparing lessons and teaching classes, supervising students, building equipment, developing ideas or analyzing data on paper or on a computer, writing journal articles, discussing ideas and giving seminars at your institution or at national and international conferences, serving on committees in your department or for professional associations, reading journal articles, and evaluating the research of others before it is published. Electronic mail has become the medium of choice to discuss your research and plan projects or conferences with colleagues from around the globe. Most major journals, reports, and astronomical data are now accessible from your desktop computer using the Internet.

Note that very few astronomers spend large amounts of time looking through a telescope. Most operate telescopes from a control room (as in the photo) or even from their computer at home via the Internet. Typical astronomers only spend one or two weeks each year observing, and the rest of their research time analyzing their data.

The rewards of being an astronomer are a sense of satisfaction and accomplishment, and even jubilation at finding the missing evidence to support a theory, or putting pieces of data together to give you a new insight into the nature of the universe. The work environment can be wonderful—astronomy is still a relatively small field, and those who work in your area of specialization form an even smaller community. It is fun to travel to remote observing sites and to conferences and to interact with astronomers from around the world.

How do I become an astronomer?

In high school take as much math and science as you can, including physics, chemistry, pre-calculus, and computer science. Do not neglect English or public speaking opportunities, such as speech or debate, because you will spend much of your time writing grant proposals and journal articles and giving talks at seminars and conferences about your latest results.



In college, you can major in physics, mathematics, computer science, chemistry, or earth science. If you plan to be an observational astronomer or build satellites, take electronics or electrical engineering as well as drafting classes. Be sure to take some science courses outside your major. Interpretation of astrophysical phenomena requires an extensive knowledge of many fields of science, particularly physics. Do not neglect courses in languages and the humanities; these will enhance your communication skills and versatility.

Most jobs in astronomy require a master's or Ph.D. degree. A master's degree takes a year or two beyond college and may lead to a job in a planetarium, teaching at a community college, as a support person or data analyst at an observatory or research institute, or perhaps as a science writer for a newspaper or magazine. A Ph.D. requires a thesis on independent research and is almost always required to become a professor at a college or university. Most professors are expected to carry out research programs and supervise students in addition to teaching. Many astronomers work at observatories (such as the Kitt Peak National Observatory), research institutes (such as the Space Telescope Science Institute), or laboratories (such as the Jet Propulsion Laboratory).

What/where are the jobs?

While the demand for astronomers has been decreasing in recent years, there are signs that the trend is leveling out and perhaps reversing. The field of astronomy has become even more exciting with the possibilities of new types of data from more sensitive detectors; with detailed images from the Hubble Space Telescope and other satellites; and with recent missions to the Sun, Mars, Jupiter, and Saturn. The capability to perform increasingly complex and realistic numerical simulations and process huge volumes of data has also increased dramatically with the advent of new generations of supercomputers and considerable computing power available on desktop computers. New discoveries are being made every day, as can often be seen from newspaper headlines or from picking up a copy of *Sky and Telescope* or *Astronomy* magazine. Recent observations are presenting new mysteries faster than they are supplying answers—we have much more work to do!

Joyce Ann Guzik, Astrophysicist
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For more information

Write for the brochure *Space for Women*
Harvard-Smithsonian Center for Astrophysics
Publications Department, MS-29
60 Garden Street
Cambridge, MA 01238
or call 617-495-7461
http://cfa-www.harvard.edu/wpc/wpc.html

Or visit the following Web sites:

National Optical Astronomical Observatories	http:/www.tuc.noao.edu
National Radio Astronomy Observatory	http://www.nrao.edu
Space Telescope Science Institute	http://www.stsci.edu
Harvard Smithsonian Center For Astrophysics	http://cfa-www.harvard.edu

Biology

What is a biologist?

Biology encompasses a wide variety of subdisciplines such as biochemistry, microbiology, physiology, botany, toxicology, embryology, ornithology, mammalogy, and zoology. Biology also encompasses related disciplines in natural resource management such as ecology, forestry, silviculture, range management, and wildlife management. A biologist studies the origin, relationship, development, anatomy, and/or functions of living organisms ranging in size from microscopic to large.

Physicians, veterinarians, medical researchers, and medical technicians are all biologists working to understand the biology of the human body and other organisms. Through human and animal research, they seek to develop cures for cancer and other diseases, and they investigate inheritance, immunological functions, microorganisms, physiological functions, and morphology (the form and structure) of cells and organs. Other biologists are concerned with understanding the relationships between organisms (plants and animals) and how to help manage their populations in the wild. Others are concerned with improving the quality and yield of crops.

The greater western mastiff bat (Eumops perotis) is the largest bat in North America. Only a few roosts for this species are known and much about them is still to be determined. Here, Forest Service Biologist, Heather Green is holding a female mastiff bat that will be fixed with a radio transmitter so that its roost can be located.

What makes a good biologist?

To be a good biologist, an individual should be interested in the life sciences and should understand mechanisms involved in living organisms. She does not have to have superior intelligence but needs to have common sense and be able to use logical reasoning.

There are two aspects of a career in biology: research and management. Both researchers and managers in the biological sciences needs to be enthusiastic and interested in the work; inquiring; willing to work independently and in collaboration with others at local, national, and international levels; and able to communicate their findings, orally and in writing, in clear and concise language. As in most other scientific disciplines, they must be motivated and organized since there always seems to be more work than time in which to do it.

A research biologist needs to be imaginative in order to design appropriate and relevant experiments. She must be familiar with research techniques and with laboratory equipment such as electron microscopes and centrifuges; a knowledge of computers can also be useful in conducting and interpreting experiments. A manager in the biological sciences needs to be dedicated and flexible to be able to deal with the various organizations that have opinions on how lands and animals should be managed.

What is life as a biologist like?

A biologist's typical workday depends upon her education and specialty. A research biologist with a Ph.D. degree may conduct independent research at a research institute, in a medical school, in an undergraduate college or a university, or in industry. In all these environments, with perhaps the exception of industry, she may direct graduate students in independent research and academic studies. Although most biologists do research in a laboratory setting, some, particularly botanists and zoologists, may take field trips that involve strenuous physical labor and primitive living conditions. Time may also be devoted to writing scientific papers or chapters of books and grants for federal funding to support research, traveling to and presenting scientific papers at national and international conferences, reviewing scientific literature, or serving in a management or administrative position.

A research biologist with a master's or bachelor's degree applies skills required for laboratory or medical research as a laboratory technician. Depending on the laboratory, she may have a great deal of freedom to design her own experiments or, on the other hand, she may be a "pair of hands" assisting with experiments already designed. With a master's degree, her responsibility is greater and may include a supervisory position in a clinical laboratory. She may also be employed in industry, testing and inspecting food, drugs, and other products, or selling and/or servicing technical equipment.

A management biologist with a master's or bachelor's degree applies skills required for field surveys for federal (Forest Service, Bureau of Land Management, or Park Service), state, and private (e.g., Nature Conservancy or industrial) land management agencies. Depending on the agency, she may have a great deal of freedom to determine her own field work, or she may be a member of a crew assisting in larger management projects. If she has a master's degree, her responsibility is greater and may include a supervisory position or a position with the responsibility of making management decisions.

General bat surveys using mist nets over water sources give biologists an idea of what species are in the area. Radio telemetry can then be used to determine roost locations and foraging areas. Forest Service District Biologist Melissa Siders is holding a big free-tailed bat (*Nyctinomops macrotus)* captured during mist netting.

How do I become a biologist?

You do not need an advanced degree to become a biologist, although your independence in conducting research increases with an advanced degree. A master's degree normally takes two to three years of classroom studies beyond a bachelor's degree. It frequently requires a research project and a thesis. A Ph.D. degree, which often takes four to seven years beyond a bachelor's degree, requires classroom studies, work on an independent research project with a faculty advisor, and preparation of a written thesis. A Ph.D. degree is necessary if you want a faculty position at a university or medical school. A master's degree is becoming required more frequently for year-round positions with management agencies.

In college you should take any biology or biology-related courses offered. In addition, mathematics, chemistry, and physics courses are absolutely essential. All of these help build the background you need to think logically in devising and analyzing a research or management problem. Take a broad range of courses in your field and in related fields. A broad background provides you with knowledge essential to your own field of study and for collaborative work. You will specialize in a specific area if you decide to obtain an advanced degree such as a Ph.D.

It is highly recommended that you obtain experience during summer breaks from college in various temporary jobs in biology. This will not only make you more competitive once you finish your degree, but it will also allow you to explore various aspects of biology to determine your interests and skills.

What/where are the jobs?

Biologists are employed in universities, medical schools, hospitals, industry, and various government agencies. About one-third of all biologists are involved primarily in research and development; one-fifth are primarily involved in teaching. Some work as managers for federal, state, or local government agencies. Some work as consultants to business firms or to federal, state, or local government agencies. Employment in biology will increase faster than the average for all occupations in the next decade because of the continuing interest in medical research and the increased concern about preserving the environment. Opportunities are particularly good for biologists with advanced degrees; those with lesser degrees may face competition for the available jobs.

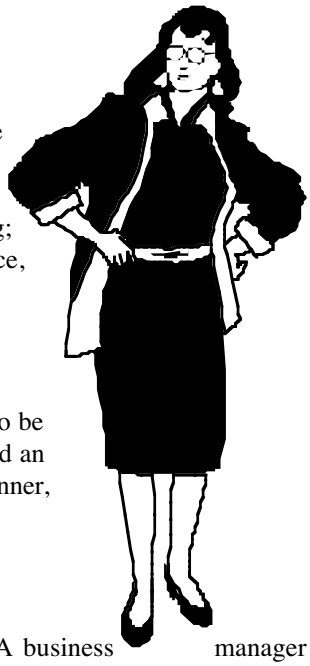
Melissa Siders, Wildlife Biologist
N. Kaibab Ranger Station
PO Box 248, Fredonia, AZ 86022
http://www.xpressweb.com/~talon/BATSinAZ.html

Biologists can conduct surveys in remote and interesting places. This is a Forest Service Biological Technician (Laura Williams) entering a cave to determine what wildlife use was occurring in the cave to assist in the evaluation of whether it is being impacted by human uses.

For more information

General information on careers in the life sciences is available from the American Institute of Biological Sciences, 1401 Wilson Blvd., Arlington, VA 22209 http://www.faseb.org/careers/chcnews/chcnews.htm http://www.faseb.org/careers/pubs/

Business Management



What is a business manager?

A business manager directs or plans the work of others in order to run a business at a profit. She should have a working knowledge of the following areas, and may be a specialist in one or more: sales, marketing, and public relations; research, operations analysis, data processing, mathematics, statistics, and economics; production; finance; accounting, auditing, tax, and budgeting; purchasing; and personnel. Other technical areas in which a business manager may have expertise are law, science, or engineering.

What makes a good business manager?

The business manager needs to be a self-starter, needs to be observant and persistent, and needs to be able to work well with other people. She needs decision-making skills, assertiveness, fairness, and an interest in business. She should be able to communicate her ideas to others in a clear and accurate manner, both orally and in writing.

What is life like as a business manager like?

Business managers direct workers in sales, research, production, accounting, and purchasing. A business manager may own her own business, or she may work as part of a management team in a business owned by others. In larger businesses, she may spend most of her time planning, supervising, and measuring results of operations. In smaller businesses, she may do all of this and take part in some of the operations herself. There is usually no set working schedule; she invests the time required to get the job done.

How do I become a business manager?

With the exception of sales and production, college degrees are preferred or required for all business management positions. A college degree is an asset for sales and production as well, although a high school degree and on-the-job training may be acceptable in many companies. Many business owners do not have college degrees, relying on their own experience and using qualified staff and outside professionals for areas in which they have no expertise, or no time.

In high school you should take college-preparatory courses, particularly those which develop speaking and writing skills. Take courses in the social sciences, such as history and economics. Courses in math and the natural sciences will develop your analytic skills.

Undergraduate degrees are offered in most of the specialties named in the section describing what a business manager is. Either a business or management degree will offer some coverage of each of the specialties. A liberal arts degree prepares one for analytic thinking, discussion, and writing and may be acceptable to businesses that have their own training programs for managers. The graduate program that offers the best training for management is the Master of Business Administration (MBA). For the future business manager who intends to specialize in mathematics, economics, or engineering, graduate work is often a requirement; it is definitely a requirement for specialization in corporate law.

What/where are the jobs?

In New Mexico there will be a growing need for business specialists and managers, especially in sales, accounting, purchasing, and personnel. Nationwide, the fastest-growing specialties in business are the technical ones that require math and computer skills. Business managers are one of the fastest growing occupation groups in the country.

Linda McEwen
Sales Representative
Commerce Clearing House, Inc. (1984)
Albuquerque, NM

Chemistry

What is a chemist?

Chemists are science career professional doing extraordinary work. They have the ability and the desire to seek and understand accumulated knowledge. Their work affects all areas of our lives. Whether it is the application of an established principle or a new one, whether it is a new product or a new use for an old one, the work of chemists makes the difference between success and failure of many projects. A chemist can be a man or a woman. History has shown that chemistry is a science that was open to women from its beginning. Women chemists have made and continue to make major contributions to the advancement of the field.

Chemists are physical scientists that specialize in the study of matter. They follow the scientific method: develop a hypothesis on what, why, and how matter will react; then they design experiments, observe changes, and characterize products. The results, in the form of laboratory data, are carefully evaluated and conclusions drawn, illustrating graphics are added, and a document is published for use and evaluation by other chemists.

It is impossible for a chemist to know all there is to know in all fields of chemistry. Therefore, most chose to specialize in a given area. Some chemists spend their entire careers analyzing things (analytical chemists) others may synthesize chemicals (synthesis chemists), still others may classify themselves as physical chemists, organic chemists, inorganic chemists, biochemists, or medicinal or pharmaceutical chemists. Fields are defined by a prescribed set of guidelines that may be mixed to produce things like organic-analytical chemists. The liberal arts education required of chemists serves as a bridge when they move from one category to another.

What makes a good chemist?

Preparation and practice are the key elements that make a good chemist. Required college-level courses, technical training, and on-the-job experience can propel the new chemist into her career at a competitive level. Then, a good chemist chooses projects and activities wisely, is disciplined and patient, follows the scientific method, learns from mistakes and experiments that fail, is a good communicator, and focuses on her chosen career directions. The good chemist is a nurturing mentor of other aspiring chemists. She maintains interactions with professional organizations and has the respect and the support of her peers. The latter is an added benefit to the career of a chemist.

What is life as a chemist like?

Being a chemist is exciting and rewarding work. Whether the chemist is a teacher, researcher, technician, sales representative, consultant, museum worker, automobile industry chemist, editor/writer, or administrator, she tends to put in very long hours on the job. Yet she makes time to be involved in family and community activities. Today's chemist, like those of the past, surrounds herself with books, journals, chemicals, hoods and shields, beakers, test tubes, columns, analytical balances, instruments, and some self-invented devices. Some chemists work on proprietary projects, others work on classified projects.

One glaring difference between chemists of today and those of the past is the sophisticated computers and advanced technology now available that make work easier but thinking and analysis more intense. Another difference is the established rules that must be followed and the added protection and safety required of today's chemists. This is good because it protects the health of the worker. Some chemicals are hazardous (acids, bases, toxic substances, explosives, flammable, or carcinogens.) Therefore, chemists must wear protective clothing such as safety glasses, safety shoes, gloves, and sometimes respirators. While performing an experiment, the chemist usually works inside a hood that has an exhaust system equipped with filters and scrubbers to prevent harmful materials from reaching the atmosphere. Nevertheless, the chemist's inquisitive nature and continued quest to understand how matter reacts is the same as it has been for hundreds of years.

How do I become a chemist?

Chemists spend many years in colleges and universities preparing for their life's work. The goal for most chemists is to obtain a Ph.D., but this degree is not necessary to become a technician or to teach or to become a chemical engineer. Deciding on a specialty is important. Many chemists began with elementary or secondary school science projects, then find summer jobs in industry or internships with chemical companies. A mentor or several mentors may help with advice and projects that advance the neophyte into a strong chemistry career.

Chemical engineers often do not obtain advanced degrees, but their median salaries with a B.S. degree were nearly $4,000 per year higher in 1980 than were salaries for chemists with Ph.D.s!

Take as much mathematics and science in junior high and high school as you can. Mathematics is an indispensable tool in chemistry. It also teaches you to think logically and helps you to formulate problems. A thorough knowledge of English and written and oral communication will be invaluable for communicating your ideas and results to others; there is a particular need for those who can communicate with the nonscientist as well as the scientist. Take courses in other sciences as well. You may find that you wish to combine chemistry with physics, biology, geology, or some other discipline and pursue an interdisciplinary course. Nevertheless, make sure that you obtain a firm foundation in the fundamentals of chemistry before specializing as an undergraduate.

What/where are the jobs?

Chemistry can be an exciting and satisfying profession in which job opportunities are plentiful. Typically, chemists working for private industry or the federal government earn more than those in academia or in nonprofit organizations. The highest salaries have historically been paid by the petroleum industry. The data include analytical, organic, pharmaceutical, and polymer chemists and biochemists.

These data from an American Chemical Society 1996 survey on average salaries (per thousand dollars) show the beginning salaries of various degree levels in different employment areas.

DEGREE	State/local	Military	College/Univ.	Indust.
B.S.	24.5 K	20 K	20 K	27 K
M.S.	22.3 K	NENF	22.9 K	36 K
Ph.D.	25.3	23 K	31.2 K	55 K

DEGREE	Elem/Sec.	Fed. Gov.	Hosp./Lab. Tech.	Self-Emp.
B.S.	23 K	25.3	20 K	24 K
M. S.	25 K	37.4	26.9	25 K
Ph. D.	32.5 K	42.5 K	30.3 K	60 K

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Computer Science/Engineering

What is a computer scientist/engineer?

Computers are made up of hardware and software. The physical parts of the computer, for example, the keyboard, printer, connectors and chips, are hardware. The software part of the computer is the collection of programs that make the computers useful. A program is a set of instructions that tells the computer how to perform a task such as how to play solitaire or how to check the spelling of a story you write. Computer engineers design and build computer hardware. Computer scientists (or software engineers) write computer programs.

What makes a good computer scientist/engineer?

If you like to solve problems, you might become a successful computer scientist or computer engineer. It is important to think logically and to be able to break a problem up into its parts and to assemble a solution from these parts. It is also important to pay attention to details; in this field a small oversight can have disastrous consequences. These careers also require good communication skills, which are used to define the problem and to document your solutions.

What is life as a computer scientist/engineer like?

Both computer scientists and engineers work primarily in groups that work together to define the problem, establish schedules, brainstorm the solution, and document the results. An individual group member will be responsible for one aspect of the problem. Computer engineers often spend some part of their time in laboratories building and testing prototype hardware devices. They may be responsible for overseeing manufacturing of the actual devices. A computer scientist will do most of her programming in an office using a computer workstation.

How do I become a computer scientist/engineer?

In high school take a broad selection of challenging courses that make you think. If possible, take mathematics classes including algebra, geometry, and trigonometry. High school physics gives a good introduction to electricity, which is the power behind computers. Don't forget to take courses that emphasize communication, both writing and public speaking. After high school, some two-year programs are available in computer electronics and computer technology. Most colleges and universities offer four-year programs leading to a degree in computer science and four- or five-year programs leading to a degree in electrical engineering or computer engineering. These programs require classes in mathematics, physics, and programming. Advanced degrees are available for those interested in careers in advanced research or college teaching.

What/where are the jobs?

Jobs for computer scientists and engineers are everywhere: in schools, industry, government, and universities. Demand far exceeds supply, and this condition will continue for many years. Currently many well-paying, interesting jobs require computer skills, and the more mathematics, computing, and engineering courses you have taken, the more choices you will have.

For more information

Women and Mathematics: http://forum.swarthmore.edu/social/math.women.html
There's also the general Association for Computing Machinery (ACM) http://www.acm.org
CRA Committee on the Status of Women in Computer Science and Engineering http://www.cra.org/Activities/craw/

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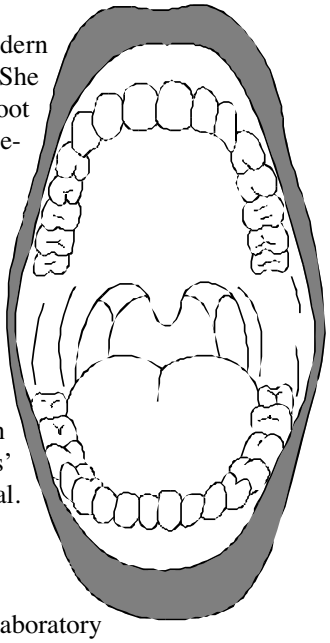
(original article by Nancy Martin, 1984)

Dentistry

What is a dentist?



A dentist diagnoses and treats diseases and trauma to the teeth, gums, and jaw bones. Modern dentistry now gives her many options for the removal of decay and materials used for fillings. She must have a broad understanding of oral surgery, orthodontics, pedodontics (treating children), root canal treatment, gum treatment, cosmetic corrections, fabrication of oral prosthesis for the replacement of missing teeth, and many other techniques.

What makes a good dentist?

Whether removing decay with a dental drill or laser and placing a filling, or removing a wisdom tooth, a dentist must have good manual dexterity, a good judgment of space and shape, and a high level of diagnostic ability. Dentistry is teamwork. A dentist will work closely with her assistant, who provides her "third and fourth hands"; a dental hygienist, who cleans teeth; her lab people who make crowns, dentures, and other oral prostheses; and also her staff, which can include receptionists and office managers. She must also be very understanding about her patients' needs and anxieties. The ability to communicate openly with both her staff and patients is essential.

What is life as a dentist like?

A dentist spends most of her time treating patients; she may also choose to do some of her own laboratory work. Most dentists are their own bosses, and so they will also spend time managing their staffs and being businesswomen. Being self-employed, they can choose their own hours; these will usually correspond to regular business hours, though a dentist may choose to work evenings or weekend hours. A small percentage of dentists will teach or do research. Some will work for public dental health programs. More dentists are now working as employees for large health corporations. This takes away some of your ability to "be your own woman," but it may also may lessen the pressures of being a "boss." Above all, you are a health care giver and a craftswoman; your patients appreciate you very much when you strive to do your best for them.

How do I become a dentist?

Becoming a dentist requires four years of college and graduation from a dental school, which is four more years. Courses in dental science, clinical technique, anatomy, microbiology, biochemistry, physiology, pathology, and many other sciences are taken the first two years of dental school. During the last two years the dental student will treat patients in a clinic. Both college and dental school are very demanding periods of study, requiring a lot of hard work and dedication. To be licensed in most states you must pass practical and written exams. If she chooses, a dentist can continue in school to become a specialist in a particular field of dentistry.

Predental education in college should include courses in science and humanities. In high school a young woman should take as many classes in biology, chemistry, math and health as possible so that she will be better prepared for college courses.

What/where are the jobs?

Jobs are not hard to find, most are in private offices. One may also join the armed forces or public health programs. Because the financial outlay required to set up a dental practice is very high, most new dentists work for and buy into an already established private practice. Dentists have the ability to earn a very good living and can retire early if they are careful businesswomen. They can also choose to work part-time for another dentist or in a clinic and thus still be able to raise and enjoy a family.

For more information:

American Dental Association 1-800-621-8099

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Ecology

What is an ecologist?

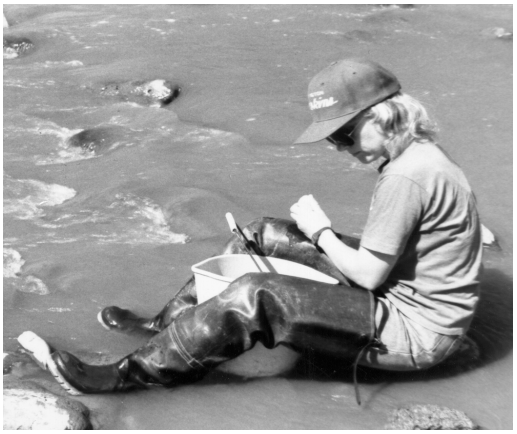
An ecologist studies the interactions between organisms and their past, present and future environments. This information helps solve environmental problems such as habitat damage and loss, species extinction, global climate change, deforestation, and ozone layer depletion. Mysteries surrounding the spread of diseases such as Hanta virus and Lyme disease have been unraveled by ecologists. Other studies concern natural disturbances such as fire, drought, flooding, and insect outbreaks. Ecologists also study the flow of energy and the cycling of nutrients. There is a close link between ecology and evolution: the abundance and distribution of organisms depends on both their environment and evolutionary history. One example of an evolutionary study is the interaction between some flowering plants and their insect pollinators.

Ecology includes the physiological response of individuals, population structures and dynamics, interactions among species of plants and animals, community organization, and ecosystem and landscape ecology. Subspecialties focus on soil ecology, aquatic ecology or limnology, marine biology or oceanography, terrestrial ecology, paleoecology (e.g., tree rings and pack rat middens), and animal behavior such as the mating, feeding, and singing of birds. There are also theoretical and statistical ecologists.

What makes a good ecologist?

Good ecologists are curious about the past and inspired by visions of the future. They are capable of critical thinking and develop their observation skills. Ecologists often either love the outdoors or are drawn to their profession by social responsibility and an environmental ethic. An ecologist must have good communication, mathematical, biological, and physical science skills and be able to work as a team member to solve problems. Writing skills are essential for getting project funds and for publishing exciting results. Oral presentations are important to communicate results and provide testimony to legislators and other decision-makers.

The studies of some ecologists bring them to desolate and remote areas, such as wilderness areas of Alaska or Antarctica. These beautiful outdoors environments often have a special appeal that compensates for the lack of modern conveniences. Some field work can be strenuous and in extreme weather conditions that demand hardy and healthy individuals. Other work environments include traditional laboratories, offices, computer pods for mathematical modeling, and work stations for mapping with geographic information system technology.



Deborah Ulinski Potter, Research Assistant Professor of Biology, is taking samples along the stream to determine whether the water quality meets state standards.

What is life as an ecologist like?

Ecologists address their hypotheses by observing and describing organisms in their natural habitats or under experimental conditions. They may travel to exciting places like coral reefs, tropical forests, mountains, deserts, and lakes or streams. In addition to collecting field samples of soil, water, air and other physical factors, the ecologist may sample animal or plant populations. The collected samples are then brought into the laboratory to be identified, cataloged, and further studied. Field and laboratory data are usually entered into a computer for analysis. After analyzing the data, an ecologist may prepare reports and present talks at scientific meetings. Ecologists often achieve career satisfaction by helping us all to better understand and protect Earth's limited resources.

How do I become an ecologist?

Ecology is a broad field that can accommodate many interests. To become an ecologist, you should take as much math and science in high school as possible. Be sure to study biology, chemistry, physics, and math such as trigonometry, algebra, and calculus. In addition to general ecology, your undergraduate education should include environmental studies, biological sciences, chemistry,

physics, calculus, and statistics. Courses in areas of specialization can be taken in graduate school to obtain M.S. and Ph.D degrees. Ecologists also benefit from a broad undergraduate background that can include geology, natural resource policy, engineering, geography, computer science, and liberal arts.

Where/what are the jobs?

Ecologists work in both research positions and applied areas such as enforcement of environmental laws, forestry and range management, or restoration ecology. Employers include a variety of federal agencies such as the Departments of Agriculture and Interior, (Forest Service, National Park Service, Bureau of Land Management) and the Environmental Protection Agency. State governments also hire ecologists, and New Mexico offers jobs as environmental associates, specialists and scientists, environmentalists, and experts in the fields of water, air, and hazardous waste management. Local governments, such as Albuquerque's Environmental Heath Department, and environmental consulting firms also provide career opportunities.

Universities are great places to conduct ecological research and to inspire new students. Studies of long-term ecological changes include two sites in New Mexico that are part of a national network funded by the National Science Foundation. NMSU's Jornada site near Las Cruces explores the causes of desertification in semi-arid lands. UNM's Sevilleta site near Socorro encompasses themes of biodiversity, the role of water in ecosystem processes, carbon cycling, land use and the effects of climate change.

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(original author Diane Dudzinski)

Engineering

What is engineering?

Engineering is a profession that involves applying science and mathematics to make products or processes that benefit people or society. Engineering is a field so diverse that many people are unsure what engineers actually do.

Nearly all engineers specialize in one of the more than 25 fields of engineering based on their individual interests. Mechanical engineers specialize in converting energy into a useful form. Examples are designing automobile engines, generating electrical power, and designing refrigeration systems. In general, electrical engineers deal with electrical power, but electrical engineering encompasses the fields of communications, computers (microelectronics), and lasers (electro-optics), among others. Civil engineers are the builders of the engineering world. They design and construct buildings and facilities such as dams, bridges, and tunnels. Industrial engineers are concerned with industrial production: making production more efficient, ensuring the quality of the final product, and establishing efficient procedures. Other common specialties are bioengineering, chemical, aeronautical, environmental, agricultural, materials, nuclear, petroleum and natural gas, and mining engineering.

Engineering is a very large field. There are more engineers employed than chemists, geologists, biologists, medical scientists, and mathematicians combined. Over eight percent of engineers of all ages are women, but the percentage of graduating engineers who are women is much higher.

Because engineers typically provide services that relate directly to producing a product or service that can be sold, they are usually in high demand in the job market. Engineers can normally find employment directly in the field for which they are trained. Engineering can be a challenging and rewarding career offering both personal satisfaction and material rewards.

What makes a good engineer?

Engineers need to be able to analyze and solve problems creatively. Engineers typically have strong interests in science and mathematics. Many just like to "figure out how things work." Others like the latest technologies: computers, household gadgets, or the latest aircraft. The ability to work as part of a team is very important as well as the ability to present your work, both in writing and orally. Frequently, an engineer will work as part of a team, so the ability to communicate and get along with others is very important.

Engineers must keep up-to-date with the latest techniques and information. A commitment to lifelong learning is a necessity. Employers usually subsidize or reimburse education and training expenses in the field in which you work.

Liz Sorroche, in the Mechanical & Corrosion Metallurgy Department at Sandia National Laboratory, operating a Physical Electronics Model 660 Scanning Auger Microprobe (SAM). SAM permits ultra high vacuum friction testing and in situ compositional analysis of worn surfaces.

What is life like as an engineer?

The type of work environment for an engineer depends on the specialty that she selects. Many engineers work in offices; others, especially in fields such as environmental and civil engineering, may work outdoors part of the time. Nearly half of all engineering jobs are in manufacturing industries, including microelectronics. Many engineers travel at least occasionally as part of their jobs. Many opportunities exist for engineers who wish to work in foreign countries. Engineers usually work in 40-hour-per-week jobs but voluntarily work extra hours, especially when they are working under deadlines. Many engineers have a great deal of responsibility in their jobs, and some make a transition to management later in their careers.