CAREERS

Exploring the Possibilities

Published by the New Mexico Network for Women in Science and Engineering
http://nmnwse.org

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http://nmnwse.org/careers/.

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We are the New Mexico Network for Women in Science and Engineering (NMNWSE), a nonprofit association of women who are scientists, engineers, educators, parents, community leaders, and professionals in business, government, and industry. The mission of NMNWSE is to encourage women to enter into careers in science, technology, engineering, mathematics, medicine, and allied professions (STEMM), and to recognize and encourage women's achievements in STEMM careers.

NMNWSE holds annual conferences around New Mexico to introduce young women in their teens to STEMM careers. These conferences are called "Expanding Your Horizons," and they were originally conceived by and are licensed through the national EYH Network, http://www.expandingyourhorizons.org/. During Expanding Your Horizons conferences young women are given the opportunity to engage in hands-on activities and meet successful women who are working in STEMM careers.

Why this book? What do you want to be when you grow up? Chances are when children answer this question their responses are limited to the careers of the people around them. We want to expand the possible answers to this question by introducing young women to all of the women who contributed to this book. Each author has provided insights into her own career, and the enthusiasm she feels comes through in each description. We hope that this book will spark the interest in all our readers, but particularly those for whom this was written - young women exploring their possibilities.

Thank you to all the authors who dedicated their time and efforts to see that the women that come after them have a headstart at a fulfilling career, as well as to the NMNWSE members and friends who helped with editing, organizing, updating, and publishing of the current as well as previous editions.

The NMNWSE Board, 2008
NMNWSE_Board-l@list.unm.edu

For further information on NMNWSE, write to:

New Mexico Network for Women in Science and Engineering
P.O. Box 1360
Los Alamos, New Mexico, 87544 USA
email: NMNWSE_Board-l@list.unm.edu

Or visit our Web site at: http://www.nmnwse.org

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Archæology

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.

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.

Pot shards found at an archaeology site at Bandelier National Monument.

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/public/ - Archaeology for the public

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 client's 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 client's 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?

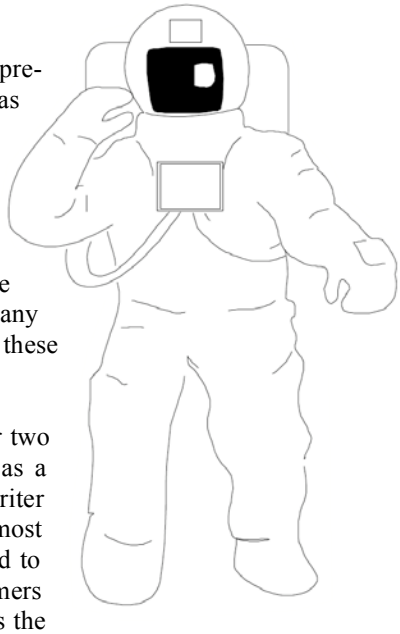
One of the best aspects of being an astronomer is the variety of tasks that astronomers do each day. Most astronomers have quite a bit of freedom in planning their own research projects and approaches.

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
Applied Theoretical and Computational Physics Division
Los Alamos National Laboratory
E-mail: joy@lanl.gov

For more information

Download the brochure ***A New Universe to Explore: Careers in Astronomy***
from the American Astronomical Society's Education Office.
Adobe pdf version: http://www.aas.org/education/publications/careerbrochure.pdf
Web browser version: http://www.aas.org/education/careers.php

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 need 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.

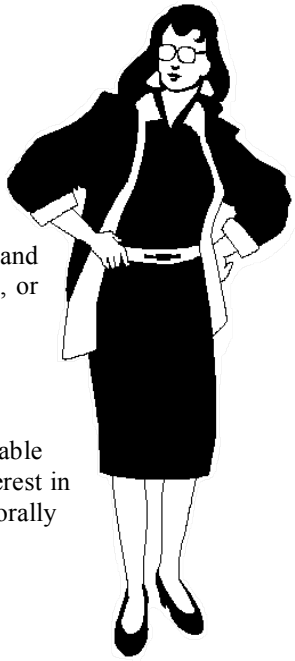
Melissa Siders, Wildlife Biologist
N. Kaibab Ranger Station
PO Box 248, Fredonia, AZ 86022
http://www.xpressweb.com/~talon/BATSinAZ.html

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, 1444 I St. NW, Suite 200, Washington, DC 20005, 1-202-628-1500, http://www.aibs.org/careers/. More information can be found on the Federation of American Societies for Experimental Biology's career page, http://www.faseb.org/careers/.

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 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	—	22.9 K	36 K
Ph.D.	25.3 K	23 K	31.2 K	55 K

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

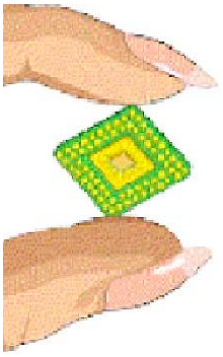
original article by
Darleane C. Hoffman, Chemist
Lawrence Berkeley National Laboratory

updated by
Betty Harris, Chemist
Los Alamos National Laboratory
E-mail bharris@lanl.gov

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.

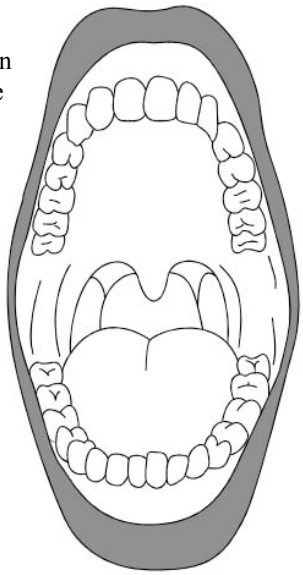
Denise C. George
Theoretical Division
Los Alamos National Laboratory
E-mail: dgeorge@lanl.gov
(original article by Nancy Martin, 1984)

For more information

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

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 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

(Original article by: Sherilyn Azvedeo, DDS, Albuquerque, NM)

Updated by
Gail Ray, DDS
507 N. Bullard
Silver City, NM 88061

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.

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

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.

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.

What/where 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.

Deborah Ulinski Potter, Ph.D.
Research Assistant Professor of Biology
University of New Mexico
ulinski@sevilleta.unm.edu

(original author Diane Dudzinski)

For more information

The Ecological Society of America
1707 H Street, NW, Suite 400
Washington, DC 20006
(202) 833-8773
esahq@esa.org
http://www.esa.org/
Careers webpage: http://www.esa.org/education_diversity/explore.php

Society for Ecological Restoration International
285 W. 18th Street, Suite 1
Tucson, Arizona 85701 USA
(520) 622-5485
http://www.ser.org
Primer on Ecological Restoration: http://www.ser.org/content/ecological_restoration_primer.asp

Engineering

What is engineering?

Most people do not even know what an engineer does!?!? And it is difficult to sum up the field of engineering in just a few words. In a broad sense, engineering is the application of math and science to create something of value. An engineer is not the same as a scientist. While both have a background in math and science, an engineer applies these basic principles to practical problems. A scientist is not as application oriented, and is dedicated to the understanding of basic principles. Engineers are also very creative people. They create new things and make old things better. People in the arts are creative people also; but their creativity deals with thoughts or emotions. Engineering creativity deals with things. Things? A great example of this is the design of roller coasters! This incorporates a wide range of engineering specialties to create a combination of fun and safety. Some of these specialties might include electronic controls, computer aided design (CAD), aerodynamics, mechanical systems, incorporation of modern materials, and structural innovations.

Some of the most popular disciplines of engineering are also some of the oldest. The core list includes: civil, chemical, electrical, and mechanical. There are a variety of specialties within any single discipline, and there is also a lot of overlap between the different disciplines. Most engineers specialize in an area based on their individual interests. The field of civil engineering [asce.org] is concerned with development and improvement. It involves the conception, planning, design, construction, and operation of facilities essential to modern life. This may range from transit systems to offshore structures to space satellites. Civil engineers are problem solvers, meeting the challenges of pollution, traffic congestion, drinking water and energy needs, urban redevelopment, and community planning. Chemical engineers [aiche.org] work in the areas of manufacturing, pharmaceuticals, food processing, polymers, and biotechnology. They strive to make the world better by looking for hardier strains of wheat, rice, and corn that will survive drought, insects, and disease. A chemical engineer might design high strength plastic composites, or join the war against cancer and other deadly diseases. Electrical engineers [ieee.org] get to design things like cell phones, computers, integrated circuits, stereo systems, and space vehicles. An electrical engineer may work on ways to improve the transmission of messages by laser, or ways to automatically detect cancer cells. They have even worked with medical doctors to invent things like pacemakers, sonograms, and x-ray machines. Mechanical engineers [asme.org] play a key role in the invention and improvements of the automobile, airplane, air conditioning, space exploration, power generation, computer aided design, and bioengineering. A mechanical engineer works with areas such as heat transfer, fluid dynamics, thermodynamics and numerical modeling, and simulations. Other specialties include, but are not limited to, aerospace, environmental, safety, fire protection, agricultural, manufacturing, computer, materials, ceramic, nuclear, geological, industrial, textile, petroleum, geothermal, naval, optical, robotics, transportation, metallurgy, and mining engineering.

An engineering education will open many doors to technical and creative challenges. 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 have studied.

What makes a good engineer?

Potential engineers usually demonstrate a number of problem solving traits. They tend to enjoy science and mathematics (try not to equate enjoyment of a subject matter to the individual teacher or grade). Engineers must keep up-to-date with the latest techniques and information. Another important trait is the ability to present results, both in writing and orally. Additional qualities include being logical, wanting to make things work better, and enjoying working in the laboratory and working in groups. A commitment to lifelong learning is a necessity to be a successful engineer. If you have any or all of these characteristics, then engineering may be the field for you!

What is life as an engineer like?

Most engineers work weekdays, Monday through Friday. Typically they work from eight to ten hours per day. The type of work environment for an engineer depends upon the specialty that she selects. Most engineers work in offices; others may work outdoors part of the time. Engineers may travel, depending mainly upon the company they work for and the work they are performing for them. Many opportunities exist for engineers who wish to work in foreign countries. Engineers have a great deal of responsibility in their jobs. Some make a transition to management later in their careers. When additional learning is necessary, employers usually subsidize or reimburse engineering education and training expenses.

Engineers generally earn a nice salary. An engineer will typically make more than most salaried professionals, but not as much as some of other professionals such as doctors or lawyers. An entrepreneurial engineer can go into private practice, or create her own company, and do quite well.

How do I become an engineer?

Engineering is a difficult major. It requires a considerable amount of time and energy, but the rewards are well worth it! You can begin your engineering career right now!! Take as many math and science courses as you can and gain experience with computers. However, do not neglect your english classes, as engineers are expected to be able to write technical papers about their work and present their work to other engineers, and even their customer. Additionally, get involved in extracurricular activities—you do not have to be a nerd to be an engineer! A well-rounded engineer is a highly desired commodity.

A bachelor's degree in engineering is necessary (for most jobs). A bachelor's degree in engineering is available through a four- or five-year accredited college or university program. An engineering student will take classes in two categories, humanities and engineering. The humanities will probably have an equal ratio of men to women. The engineering (including math and science) classes will have more men than women.

After obtaining a bachelor's degree, you can either find a job, or attend graduate school and obtain a master's degree (1 1/2 years to 2 1/2 years) or a Ph.D. (approximately 5 years). These are referred to as advanced degrees. They may earn a promotion or simply help keep up with new technologies. A Ph.D. is needed for most teaching and research positions. Because of the demand for engineers, many companies offer funding and financial assistance to employees seeking additional education.

It is possible to combine an undergraduate engineering degree with advanced degrees in other fields. Many executives began their careers as engineers and later earned a master's degree in business administration (MBA). Other engineers obtain law degrees and specialize in areas of law relating to technology and patents. Obtaining a chemical engineering degree has historically been a great way to get into medical school.

College engineering programs for the bachelor's degree are solidly founded in mathematics and science. In a typical four-year curriculum, the first two years are spent studying basic sciences—math, chemistry, physics, introductory engineering, and the humanities. The last two years are spent studying one or more of the engineering specialties. Often students find that it takes five years to complete their bachelor's degree. Many colleges and universities offer five- or six-year cooperative education programs that provide experience and allow the student to earn a substantial part of her educational expenses. In such a program, a semester of full-time academic study alternates with a semester of full-time engineering-related work (and pay!).

What/where are the jobs?

Engineers are in demand in the job market, and the outlook for jobs in the future is good. Engineers work wherever problems need to be solved, whether at a construction site, at a desk in an office, or in a research laboratory. Nearly half of all engineering jobs are in manufacturing industries, including microelectronics. Non-manufacturing jobs are in research and testing services, construction, and utilities. Other engineers work for government, mainly the federal government in the Departments of Defense, Transportation, Agriculture, Interior, and Energy and in the National Aeronautics and Space Administration (NASA). Some engineers are self-employed consultants, and others are entrepreneurs who start their own companies. Engineers work in large and small cities and in rural areas, and employment can be found in every state.

Kim Dalton Linder, PhD
Honeywell FM&T, Albuquerque, NM
E-mail: klinder@kcp.com
(modified from articles by Donna Cowell Senft, Sandia National Laboratories, and Delores Etter)

Jennifer Valverde, Manager of Engineering Sciences at Honeywell FM&T, evaluates a laser engagement microcontroller prototype circuit. Prototype circuit designs are created to prove concepts prior to manufacturing.

For more information

Discover Engineering Online http://www.discoverengineering.org/
National Society of Professional Engineers http://www.nspe.org/
Society of Women Engineers http://www.swe.org/

Engineering and Science Laboratory Technician

What is a lab technician?

A lab technician is someone who has learned the practical details and special techniques that are required in a modern scientific laboratory. Lab technicians can be found in such diverse fields as electronics, mechanics, biology, chemistry, and metallurgy. Computer technicians usually go to the computers rather than bringing them to a lab to work on.

Lab technicians generally work with scientists and engineers, running experiments, conducting research projects that can result in new ideas and expand our scientific knowledge, or running routine diagnostic samples. Thus, lab technicians contribute to the scientific teamwork responsible for the many new developments, products, and breakthroughs that are seen from day to day and taken for granted by all.

What makes a good lab technician?

To be a good lab technician certain qualities are needed. You should be able to work well with others. Many projects are worked on jointly by a group consisting of a project leader, often an engineer, and other lab technicians. You should be willing and able to voice your opinion and to volunteer your ideas to help the group meet its ultimate goal. You must also have the initiative to work on a project that might be assigned only to you. Determination and patience are often needed to meet schedules and solve problems that present obstacles. You should also have the patience to run the same or similar tests over and over again for routine samples.

What is life as a lab technician like?

What you do on the job depends greatly on your field of specialty. For example, if you are an electronics technician, you might take a circuit design, gather all the necessary components or parts, build the circuit, test it, and troubleshoot the circuit if it is not working. After the circuit works, you would do the necessary checkouts of the circuit—electrical continuity, environmental tests such as temperature cycling and air gun shock tests, and any required calibrations. A typical project for a mechanical technician might be to take a design for a scientific apparatus, prepare the necessary mechanical drawings, set up the apparatus, test to make sure it performs the required function, and make any needed modifications.

Research on a project can sometimes be long and tedious. But after the project is complete and you have achieved your goal, the feeling of satisfaction you have is very rewarding.

How do I become a lab technician?

Lab technicians in any field need at least a two-year associate degree and, increasingly, a bachelor's degree. Associate degrees are offered at many institutions such as junior colleges, community colleges, many four-year colleges, and private technical schools. To become a scientist or engineer, you almost always need a more advanced degree.

Northern New Mexico Community College offers a program sponsored by Intel to train wafer fabrication technicians. UNM-Los Alamos offers several programs to train chemical technicians, radiation control technicians, and others. The Technical Vocational Institute in Albuquerque has similar courses, as well as several to train hospital technicians, electronics technicians, and others.

Take as much mathematics as possible in both high school and in your further training. In order to solve many technical problems, advanced mathematics can be necessary. Computer science is also needed; the computer is very commonplace in scientific laboratories today as a tool in analyzing data, solving problems, or plotting graphs. Take science courses. These courses contain many of the basic theories you will need later to understand the research projects you are working on.

What/where are the jobs?

The demand for lab technicians is always increasing. Employment can be found in hospitals, food packing companies, and sanitation plants, as well as in private and government laboratories. The computer industry has created whole new categories of technicians, such as wafer fabrication technicians, who are hired by chip manufacturing plants.

Updated by
Catherine A. Hensley
Chemical Technician
Los Alamos National Laboratory
Los Alamos, NM
(Original article by Marcie H. Fuerschbach, Electrical Engineering Technician, Sandia National Laboratories; now with Southwest Airlines)

For more information

Contact the American Chemical Society Division of Chemical Technicians at
http://members.aol.com/ACSDoCT/techhome.htm

Here is one school's curriculum for training as a biological technician:
http://mauis.fhda.edu/FOOTHILL/divisions/Bio_and_Health/biotech/biotechhp.html

Center for Advancement of Hispanics in Science and Engineering Education
http://cahsee.org

The Society of Hispanic Professional Engineers
http://shpe.wdi.net/

Environmental Science

What is an environmental scientist?

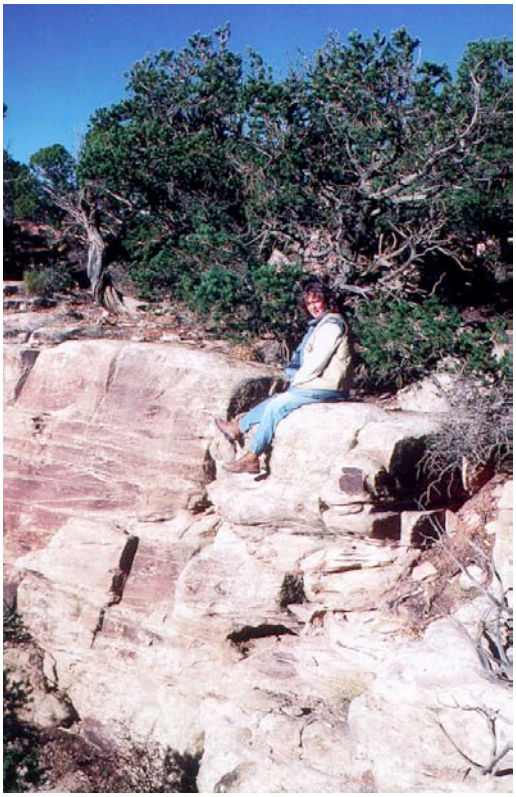
An environmental scientist works to prevent contamination of the environment. In some cases this means keeping contamination from reaching the environment in the first place, and in other cases it means cleaning up contamination that has been released to the environment. Just about every industry in the world creates waste products. Before there were laws and regulations governing the disposal of these waste products, the waste was disposed of in the environment—on land, in surface water, or in groundwater. In these old disposal areas, the waste products that could pose a risk to humans or to the plants and animals in the environment must be cleaned up. With the establishment of laws and regulations governing where waste products can be disposed of, most industries use environmental scientists to find ways to minimize and recycle the waste they produce.

What makes a good environmental scientist?

Good environmental scientists have a desire to clean the environment so that it is safe for people, animals, and plants to live in. In order to do this, environmental scientists must have a good understanding of one or more of the many branches of science (e.g., hydrology, chemistry, biology, toxicology, and engineering) that must be applied to the problems of cleaning up contaminants in the environment or preventing them from entering the environment. Because one person cannot be an expert in all of the sciences, a good environmental scientist must be able to work well in teams made of people with different backgrounds. They must also be able to communicate well, both in large and small groups and in written form.

Environmental scientists must enjoy working outdoors. Often this type of work requires collecting samples from the environment to test them for contamination. Depending on the specialty of the environmental scientist, she may have to collect samples (or observe or map) the soil, water, vegetation, or animals. Once the samples have been collected and the testing is done, the environmental scientist must analyze the information to decide how best to clean up the site. This analysis generally involves using computers to model or predict where the contamination will go.

Finally, a good environmental scientist must be able to understand the environmental laws and regulations, particularly how they apply to the specific problem that is being worked on.



An environmental scientist, Kelly Bitner, is mapping the geographic formations in Utah. The mapping was important to deciding where to locate a disposal area for radioactive waste.

What is life as an environmental scientist like?

Environmental scientists generally have a good balance between outdoor work and office work. There is a great deal of satisfaction in collecting data and then analyzing it to develop conclusions based on scientific principles. This is particularly true when working in a team, where all the team members contribute ideas and perspectives from their own experiences. This can be a very intellectually stimulating environment. The greatest feeling for an environmental scientist is finishing the cleanup of a contaminated site, knowing it is safe for people and the environment.

How do I become an environmental scientist?

Environmental scientists come from a broad range of educational backgrounds because it takes people from many scientific disciplines to figure out how to clean up a contaminated area. To become an environmental scientist, you should take as many math, science, and communication classes in high school as possible. Important areas to study are chemistry, physics, biology, trigonometry, algebra, and calculus. In college, your undergraduate education should be broad and include some courses in many dif-

ferent sciences including geology, geography, computer science, engineering, technical writing, statistics, calculus, biological sciences, chemistry, and physics. A graduate degree is strongly recommended for environmental scientists, and during graduate studies is the time to choose a discipline to specialize in.

What/where are the jobs?

Environmental scientists work in both the private and public sectors. In the private sector there are consulting firms that contract with both industry and government to conduct environmental investigations and cleanup. Some private firms specialize in areas such as the cleanup of leaking underground storage tanks or cleaning up groundwater that is contaminated. In the public sector, there are jobs as regulators with cities (Albuquerque Environmental Health Department, the State (New Mexico Environment Department), or the Federal government (Environmental Protection Agency). The regulators watch over industry and contractors to make sure all their work is in compliance with laws and regulations. Other federal agencies, such as the Department of Energy or Department of Defense hire environmental scientists to mange the cleanup of contamination on their property.

Kelly Bitner
Lead Environmental Specialist
MACTEC, Inc.
2309 Renard Place SE, Suite 103
Albuquerque, NM 87106
E-mail:kellybitner@MACTEC-nm.com
505-242-7524

An environmental scientist, Kelly Bitner, and her assistants are collecting soil samples from a test pit. The soil samples were tested in the laboratory to estimate the age of the soil.

For more information

U.S. Environmental Protection Agency
http://www.epa.gov

Careers in Environmental Research
Environmental Protection Agency
Policy and Research Division
Recruitment and Employment Program Branch
401 M Street
Washington DC 20460
202-260-4193
Order number EPA210K92009

New Mexico Hazardous Waste Management Society
P.O. Box 40353
Albuquerque, NM 87196

Academy of Certified Hazardous Materials Managers
P.O. Box 1216
Rockville, MD 20849
1-800-437-0137
http://www.achmm.org

Field Service Technology

What is a field service technician?

Just as people get sick, car engines develop knocks, and clothes washers leak, computer systems and other sophisticated business and scientific equipment occasionally break down. Repair of such systems is performed by the field service representative, who may be known as the field engineer, customer engineer, computer service technician, service representative, or "that gal/guy who fixes these things." The "things" that get fixed may be any part of the equipment such as, in the case of a data processing system, the computer itself or any number of related devices including magnetic tape and disc drives for memory storage, plotters for graphic representation, copiers and printers, and terminals that allow the operator to talk to the computer via a typewriter keyboard or TV screen. When the equipment breaks down, it is cheaper and easier to bring the technician to the site rather than transporting the unit to a repair center. The field service representative is thus a "doctor" who makes "house calls"; she diagnoses the problem and performs necessary repairs and adjustments. Installation of new equipment, modifications, updates, and routine preventive maintenance are also part of the job.

What makes a good field service technician?

A good field service technician must have two important skills. The first is technical knowledge. This would consist of a good base in electronics technology and the ability to think logically for troubleshooting problems. The electronics part is critical. You must have a good understanding of basic electronics theories, the proper use of measuring equipment, and the safe handling of electronic devices. The use of troubleshooting techniques and flow charts is also necessary. These are skills that can be acquired fairly easily by taking an electronics course at a vocational-technical school or college.

The second and equally important skill for a field service technician is customer relations. You will be going on-site to many different locations, with many different types of customers. Some are upset that their equipment broke down, and others are angry at you and your company. You must be able to handle both types. It is difficult not to throw anger right back at the customer; after all, you were not responsible for the breakdown of the equipment. You have to be able to listen to the customer's concerns and complaints while remaining calm. It takes a strong individual to take charge of a situation like this and to take the opportunity to turn an angry customer into a happy one. A customer skills workshop or course can help develop this ability.

What is life as a field service technician like?

There is no "typical" day in the life of a field service technician. You do not go to an office at 8:00 a.m., sit at a desk or bench, take a lunch at noon, and leave at 5:00 p.m. The field service technician's job is different every day. One day might be spent at one customer site repairing one piece of equipment, and the next day a lot of travel may be involved, depending on the size of the territory for which you are responsible. Some techs may travel three or four hours and work on one piece of equipment, while others may work in just one city. Some techs are flown all over the country!
You could spend a day counting and restocking your parts inventory. Many companies have a lot of technical data to keep abreast of, so several hours a week may be spent on studying technical literature. The company also must keep you trained on new equipment, so you may spend a week in a formal classroom setting. The field service technician is rarely bored with the same old thing every day.

How do I become a field service technician?

There is no one path to follow, but a field service technician typically has two or more years of electronics technology. This may be acquired at a vocational-technical school, a community college, or a university. A two-year certificate or associate degree is common. You will have an easier time acquiring these if you buckle down in high school and take as much math and physical science as you can. Some of the math in electronics can be difficult without a good solid base of algebra for starters. It is also a good idea to have computer skills. Most electronic equipment today is computer-controlled, or it is hooked up to a computer. So, attain a working knowledge of a PC. You don't have to be an expert at the use of hand tools, but you must be able to learn their use. A tech's tool kit will contain screwdrivers, pliers, cutters, wire strippers, soldering irons, etc. All of these tools will be used in your electronics training, so you can build your skills from there. Some field service techs start out as bench technicians. A bench tech works at a location where customers bring in broken equipment, and the tech repairs it at a repair depot. This allows

you to develop your troubleshooting skills without a customer breathing down you neck. You can then move into the world of field service. There are many ways to get into field service, but the first step is always gaining technical knowledge.

If you are a girl who likes math and science, and you enjoy people, field service might be for you. Just because it seems like a man's job, it does not mean that you would not do well at it. Women can have a real advantage in this field. Their natural nurturing skills may come in handy when a customer is disappointed in piece of equipment. You can listen intently and show concern more easily than some men. If you approach it right, you can also have a calming effect on an angry customer. Women tend to be more thorough and patient. This will help you fix the problem right and prevent possible future problems. You also have a smaller build and smaller hands than a man, which will allow you to get to smaller parts without being "all thumbs." You may feel disadvantage where strength is concerned, but women are more likely to get help in lifting something without even asking for it. These may seem like small advantages, but they are real. Any woman who thinks she might like this type of career should not be afraid to enter this "man's field."

What/where are the jobs?

There are many different types of field service jobs. The U.S. is full of them since we have a service economy, meaning many corporations are based on providing a service. Some techs will go to people's homes to repair washing machines, TVs, and VCRs. Others might work on exercise equipment in gyms. Some will repair high-tech printers and plotters in offices. You might specialize in the repair of industrial equipment like conveyors, presses, or assemblers. Some companies do only field service work. They send their techs to many different training classes to allow them to work on many types of equipment. As you can see, there is about any type of work environment you might desire in field service.

A personal note

I was an honor student in school. I took many advanced math and science classes. When representatives from the area vocational-technical school came to talk to ninth and tenth graders, I decided to take electronics over the next two years. I was discouraged by teachers and counselors alike. They all said that I would do much better in regular classes. That just made me want it more! I took the two years of vocational-technical classes and was the only girl in my class of 35 students. It felt a little weird at first, but I really enjoyed it and I rose to the top of that class of boys. My efforts paid off with a college scholarship to a University's two-year program for an associate degree in electronics. I again encountered the same boy-to-girl ratio, but I remained confident. I graduated with honors, and I haven't looked back since. I have been working in field service since I was 20 yrs. old; I am now 31. I have more than doubled my salary in that time, and I am confident that I am one of the best field service technicians that my company has on staff. The moral to this story is not my accomplishments, but my determination. Had I listened to the counselors and teachers that told me not to take that first step into electronics, I would not have the satisfying career that I have today. Don't be afraid to take a path less traveled by women.

Christy Rixman, Field Service Specialist
Tektronix, Inc.
Wilsonville, Oregon
E-mail: christy.lee.rixmann@tek.com

Geology

What is a geologist?

A geologist is a scientist that studies the earth—its origin, history, and structure. The field of geology is very diverse, as diverse as the earth itself. The world we live on is a spectacular natural laboratory just waiting to be explored, its secrets discovered, and its processes understood. Geologists use their observations to form theories about how the earth works, how it is structured, and of what materials it is composed. Studying rocks and their minerals can tell us much about the history of the earth. Geologists collect information by drilling holes and by collecting rock and soil samples from the surface. They then examine these samples in great detail and try to recreate the events that lead to the rocks being formed and deposited.

There are many branches of geology and thus many types of geologists. There are mineralogists and petrologists who study minerals and rocks. There are geophysicists and geochemists who study the physical and chemical aspects of the earth and its rocks. There are seismologists and volcanologists who study and help predict earthquakes and volcanic eruptions. There are economic, exploration, mining, and petroleum geologists who help to find and develop natural resources such as precious metals and oil. There are hydrologists who study water flow and water conservation. There are geological engineers who advise construction engineers on the stability of dams, buildings, and highways. There are also paleontologists who study fossils, environmental geologists who work to understand and protect the environment, and even astrogeologists who study planets and moons. So you see that the sky is the limit when studying geology!

Student Marguerite Rodriguez during a field mapping exercise at a six-week field camp in White Mountains, CA.

What makes a good geologist?

To be a good geologist you must have good observation skills. This means being able to observe something and describe it in detail, in writing and verbally, so that you or others can use the information to draw conclusions. Being a good geologist also requires having the ability to take the information that you or someone else has collected and figure out the meaning of that information. You must be an "interpreter" of what the rocks tell you. It is sort of like being a private investigator: you must seek out clues and use the clues to solve some mystery.

To be a good geologist, you must also love science in general. The field of geology is a combination of many sciences: earth science, physics, chemistry, biology, mathematics, and engineering. A basic understanding of all of these sciences is a must for a successful geologist. However, geologists also work with professionals in these fields so that when true expertise is needed, it is available.

Geologist Pam Pinson looks for copper minerals through a binocular microscope.

Most of all a good geologist must love what she does. The satisfaction of working in her chosen area will give her the determination and motivation to be creative in her methods and thorough in her investigations. She should enjoy working independently and as part of a team. She should love the outdoors but not be intimidated by computers and other laboratory machinery. She should be in the field of geology for the love of it, not for the money.

What is life as a geologist like?

Depending on the specific branch of geology, a geologist may spend most of her time in the field or in the office. Most positions involve a balance of both. Life as a geologist can mean very long hours in the field collecting data. Many times deadlines on reports also require more than an eight-hour day. Geologists are professional scientists so

Geologist Pam Pinson and drillers at a drilling site.

they must often design their own study programs. This takes organization and foresight in planning. The program of study often involves collaboration with professionals from other fields. Geologists spend much of their time working with others but must also be able to work independently and trust their own knowledge.

Some branches of geology, such as exploration, mining and petroleum geology, volcanology, and environmental geology require that you travel and work on location. This may mean being away from home for months at a time or moving frequently. Keep in mind this possible demand for relocation when you are considering your career choice. Other positions, such as research or teaching positions or government or consulting jobs, may provide long-term stability in one location and require little or no travel. Most careers in geology do require some field work, even if it is just to stay in touch with the earth and to keep field skills sharp.

How do I become a geologist?

If you like rocks and minerals and you like the outdoors, you are well on your way to becoming a geologist already. To get a head start on college, you should try to take as many math and science courses as possible while in junior high and high school. You can also start learning about the rocks and minerals that you collect. Collecting rocks and minerals is a fun way to learn about geology.

Geologist Marguerite Rodriguez analyzes a rock sample in a copper mine near a 56-cubic-yard shovel.

Careers in geology require a bachelor's degree as a minimum (that's at least four years of college). Because there are so many specific fields of geology, however, it is very worthwhile to receive further education and get a master's degree or Ph.D. (that's anywhere from six to ten years of college but worth it!). During undergraduate education the required classes give you just the basics in all of the fields of geology. You do not really get into any specific subject in great detail unless you go to graduate school.

Geologist Marguerite Rodriguez mapping a mine bench face, looking for copper minerals at the Phelps Dodge Chino Mine.

In order to specialize in one of the specific fields of geology, you should continue your education after your bachelor's degree and pursue a master's degree. There you can decide what interests you most and study it in great detail, doing your own research and coming up with your own discoveries! This is a time of great learning. Obtaining a master's degree or Ph.D. in your area will help guarantee that you will find a professional position in your geological field of choice. A bachelor's degree is not worthless though. It can be more difficult to get into your favorite field, but it is not unusual. Many geologists with bachelor's degrees are top-notch in their fields. It takes a little more perseverance and study, but what can be learned in further schooling can often be learned on the job as well.

During your college education you will have a chance to learn about all of the basic sciences—math, chemistry, physics, biology, and engineering. Beginning classes of geology teach about the earth's processes, history, and place in the solar system. Next you will learn about the many different types of rocks and minerals and how geologists classify them. You will also learn about the structure of the earth and its physics and chemistry. Many of the classes have field exercises where you get a chance to get out of the classroom and do some hands-on field mapping and rock identification. Most universities also require a six-week field-camp course where you learn in detail the field methods required to be a geologist.

One good way to help you learn about what geologists do first-hand, and to help you gain valuable experience, is to work with geologists in a summer internship program during your undergraduate years. Many mining and petroleum companies offer summer student employment. Check with your advisor and ask around in your geology department to learn about opportunities such as these. Career-related experience during college is the best thing you can have to increase your chances of finding a job when you graduate. You gain experience, exposure, and valuable contacts.

What/where are the jobs?

One of the most exciting and fun things about a career in geology is being able to travel and visit beautiful and exotic areas of the world. Geologists work on every continent and in every ocean. There are many possible types of careers and thus many types of job settings, from the research laboratory to the classroom, to the field.

Geologists work for many types of employers such as government agencies like the U.S. Geological Survey, mining and mineral exploration companies, petroleum companies, construction firms, colleges and universities, and research institutions. Some geologists are self-employed as private consultants. Geology provides a wide variety of opportunities in many locations; that's what makes it so inviting!

Marguerite Rodriguez, Geologist
505-536-3810
(original article by Georgianna E. Peña-Kues, 1984)

For more information

The U.S. Geological Survey Learning
http://www.usgs.gov/education/

Ask-A-Geologist
http://walrus.wr.usgs.gov/docs/ask-a-ge.html

American Geological Institute
4220 King Street
Alexandria, VA 22302-1507

Earth Science Information Center
U.S. Geological Survey
507 National Center
Reston, VA 22092

Health Physics

What is a health physicist?

Health physics is devoted to protecting people and the environment from radiation hazards, while making it possible to enjoy the benefits of the peaceful use of the atom. Health physics is diverse and one of the most interesting and rewarding fields of scientific endeavor. Many industries, medical facilities, national laboratories, and research laboratories demand professionals who understand radiation hazards and their prevention and control.

For decades, ionizing radiation has been used in beneficial ways, such as in medicine, treating cancer, irradiating food and medical wastes to destroy bacteria, and generating electrical power. But when used unsafely, ionizing radiation can harm living organisms. Care must be taken with nuclear reactors, high-energy particle accelerators, x-ray machines, and radionuclides used in biomedical research and therapy. Health physicists help minimize the potential for unnecessary irradiation of individuals or environmental contamination. Health physicists work in a variety of disciplines, including medicine, research, industry, education, environmental protection, and enforcement of government regulations. Although usually concentrating in one of these areas, a health physicist typically performs duties in several areas.

What makes a good health physicist?

A good health physicist needs to be able to draw from a wide variety of disciplines including physics, biology, biophysics, engineering (nuclear, civil, mechanical, or electrical), physiology, genetics, ecology, environmental sciences, toxicology, meteorology, and industrial hygiene. These disciplines must be integrated in an analytical fashion to solve specific problems. Although the health physicist may specialize, a professional health physicist typically performs duties in several areas. The wide spectrum of knowledge required of the health physicist makes this profession both challenging and rewarding.

What is life as a health physicist like?

One of the advantages of health physics is that one may specialize in one or more of the following fields:

Health physics research: If involved in research, a health physicist may investigate the principles by which radiation interacts with matter and living systems. Health physicists also study environmental radioactivity and the effects of radiation on biological systems on earth and in space. This research is used in many ways, ranging from designing radiation detection instrumentation to establishing radiation protection standards.

Medical health physics: Those interested in medicine may choose to specialize in medical health physics. They work wherever radiation sources are used to diagnose and treat human diseases. Hospitals, clinics, and major medical centers use radiation sources, including x-ray machines, particle accelerators, and many types of radioactive materials. Medical health physicists are needed to ensure proper and safe working conditions for both patients and medical staff. Health physicists may assist physicians in setting up shielding for x-ray rooms, ensuring that machines are properly calibrated, assisting with treatment planning for radiation therapy, or ensuring radiation protection for diagnostic nuclear medicine departments. The medical health physicist may also teach courses in radiation physics and biology, and review research projects involving radiation work. Through her personal supervision of radiation installations in hospitals and clinics, the health physicist seeks to obtain the maximum benefits of nuclear medicine with minimum risks of radiation exposure.

Environmental health physics: The environmental health physicist is the professional most closely associated with protecting the public and environment from unnecessary exposure to manmade and technologically enhanced natural radioactivity. One important task is the environmental surveillance for radioactivity, which involves many types of instrumentation and field sampling technologies. Another typical area of responsibility is using computer models to assess the environmental impact of radionuclides released to the environment.

Industrial or applied health physics: These health physicists advise managers regarding methods and equipment for radiation work. She also assists engineers and scientists in designing facilities and new radiation control programs.

Educational health physics: Those working in education develop and conduct training programs for future health physicists. They also train radiation workers and the general public. These individuals instruct workers and other health physicists regarding the risk associated with radiation sources and methods used to reduce risk. One goal is to help individuals understand the relative risk of radiation exposure. In most cases, the risk is no greater than that found from other hazards in industries. Health physicists

in education may be found in college or university classrooms and laboratories, or at off-campus training sites where they supervise student instruction. Sometimes educators conduct their own health physics research projects and publish their findings.

Regulatory enforcement health physics: Those who work in regulatory enforcement must have knowledge and experience concerning all types of radiation hazards in order to establish guidelines for adequate radiation control. These guidelines help society receive the greatest benefits from radiation sources at the lowest possible risk.

Power reactor health physics: A power reactor health physicist is responsible for all phases of radiation protection at a reactor site. Responsibilities may include selecting, purchasing, and maintaining radiation protection, laboratory, and detection equipment. Nuclear power plant workers require extensive training, while plant process systems require detailed study. The power reactor health physicist must be ready to respond quickly and with expertise in the unlikely event of a radiation accident. Health physicists make assessments of the potential environmental impact and ensure that the facility complies with federal regulations. Procedures must be prepared and updated, safety standards and emergency plans must be written, and preparedness drills conducted. It is common for a power reactor health physicist to supervise as many as 70–80 technicians and professionals, such as chemists and radiochemists. The daily work of a power reactor health physicist may involve reviewing radiological monitoring data for as many as 2000 employees. Area radiological surveys, radiation records, and internal and external measurements of radioactivity must be reviewed. In addition, survey and laboratory results are analyzed to ensure the reactor is operating within prescribed limits. The power reactor health physicist's career is multifaceted, satisfying, and rewarding.

How do I become a health physicist?

Because health physicists have responsible technical positions in several disciplines, you will need a broad background of education and experience. A bachelor's degree with basic education in the physical sciences is necessary, but training is also required in other areas, such as biology and math. In addition, most health physicists have a master's degree in health physics. A few go on to receive a Ph.D. in health physics. Academic programs in health physics, leading to baccalaureate and advanced degrees, are now offered in several American universities. These comprehensive programs will allow you to specialize in areas such as medical physics, biophysics, nuclear engineering, and radiation biology.

Health physics technician: Opportunities also exist in the field for health physics technicians. The educational requirements are less than that for a health physicist; two-year associate's degrees in this specialty are offered by several schools. Academic training alone will not make a health physicist. Practical experience in applying radiation protection principles is essential. To provide hands-on, real-life experience, cooperative programs are offered at many universities in collaboration with national laboratories and utilities.

What/where are the jobs?

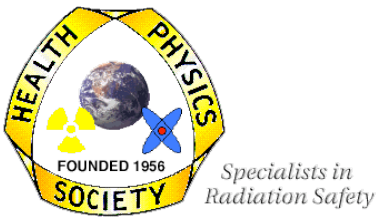
Health physicists are in demand in the job market, and the outlook for jobs in the future is good. They work in research, industry, education, national laboratories, and government at most every level. Some health physicists are self-employed consultants, and others are entrepreneurs who start their own companies. Employment can be found in every state.

For more information

The Health Physics Society has a comprehensive Education Reference Book that describes the health physics academic programs and fellowships available in the US. If you would like to receive this book and additional information about scholarship programs, professional salary levels, and careers in health physics, please contact

Academic Education Committee
Health Physics Society
1313 Dolley Madison Blvd., Suite 402
McLean, Virginia 22101
Phone: (703) 790-1745
Fax: (703) 790-2672
E-mail: hps@burkinc.com
Home Page: http://www.hps.org

article by:
J. Margo Clark, Ph.D.
Technical Staff Member
ESH-12 Radiation Protection Services
MS K483
Los Alamos National Laboratory
Los Alamos, NM 87545
E-mail: jmclark@lanl.gov



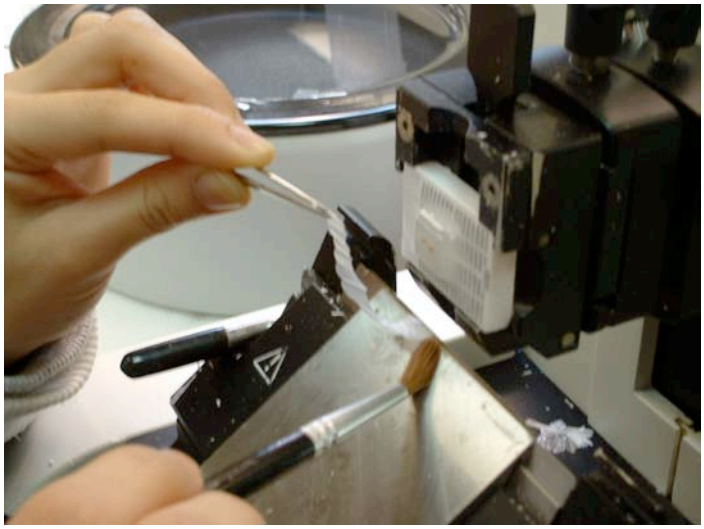
Histology

What is a histologist?

A histologist is a laboratory professional who has received specialized training in preparing human, animal, plant or other samples for examination and diagnosis by a pathologist. The histologist is concerned with cellular structure, chemical composition and function of normal and abnormal tissues. The specimen is processed with specialized equipment that allows the histologist to cut very thin sections (normally 4/10,000 of an inch), then treating with dyes and chemicals yielding a tissue section on a glass slide that exhibits tissue structure. The slide is then examined by a pathologist to evaluate normal or abnormal conditions.

What makes a good histologist?

Histologists have certain common characteristics: they are problem-solvers, like challenges, embrace responsibility, and appreciate the need for accuracy and reliability in their profession. Histologists work well under pressure and expect quality and commitment from themselves. They are deeply committed to their profession, being truly fascinated by all that science has to offer.



Paraffin ribbon containing tissue sample being prepared for placement on a microscope slide.

What is life as a histologist like?

Because the work of histology requires the preparation of samples as quickly as possible to allow the pathologist to communicate a diagnosis to the primary care provider, work hours often begin in the very early mornings. In larger hospitals and reference laboratories, the lab runs shifts that oftentimes provide 24/7 coverage, thus offering a variety of hours available to the histologist. The histologist must function as part of a team, every member of which is dedicated to producing quality work in a fast-paced environment. There is a certain amount of pressure to meet deadlines – your work may provide the critical piece of evidence needed to diagnose the patient, solve the crime or confirm the effectiveness of a new pharmaceutical.

How do I become a histologist?

To prepare for a career as a histologist, a student should have a solid foundation in high school sciences (biology, chemistry, math, and computer science). Clinical education is required in a histology training program accredited by the National Accrediting Agency for Clinical Laboratory Sciences (NAACLS) or an associate degree from a community college and training at a hospital. To ensure that the histologist is competent and able to perform high quality testing, the Board of Registry of the American Society for Clinical Pathology (ASCP) gives a national certification exam. Students take the exam after meeting their academic and clinical laboratory education requirements. Those who pass the exam may use the initials "HT (ASCP)" after their name to make known their proficiency in the field. It is highly likely that a histologist can begin work immediately upon completion of training.

What/where are the jobs?

With current television series dealing with forensic pathology and crime scene investigation, attention has become focused on the importance of the laboratory professions in general and histology in specific. It is the smallest detail and the technician's knowledge and experience that are critical to diagnosis or solution. Without the histologist who has the expertise to provide this vital link, the pathologist cannot diagnose the condition for the surgeon, who in turn communicates with the patient's primary care provider to plan for resolution or care. Histologists have an unlimited choice of practice settings. Hospitals, reference laboratories, clinics, public health facilities and industry currently have positions open. Other opportunities include pharmaceutical and industrial research, anatomic and clinical pathology, forensic pathology, and marine biology. At this writing, there are more than 250 positions available across the country and the demand for histologists will only grow. Positions currently available can be found at the NSH website and many others, including http://www.histologyjobs.com.

Sally Breeden, HT (ASCP)
New Mexico Department of Agriculture
Veterinary Diagnostic Services
700 Camino de Salud NE
Albuquerque, NM 87106
(505) 841-2576
sbreeden@nmda.nmsu.edu

Placement of a tissue specimen in liquid paraffin in preparation for sectioning on a microtome.

Photographs used in this article courtesy National Society for Histotechnology.

For more information

National Society for Histotechnology (NSH)
10320 Little Patuxent Parkway, Suite 804
Columbia, MD 21044
(443) 535-4060
http://www.nsh.org

American Society for Clinical Pathology (ASCP)
33 West Monroe Street, Suite 1600
Chicago, IL 60603
(800) 267-2727
http://www.ascp.org
http://www.ascp.org/Certification (Board of Registry)

National Accrediting Agency for Clinical Laboratory Sciences (NAACLS)
8410 West Bryn Mawr Avenue, Suite 670
Chicago, IL 60631
(773) 714-8880
http://www.naacls.org

These resources will provide a wealth of information. More information on the profession can be found by using a search engine specifically targeting the words "histology", "histotechnology", "histotechnician", or "histologist".

For information regarding the New Mexico Society for Histology (NMSH), please email nmhisto@aol.com.

Hydrology

What is a hydrologist?

The job of the hydrologist is to solve problems of water quality, quantity, and availability. Hydrologists study all of the physical, chemical, and biological processes involving water as it travels its various paths over and beneath the earth's crust. Trained hydrologists may have a wide variety of job titles. Some specialize in the study of water in just one part of the hydrologic cycle: hydrometeorologists study water in the atmosphere, glaciologists study water and ice associated with glaciers, geomorphologists understand past water events from present landforms, geochemists study water quality, and hydrogeologists evaluate the effects of geologic conditions on water in the ground and on the land surface. Engineers who study hydrology include those in agricultural, civil, environmental, hydraulic, irrigation, and sanitary engineering.

What makes a good hydrologist?

Good hydrologists are curious about the past and intrigued by the possible developments of the future. They are trained to observe natural processes that may unfold over long periods of time, make notes of their observations, and analyze them critically. Hydrologists often love the outdoors and are drawn to their profession by a feeling of social responsibility or an environmental ethic. Many hydrologic studies now include scientists with expertise in other fields, so a hydrologist must have good communication skills and be able to work as a team member to solve problems.

Pedernales Falls, TX

What is life as a hydrologist like?

The work of hydrologists is as varied as the uses of water and may range from planning multimillion dollar interstate water projects to advising homeowners about backyard drainage problems and advising engineers on the construction of wetlands. Scientists and engineers working in hydrology may be involved in both field investigations and office work. In the field, they may collect physical data from rivers, streams, and wells; collect water samples and conduct tests of water quality; direct field crews; and work with heavy equipment and delicate monitoring devices. Many hydrology jobs require travel, some local, some abroad. A hydrologist's field sites may range from suburban yards to remote and rugged terrain accessed by helicopter. In the office, hydrologists interpret hydrologic data, write reports, and prepare oral presentations of results. Much of their work relies on computers for organizing, summarizing and analyzing masses of data, and for developing predictive models of phenomena such as river flooding, the consequences of reservoir releases, and the effect of leaking underground oil storage tanks on nearby ground water supplies.

How do I become a hydrologist?

Students who plan to become hydrologists need training in mathematics, statistics, geology, physics, computer science, chemistry, and biology. In addition, some background in other subjects—economics, public finance, environmental law, government policy—can be useful for communicating with experts in those fields and to understand the implications of their work on hydrology. A hydrologist must learn to write clearly and concisely in order to communicate results to policymakers, regulators, other scientists, and the general public. Experience in public speaking is also useful to the hydrologist, who will often make public presentations to those audiences.

What/where are the jobs?

Hydrologists work both in research positions and applied areas wherever the availability, quality, or disposal of water is part of the task. Employers include a variety of federal agencies such as the Departments of Agriculture, Commerce, Defense, and Interior, and the Environmental Protection Agency. State and local governments also hire hydrolologists to help manage the use and preservation of water resources. Environmental consulting firms also provide many career opportunities for hydrologists, and university faculty not only conduct research but also teach new students.

Martha A. Hayes, Hydrologist, Baltimore, MD, E-mail: mahayes@ugs.gov

For more information

Refer to the U.S. Geological Survey's National Water Information Center http://water.usgs.gov/public/wrd005.html and the American Geophysical Union's hydrology section at http://www.agu.org/.

Investment Analysis / Brokerage

What is an investment analyst?

You would find a job as an investment analyst, or stock broker, appealing if you like excitement and constant change. An investment analyst gathers pertinent facts on the past performance of management, markets, price/earnings ratios, etc., of companies, compares these facts to those of other companies in the same industry, and estimates a company's future performance. She educates clients on the whole realm of investments; hence, she must be fully informed about world and local political affairs as they relate to the financial world, and she must be able to present facts on more than 40 investment vehicles. Tax investment planning, including real estate, oil and gas limited partnerships, and estate planning, can play an important role in her job. Basically, an analyst is an idea giver, fitting a client's needs and goals to particular investment vehicles, whether the client is an individual investor or a bank, a labor union, a teachers' pension fund, or a government agency.

What makes a good investment analyst?

An investment analyst must be able to read and digest a tremendous amount of information in order to determine whether a given product fits a customer's needs. She must be very self-motivated, have a high tolerance for stress, be basically optimistic, enjoy interacting with and selling to the public, and be able to keep accurate records of discussions and transactions with a client. She must be able to make decisions quickly and accurately; a good basic understanding of economics, mathematics, banking, and money markets contributes to the ability to make decisions effectively.

What is life as an investment analyst like?

It is difficult to imagine a job that is more difficult, exciting, hectic, frustrating, and rewarding. For example, as a fledgling stock broker you can spend 60–70 hours per week building up a clientele. Your day begins early, with a reading of current financial news (in the Wall Street Journal) and research comments to prepare for questions clients might have concerning financial investments. Once the financial markets open, a seemingly endless string of phone calls commences: client and broker make decisions and orders are entered. Dealing with problems that have come up and handling paperwork make up most of the remainder of the day.

How do I become an investment analyst?

A college degree in business and/or economics is helpful but unnecessary to be an analyst; nevertheless, it is increasingly important in the larger securities firms. Course work in math, economics, banking, marketing, speech communications, psychology, and sales is beneficial. If you become a broker, an in-house training period usually prepares you for the uniform National Association of Securities Dealers/Securities Exchange Commission examination required by the federal government. In addition, most states require a state examination in order to be licensed.

What/where are the jobs?

Brokerage houses, trust departments at banks, investment divisions of insurance companies, and private investment advisor groups employ investment analysts. Analysts are also increasingly in demand in large corporations. Young women should seriously consider "Wall Street" as a career because firms are bending over backwards to comply with the regulations of the Equal Employment Opportunity Commission.

Linda Kay Thorne (1984)
Account Executive
Merrill Lynch
Pierce, Fenner & Smith
Albuquerque, NM

Law

What is a lawyer?

A lawyer helps others resolve legal disputes; that is, a lawyer has been trained to listen to a set of facts, to analyze those facts in order to identify the legal questions involved, and if asked, then to represent a client's interest. The resolution of a legal dispute can take place in a courtroom, or lawyers can negotiate and settle differences out of court. Also, a lawyer sometimes acts as a counselor and advisor in planning future conduct to avoid legal disputes.

Lawyers vary in the kinds of legal questions they handle. Some specialize in criminal law, representing clients accused of crime. Other lawyers specialize in tax law, giving advice about the wide variety of taxes collected by state and federal government. Intellectual property attorneys represent clients who wish to obtain or protect rights in patents, trademarks, copyrights, or trade secrets. Still others specialize in property law, advising clients on buying or selling a house, or in estate law, making wills and trusts, for example.

What makes a good lawyer?

The same habits of mind and temperament that make a good professional also make a good lawyer. A lawyer, like a physicist, needs common sense, a good imagination, and a curiosity about the way people and things work. In law, however, some qualities of mind and temperament are uniquely important. First, you need to be careful. Much of law is tedious, detail can be significant, and all lawyer's jobs require preparation. You must be sufficiently conscientious to handle a lot of paperwork. Second, you need to be flexible. Often a problem cannot be resolved in the manner the lawyer first tries or even thinks is best. Lawyers need not only the imagination to conceive alternative resolutions but also the temperament to change approaches. Third, you need a tolerance for ambiguity. Sometimes there are no answers, and you must develop a solution or choose a course of action for a client that seems safe even though the legal ramifications are not entirely clear. Many people find this ambiguity exhilarating; some find it terribly frustrating.

Finally, a lawyer must be able to communicate easily and well in writing and in professional dialogue; she must be a good reader and a good listener. Not every lawyer, however, has to be a brilliant speaker. Effective speaking can be learned, and for most lawyers, written advocacy and face-to-face negotiation play a larger role than does argument in court.

What is life as a lawyer like?

Unlike the criminal defense lawyer Perry Mason, the average lawyer rarely goes to court but rather spends time doing research in a law library, talking to clients, and writing letters, legal arguments, or papers to be filed in court or an administrative agency. Much time is spent talking to other lawyers, either negotiating with an opponent or consulting with colleagues. Lawyers also participate in bar association activities or in community affairs, such as speaking to lay groups interested in legal issues. Many run for elective office or serve as judges.

How do I become a lawyer?

To become a lawyer, you need a law degree, and you need to be admitted to practice law in a particular state. To become a patent attorney, you must also have a science or engineering background and be admitted to practice before the U.S. Patent and Trademark Office. Rules for admission to the Bar vary considerably from state to state, and admission to practice in one state does not automatically entitle a lawyer to practice elsewhere. Most states require a law school graduate to pass a bar examination before issuing a license to practice law.

Admission to law school usually requires a bachelor's degree, and the applicant almost always takes an aptitude test, the Law School Admission Test (LSAT), which does not require knowledge of the law.

The most worthwhile high school courses are those that develop skills in careful reading and exact writing. The development of skills and habits conducive to legal reasoning is more important than the subject matter. Take courses that develop a broad cultural background; the ability to organize materials and communicate results; habits of thoroughness, intellectual curiosity, and scholarship; and verbal skills. Courses in literature, language, speech, composition, and logic cultivate such skills. Questionnaires several years ago asked leaders of the Bench and Bar which prelaw college subjects they considered most valuable. The following subjects were listed, in order of preference: English language and literature, government, economics, American history, mathematics, English history, Latin, logic and the scientific method, and philosophy. Accounting (not bookkeeping) and public speaking were also recommended.

What/where are the jobs?

A law degree represents a very flexible career choice. Most attorneys are in private practice; many, including judges, are in government service; some are employed by private business; and the rest are in fields such as stock brokerage, banking, teaching, and politics. Several famous television journalists have law degrees.

Lawyers are distinguishable in terms of whether they represent individuals or institutions. Some work for the state, federal, or city government. Others work for corporations, such as General Motors or Exxon, as "in-house" counsel on a permanent basis. Lawyers who represent numerous clients are said to be "in private practice." They may work in a large firm of 100 lawyers or more, in cities such as New York, Dallas, or Chicago; as sole practitioners; or in a small or medium-sized firm. Albuquerque's largest private law firm employs about 50 lawyers.

There is no standard wisdom on where new openings are likely to occur. Certainly some of the largest cities seem to be, or to be rapidly becoming, "over-lawyered." New or migrating lawyers in growing areas like the Southwest, however, seem to find jobs with little difficulty. Income varies greatly with location, experience, area of specialization, and education.

Updated by

Morrison Bennett
Los Alamos National Laboratory
Legal Counsel Business & Patent Law
MS D412
Phone: 505-667-6989
Fax: 505-665-3100
E-mail: mbennett@lanl.gov

(Original article by Pamela B. Minzner, Lawyer, Professor,
The University of New Mexico School of Law, Albuquerque, NM)

Materials Science

What is a materials scientist?

Materials scientists and engineers work with the materials involved in manufacturing all products used in our society. These materials range from well-known metals that have been around for ages such as iron, tin, copper, and steel to many recently developed materials like polymers, ceramics, superconductors, and high-performance alloys. Materials scientists study how the properties of simple and complex materials can be controlled and modified by chemistry changes as well as by variations in processing. They also find ways to manufacture useful parts from these materials while maintaining the desired properties.

Materials science and engineering is important to our society. Many technological advances have happened because new materials were invented and/or better ways were found to manufacture existing materials. Automobiles are being manufactured to be lighter and more fuel-efficient and with more of their parts easily recyclable. Improvements in biomedical alloys have made implants that last longer, and they are more easily accepted by the body. The tiles on the space shuttle were specially designed to protect the shuttle during reentry and to be strong enough to withstand the forces of takeoffs and landings. New advances in plastics have made these materials very versatile and more directly recyclable.

What makes a good materials scientist?

A good materials scientist is curious about why materials perform the way they do and what can be done to make them better. Experiments play a big part in materials research so a good scientist should be able to run experiments accurately using many different types of equipment and to keep good, detailed records. Since materials science is a mix of chemistry and physics, interest in these subjects is a plus. Good communication skills are always necessary, and computer skills are becoming increasingly important.

What is life as a materials scientist like?

Life as a materials scientist can be varied. Some scientists work in laboratories using sophisticated equipment to fully analyze, test, and develop new materials. Some scientists work mainly with small quantities of materials using microscopes and small testing equipment, while others may work with full factory setups making industrial products. Still other scientists may work in the field or in a manufacturing plant to solve problems—there only the experiments necessary to solve the problem are performed, and decisions are made quickly.

How do I become a materials scientist?

Materials science is a broad field that can accommodate many interests. To become a material scientist, you should take as much math and science in high school as possible. Be sure to study chemistry, physics, and math, such as trigonometry, algebra, and calculus. In college your undergraduate education should include chemistry, physics, calculus, and classes in the materials science field including microscopy, x-ray diffraction, heat, fluid and mass transport, and if desired, engineering. Courses in areas of specialization can be taken in graduate school to obtain M.S. and Ph.D. degrees.

What/where are the jobs?

Many types of organizations employ materials scientists and engineers. Materials-producing industries such as metals, glass, ceramics, and plastics, and manufacturing industries like automotive, aircraft, electronic, and medical supplies are sources of employment. These can be large or small companies and are located all over the country. Universities and national laboratories are also good sources of employment. Since materials science is such a broad and necessary field, there is a great deal of diversity and options for employment.

Deniece Korzekwa, Materials Science Division, Los Alamos National Laboratory, Email: deniece@lanl.gov

Mathematics

What is a mathematician?

A mathematician uses numbers and symbols in many ways, from creating new theories to translating scientific and technical problems into mathematical terms. Some mathematicians are more focused on pure mathematics. There are two types of developing mathematicians: the theoretical mathematician, who works with pure mathematics to develop and discover new mathematical principles and theories without regard to their possible application, and the applied mathematician, who uses mathematical methods to solve practical problems in such diverse areas as physics, astronomy, engineering, computer science, biology, ecology, medicine, economics, and psychology. The pure or theoretical mathematician is more likely to teach and do research at universities or other research institutes, while the applied mathematician is likely to work for business, government, or industry. Some mathematicians have their own consulting firms.

What makes a good mathematician?

According to Karl Weierstrass, a famous German mathematician, "A mathematician who is not also something of a poet will never be a complete mathematician." A mathematician appreciates beauty, symmetry, and order in nature and in logical and analytical thought. She should have a logical mind, a sense of curiosity, the desire and ability to solve problems, and numerical aptitude. A mathematician cannot be easily discouraged, for solving research problems often requires months of work. Some mathematical problems have remained unsolved for centuries. An applied mathematician must be able to communicate effectively and bring structure and analytical rigor to what is often a morass of confusing information. A mathematician, however, need not be a genius; a desire to work hard and an ability to formulate problems in mathematical terms is what makes a good mathematician.

What is life as a mathematician like?

A mathematician's life is spent learning and discovering new principles and using mathematics to formulate and solve problems. The tools of a mathematician, whether she teaches in a university or works in a laboratory, government, or private industry, are few in number: she needs a pencil (and an eraser!), paper, sometimes a computer or calculator, a good library, and professional colleagues. A mathematician rarely works completely alone. A theoretical mathematician will discuss new theories with co-workers and learn from their comments, and an applied mathematician will work closely with the scientists, engineers, or other clients, who need a mathematician to help solve problems in their fields. Besides communicating with co-workers and clients, a mathematician reads mathematical and scientific publications, attends national and international professional meetings here and abroad, gives presentation talks about her work based on her research, writes technical papers, and may teach. The love a mathematician has for her work and the satisfaction she derives from it make her professional life stimulating and rewarding.

How do I become a mathematician?

A future mathematician should take four years of mathematics in high school, including algebra, geometry, trigonometry, and analytic geometry, or precalculus (if it is offered, she should take calculus). In college, she should take many theoretical math courses (calculus, algebra, real and complex analysis, geometry, and differential equations), applied math courses devoted to problem solving (probability, statistics, numerical analysis, and computer science), and physical science courses (physics, chemistry, and engineering). To widen her career options, she should acquire a broad background not only in both pure and applied mathematics, but also in the sciences such as physics, chemistry, engineering, and biology. College English composition classes are also invaluable; the ability to write clearly and correctly is essential in any profession.

A bachelor's degree with a major in mathematics is the minimum requirement for starting positions in mathematics. To advance to higher-level positions and do research or teach at the college level, a master's degree or a Ph.D. is necessary. Most mathematicians seeking advanced degrees decide in graduate school between pure and applied mathematics as their specialty.

What/where are the jobs?

The college graduate with a bachelor's degree in mathematics can qualify for some positions in business, industry, government, and teaching. The opportunities and the pay increase significantly with higher degrees. Companies in the computer and communications industries employ many mathematicians as do oil companies, banks, consulting firms, and insurance companies.

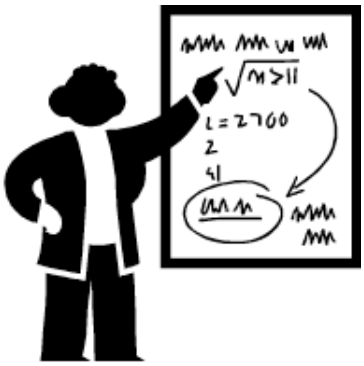
Almost every bureau and branch of the federal government employs mathematicians in some capacity. Mathematicians work in universities and colleges, teaching and doing research. In most four-year colleges and universities, the Ph.D. is necessary for full faculty status. Many mathematicians with a master's degree teach at the high school level.

Many other job titles apply to mathematicians who have specialized in an applied branch of mathematics. Actuaries assemble and analyze statistics to calculate probabilities, and thereby set insurance rates. Operations research analysts apply scientific methods and mathematical principles to organizational problems. Statisticians design, carry out, and interpret the numerical results of surveys and experiments. All of these careers begin with an education in mathematics and a curiosity about the use of mathematics to solve problems.

Elizabeth J. Kelly
Team Leader for Environmental Risk Assessment, Member of Technical Staff
Sandia National Laboratories, Albuquerque, NM
ekelly@lanl.gov

(original article by Barbara G. Epstein, Applied Mathematician, Los Alamos National Laboratory, Los Alamos, NM)

For more information



There are several professional organizations for mathematicians that have pamphlets and Web pages describing careers in mathematics:

The American Mathematical Society
P. O. Box 5904
Boston, MA 02206-5904
1-800-321-4267 or 401-455-4000
e-mail:ams@ams.org
http://www.ams.org/

Be sure to check out the American Mathematical Society's "Professional Information and Services Career Information for High School Students," available from the organization's Web home page.

The Association for Women in Mathematics
4114 Computer and Space Sciences Building
University of Maryland, College Park, Maryland 20724-2461
Tel: 301-405-7892
http://www.math.neu.edu/awm/

Association for Women in Mathematics is a national professional organization for women and men that aims to improve the status of women in mathematics. Future mathematicians are encouraged to join the Association for Women in Mathematics.

The Mathematical Association of America: http://www.maa.org/

Society for Industrial and Applied Mathematics: http://www.siam.org/

Women's Research Center
Wellesley College
828 Washington Street
Wellesley, MA 02181
This group publishes an interesting and informative bimonthly newsletter.

Medical Technology

What is a medical technologist?

Medical technology is concerned with laboratory tests used in the prevention, diagnosis, and treatment of disease. These tests and analyses are performed by a medical technologist (MT) or a medical laboratory technician (MLT). A medical technologist is knowledgeable in all areas of clinical laboratory work and is able to perform all routine procedures as well as specialized tests requiring more complex techniques. The MT makes independent decisions concerning the quality of laboratory results. Responsibilities often include education of peers, students, and subordinates; research and development of new techniques; and laboratory supervision. The MLT performs most routine laboratory procedures under the supervision of a medical technologist.

What makes a good medical technologist?

The medical technologist (and MLT) must possess the ability to work well with people and the desire to be of service to others. She must demonstrate the highest degree of integrity—honesty, confidentiality, and responsibility—in all areas of her professional and private life. Working under stress while maintaining manual dexterity and logical thinking is essential. Accurate and precise laboratory results require neatness, a high degree of persistence, and a capacity for patient, thorough effort. An interest in and an aptitude for science and mathematics are also helpful.

A research and development (R&D) medical technologist must be creative and have a strong science background. Medical product development can be very challenging and exciting. To become an R&D scientist, one can have a B.S., M.S., or Ph.D. degree in any area of science.

What is life as a medical technologist like?

Few people encounter a medical technologist unless they are hospitalized, and even then they may not realize that the blood specimen taken in the early morning is sent to the laboratory where a technologist or technician analyzes it to help monitor conditions in many parts of the body. By treating the sample in various ways to measure the constituents, a technologist aids the physician in assessing the functions of vital organs and their responses to therapy.

Medical technology is a rapidly advancing and changing field in which automated equipment such as electronic cell counters, computers, and self-regulating chemical analyzers have joined the test tube, the centrifuge, and the microscope as laboratory tools. Technologists must not only master the use of these instruments but also handle their routine maintenance in order to forestall critical work stoppages. They must continually monitor the quality of the performance of these tools, or the results obtained will be incorrect.

Most MTs and MLTs specialize by working in one of several diverse departments such as blood banking, chemistry, hematology, microbiology, or serology. They are among the physician's most valuable assistants in problem-solving, tracking down the causes of disease, checking the effect of antibodies on various microbes, exploring the hormonal status of sterile women, testing for pregnancy, or measuring the clotting capacity of blood. Some technologists become supervisors. They are responsible for orienting new employees, instructing trainees, managing supplies, monitoring work quality, maintaining records, and keeping laboratory procedures up to date.

A research scientist in the field of medical technology creates medical products to help improve health care. She will first research a known problem in a hospital, such as a need for a product that will provide more rapid test results or possibly a new instrument to perform a test or procedure quickly and accurately. Once the problem is identified, a team will develop and test many designs to try to solve the problem. The resulting product will need to work effectively in many types of conditions; it must be easy to use and have a long shelf life. It is likely to take many years to develop a new medical product.

How do I become a medical technologist?

A medical technologist needs a bachelor's degree in a laboratory science or a related area; the curriculum includes structured clinical training in medical technology in a hospital laboratory. Academic programs of universities vary so widely that no typical course outline can be given. Nevertheless, certification requires that courses prior to clinical training include 16 hours of chemis-

try (including organic and/or biochemistry), 16 hours of biological science (including microbiology and immunology), and one course in college-level mathematics. Training programs vary in length and structure; most are a year long (50 weeks, 40 hours per week) and replace the fourth year of college or are taken after the B.S. degree is earned. Upon completing training, the graduate is eligible to take state or national certifying examinations given by agencies such as the Board of Registry (American Society of Clinical Pathologists) and the National Certification Agency of Medical Laboratory Personnel.

To undertake such a university curriculum, the student should have taken high school biology, chemistry, and mathematics through trigonometry, with physics as an optional but useful addition.

A medical laboratory technician must complete an associate degree curriculum in laboratory science, including a structured training program in all areas of the clinical laboratory; such a degree program is usually given by community colleges. The graduate takes state or national certifying examinations at the MLT level.

What/where are the jobs?

In their first jobs, most technologists and technicians work in hospital laboratories; nevertheless, positions are available in other health-related or scientific areas. Laboratory professionals may also work in private or industrial laboratories, in public health agencies, in health maintenance organizations, in research or teaching institutions, or in medical programs such as the Peace Corps, VISTA, or Project Hope. Availability of jobs other than in hospitals depends on geographic location, job description, and qualifications. The job outlook is very good and will continue to be good, although opportunities vary among cities and states. Locations with the greatest demand include inner-city facilities and rural areas. Like the job market, salaries vary with location, education, experience, and responsibilities.

Pat Olson
Medical Technologist Instructor
The University of New Mexico
Albuquerque, NM

Updated by
Judy Hendricks
Medical Technologist

For more information

An Introduction to the Profession of Medical Technology, M. R. Williams and D. S. Lindberg, 3rd edition, Lea and Febiger, Philadelphia (1979).

Medicine

What is a medical doctor?

A medical doctor is a practitioner of the healing arts. She examines patients, analyzes the results of laboratory tests, diagnoses and treats the patient's medical condition, prescribes drugs, and advises the patient about methods of preventive health care. A medical doctor differs from a pure scientist in that medicine is a marriage of the biological sciences and the humanities. An M.D. must apply her scientific knowledge in the context of patient care.

What makes a good medical doctor?

A doctor is broadly trained in the sciences and the scientific method. A good M.D. must have an interest in and an understanding of how the human body functions. She should have a desire to work with people as well; compassion and honesty are as important as inquisitiveness and scientific aptitude. As in all fields, common sense, too, is helpful. The good doctor listens to the patient and is aware of the patient's feeling about the medical problem, not just the problem itself. She must be able to recognize what are the most important questions to ask a patient and what are the best tests to perform to arrive at a diagnosis.

What is life as a medical doctor like?

Life as a medical doctor can vary depending on your field of practice. A general practitioner, internist, pediatrician, or obstetrician-gynecologist provides primary care of patients. Specialists such as ophthalmologists (eye physicians and surgeons), otorhinolaryngologists (ear, nose, and throat doctors), orthopedists (bone doctors), endocrinologists (gland and hormone specialists), and dermatologists (skin doctors) diagnose and treat problems specifically related to their areas of specialization.

Depending on the specialty, you may have regular office hours or you may receive emergency phone calls in the middle of the night. As a doctor, you can have an individual practice or a group practice, or you can do all your medical work at a hospital. Some M.D.s are totally involved in patient care, others in teaching at a medical school. Many combine the two and spend part of their time teaching medical students, interns, and residents.

Another important function of an M.D. is to serve on various panels with colleagues and other members of the medical profession and on committees such as the medical malpractice panel of the state medical society or on hospital committees, such as patient care or cost containment. A large part of your time must be spent in continuing education to maintain your license as an M.D. as well as certification in your area of specialization. The field of medicine changes so rapidly that you must keep up with the current state of the art in order to provide up-to-date care for your patients.

The advantages of a career in medicine can include the satisfaction in the development of a trusting and lasting relationship with a patient. A doctor is often involved in life-and-death type responsibilities; coping with the severe illness or death of a young child can be very wearing.

How do I become a medical doctor?

To become a medical doctor, you need a college education and graduation from a school of medicine. Medical school generally takes an additional four years beyond college. Specialization takes further training. In ophthalmology, for example, residency takes three additional years of training and, until recently, a year of internship prior to the residency. Other specialties, such as surgery, can require six years or more.

All doctors must be licensed by their respective state boards of medical examiners. Nevertheless, in most states renewal of licenses is a mere formality. New Mexico and several other states, however, make renewal of the license to practice medicine contingent upon completion of a prescribed amount of accredited postgraduate study in medicine.

You must take many science courses, particularly in the biological sciences, in both high school and college. Nevertheless, there are qualities besides scientific knowledge that make a good doctor. You can run the risk of becoming so intent on making good grades in the sciences that other areas are neglected. Be realistic and understand that competition for entry into medical school is stiff. A broad education in high school is advisable before you must begin to concentrate on the required courses in college. High school courses should include English, mathematics, biology, and chemistry. Since requirements differ from school to school, determine the various college courses necessary for admission to different medical schools.

What/where are the jobs?

More doctors are needed in the area of family practice or general practice, i.e., the area of "primary care." Openings in the specialties, in general, are less common. Small towns are more in need of doctors than large cities; the South and Midwest are more in need than the east and west coasts. Salaries are extremely variable depending on location, type of practice, and type of specialty.

Betty A. Hagman
Ophthalmologist (1984)
Albuquerque, NM

For more information

A list of approved medical schools and general information on premedical education, financial aid, and medicine as a career are available from the following:

Council on Medical Education
American Medical Association
535 N. Dearborn Street
Chicago, IL 60610

Association of American Medical Colleges
Suite 200, One Dupont Circle NW
Washington, DC 20036

For careers in anatomy:
http://www.anatomy.org/anatomy/

Oceanography

What is an oceanographer?

Life as an oceanographer is not routine. Oceanography Camp* participant sampling the coastal environment near shore. This teen oceanographer is using a sieve net to identify the fish inhabiting the area.

An oceanographer can be a biologist, chemist, physicist, geologist, engineer, mathematician, computer scientist, meteorologist, or you! As a relatively new frontier, oceanography is a wonderfully challenging and exciting field of study providing many career opportunities. It's an important field of study because oceans encompass 70% of the earth's surface, and they also have an important role in understanding global weather patterns.

Chemical, geological, and physical oceanographers investigate the physical aspects of the ocean, such as salinity, currents, and the ocean floor. Biological oceanographers study marine plants and animals and their processes within the context of their ocean environments. Ocean engineers provide the technology and instrumentation that allows oceanographers to explore questions and solve problems in a variety of ways.

Oceanographers are global scientists who study a wide variety of topics. There is never a shortage of questions to answer or things to discover! For instance, as a chemical oceanographer you might study how sea water and sediments form, how pollutants and waste disposal impact the ocean, or how the ocean affects climate. As a physical oceanographer you study the ocean from a "big picture" perspective, often using satellites (remote sensing) to understand how and where water moves, and how the ocean interacts with the land and atmosphere to influence weather patterns. As a marine geologist or geophysicist, you may study the formation of beaches, map the earth's interior, or drill into the ocean's floor to discover the ocean's history of sea-level rise and earthquakes. Understanding these questions helps to develop sound management policies for harvesting seafood, responding to pollution, and recovering resources for biotechnology.

Teen oceanographers "out at sea" during Oceanography Camp* collecting a sediment sample during a research cruise near Tampa Bay, Florida. This information helps to understand the types of sediments that compromise the ocean floor near estuaries.

The newest area of biological oceanography is marine molecular biology. Marine biology is the best known area of biological oceanography, and because of its popularity, it is currently the most competitive field of oceanography to find a job in. Oceanographic research branches into other disciplines as well. These fields include, but are not limited to, marine resource management, computer modeling of marine ecosystems, aquaculture, limnology (the study of inland water systems), and mining for natural resources including nickel, copper, manganese, petroleum, and natural gas.

Because the oceans are linked to our survival on planet Earth (comfortable climate and oxygen to breathe), oceanographers work side by side with policy makers, social scientists, educators, and businesses to develop effective ways of managing and maintaining our ocean resources. Our dependence on the global ocean will increase as we look to the ocean to sustain our expanding population's needs such as food and water. Through continued research and new technology, we are learning how the oceans affect life and the future of our planet.

What makes a good oceanographer?

Just as the ocean environment is incredibly diverse, so too are the many people who study the global ocean. Oceanographers share an excitement, curiosity, and sense of adventure in exploring planet Earth's largest environment. An oceanographer needs patience to collect data and conduct experiments. It is really beneficial to develop good communication skills and to work effectively

It's fun to do science. Oceanography Camp* participants collecting a water sample from several meters below the ocean's surface. Water samples will be analyzed for nutrient levels and chlorophyll concentrations.

as a team member. Most major questions about the global ocean are answered through the collaboration of many people with various specialties. In preparing to be an oceanographer, you should be flexible and explore all your options in this ever-growing field. Oceanographers are generally very creative and innovative people who embrace challenging problems and address complex issues impacting our society today and in the future.

What is life as an oceanographer like?

Your life as an oceanographer is really variable, and you could work in a lot of different settings. For example, you may be in a small boat along the coastline for a day, in a laboratory setting over several days, or on a research vessel near Antarctica for several months. You may be on the water, in the water, under the water, or studying the areas along the shoreline. In the laboratory oceanographers process data, perform library research, prepare graphs and tables, and write about their results. Oceanographers also present their research at scientific meetings and in scientific journals.

Entry level oceanographers with a B.S. degree work as research or laboratory assistants, performing routine data collection, computation, and analysis. Most beginning oceanographers receive on-the-job training as needed. Experienced oceanographers direct surveys and research programs or advance to administrative or supervisory positions in research labs.

Life as an oceanographer is not very routine and is definitely not a nine-to-five job. In fact, you may spend long hours on a project or be on a research cruise for months at a time. You must be flexible. Be encouraged to know that all the hard work and long hours are extremely rewarding! Being an oceanographer is a great career. It is truly exhilarating to discover things first-hand and explore questions whose answers will benefit our planet as a whole. As an oceanographer you may be an educator who has the privilege of passing along to others the experiences of your career and research.

How do I become an oceanographer?

The minimum requirement for an oceanographer is a B.S. degree in oceanography, biology, earth or physical sciences, mathematics, or engineering. Most jobs require graduate training in oceanography.

Prepare early! Take as many math, science, and computer classes in school as you can. Currently, the more math classes you take the better your job opportunities will be because you will be best prepared for a variety of jobs. Even if you do not understand why you're taking some classes or how they relate to your interests, take them anyway and do well.

Generally, more math means a higher salary. Your goal in high school should be to have at least four math credits (including trigonometry, algebra, and calculus) and four science credits (including geology, chemistry, biology, and physics). Your college courses should include biology, meteorology, geophysics, and some specialized science classes that apply to the study of oceans. Graduate courses should include advanced oceanography as well as areas of special interest for you. While all these classes might sound intimidating, they are taken in a sequence that allows you to build on what you have already learned.

Be a volunteer and "shadow" in as many places as you can (industries, governmental agencies, aquariums, museums, colleges, libraries). Look for opportunities to gain hands-on experience. There are a lot of summer programs available in the sciences. To identify programs contact the National Marine Educators Association 408-648-4837. Be prepared for a challenge, and keep your goal in sight even when the way seems difficult. Persevere in following your dream. Be committed to hard work and dedication. Don't give up; you will succeed, and you will be greatly rewarded!

Campers at the Oceanography Camp for Girls* spent the day restoring our local environment by planting marsh grass along the shoreline of Tampa Bay, Florida. This camper is holding a cup of fertilizer, which is used to give the salt marsh plants a head start in their new lives.

What/where are the jobs?

Oceanographers are employed by industry, the federal government, and in academia. As with any field, the career opportunities available will depend on market demand and competition.

Currently, the greatest demand in oceanography is for chemical and physical oceanographers and ocean engineers. The future looks bright in the fields of remote sensing, mathematical modeling, computer programming, aquaculture, biotechnology, engineering, and public policy. Salaries depend largely on your training and area of specialization. Be realistic! Stay current on the job market through your college and advertisements in science periodicals, join professional organizations, and access electronic bulletins. If you are committed to exploring a career in oceanography, you should pursue it aggressively and know that the ocean sciences are available to all!

Lori Cary-Kothera
Oceanographer
811 Issaqueena Trail #410
Central, SC
864-653-9327

Teresa Greely, Oceanographer
University of South Florida Department of Marine Science
1407th Avenue South
Saint Petersburg, FL 33701
813-553-3921
E-mail: greely@marine.usf.edu

Team work! Hard work. Not routine, be flexible! Oceanography Camp* participants use a trawl net to discover who lives in the bay. The net contained lots of different fish and invertebrates, which were identified, counted, measured, and promptly returned to their ocean home.

*The Oceanography Camp for Girls is sponsored by the Department of Marine Science in St. Petersburg Florida and by the National Science Foundation. They supplied all pictures in this chapter. The girls shown in the pictures are from the Tampa Bay region.
See http://www.marine.usf.edu/girlscamp/.

For more information

Careers in Oceanography and Marine-Related Fields
The Oceanography Society
4052 Timber Ridge Drive
Virginia Beach, VA 23455
804-464-0131

National Sea Grant College Program
National Oceanic and Atmospheric Administration
SSMC3 Room 11606, 1315 East-West Highway
Silver Spring, MD 20910
301-713-2431

The Women in Engineering Program Advocates Network
1284 CIVL Building, G-296
Purdue University
West Layfayette, IN 47907-1284

Association for Women Geoscientists
4779 126th Street North
White Bear Lake, MN 55110-5910

Association for Women in Science
1522 K Street, Suite 820
Washington, DC 20005
202-408-0742

Marine Science Careers -
A Sea Grant Guide to Ocean Opportunities
Sea Grant Communications Office
Kingman Farm
University of New Hampshire
Durham, NH 03824-3512
603-749-1565

The Environmental Careers Organization
206-625-1750. Internships

National Marine Educators Association
PO Box 51215
Pacific Grove, CA 93950
408-648-4837

American Society of Limnology and Oceanography
Virginia Institute of Marine Science
PO Box 1346
Gloucester Point, VA 23062
804-642-7000

The National Science Foundation
Office of Legislative and Public Affairs, Room 1245
Wilson Boulevard, Arlington, VA 22230
703-306-1070

Patent Agent

What is a patent agent?

A patent agent helps inventors or owners of inventions get patents on their inventions. In order to understand the technical nature of the invention, patent agents talk with scientists or engineers who have made the invention and entrepreneurs or business people who have acquired rights in the invention. The patent agent must then gain an understanding of where the invention fits in the technology it represents and in what ways it is unique and thus eligible for a patent. Next the patent agent presents the invention to the U.S. Patent and Trademark Office in the form of a patent application with claims to the invention. The patent agent has been trained in the rules for working with the U.S. Patent and Trademark Office to get the patent issued.

What makes a good patent agent?

A good patent agent has curiosity about the way things work and the ability to understand technical concepts, processes, and apparatuses. The patent agent must be an excellent communicator, both verbally and in writing. The patent agent has to be able to explain the rules for patentability and procedures for obtaining a patent to the inventor or owner of the invention. The patent agent has to be able to write a description of the invention that will enable others to use the invention, and write claims to the invention that communicate clearly what it is that the public is excluded from making, using, or selling without permission from the holder of the patent.

Patent agents need excellent negotiating skills to get patent examiners at the U.S. Patent and Trademark Office to agree with the patent agent, the inventor, and, if the rights to the invention have been assigned, the owner of the invention, as to the nature of the invention and how much of the particular technical area can be claimed as the invention.

Patent agents have to be detail-oriented and well organized so that they meet all deadlines imposed by the rules and U.S. Patent Office during the process for obtaining a patent, which often includes timely submission of a number of forms, requests for amendments to the patent application, declarations by persons skilled in the technical area, petitions for various procedures, and drawings of the inventions that meet very exact standards published by the U.S. Patent and Trademark Office.

What is life as a patent agent like?

Patent agents most often work for a law firm or a corporation or enterprise that has research and development activities resulting in inventions or that purchases rights to inventions. A small number of patent agents have been hired by national laboratories where research is taking place. Other patent agents are self-employed and seek inventors or businesses or investors who desire patents. These agents may go to meetings of inventors' clubs and entrepreneurial organizations, give talks on how to get patents on an invention, and get referrals from attorneys and business people who deal with inventors and small businesses. Most of a patent agent's professional life is spent reading, writing, and talking with inventors, owners of inventions, and patent examiners employed by the U.S. Patent and Trademark Office.

How do I become a patent agent?

To become a patent agent you must have a science or engineering background, and you must be admitted to practice before the U.S. Patent and Trademark Office, a United States government agency. Admission to practice before the U.S. Patent and Trademark Office requires a college degree in science or engineering or equivalent experience and a passing score on an examination of your knowledge of the rules of practice before the U.S. Patent and Trademark Office.

The most worthwhile high school courses are those that teach scientific or engineering concepts and those that help you develop communication and negotiation skills. Courses that develop your intellectual, scientific, and technical curiosity and the ability to organize ideas and pay attention to detail are important. College subjects needed are those that will result in one of the scientific or technical degrees listed by the U.S. Patent and Trademark Office as meeting the requirement for registration for practice before the U.S. Patent and Trademark Office as well as courses that build on the high school courses referred to above.

What/where are the jobs?

Jobs for patent agents, especially self-employed patent agents, can be anywhere in the United States. Many patent agent jobs are in cities like Washington, D.C., where the U.S. Patent and Trademark Office is located, and cities such as New York, Chicago, Los Angeles, and San Francisco, where many large corporate headquarters are located. A good number of patent agent jobs are in patent departments of the largest corporations with research and development departments in the towns and cities where the research and development facilities are located.

Morrison Bennett
Los Alamos National Laboratory
Legal Counsel Business & Patent Law
MS D412
Phone: 505-667-6989
Fax: 505-665-3100
E-mail: mbennett@lanl.gov

For more information

Applications for taking the U.S. Patent and Trademark registration examination are available from

U.S. Patent and Trademark Office
Office of Enrollment and Discipline
Washington, D. C. 20231
Telephone: 703-308-5316

Courses that specifically prepare people for taking the examination for registration of patent agents are offered by several companies, including the following:

Patent Resources Group, Inc.
528 East Main Street
Charlottesville, VA 22902
1-804-296-3900

Patent Law Institute
810 Seventh Avenue
New York, NY 10019
1-800-260-4754

Pharmacy

What is a pharmacist?

A pharmacist works with drugs in their preparation and use to cure, control, and prevent illness. The majority of pharmacists work in retail pharmacies with the remainder working in such areas as hospitals, nursing homes, manufacturing, biopharmaceutics, or research. In the health care system, retail pharmacists dominate in the dispensing of drugs prescribed by physicians. A pharmacist must work hand-in-hand with the doctors to make sure that each patient receives the correct medication for his/her condition. Pharmacists help patients understand how their medications will control or cure their illnesses as well as how to properly take and store the medications.

A research pharmacist works with chemicals that possess desirable drug effects and the challenge of putting these chemicals into finished products such as tablets, injections, suspensions, suppositories, or patches. The final drugs must meet the Federal Drug Administration requirements related to stability, safety, and effectiveness.

A pharmacist may choose a hospital or clinic setting where she deals directly with doctors and nurses by showing them how to prepare and administer drugs safely. She is also included on patient-care teams that evaluate the patients' conditions and recommend drugs for their treatment.

What makes a good pharmacist?

A good pharmacist is interested in the study of drugs and their effects on the human body. She must love chemistry, biology, and mathematics. A pharmacist must have the desire to work with people and be able to communicate effectively with physicians. Most importantly, a good pharmacist must have the desire and the patience to work with the elderly and with very ill patients.

What is life as a pharmacist like?

Working as a pharmacist is a very exciting experience. Knowing that you play a role in helping a patient prevent or treat illness is very rewarding. A retail pharmacist is well-respected, and is, according to a recent Gallup Poll, "...the most trusted professional in America." That's quite a challenge to live up to! Patients tell you intimate details of their lives and illnesses, and you must respect their privacy and truly care about them. Pharmacists help patients understand how their medications will control or cure their illnesses as well as how to take and store medications properly.

How do I become a pharmacist?

If you are interested in pharmacy, you should take as many chemistry, math, and science classes as possible in high school, including physics, biology, algebra, trigonometry, and calculus. A pre-pharmacy program of two years of select college classes is required before you can apply for admission to the College of Pharmacy at the University of New Mexico. Classes in the College of Pharmacy are limited to forty to forty-five students per year, and you will be competing with several hundred students for admission, so good grades are a must. Once you are accepted into the College of Pharmacy, you must complete four years of pharmacy classes. After graduating with a Pharm-D degree, you have to pass a national board examination and a state laws exam. You must then apply for registration in the state where you want to practice. Each state requires a law exam, but the pharmacy portion of the exam will transfer among most states.

What/where are the jobs?

Pharmacists work in retail stores, drug manufacturing, research hospitals, nursing homes, and education. A retail pharmacist may choose to work for a national chain or own her own store. Hospital pharmacists may choose a small clinic hospital or a large, complex health care facility to work in. The armed forces offer pharmacists an officer's commission.

New Mexico has a lot of great opportunities for employment in the rural areas. A pharmacist can work full-time or part-time, or simply do relief work when she wants to. Some pharmacists in the larger cities have full-time jobs and pick up extra hours at a chain store that is open twenty-four hours a day. There are a large variety of jobs available in pharmacy—something for everyone.

Barbara Wood
The Medicine Shoppe
Silver City, New Mexico

For more information

New Mexico Pharmaceutical Association: http://www.nm-pharmacy.com/, (505) 265-8729
Virtual Library Pharmacy: http://www.cpb.uokhsc.edu/pharmacy/pharmint.html
American Soc. for Pharmacology & Experimental Therapeutics: http://www.aspet.org/

Physician Assistant

What is a physician assistant (PA)?

A PA is a health professional licensed by the state or certified by a federal employer to practice medicine with the supervision of a physician (doctor). PAs practice as part of a team with their supervising physicians. They perform a wide range of medical duties including diagnosing and treating illness and injuries, providing medical emergency care, assisting in major surgery, and providing pre- and post-operative care. PAs are trained to provide approximately 80 percent of the services usually designated to a doctor in a primary care or general medical service setting. Responsibilities of a PA depend on the PA's training, experience, state law, and what the supervising physician delegates to the PA. Currently forty states, the District of Columbia, and Guam authorize PAs to write and sign prescriptions without the physician's co-signature.

What makes a good physician assistant?

PA programs look for students who want to study, work hard, and be of service to other people. A good PA must have an interest in and an understanding of how the human body functions. She should have a desire to work with people as well; compassion and honesty are as important as inquisitiveness and scientific aptitude. As in all fields, common sense, too, is helpful. The good PA listens well and is aware of the patient's feeling about the medical problem, not just the problem itself. She must be able to recognize what are the most important questions to ask a patient so that she and the physician can determine the diagnosis and plan the best treatment.

What is life as a physician assistant like?

Physician assistants perform physical examinations, diagnose illnesses, formulate and carry out treatment plans, order and know how to analyze laboratory tests and other diagnostic studies, assist in surgical procedures and sew up wounds, apply casts on broken bones, and provide information to the patient on care of his/her illness or injury and on prevention of disease.

PAs and their supervising physicians often work in the same location, so that there can be immediate consultation between the physician assistant, doctor, and patient in unusual or complicated cases. But most states do not require that PAs and their supervising physicians are at the same location; states require the supervising physician to be immediately available for consultation either in person or by telephone, radio, or other method. This allows PAs to treat patients in remote areas that might otherwise not have immediate access to medical care (e.g., rural towns, Alaska, Native American reservations, migrant farm workers' locations, ships, etc.)

How do I become a physician assistant?

Most programs require you to have some previous health care experience (e.g., nurse's aide, home health care aide, or military medical experience) and some college courses. Most people who apply to a PA program have a college degree. College courses typically required before you apply to a PA program include English, math, biology, microbiology, chemistry, medical terminology, and psychology. There are currently 104 PA programs in the U.S. located at colleges, universities, medical schools, or teaching hospitals, and through the Armed Forces.

A typical PA program is two years in length. The first year includes classroom lectures and lab sessions in anatomy, physiology (how the body works), microbiology, pharmacology (how medicines work), medical decision-making, and patient education. The second year is spent in clinical rotations with other health care professionals such as medical students, interns, and residents in areas of family and internal medicine, surgery, pediatrics, obstetrics and gynecology, mental health, and other specialties. Depending on the specific PA program, the credentials awarded include a Certificate of Completion, associate's degree, bachelor's degree, master's degree, or Graduate Certificate of Completion. After graduation from an accredited PA program, you may choose to obtain even more specialized training in a post-graduate residency program. Some of the specialty areas currently offering this training include emergency medicine, surgery, orthopedics, neonatology, and occupational medicine.

After graduating from a PA program, a PA must pass a national certification examination developed by the National Board of Medical Examiners and administered by the National Commission on Certification of Physician Assistants (NCCPA). A lifetime

of learning continues as every PA must take continuing medical education classes throughout her or his career and pass a national recertification examination every six years. This helps to insure that each PA will maintain a core competency of medical and surgical knowledge.

What/where are the jobs?

PAs work in many different types of health care settings. Some work in hospitals, clinics, doctors' offices, schools, and private companies. PAs also work for the U.S. government in the military, Public Health Service, Veterans Administration, Bureau of Prisons, and in the White House. PAs serve communities of all sizes, from remote and rural towns to major cities. Most PAs work in primary care medicine—general or family medicine, internal medicine, obstetrics and gynecology (women's health), pediatrics (child health), and mental health. But many also work in specialty areas such as orthopedics, surgery, neonatology (newborn care), and occupational (work-related) medicine. PAs can also work in educational settings like colleges or universities where they may offer medical care and/or teach other health care students, in health care administration, and in medical research settings.

The profession has grown so that now there are approximately 30,000 practicing PAs in the U.S. The demand for PA services is rapidly increasing as a result of increased recognition of the quality of care that PAs provide and the cost-effectiveness of those services. The Department of Labor projects that the total employment in the U.S. will grow by 14 percent through the year 2005. During that same period the number of PA jobs is expected to grow by 23 percent.

M'Lou B. Stevens, PA-C
National Institutes of Health
Washington, D.C.

For more information

For more information on physician assistant programs, the PA profession, employment opportunities and salaries, and obtaining credentials, please contact the following:

American Academy of Physician Assistants
950 North Washington Street
Alexandria, Virginia 22314-1552
703-836-2272
Fax: 703-684-1924
http://www.aapa.org

National Commission on Certification of Physician Assistants, Inc.
6849-B2 Peachtree Dunwoody Road
Atlanta, Georgia 30328
770-399-9971
Fax: 770-399-2766

Association of PA Programs
950 North Washington Street
Alexandria, Virginia 22314-1552
703-548-5538

For careers in anatomy:
http://www.anatomy.org/anatomy/

Psychology

What is a psychologist?

A psychologist studies behavior and learning using observation, experimentation, and survey techniques. Some psychologists teach, some conduct research, and some apply their knowledge to problems of human behavior. Any combination of these is also possible. Most people think of psychologists as clinicians who test, diagnose, and treat emotional and behavioral problems. Clinical psychology is one of the major areas of psychology, but it is far from the only one. Developmental psychologists study normal patterns of development in children, adolescents, adults, the aged, or other animal species. Experimental psychologists increase our understanding of basic processes such as learning, motivation, emotion, and perception. Industrial and organizational psychologists aid in the selection and development of human resources in business or government. School psychologists treat social and learning problems of school children. Engineering psychologists design products, machinery, and work or living areas with the "human factor" in mind. Forensic psychologists work for the criminal and civil justice systems.

What makes a good psychologist?

An ability to work with people is important for most specialty areas. Curiosity, a strong sense of ethical responsibility, enjoyment of the problem-solving process, and good verbal skills are major characteristics of a good psychologist. Psychology requires creativity along with rigorous study and a desire to expand knowledge as well as apply it. A psychologist should have mathematical and scientific skills as well as an interest in people, behavior, and ideas.

What is life as a psychologist like?

A psychologist's work is challenging and interesting. The hours of work and intellectual energy needed can be great. Extensive work with disturbed people can make heavy emotional demands. It can be frustrating to have a client relapse or to have a carefully designed and executed study fail to support your ideas about behavior. Yet the gratification of advancing knowledge about behavior or helping others help themselves is not only satisfying but even exhilarating.

How do I become a psychologist?

A psychologist has different training than either a psychiatrist or a counselor. Psychiatry requires a medical degree with a specialization in psychiatry. Counselors concentrate on developing counseling and therapeutic skills in their advanced training. In contrast, a clinical psychologist must obtain a Ph.D. or Psy.D. in order to develop research skills as well as counseling and therapeutic skills. Clinical, consulting, and forensic psychology often require several years of supervised experience beyond the Ph.D. Many states, including New Mexico, require both a Ph.D. and supervised work experience before you can be certified to practice independently as a psychologist.

Almost all jobs require at least a master's degree, and a large majority require a Ph.D. degree. College teaching requires a Ph.D., as does most research. Junior college teachers should have at least a master's degree; more often than not, a Ph.D. degree is required. With a bachelor's or master's degree, you can teach in high school or work in government or business. For example, a bachelor's degree could lead to a job as an advertising consultant. Few high school teachers concentrate solely on psychology; instead, most obtain certification in the social sciences.

In high school you should take college-preparatory courses in math and the social and natural sciences to develop your research and analytic skills. A solid background in algebra is needed to understand how tests are developed and how scores should be interpreted. Trigonometry and calculus are important to understand the multivariate statistics increasingly in use by social scientists. A course in computer programming is also helpful. Take a broad sampling of psychology courses in college, even if you have already chosen your specialty. Some of the greatest advances in each area of psychology have been made by combining concepts from other areas, and you will be better able to discuss your work with people from varying backgrounds. Take laboratory courses to learn methods of inquiry and problem solving, and develop your math and science skills with courses in statistics, computer programming, and research methods. Do not neglect the humanities. Some of the most insightful ideas about people, behavior, and the mind come from philosophy, literature, and the arts.

In graduate school, traineeships can provide valuable and often necessary experience in most areas of psychology. Internships are a major component of all teaching and clinical practice programs, and a few corporations offer internships in engineering and industrial psychology.

What/where are the jobs?

Psychologists are employed by universities, large industries, government, medical and health facilities, and consulting firms. As in other fields, opportunities for employment in four-year colleges and universities are shrinking. Many clinicians choose to work outside academia in private practice, health organizations, school systems, or large businesses. Managed behavioral health care is slowly but steadily changing opportunities for clinicians to work, increasing opportunities for Master's level clinicians and decreasing them at the doctoral level.

Original article by
Therese Elizabeth Goetz, Psychologist
Assistant Professor, The University of New Mexico
Albuquerque, NM
Human Resource Consultant, Albuquerque, NM

Updated by
Amy Anderson, Counselor; and Tom Locke, Psychologist
Los Alamos National Laboratory

For more information

Call the American Psychological Association at 1-800-374-2721. They have a variety of publications including a free brochure entitled *Psychology: Scientific Problem Solvers—Careers for the 21st Century.* They also have a book for sale entitled *Career Paths in Psychology: Where Your Degree Can take You*, (1997).

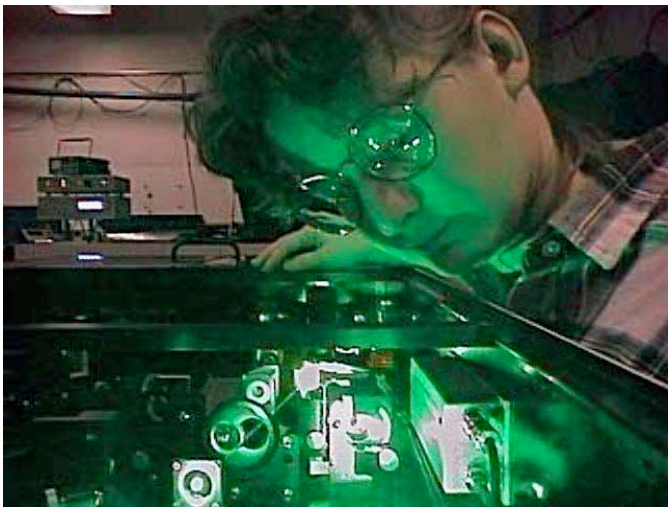
For additional information, see *Careers for Psychologists* (Washington, DC: American Psychological Association, 1979 ed.)

Physics

What is a physicist?

A physicist studies how the universe works. Experimental physicists do laboratory work to discover or verify laws of nature. Theoretical physicists come up with mathematical models to describe those laws. Physicists study problems ranging from how the smallest possible particles behave to how galaxies form. We look for ways to describe how water flows through pipes, how electric circuits work, how light splits into colors, why magnets attract certain types of metals, what keeps the sun hot, what keeps molecules from falling apart, how space bends or curves, and millions of other problems.

Physics also combines with other disciplines. Applied math uses equations to predict what will happen in real-life systems. One of my favorite problems is using the "Heat Equation" to figure out the temperature of a bar of metal at any given time and at any place in the bar if I know how hot the bar is when I start. It always amazed me that equations can describe what happens in the real world. There are many other areas where physics combines other subjects such as biophysics, chemical physics, and geophysics. My own specialty is the branch of chemical physics that uses quantum mechanics to describe how atoms and molecules behave. I also recently attended a NASA conference on "Breakthrough Propulsion Physics," which means that we looked for new ways to power space ships.



Jennifer Siders, a Ph.D. physicist at Los Alamos National Laboratory, works on aligning her ultrafast Ti:Sapphire laser amplifier, which she uses to study superconducting materials.

What makes a good physicist?

Physicists are curious about why the universe works the way it does. A good physicist likes to ask questions and look for answers. A willingness to study new material and learn math is important too. One reason I love theoretical physics so much is that I thoroughly enjoy doing math. A good experimental physicist knows how to work in a lab and how to "think up" good experiments and try them out. Of course, when a student is just starting out, no one expects her to already have the skills to go into a lab or do advanced math. These are all learned, starting in school. So a good physicist is willing to study, not only in school, but all through her career.

What is life as a physicist like?

The life is exciting, frustrating, but never humdrum; in terms of hours of work and intellectual energy expended, it can at times be very demanding. A physicist is a seeker of the truth, but the truth does not always come easily. A famous physicist, Niels Bohr, has described an expert in science as one who has made all the mistakes that can be made in a very narrow field. You can be frustrated by seeing an experiment fail and by realizing that one of your pet ideas is faulty. But the pleasure in making a discovery that represents a real advancement in understanding, and the satisfaction in doing a very tricky experiment successfully, make it all worthwhile.

A typical day in the life of a physicist might involve teaching students; conducting research in a lab; investigating new ideas with a scratch pad or a computer; traveling to a professional meeting to give a short talk describing her research; visiting colleagues in other laboratories or universities; preparing a paper for a scientific journal; reviewing scientific literature; or supervising coworkers or lab technicians.

How do I become a physicist?

To become a physicist, you should take as much math and science as possible. Math is particularly important. Get to know your teachers. At the high school stage and lower grade levels, become involved in science fairs. In college, ask a professor whose work interests you if you can do a research project with him or her. Join physics or science clubs and read magazines such as Scientific American.

However, there is no one path to becoming a physicist. I was a ballet dancer when I entered college. I knew I liked science and math, but didn't realize how much until I started taking classes outside my major. I ended up earning a B.S. in chemistry, with my undergraduate thesis in chemical physics. In graduate school I earned a master's degree in physics and a doctorate in chemical physics, specializing in atomic and molecular theory. So I came to the discipline along what is considered an unusual path. The way I did it was by studying hard, working on research projects for professors, and obtaining undergraduate fellowships to do summer work in the field. It meant long hours of study to catch up on the gaps in my background, but I thoroughly enjoyed it.

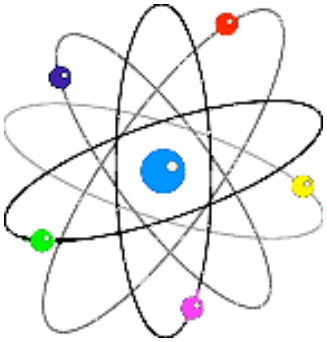
What/where are the jobs?

There are many possible jobs for physicists. Many become professors at universities or colleges or teach in high school, middle school, or elementary school. Others go to work for industry, in companies ranging from small start-up business all the way up through the major technology companies. Some physicists' knowledge of computers leads them into the computer industry. Some theoretical physicists use their math expertise for jobs in the world of finance. Some physicists go to work for places such as NASA, government research labs, or defense-related labs. Others become writers for more general audiences, publishing articles or books on popular science, and some even write science fiction. There's a wide range of potential job opportunities.

Physicists have many sides to their personalities as do people in other professions. I have always danced—ballet and jazz—and I have used scientific papers I have written as the basis for some of the science in my three published science fiction novels.

Judith Margo Clark
ESH-12 Radiation Protection Services
MS K-483
Los Alamos National Laboratory
Los Alamos, NM 87545
Phone: 505-665-3634
FAX: 505-667-9726

Updated by:
Catherine Asaro
Molecudyne Research
asaro@sff.net or asaro@stars.gsfc.nasa.gov



For more information

Society of Physics Students
One Physics Ellipse
College Park, MD 20740
e-mail: sps@aip.org
http://www.aip.org/education/sps/sps.htm

American Institute of Physics and
The American Association for Physics Teachers
One Physics Ellipse
College Park, MD 20740-3843
Email: aipinfo@aip.org
Phone: 301-209-3100; Fax: 301-209-0843
http://www.aip.org/

Association for Women in Science
1200 New York Ave. NW Suite 650
Washington, DC 20005
Tel: 202-326-8940 Fax: 202-326-8960
awis@awis.org
http://www.awis.org/

Visual Physics for Students
http://library.advanced.org/10170/menuf.htm

For careers in health physics/radiation protection:
http://www2.hps.org/hps/

Statistician

What is a statistician?

The stereotype of a statistician tabulating and summarizing masses of numbers fails to capture the diversity and creativity of statistical work. A statistician does collect and analyze data, but there are many aspects of this work, and as a statistician you will be involved in all of them. You will design sample surveys and laboratory experiments to maximize the information gained within time and budget constraints. You will modify standard analytical techniques so that they can be applied to the available data. You will also spend time educating students and colleagues about what statistics can and cannot do and learning from those colleagues about their problems.

Statisticians can be classified as "applied" or "mathematical," although those with advanced degrees find that they wear either hat as the occasion requires. An applied statistician primarily works at solving problems for and with clients from other disciplines, frequently as a member of a multidisciplinary team. A mathematical statistician evaluates existing statistical techniques, devises new ones, and explores the underlying mathematical theory, often within the statistics or mathematics department of a university or other research institution.

What makes a good statistician?

The range of study areas in which statistics can be applied is enormous, and good statisticians take an interest in a broad spectrum of scientific and sociological problems. While they usually specialize to some extent, for example in applications related to medicine, engineering, or economics, they are versatile and enjoy learning about new areas of application throughout their lifetimes.

A critical skill is the ability to extract the important features of a problem from a mass of facts. A statistician must be at ease with mathematical concepts and must be able to formulate new problems in mathematical terms. In the last two decades, high-speed computers and new data-visualization techniques have revolutionized statistics, so it is essential to know how to use computers effectively.

Although they may prefer working with "things" rather than people, statisticians must be able to communicate with people outside their field as well as with their statistical colleagues. They must be both willing and able to go more than halfway to understand the problems and constraints of the researchers and other clients with whom they work, and to explain statistical conclusions to those with little or no statistical training.

What is life as a statistician like?

The long-term rewards come both from being part of the discovery process and from helping managers, teams, and researchers to make sound, data-based decisions. On a day-to-day basis, statisticians take pleasure in revealing the structure underlying a set of data and in using logic and mathematics to solve real-world problems. Like most jobs, statistics also requires a fair amount of plugging along at more mundane tasks, debugging computer programs, or proofreading reports. Perhaps the most frustrating aspect is the multiple demands on your time, keeping several projects going at once, and sometimes feeling unable to do justice to any of them.

If you are associated with a university, you will be teaching and helping students. As a statistician in any organization, you will spend time both on consulting on quick problems and learning in depth about new ones. You will need to review current journals both to find the right technique for a new problem and to keep abreast of new developments. You will probably do some traveling to meetings and short courses in the course of your consulting work.

How do I become a statistician?

A few universities offer a bachelor's degree in statistics, but many statisticians obtain their bachelor's degree in another field, such as a natural science, economics or sociology, mathematics, or computer science. With any degree that includes a strong

background in mathematics (calculus, linear algebra, one or two courses in probability and statistics, and some computer science), you can work with other statisticians, conducting surveys and running standard data analyses.

Most statisticians complete a master's degree, which equips them to work independently on applied statistical problems. Here the training is more specialized, including several courses on statistical theory and methods as well as valuable consulting experience under the guidance of a faculty member. It is important to take courses in one or more areas where you might apply statistics (e.g., in the natural or social sciences) and to learn to use the computer creatively as well as being familiar with the commercially available statistical software. As part of your general background, you might also take courses in technical writing and in the history and philosophy of science.

To become a mathematical statistician, teach at a university, or obtain a job in which you devote part of your time to research, you will probably need a Ph.D. degree. This involves further course work in specialized areas of statistics as well as writing a dissertation that represents an original contribution to the field of statistics.

What/where are the jobs?

The demand for statisticians continues to be strong. Industry employs about two thirds of all statisticians in many kinds of work: pharmaceutical research, quality control and reliability engineering, development of agricultural products, marketing and forecasting, and dozens of other areas. Government is concerned about demography, labor force surveys, natural resource estimation, and environmental monitoring, among other areas, and currently employs 10% to 15% of working statisticians. Established individuals with advanced degrees occasionally go into business for themselves, consulting for industry and government. Universities and colleges need statisticians with advanced degrees who will teach and collaborate with students and faculty in other fields.

Katherine Campbell, Statistician
Staff Member
Los Alamos National Laboratory
Los Alamos, NM 87545
E-mail: ksc@lanl.gov

For more information

The American Statistical Association (ASA)
1429 Duke Street
Alexandria, VA 22314-3415
http://www.amstat.org/

The American Statistical Association (ASA) is the largest association of statisticians in the United States. Its Web page provides links to many sources of information.

Check out

"Careers in Statistics," "Education" and "Professional Opportunities" (all accessible from the ASA home page), as well as the links under "Related Information."

Technical Communication

What is a technical communicator?

Whenever you talk, write, or make a hand gesture, you're communicating information. When you write a procedure for safely operating equipment, draw a diagram to show how a machine works, or explain to someone else how to use a computer program, you're communicating technical information. Technical communication is the literature of science and technology.

Have you ever used a help screen in a computer program? Used a CD-ROM to play a game? Surfed the Web by clicking on your favorite links? Used a safety procedure? Assembled a bicycle? Read an article in Scientific American? Used a diagram to help set up your family's computer? If you have, you've used the product developed by a technical communicator.

The information developed by science and technology must be recorded. Sometimes it must be written in clear, uncomplicated language for nonspecialists in the subject; sometimes it must be presented in great detail for specialists.

Technical communicators produce material that conveys scientific and technical information precisely, accurately, and clearly. The projects that technical communicators work on are as varied as the companies and laboratories that do the research. Although producing online documentation or writing for technical publications may be a communicator's primary responsibility, she may also be expected to produce speeches, news stories, scripts for videos and films, or electronic publications.

What makes a good technical communicator?

If you can express yourself clearly in writing and speaking, and if you are curious about science and technology, you have two important qualities of a technical communicator. You should also enjoy interacting with people and be enthusiastic about learning about new ideas.

You must be able to do research and be persistent in finding facts; able to listen, observe, and verify; and able to separate fact from hearsay or fantasy. You must also be able to think clearly, pick out important facts, and organize separate items into a clear, logical, and accurate whole. And, of course, you must be able to write well.

What is life as a technical communicator like?

A technical communicator is typically a very busy person with many demands on her time. Because much technical material explains current research, introduces a new technology, or provides information necessary for others to do their work, time is an important factor in most technical communication jobs. A technical communicator is often working on several projects at once, some with strict deadlines. Or, as documentation manager, she may be responsible for just one large project—from concept to finished product. A technical communicator may work with many people during the evolution of a product: scientists, engineers, photographers, printers, and other communicators such as technical artists, user interface specialists, production team members, quality assurance people, and other specialists. She does most of her work at a computer terminal.

The rewards in technical communication come from seeing your work published on paper or appearing on-line, from the challenge of taking complex technical information and translating it into a useful product, and from working with other people.

How do I become a technical communicator?

The usual educational preparation for a career in technical communication is a bachelor's degree with emphasis on both writing and science. Many colleges and universities offer courses in technical communication, scientific journalism, and technical art. Many schools have four-year bachelor's degree programs in technical communication, and many universities offer master's and Ph.D. degrees in the field.

In high school you should take as many courses as you can in English, the sciences, math, social sciences, and art. You should make a conscious effort to build your vocabulary and learn to use words carefully and accurately. If the university of your choice does not have a degree program in technical communication, you should consider taking many courses in science and mathemat-

ics and courses in composition, literature, journalism, graphic arts, and linguistics. Such a program would prepare you well for selling your talent as a technical communicator.

An increasing amount of technical communication is produced digitally in the "paperless office." The growth of nonprint, nonlinear information, such as that found on the Web, is almost explosive. To meet the demands of rapidly changing technologies and ways of finding and using information, the technical communicator must also be accomplished in using computers and computer technologies.

What/where are the jobs?

The sciences requiring technical literature and art include engineering, physics, mathematics, chemistry, medicine, and the computer industry; but there is a need for technical communication wherever scientific or engineering work is done—at a research laboratory, a university, a chemical manufacturing company, an assembly plant, or a software company. Producing technical material has become a part of business and government. Hundreds of technical journals and Web sites are devoted exclusively to scientific and engineering subjects.

Peggy Durbin
Los Alamos National Laboratory
E-mail: mdurbin@lanl.gov

For more information

There are many professional societies for the technical communicator. Membership will prove profitable and pleasant, with the opportunity to share your experiences with others engaged in similar activities. The principal professional society for technical communicators is the Society for Technical Communication. Professional groups for more highly specialized technical communication include Nuclear Energy Writers Association, Association of Petroleum Writers, Aviation-Space Writers Association, National Association of Science Writers, American Medical Writers Association, and American Computing Machinery's Special Interest Group for Documentation. On the Web you can find these and other professional organizations that reflect your own interests.

 Toxicology 

What is a toxicologist?

A toxicologist studies the adverse effects of chemical agents on biological systems. The toxicologist performs studies to determine how easily a chemical enters an organism, how it behaves inside the organism, how rapidly it is removed from the organism, what cells are affected by the chemicals, and what cell functions are impaired.

The professional activities of toxicologists fall into three main categories: descriptive, mechanistic, and regulatory. The descriptive toxicologist is concerned directly with toxicity testing. In this field she designs the appropriate toxicity tests in experimental animals or cell cultures to yield information that can be used to evaluate the risk posed to humans and the environment by exposure to specific chemicals. The mechanistic toxicologist is concerned with determining the mechanisms by which chemicals exert their toxic effects on living organisms. The regulatory toxicologist has the responsibility of deciding (on the basis of data provided by the descriptive toxicologist) if a drug or other chemical poses a sufficiently low risk to people when marketed for a stated purpose.

What makes a good toxicologist?

Good toxicologists are curious about the way chemicals and environmental factors interact with the body. They must be interested not only in the final outcome of that interaction but what goes on at the molecular level (i.e., how individual chemicals interact with cells and cellular functions). A toxicologist must be capable of critical thinking and have good observation skills. She must be a good communicator and have a strong background in biology, chemistry, biochemistry, pharmacology, and anatomy. Writing skills are essential for getting project funds and for publishing results. Good oral presentation skills are important for communicating results and providing data to regulatory boards.

What is life as a toxicologist like?

Toxicologists address their hypotheses by observing the effects of model compounds in whole animals and cellular extracts. Therefore, they must be willing to work with animals in a humane and appropriate manner to develop information that is necessary to translate to human applications. Because chemical interactions involve various biological systems, toxicologists must be able to work with researchers in other fields outside of toxicology to get necessary data to understand important mechanisms. In addition, researchers in applied toxicology must have a broad understanding of the field in order to provide information to forensic, clinical, or regulatory agencies.

How do I become a toxicologist?

Toxicology is a broad field that can accommodate many interests. To become a toxicologist 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 studies, your undergraduate education should include environmental studies, biological sciences, biochemistry, chemistry, physics, calculus, and statistics. Courses in areas of specialization can be taken in graduate school to obtain M.S. and Ph.D. degrees in toxicology.

What/where are the jobs?

Toxicologists can work in research positions at universities and private industry and applied areas primarily in private industry and government. Research in toxicology can include studies of the toxicity of chemicals on the various systems of the body including nervous system, endocrine system, digestive system, respiratory system, immune system, and cardiovascular system. Such research can assess the effects of toxicity on such target organs as the kidneys, lungs, liver, heart, eyes, etc.

Applied toxicology includes studies in three specialized areas: forensic, clinical, and environmental. Forensic toxicology is a hybrid of analytical chemistry and fundamental toxicological principles. It is concerned primarily with the establishment of cause-of-death in postmortem investigations. Clinical toxicology is concerned with the effects of drugs on disease or with abuse.

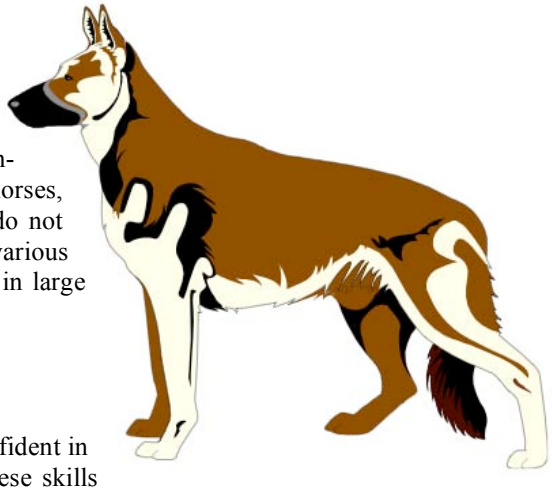
The clinical toxicologist provides important information to emergency room physicians and nurses. Environmental toxicologists usually study the effects of pollutants on wildlife and subsequently on the ecosystem, including the effects of environmental pollutants on humans.

Melecita Archuleta
Sandia National Laboratories,
Albuquerque ,NM
E-mail: melarch@sandia.gov

For more information

Society of Toxicology: http://www.toxicology.org/
Society of Forensic Toxicologists: http://www.soft-tox.org/
Fed. of American Societies for Experimental Biology: http://www.faseb.org/
Chemical Industry Institute of Toxicology (CIIT): http://www.ciit.org/
WEB Toxicology Resources: http://www.uky.edu/Libraries/guide.php?lsub_id=140

Veterinary Science



What is a veterinarian?

A veterinarian is a surgeon, a dentist, a radiologist, an internist, an ophthalmologist, a neurologist, and a pathologist for cats, dogs, sheep, pigs, horses, cattle, goats, birds, fish, rabbits, gerbils, hamsters, etc. Most veterinarians do not specialize beyond working on small or large animals. A specialty in the various fields mentioned is possible, but only in universities or very large practices in large cities.

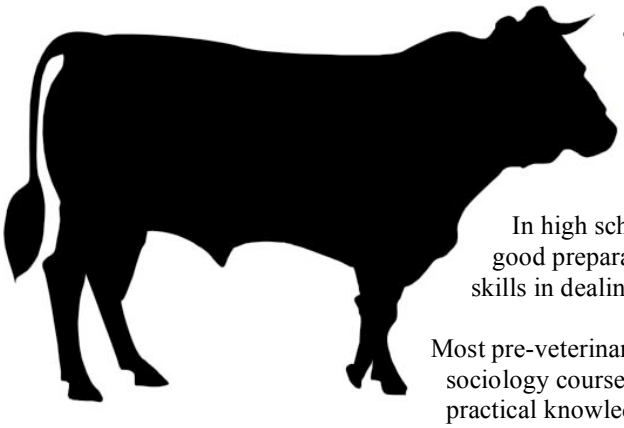
What makes a good veterinarian?

A good veterinarian is skillful with her hands, enjoys solving problems, is confident in handling animals, and has a broad knowledge of medicine and surgery. These skills can be learned, but they are of little value if the veterinarian cannot communicate with people. Being able to interact with people is actually much more important than being able to interact with animals; the most skillful veterinarian will probably sit idle if she does not enjoy people.

What is life as a veterinarian like?

Life as a veterinarian is rewarding, frustrating, and time consuming, but it is never boring. A major portion of the work itself is routine; nevertheless, no two animals and no two owners are alike, so each case is a new challenge. Only a very small portion of the work involves gloriously saving lives or performing miraculous surgery. A lot of time is spent at the south end of a north-facing animal. A typical day might include performing surgery; seeing animals with health problems; giving inoculations; going out on calls in the country; working at a racetrack; working in a zoo; establishing a herd health program for a feedlot, dairy farm, or large poultry operation; inspecting meat at a slaughterhouse; or doing research for a drug company. In the evening you might be called back to the office to deal with an emergency that often turns out to be an animal that has been sick for two weeks. The call usually comes just as you sit down to eat or just as you go to bed. After you have helped an animal that truly needs your help, however, it seems worth the trouble.

How do I become a veterinarian?



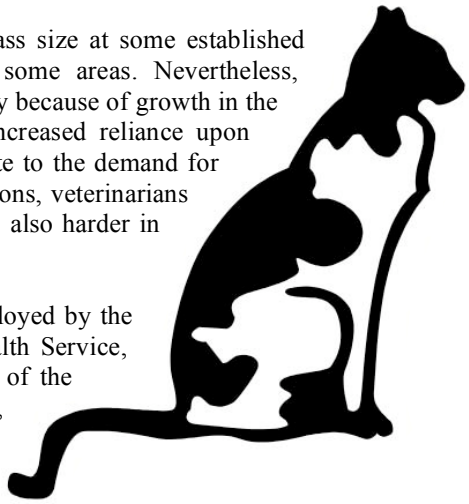
To receive a doctor of veterinary medicine (D.V.M. or V.M.D.) degree requires a minimum of three years in college plus four years in veterinary school. Most people are not accepted in veterinary school, however, without completing four years of college. To obtain a license you must pass written and oral examinations.

In high school, a college preparatory curriculum that includes math and science is good preparation for the courses you need in college. Any courses that help develop skills in dealing with people are beneficial.

Most pre-veterinary curricula include biology, math, physics, chemistry, English, and some sociology courses. In addition to taking your college courses, it is important to gain practical knowledge by working for a veterinarian. Too many students applying to veterinary schools have romantic ideas about being a veterinarian; therefore, veterinary schools are looking for people who know what they are getting into.

In most veterinary schools, you do not have a choice of classes. You will take anatomy, physiology, microbiology, pathology, medicine, surgery, pharmacology, and nutrition. During the last two years you work mainly in the clinic gaining practical knowledge.

What/where are the jobs?



Because of the opening of several new veterinary schools and the increase in class size at some established schools, new veterinarians may face competition in establishing practices in some areas. Nevertheless, employment is expected to grow faster than the average for all occupations, primarily because of growth in the pet population. Growth in public health and disease-control programs and an increased reliance upon scientific methods of raising and breeding poultry and livestock will also contribute to the demand for veterinarians. While an oversupply of veterinarians seems imminent in some locations, veterinarians will probably always be needed in remote rural areas; however, making a living is also harder in these areas.

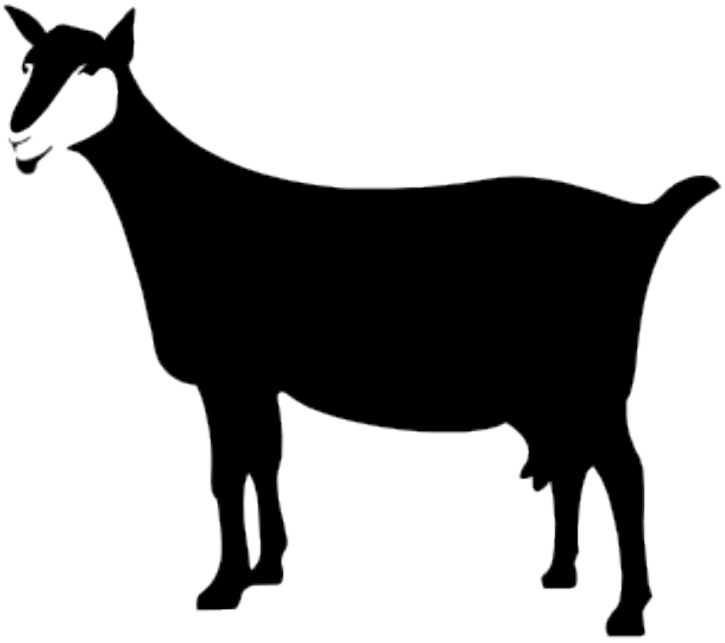
The majority of veterinarians are in private practice. About seven percent are employed by the federal government, chiefly in the Department of Agriculture and the Public Health Service, with a small number serving as commissioned officers in the veterinary services of the Army and Air Force. Other employers are state and local government agencies, schools of veterinary medicine, research and development laboratories, large livestock farms, and pharmaceutical companies that manufacture drugs.

Patricia M. Moore, (1984)
Doctor of Veterinary Medicine

For more information

A free pamphlet entitled Today's Veterinarian, which contains additional information as well as a list of colleges of veterinary medicine, can be obtained by sending a self-addressed stamped envelope to:

American Veterinary Medical Association
930 N. Meachem Rd.
Schaumburg, IL 60196



Selecting an Occupation

So, the time has come for you to "get a career," but where do you start? Well, you'll find most of the information right inside yourself. Start by assessing your values, interests, skills and personality characteristics. Here are a few questions to get the ball rolling:

- What important decisions have you made, and what values were inherent in those decisions?
- Think about the times when you have been angry, frustrated, overjoyed, or ecstatic. What were the underlying values present in those situations?
- What hobbies do you have, and what do you like about them?
- What are/were your favorite and least favorite high school subjects and why?
- What adjectives describe you? How would others describe you?
- How do you define success?

Next, allow yourself to dream. What might a day in your life look like ten years from now? If you could clone yourself into five people, what different occupations would each of the five do? What is similar about all five? What's different?

After you have a pretty good idea of who you are and what characteristics you wish to display in the world of work, it's time to get information about what's out there. How do you do this research? There are several ways. One is to go to the public library or to a career resource center (colleges and universities usually have them) and see what information they have on your desired occupations. You can also check the Internet or write to the professional/trade association (find where to write in the Encyclopedia of Associations in the reference section of a library). Some high schools, colleges, and universities may also have a computer guidance system to help you. But really, the best source of information about any occupation comes from the people who are currently doing the job. Find out who they are and request a short (twenty-minute) interview with three or four people who work in different settings. Maybe they would let you follow them around for a few hours or even for a whole day to experience what life on the job is really like.

Here's an example. Let's say I'm interested in engineering, but I'm not sure what area specifically. My mom has a friend that's an electrical engineer at Intel, our neighbor is a chemical engineer at Los Alamos National Laboratory, and my brother's friend is a civil engineer for the highway department. I arrange to interview each of these three people and they even let me follow them around (job shadow) for a few hours. After these experiences, I have a much better idea of what tasks and environments are involved with these types of jobs. Of course, I would also take the opportunity to get advice on how I should proceed with my career from these experts. (Don't forget to send a thank you card or letter for their time!) I may have found that none of these areas are for me, so it's back to the library to research some other areas.

It is important to remember that you are a woman of many talents, and there are many ways you can display these talents in the world of work. What may be an ideal job now may be boring in five years. What is only a hobby now may become your primary source of income in the future. A career is a succession of vocations and avocations (e.g., hobbies) over a lifetime. You have one career which may be made up of many different jobs in different fields. The best thing to do is to continue exploring occupations of interest and occasionally reassess your values, interests, skills and personality characteristics to see which talents you wish to display in the world of work at any given time. Explore! Explore! Explore!

Now that you've assessed your values, interests, skills and personality characteristics, weave it all together into a "job wanted" ad as if it were to appear in the classified advertisements. Use the following outline to help you:

- The functions I would perform are (skills and abilities):
- The organization I work for will share my following goals (values):
- I will work with people who have the following traits (my personal qualities/values):
- The environment I work in would use one or more of the following special knowledge or interest areas (interests/special knowledge areas):
- Other areas I want my ideal job to include:

Next, target your resume for your ideal job.

Original article by Barbara Solari, Personnel Manager, Lovelace Inhalation Toxicology Research Institute, Albuquerque, NM
Updated by Joanne M. Wambeke, M.Ed., NCC, Santa Fe Community College, P. O. Box 4187, Santa Fe, NM 87502-4187

Why Take High School Mathematics?

A good foundation in mathematics in high school can be your passport to a challenging, high-paying job that provides personal satisfaction. Four years of mathematics, including algebra, geometry, and trigonometry, are essential for entry into the standard freshman calculus courses required for undergraduate majors in engineering, science, business administration, and computer science. Even the social sciences and the humanities are making use of mathematics, statistics, and computer techniques; high school mathematics will increase your understanding of such techniques.

Admission to college requires the ACT, an aptitude test administered by the American College Testing Service, or the SAT, the Scholastic Aptitude Test. Both tests include questions on high school algebra and geometry. Furthermore, a passing grade on national admissions tests to dental, medical, or veterinary schools requires a strong background in high school mathematics and college calculus; the law school admissions test requires high school mathematics.

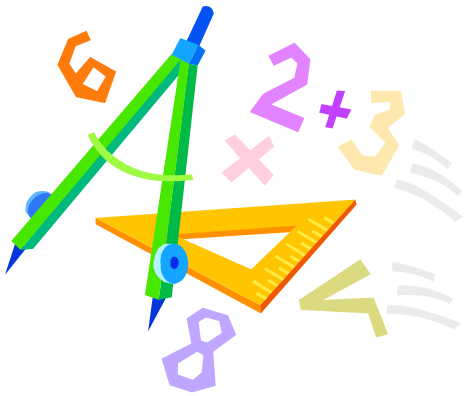
Unfortunately, every year students graduate from high school without having these subjects. Algebra and geometry, in particular, should be taken by all high school students, whether or not they plan to attend a four-year college or university. These subjects are required even for traditional careers (such as nursing, physical therapy, and art) and for entry into technical vocational programs that do not require a college degree (such as electronics, laboratory technology, and paramedical careers).

You may be tempted to avoid courses considered difficult such as algebra and geometry and, instead, take easier mathematics courses. However, if you have not had these more difficult subjects, you will be undereducated for today's job market; doors will be closed to many jobs you might otherwise obtain. A student who earns a C in algebra or geometry will have more career options than a student who earns A's in easier mathematics courses. In high school mathematics, you learn how to express relationships between different quantities by using mathematical equations. More importantly, you learn to reason logically; such a skill is useful regardless of whether you ever see an equation after you graduate.

However, suppose the particular career you choose does not require high school mathematics. Like many high school students, you may be sure that you already know what career you want to pursue. Nevertheless, you will find, as many before you have found, that your life goals can change. If you take sufficient mathematics in high school, you can more easily attain your new goals.

It is possible to make up the high school mathematics you have missed. However, this may delay you in getting started in your major if you do decide to go to college, and remedial mathematics courses may not count towards your degree. Furthermore, math will seem much harder after you have been away from it for a few years, and your remedial college mathematics courses will be much faster-paced than high school courses.

Mary Ann Sweeney, Physicist (1984)
Member Technical Staff
Sandia National Laboratories
Albuquerque, NM



Education Options After High School and College

After High School

Three basic educational options are available after high school:

A **certificate** program in a vocational field usually requires 12 to 18 months to complete.

An **associate degree** program, Associate of Arts (A.A.) or Associate of Science (A.S.), usually requires two years for completion.

A **bachelor's degree** program such as Bachelor of Arts (B.A.), Bachelor of Science (B.S.), or Bachelor of Business Administration (B.B.A.) usually takes four years.

Option 1

Certificate programs

For students choosing the first option, follow-up courses are available for later enrichment. Certificate programs do not have set requirements, but many expect high school graduation or a GED certificate, obtained by passing a high school equivalency test. Some vocational schools (e.g., TVI in Albuquerque) require basic skills tests. Financial aid, frequently based on need, is available in the form of loans, grants, scholarships, or work-study programs.

Option 2

Associate degree

With the second option, transfer to a four-year program is possible with much of the first two years' work counting. Associate degree programs generally require high school graduation or the GED certificate. Some, such as the New Mexico Military Institute, require a specific number of college preparatory courses.

Option 3

Bachelor's degree

Bachelor's degree programs require graduation or the GED certificate. A few colleges, including St. John's College, accept students under special circumstances who are just finishing their junior year. Required preparatory courses vary, but most colleges require fifteen to eighteen high school units (one unit for a full-year course): usually three units in English, two to four in mathematics, two in science, two in social science. Out-of-state schools often require two units in a foreign language; New Mexico schools do not. New Mexico schools generally require the ACT, an aptitude placement test administered by the American College Testing Service; out-of-state schools usually require the SAT, the Scholastic Aptitude Test. In addition, some schools require achievement tests in specialized subjects. Graduate programs are available for students choosing third option.

Think About College Now!

Any High School Graduate Can get a Virtually Free Education

by Tony Oviedo, Managing Editor,
Bobcat's Eye, McCurdy School

Juniors, if you haven't started to look at colleges, it would be best to start now.

How, you say? Well, I'll tell you: go to the counselor's office as soon as you can and give him or her a list of colleges that you might be interested in. If you don't do it this school year, there's no way you can get the best deal possible. If you don't have a case of wanderlust and don't mind staying in state, then it's simple. You can wait to get your scholarship applications and admissions forms early next school year.

If you are under the impression that scholarships are exclusively for the smart kids, you're wrong. Anyone graduating from high school can get a virtually free education, that is, in New Mexico, of course.

It's simple. All you have to do is apply for all the scholarships that you quality for, and if you don't get one of those, you automatically receive the Lottery Scholarship. It may seem like a lot of work, but in actuality it only takes a couple of hours. It's the easiest money you'll ever make.

Now, for all the seniors: If you have done nothing toward college at this point, go talk to your counselor and pray.

(Used with permission from *Albuquerque Journal North* and the author, January 1998.)

Where to Get Your Education

Your future career can be strongly affected by where you choose to get your education. Follow the decision-making model described in a separate chapter of this book ("Selecting an Occupation") in selecting a school. Determine your objectives based on the career path you hope to follow, and determine what school can best meet these objectives. Consider all kinds of post-secondary school education: technical-vocational schools, two-year community colleges, four-year liberal arts colleges, universities, and service academies.

To make your educational experience a positive step toward your future, compare information from different sources: parents, teachers, guidance counselors, alumni, friends, school catalogs (see a local public or college library), school career resource centers, and college entrance guides. A yearly publication entitled "Consumer Guide to Post-Secondary Education" provides general information on all in-state (New Mexico) schools; copies are available at high schools and post-secondary schools. Another vital source of information is special senior programs such as Senior Days at colleges or College Day programs where college representatives recruit potential students. Ask all the questions necessary for you to feel comfortable with your choice.

Selecting a Campus

How do you select a campus best suited to your career interests and personality?
Factors to consider in this selection are as follows:

- Degree program availability; majors offered
- Academic level of competitiveness
- Location: Is the school near or far from home?
- Do you like the setting (urban or rural) and climate?
- Size
- Atmosphere: Does the atmosphere of the school and community suit your personality and lifestyle?
- Coed or women's college
- Religious orientation
- Campus organizations and activities
- Public or private school
- Cost
- Accreditation

Visit the Campus

Many of these factors can only be assessed by making a personal visit to the campus. Visit while school is in session, stay overnight, include your parents. Investigate school surroundings and atmosphere, libraries and research facilities, departments of interest, student life, classes, and extracurricular activities. You might contact the placement office for names and employment data of former students in your field of interest. Most schools will arrange for you to visit the campus, have an interview with an admissions officer, and get a guided tour of the campus. The interviewer may ask about your scholastic standing, courses, and extracurricular activities. Interviews are generally not required for state-supported schools except in special circumstances. They are often necessary for application to the smaller private schools, though you might not have the interview at the school (an alumni representative in your locality can conduct the interview).

While colleges offer a wide variety of majors, not all colleges and universities offer the same type of major. For example, in New Mexico, one university offers the only architecture degree in the state. Schools also differ as to the level of degree program offered. Astronomy at one school may be an undergraduate program while it is a graduate program at another school.

The degree of academic competitiveness is all-important. College work should be challenging, but it should not completely overwhelm you. With the aid of parents, teachers, and counselors, you should make an honest self-evaluation: How ambitious are you? How independent are you? What are your work habits like?

Location and Size

School location can be an important factor, both in terms of proximity to home and proximity to extracurricular activities. In addition to getting an education, you can use your college years are a time for growing up and becoming independent; if you do go to school close to home and finances permit, you may prefer not to live at home. Consider living in a college dormitory.

Some people prefer the sense of community and togetherness among faculty, students, and administration that is characteristic of a small college, and the sense of being known and of making an individual impression. Others prefer the more varied atmosphere at a large university, where you develop your own community. If you are friendly and outgoing, you can make friends regardless of the campus size. Large lecture courses are rare in small colleges and can be the norm in large universities, especially in lower-level courses. However, in the case of large lecture courses, study groups of about 25 students are held as often as once a week. Many students assume that they will receive more help in a small school because the student-faculty ratio is often smaller. Nevertheless, regardless of the size of the school, you will only receive as much help as you seek. The advantage of a large university is the much greater variety of courses within a given program.

A women's college can give you a perspective through which to look at women and their accomplishments; it can give you the time and opportunity to grow, to change, and to begin to know yourself. Yet, with half of the human race absent except on weekends, it can become a very artificial environment.

Public schools are all coed and are tax supported. Because of this tax support, tuition levels are set by state government, and expenses are lower than at private schools. Entrance requirements are less stringent, and competition for a place in the freshman class is not so keen.

Cost may be a deciding factor. See the article "Paying for Your Education" for a discussion of how to finance your education.
The liberal arts structure can leave room for you to explore different career paths and change the goal that seemed so clear in your freshman year. A student can arrive as a premed student and end up attending graduate school in music and art, or vice versa. A school with a very specialized curriculum, such as an engineering school, does not allow you to "change horses in midstream" so easily.

In selecting several schools to which you apply, be prepared to compromise; no single school will fit your needs and desires in every respect. Keep in mind that the school that is best for your next-door neighbor or your brother may not be best for you. In any case, check that the schools to which you apply are accredited and that they offer the program that fits your interests.

Applying to Colleges: A Timetable

Once you decide on several schools, submit applications. Do not make the mistake of assuming that listing the colleges on a Pell Grant application represents application to those schools. (Pell Grants, which were previously known as Basic Educational Opportunity Grants, provide aid to economically disadvantaged students.) Each school has its own application form. The application fees are generally not refundable, so only apply if you are sure of your choice. Apply to several schools if you are interested only in those that are not state-supported; if you only apply to one of these and you are not accepted, you will be left out in the cold.

Junior Year

- Examine educational opportunities; investigate admission policies.
- Discuss plans with parents and guidance counselors.
- Register and take the Preliminary Scholastic Aptitude Test (PSAT) if colleges you are considering require the SAT, and take the National Merit Scholarship Qualifying Test.
- Consider whom to ask for recommendations (teachers, employers).
- Visit college campuses.
- Register for the SAT and Achievement Tests or the ACT, depending on college entrance or placement requirements.

Applying to Colleges: A Timetable *(Continued...)*

Senior Year

July, August, September

- Obtain catalogs, applications, financial aid information. (State-supported schools do not supply catalogs.)
- Have parents prepare Parents' Confidential Statement if required.

October, November

- Mail completed applications.
- Determine tests required and take them.
- Maintain good grades.
- Request that your high school send official transcripts.
- Ask teachers and employers to write recommendations.

December

- Make sure all applications are sent before Christmas if colleges do not have another deadline.
- Check that transcripts are sent before Christmas, or earlier if the colleges require otherwise.
- Financial aid forms for state-supported (New Mexico) schools are available.

January

- Tentative acceptance is sent by some schools to outstanding candidates who have completed all application requirements.

February, March

- Have high school send official transcripts that include grades for first semester and a list of second-semester courses.
- Check that all necessary tests have been taken and that applications are complete and all recommendations are sent.
- Take any required tests.

April, May, June

- Keep track of acceptances, rejections, and financial aid offers.
- Many colleges notify applicants by mid-April.
- Application to state-supported schools is often still possible up to one month before the fall semester begins.
- Reply promptly to colleges accepting you, notifying them of your decision.

Alternatives to a Four-Year College

The Two-Year College

If cost is an important factor, you might consider attending a two-year junior college and then transferring to a four-year college. The cost is low and these are basically good schools. Plan your two-year program carefully; it will save you grief later. Do the following:

- ✔ Know the requirements of the four-year college you eventually plan to attend and its transfer policies; obtain a copy of the catalog.
- ✔ Take general liberal arts classes to meet program entry requirements: English, history, philosophy, psychology, and sociology; such courses are easier to transfer. If you take specialized courses in math, science, business administration, or other subjects, you may find that they are not accepted by the four-year school of your choice.
- ✔ Plan your program carefully with a counselor at the two-year school. Let her know your ultimate goal and the four-year school you plan to attend.

The Technical-Vocational School

The most important question to ask in deciding if you should attend a technical-vocational school or a college is whether you will meet your goals. Many students assume that if they start electronics in a technical-vocational school, it will be easy to move into electrical engineering in college. These are two different areas and, in general, technical-vocational credits are not transferable to colleges. Another common error is taking secretarial training as a means of entering business administration. Again, these are two different areas. It is important to know what it is you want to do. If you attend a technical school you may use up your federal financial aid (Pell Grant) and you may not receive more for a college education. Do not misunderstand the value of state- or city-supported technical-vocational schools: they offer excellent programs if they meet your career objectives.
If you decide to attend a technical-vocational school, follow the same procedure in selecting the school as in selecting a college. Consult with teachers, counselors, family, and friends. Study catalogs carefully. Contact employers who have hired graduates of the school and contact former graduates; find out if they are satisfied with the education the school provides. Investigate the school's reputation: contact the Better Business Bureau, the state Department of Public Instruction, or an accrediting agency. Find out what type of postgraduate job placement the school provides.

How a School Evaluates You

You evaluate a school, but the school also evaluates you based on the following:

- Academic record (grades, course work)
- Entrance examination scores
- Class rank
- Recommendations
- Extracurricular activities
- Communication skills

Not all of these factors are taken into account by all schools. For example, state-supported schools do not consider admission quotas, extracurricular activities, or entrance examination scores when selecting candidates for admission.

Most colleges have certain standards that must be met. One of the first things you should do is to make yourself familiar with these requirements for colleges in general and for the particular colleges you are considering. Schools with a greater degree of academic competitiveness will require higher test scores and higher grade point averages. Most out-of-state schools require the

SAT (Scholastic Aptitude Test). State-supported schools in New Mexico usually require at least a C grade point average, high school graduation or a GED certificate, and the ACT, an aptitude test used for placement and advisement purposes and administered by the American College Testing Service. At some state schools, students not meeting minimum entrance requirements are admitted into provisional programs.

After College

Four basic educational options are available after college:

1. A master's degree program, Master of Arts (M.A.), Master of Science (M.S.) or Master of Business Administration (M.B.A.), frequently takes one to two years beyond the bachelor level. At some universities, these degrees are awarded after completion of a certain amount of course work; elsewhere, a thesis may be required.
2. A doctoral degree program (Ph.D.) generally takes from two to seven years beyond the master's, or longer, depending on the field of specialty, the dissertation topic, and the student's rate of progress. A Ph.D. is awarded upon completion of a dissertation and an oral examination on the subject of the dissertation, conducted by professors and other experts in the field. The dissertation is a paper describing original, independent research done by the student on some subspecialty in the field. Much work, experimental or theoretical, is needed before the dissertation is actually written. A dissertation advisor assists in choosing a topic and gives suggestions on how the student might proceed. Before beginning research, the student takes a "qualifying exam" that tests for a knowledge of the fundamentals of the field; this test can be written, oral, or a combination of both.
3. A law degree (Juris Doctor or J.D.) takes three years beyond college. Before a law graduate is licensed to practice as a lawyer, she must pass a written test, given twice a year in New Mexico, on state and federal law (the "bar exam") Those wishing to teach usually get further legal education, attaining an L.L.M. (Master of Laws) or L.L.D. (Doctor of Laws) degree.
4. A medical degree requires four years beyond college. The student must pass exams covering medical subjects, given during the second and third years, to become licensed. A few states, including New Mexico, require postgraduate work to maintain your license. After medical school, the graduate often does an internship and residency to become certified in a specialty; this can take four years or more.

Admissions Information

Admission to a master's or Ph.D. program requires college graduation. Most departments require the Graduate Record Examinations (GRE), which tests verbal and mathematical aptitude as well as specialized knowledge in your chosen field.

Graduation from college is required for law or medical school admission. A law school (LSAT) or medical school (MCAT) admissions test is also required.

Scholarships

In the sciences, aid is usually given, without the requirement of proving need, in the form of a scholarship or a teaching or research assistantship.

Such aid pays the cost of the education and also provides a monthly living stipend. In the nonsciences competition for the few forms of outright assistance is very keen; most aid is in the form of a loan. In law and medical school the education is usually paid for through part-time jobs and loans. Some of these jobs may provide valuable experience in the chosen field. The National Institutes of Health gives scholarship assistance to medical students; in return, students spend their residency at a public health facility. A small town or the military may provide aid in return for a promise from the future doctor or lawyer to practice there.

Patricia Luna (1984)
Program Coordinator, Office of School Relations
The University of New Mexico
Albuquerque, NM

Nancy Martin
Computer Scientist & Professor (1984)
Wang Institute of Graduate Studies
Tyngboro, MA

Paying for Your Education

Numerous financial assistance programs are available to help you meet educational expenses. Most fall into two major categories: "gifts" or grants and self-help programs. Gifts, grants, and scholarships are financial aid for which you will probably not incur any indebtedness or future obligation. Self-help is aid you either earn while you are in school, as in the case of a college work-study program, or repay when your education is completed, as with a student loan. (For most federal loans, you have a six-month "grace period" after your education is complete before interest begins to accrue and payments begin.)

Organizations that make these funds available include federal and state governments, private industry, the military, and social or service organizations at the community level. Eligibility for funding is usually determined on the basis of your financial need and/or your academic merit for an award. Other requirements can be considered and may be the determining factor in programs sponsored by private industry or social organizations. You need to contact any private donor directly to find out specifics of eligibility.

Financial Aid

The aid most readily available at post-secondary institutions in New Mexico is federal and state undergraduate grants, low-interest loans, and work-study programs. To be eligible, you must (1) apply for the type of assistance you desire, and (2) qualify for the assistance you requested. You may also have to satisfy a citizenship requirement; for example, if you are on a student visa or an exchange visitor visa, you cannot get federal student aid.

All New Mexico public post-secondary institutions use the Free Application for Federal Student Aid for federal and state programs. The private institutions may also require additional family asset information to determine your eligibility for federal and state programs. The resulting Student Aid Report provides each institution with the financial information necessary to determine your eligibility. If you are under the age of 24, the federal government considers you a dependent and will require parental information to determine your eligibility. However, consideration for independent status can be requested at each institution. Scholarship applications are different for each institution and should be requested early in the year to ensure proper consideration. Deadlines for scholarships are usually between February 1 and April 1.

Need Analysis

The end result of the information you supply is a need analysis. The need analysis compares the costs of attending a given institution with your ability to meet those costs. If the costs to attend are higher than the amount that you and/or your family can afford, you are eligible for the difference in financial aid. For example, you are recommended for a larger award if you apply to a more expensive school since the dollar amount that you and/or your parents can contribute to your education is the same no matter how expensive the school.

Planning Early

It is important to begin planning early. The preference deadline for financial aid applications from entering students is March 1 of each academic year for New Mexico schools. If you plan to enter a college, university, or other post-secondary institution in August, submit your financial aid application in February to receive maximum consideration for funding. If you wish to attend a school out of state, contact that school for information concerning application and eligibility requirements. In any case, an aid application should be made when you apply to a school, not after you are accepted. Furthermore, you must reapply for most forms of aid every year, and if you transfer to another school, your aid does not automatically follow.

After your application is reviewed, you will receive an award letter detailing the types and amounts of assistance for which you are eligible. Financial assistance will often be in the form of a "package" that includes several types of aid. Read the award letter carefully, and follow any instructions accompanying it. Evaluate how the types and amounts of aid will meet your specific needs. Pay particular attention to the amount of "self-help" assistance you have been offered, since you will need to work for this money while you are in school and/or repay the funds once you have left. If you apply for financial aid at more than one school and have an offer from each, take an advance look at how much it will actually cost to attend each school. Make your decision

based upon such factors as tuition cost, living expenses either on or off campus, books and supplies, personal expenses, and transportation expenses to and from campus. Not all applicants will be eligible for need-based assistance. If you apply for this type of aid but do not qualify, you should be notified in writing. Notification usually includes information about alternative types of aid, such as a student loan at a slightly higher interest rate from the state or a private lender.

Financing your education as a graduate student can be more difficult unless you are a potential scientist or engineer. Application for aid should be made through both the graduate department to which you apply and through the financial aid office. In the sciences, aid in the form of a scholarship or a teaching or research assistantship is usually given, without the requirement of proving need. Such aid pays the cost of tuition and provides a monthly living stipend as well. In the nonsciences, you may still be eligible for federal or state loans and work-study programs, but grant assistance, except from the institution or a private source, usually ends with the bachelor's degree. However, a rural community or the military may provide assistance to the future doctor or lawyer in exchange for the promise to locate in the military or a rural area after completion of schooling.

Where do I get more information?

Each year the New Mexico Association of Financial Aid Administrators publishes a consumer guide to aid programs available throughout the state, as well as those specific to each institution.[1] The U.S. Government Printing Office publishes a guide to six federal aid programs.[2] All types of aid programs are outlined in both pamphlets. The free state pamphlet is available from the financial aid offices of state institutions and includes information about student costs, interest rates, and repayment schedules for loans. Other sources of information include your high school counselor, various educational service centers such as the Division of Vocational Rehabilitation, the Bureau of Indian Affairs, the League of United Latin American Citizens (LULAC), the Social Security and Veterans Administrations (for those eligible), and private funding sources available on the Internet. You need to set up an interview with a financial aid advisor to help plan how you will meet your educational expenses. Through a personal contact of this type, a long-range plan for reaching your degree objective can be outlined.

Updated by Yohanna Patrice Wiuff
(ypw@chicoma.la.unm.edu)

Original article by
Jane Bennett
Financial Aid Advisor
The University of New Mexico
Albuquerque, NM

[1]University of New Mexico, 1990 Consumer's Guide to Student Financial Aid, (Albuquerque: University of New Mexico, 1990).

[2]Office of Education, U.S. Department of Health, Education, and Welfare, Student Consumer's Guide: Six Federal Financial Aid Programs, 1993-94 (Washington: U.S. Government Printing Office, 1992).

How to Have a Successful Job Interview

Going for a job interview is much like auditioning for a part in a play. You get one opportunity to present yourself, and the overall impression you make often determines whether or not you get the "part," the job.

Often, small things that occur during an interview can mean the difference between getting an offer and being rejected. Your basic goal is to spark a positive response in the interviewer; to arouse her interest and keep her attention. You can do a great deal to "set the stage" upon which you will be judged. Your "makeup and costuming" (appearance), your entrance, your "script" (resume or employment application), and your "delivery" (verbal skills) can all contribute to the "curtain call," a job offer.

First, dress the part.

Because the first impression you make on the interviewer will be visual, do everything you can to make a good appearance. When you walk through the door, you immediately project what type of worker you will be. Neat, clean clothes and shoes are in; jeans, bare midriffs, and bare feet or sloppy sandals are out. Dress conservatively; wear a suit, dress, or skirt and blouse. Concentrate on good grooming: clean hair and nails, conservative makeup, and a deodorant.

Second, write your script and practice your lines.

When you begin job hunting, prepare a typewritten resume and notes to make filling out an employment application easier and faster. A resume, necessary for all the jobs described here, should include your full name, address, telephone number, and a chronological listing of your education (name and location of schools, years attended, and when and if you graduated). Your work experience, paid as well as volunteer, should include the company or individual for whom you worked, address and phone number, job title, and a brief description of your accomplishments. More detail on how to write a resume is given in a separate article.

In completing an employment application, write legibly and neatly, give dates in chronological order, and answer all questions or write "NA" (not applicable) if they do not apply to you. Never write "see resume"; this can indicate that you lack cooperation skills. Take a pen and notebook to the interview in case you are given information you would like to write down.

Practice your "lines" by preparing answers to some of the following questions and rehearsing your answers with a family friend or someone who works in the field you hope to enter. Your answers, as well as your self-assurance and manner, are used by the interviewer in her evaluation of you. Be prepared to answer the very general question, "Tell me about yourself." This question is your opportunity to summarize briefly who you are and how well you can do the job.

Two basic questions you should be prepared to answer are, "Can you do the job?" and "Will you fit in?" Additionally, you may be asked the following:

- What courses did you take? How were your grades?
- Which subjects did you like best? Why?
- What activities did you participate in at school?
- Have you held any offices or participated in extracurricular activities?
- How do you spend your free time?
- What are your career goals?
- Which of your previous jobs did you like best? Why?
- If you could design a job for yourself, what would it be like?
- What are your strengths? What are you most criticized for?
- What have you done that you are most proud of?
- Why should I hire you?
- Why do you want to work for our company?

To answer the last question, learn as much as you can about the organization to which you are applying. Find out what product it produces or what service it offers and whether the company is successful. You may find some of this information in the public library, from the Chamber of Commerce or the Better Business Bureau, or from company annual reports to stockholders. Parents, teachers, friends, or guidance counselors may also give you some help.

Now that you are prepared, make your entrance.

You may have already made an appointment, either by contacting the personnel department or by answering a newspaper ad or job posting at school, or you may have been referred by the Employment Security Commission, an employment agency, or a school counselor. Make your entrance "on cue"; that is, do not be late. Give yourself sufficient time to find the company if you have never been there and to locate the interviewer's office.

Once you are in the interviewer's office, try to relax. Make frequent eye contact with her when you talk. Do not look at the floor, the ceiling, or the pictures on the wall. Speak clearly and smile. Be friendly and positive. Even if you have been rejected in past interviews, do not project a negative attitude. Think before answering a question. Listen carefully to the question, and ask for clarification if you do not understand it.

Remember the interviewer's name and use it during the interview. Do not call the interviewer by his or her first name unless you are asked to do so. Wait to sit until you are offered a chair or the interviewer sits. Do not smoke.

Ask questions during the interview, but do not monopolize the conversation. If you just wait for questions to be asked and dutifully answer them, you have done nothing to set yourself apart from the other applicants. Give the interviewer a chance to guide the discussion to cover the points she wants to know. Make your answers complete, but do not ramble. Ask questions about the job duties; the work hours; the pay; the company's promotion policies, if it is a permanent job; and, if relevant, the assistance offered for further training and schooling. Questions about vacation and other time off may be asked, but do not give the impression that all you are interested in is how many days you can take off. You want to sell yourself as a person who is interested in learning how to do a job and in getting it done.

Try to **find out exactly what the requirements of the position are**, so that you emphasize skills and experience that are relevant. Ask early in the interview what is expected of you in the job. Do not be afraid to sell your good points or to claim responsibility for projects on which you have worked.

While you should try to give clear answers to questions, you should not be asked some questions. Some are prohibited by equal employment opportunity laws; others, while not prohibited, should not be asked unless they are related to the job for which you are being considered. For example, you should not be asked your height and weight unless they are necessary for performing the job. You should not be asked your age (but an employer may ask if you are 18 years of age or older); your race, national origin, or religion; your marital or family status, whether you plan to have children, or whether you have an arrest record. If you are asked any of these questions on an application, answer "NA" (not applicable). If they are asked verbally, you should first politely ask their relevance to the job. If the interviewer admits these questions have no relevance to the job, politely decline to answer them.

At the close of the interview, **ask the interviewer if she has any concerns about your ability** to do the job. If she says "yes," ask what they are and respond appropriately. If she says "no," say that if any concerns do arise, you would appreciate an opportunity to respond to them. You can then ask how soon you can expect to know whether or not you got the job and if the interviewer would like you to call back to get this information. Thank the interviewer, and make your exit.

After the interview, **write down your impressions**. You may be interviewed for more than one job, and these notes can help you decide which position to accept. Write down the questions you were asked, your answers, and what the interviewer said. Such information can be valuable in preparing for future interviews. Also, because you may have more than one interview with the same person or with the same company, you can be consistent in what you say.

If you are qualified for the job, have prepared yourself well, and put your best foot forward during the interview, you stand a good chance of succeeding. The most common reason companies give for choosing one applicant over another is personality and overall impression of the candidate. Grades are surprisingly low on the list. Companies say they want top graduates, but they really want amiable, well-rounded workers who are highly motivated, can communicate well, and have the skills that the company needs. Do not be discouraged if you do not get the first job for which you apply. Review each interview and decide what you did to make a good impression and what you might do better. Then try again.

Original article by Barbara Solari, Personnel Manager, Lovelace Inhalation Toxicology Research Institute, Albuquerque, NM
Updated by Joanne M. Wambeke, M.Ed., NCC, Santa Fe Community College, P. O. Box 4187, Santa Fe, NM 87502-4187

You Need a Mentor

One of the best things you can do for yourself is to establish a mentor/protégé relationship with someone who is pursuing the career in which you are interested. Briefly, a mentor is someone who

- ✔ offers the wisdom of her experience,
- ✔ provides guidance, encouragement and feedback,
- ✔ provides information on choices and options, and
- ✔ acts as a role model.

You, of course, are the protégé. A mentor can be any age, either sex, and can be as close as your school building or as far away as your computer or "snail mail" can reach. You will have many mentors in your life. As a mid-school student, you can look for mentors at your school (your teachers), local high schools (teachers and students) or at the college level (generally college students who are majors in the field in which you want to major). A high school student can look to her teachers, college students or faculty, or people who are working in her field of interest.

Your job as a protégé is to be open to the knowledge, experience, and resources that your mentor can give you. Share your goals and objectives with your mentor. Your should receive realistic feedback and grow and build on that feedback. However, you are not a clone or copy of your mentor. While you will learn from and benefit from the mentor/protégé relationship, you will maintain your uniqueness as an individual.

How do you find a mentor? The best sources are often the closest—your parents and teachers. Professional organizations (like the New Mexico Network for Women in Science & Engineering) are another good resource. You can contact the university you would like to attend. Use the telephone book to find companies who are doing the type of work you would like to do. If you have access to a computer (if you don't, you should try your local public library) browse the Web. When you find a contact you want to make, your letter or E-mail should include the following:

- ✔ your desire to participate in a mentor/protégé program
- ✔ information about yourself (age, interests, grade level, classes you have taken)
- ✔ your career goals, and
- ✔ how to reach you.

Mary V. Bochmann
Federal Women's Program Manager
White Sands Missile Range, NM

Networking

If you have ever had to contact someone that you don't know and ask them to do something for you, you can appreciate how much easier that task would have been if you had a networking relationship with them already established.

What is a network? We are all members of various networks. As a minimum, you have family and school networks. Hobbies, sports, church, synagogue or extracurricular activities provide additional networks. Your favorite Web sites and chat rooms are also networks. Professional organizations, like the New Mexico Network for Women in Science & Engineering, Society of Women Engineers, and Association for Computing Machinery are networks.

An obvious example of a network is the New Mexico Network for Women in Science & Engineering. As a group of networked individuals, we exchange information about job opportunities, management strategies, and technical advancements, and we provide support, assistance, and encouragement to one another. If you are attending an Expanding Your Horizons (EYH) Conference and meet someone who is in a field you are interested in pursuing, you can form a piece of a network with her.

You don't have to personally know all the members of your network. If you know one person in the network, mention that person's name to a new acquaintance in the network. Just be careful and make sure that the relationship between the person you are calling and the person you refer to is a good one. Networking is one of the most effective ways of getting things done, getting help you need, and getting ahead in the world. Your networks will grow and expand with use.

You may contact someone with a specific question, or send out a general inquiry to everyone on the network. Try it; you will be amazed at how well it works.

Mary V. Bochmann
Federal Women's Program Manager
White Sands Missile Range, NM

Cover Letters

A cover letter should accompany your resume and be addressed to the person doing the hiring. Usually, cover letters consist of four paragraphs. The first paragraph is interest-generating. Use the name of a personal contact that referred you to the position or your knowledge about the company to catch the eye of the reader. The first paragraph also states or implies interest in employment with the company or organization.

The second and third paragraphs are interchangeable. One gives a background summary of your experience and education and the other is a "value-selling" paragraph highlighting your key strengths, skills and abilities and describing how they will benefit the employer.

The last paragraph compels follow-up action. State that you will call the employer on a specified date to follow-up on your resume or to arrange for an interview. Of course, if you say you're going to do it, you have to do it!

You may close the letter with a statement of appreciation such as "Thank you for considering my application, and I look forward to meeting you."

Place your cover letter and resume in a nicely addressed envelope, stamp it, and send it off!

Joanne M. Wambeke, M.Ed., NCC
Santa Fe Community College
P. O. Box 4187
Santa Fe, NM 87502-4187

Resumes

Okay, now that you've assessed your talents and know how you wish to display them in the world of work, it's time to go get a job! First, you need a resume targeting the job you're going for. Now, we know you have many talents but for this resume, we want to highlight your skills and abilities that pertain to this particular job.

A resume is a summary of who you are and how you can do the job at hand in two pages or less. Since it is a reflection of you and the quality of work you do, typos, misspellings, poor grammar, and lying (even a small lie) are NOT acceptable.

There are basically three types of resumes: chronological, functional, and a combination of the two. Chronological resumes list the paid and unpaid experience you've acquired in reverse chronological order (i.e., most recent experience first). Functional resumes allow you to highlight your skills or areas of effectiveness. A combination resume does both. Samples of chronological and combination resumes follow.

Typical categories in a resume include contact information, objective, experience, work history, and education. Additional categories are summary of qualifications, military experience, community involvement, professional affiliations / licenses / certifications, special skills, awards and recognitions, interests and activities, and a personal statement. No resume should indicate salary history or expectations, a photo (unless it is essential for the job), race, religion, political affiliation or sexual orientation, nor any negative information (e.g., terminated from a job, mental/physical health problems). Choose the categories that make the most sense for you and allow you to highlight your skills most effectively.

Write your accomplishments in the "verb noun why result" format for greatest effectiveness. For example, "I wrote a series of training manuals that shortened training time and increased productivity by twenty percent."

How do you know if your resume is effective? Give it to ten people. Ask each to spend thirty seconds looking it over. Then ask them to tell you what kind of job you're applying for and whether they think you could do the job. If their answers to the first question are in line with your target job, and they give an unequivocal "Yes!" to the second question, you've got an effective resume!

Some good references on resume writing, interviews, and career planning are:

Richard Nelson Bolles, What Color is Your Parachute (Berkeley, CA: Ten Speed Press, 1994). The address of Ten Speed Press is P.0. Box 4310, Berkeley, CA 94704.

The Quick Job-Hunting Map (Berkeley, CA: Ten Speed Press).

American Association of University Women, Job Hunter's Kit 1993, Washington, D.C., 1993. Address: 2401 Virginia Ave. NW, Washington, D.C. 20037.

H. Anthony Medley, Sweaty Palms: The Neglected Art of Being Interviewed (Belmont, CA: Lifetime Learning Publications, 1978).

Employment and Training Administration, U.S. Department of Labor, 601 D Street NW, Washington, D.C. 20213.

Updated by Joanne M. Wambeke, M.Ed., NCC, Santa Fe Community College, P.O. Box 4187, Santa Fe, NM 87502-4187
(Original article by Sherry K. Reisfeld, Los Alamos National Laboratory)

The following resumes were written and compiled by

Renee Filice
Stanford University Career Planning and Placement Center
Stanford, California, 1979.

Chronological Resume (Employment Pattern Emphasized):

KAYE STONE

Present Address:	**Permanent Address:**
P.O. Box 3196 Stanford, CA 94035 (415) 325-9320	44 Coulter Street Oakland, CA 94619 (415) 323-1846

OBJECTIVE: To obtain an entry-level position in marketing with a major computer firm.

EDUCATION:

9/89-6/93 Stanford University, Stanford, California. B.A. degree in Economics. Undergraduate course work includes computer science, accounting, industrial engineering, statistics, and psychology.

9/90-3/91 Stanford-in-Italy, Florence, Italy Studied art, history, language, and culture of Italy.

EXPERIENCE:

9/94-6/97 Fund Raiser. Heritage Fund, Office of Development, Stanford, California. Student-run scholarship service. Raised funds by contacting businesses and corporations interested in the Stanford University community.

9/94-6/95 Kitchen Supervisor. Stanford University, Stanford, California. Organized duties and scheduling for a rotating crew of four in Zeta Psi Fraternity.

9/95-12/95 Freshman Orientation Coordinator. Stanford University, Stanford, California. Selected by Residential Education Staff to assist with travel arrangements, tours, and informational sessions for incoming freshmen.

6/91-9/95 Coordinator and Instructor. San Francisco Yacht Club, Belvedere, California. Summer sail training program. Responsible for the teaching and safety of 150-200 pupils throughout the summer. Controlled $25,000 budget and delegated duties to five other instructors. Supervised maintenance on fleet of 30 boats.

ADDITIONAL INFORMATION: Vice-president, Zeta Psi, a social fraternity. Coordinated house events and meetings, organized all committees, and made all final housing arrangements.

Designed questionnaire on procrastination, administered it to student population, performed preliminary analysis using computer program.

Combination Format (Both Skills and Employment Pattern Emphasized):

KAYE STONE

Present Address:	**Permanent Address:**
P.O. Box 3296 Stanford, CA 94305 (415) 328-0519	22 Live Oak Way Morgan Hill, CA 95037 (408) 867-3258

OBJECTIVE: To obtain a position as a marketing representative for a textbook publishing firm.

EXPERIENCE:

Supervision/Administration

Supervised, trained, and motivated kitchen crew of four.

Controlled $25,000 budget for summer sail training program. Delegated duties to five instructors.

Organized and coordinated panel presentation related to career information for students interested in business.

Marketing

Raised funds for scholarship service by contacting local business people.

Writing/Editing

Edited and solicited articles for student services newsletter.

Chaired publicity committee for spring arts and crafts fair. Wrote press releases, ad copy. Coordinated production of posters. Supervised three committee members.

EMPLOYMENT HISTORY:

Coordinator/Instructor. San Francisco Yacht Club, Belvedere, California. Summers 6/90-9/93.

Fund Raiser. Heritage Fund, student-run scholarship program, Office of Development, Stanford, California.

7/93-6/94.

Kitchen Supervisor, Phi Psi House, Stanford. 9/92-6/93.

Peer Counselor. The Bridge, student-run crisis counseling center, Stanford. 6/91-9/92.

EDUCATION: Stanford University, Stanford, California. B.A. in English. Course work included economics, math, and psychology. 9/90-6/94.

ADDITIONAL INFORMATION: Member, Stanford-in-Business.

Stress Management

What is stress?

Stress is any demand placed on your body or change that you must adjust to. Life is full of experiences that involve change—making new friends, leaving high school and entering college, starting a new job, moving to a new state. Having a certain amount of stress means you are involved in life and care about doing your best. Stress can result from both positive and negative events in our lives, such as falling in love or the ending of a relationship. We can't avoid stress completely, but we can learn how to manage it. Let's look at how our bodies respond when we are experiencing a stressful situation.

The Fight-or-Flight Response

Our bodies are equipped with an innate stress alarm that allows us to respond effectively when we are faced with a challenging situation. The body releases hormones that prepare us to either confront the situation or escape from it—fight or flight. In this state you may feel a number of physical changes, including rapidly beating heart, racing mind, tense muscles, clammy hands, and churning stomach. Once the situation has been dealt with, the stress alarm is reversed and our body functions return to normal. In society today, we frequently deal with chronic stressors, such as continual fear or worry about our future. If we don't find ways to shut down the stress alarm and thus these physical changes, our bodies suffer. The accumulated toll on our bodies may come in the form of frequent headaches, menstrual irregularities, recurring diarrhea, high blood pressure, heart arrhythmias, and asthma.

Managing Stress

So how can we protect our bodies from the toll associated with chronic stress? One way is to acknowledge that we are stressed and learn to recognize the signs of stress. Read the following list of symptoms that can be signs of stress.

Headache	Sleeping too much/not enough
Stomachache	Overeating/undereating
Tiredness	Diminished initiative
Frequent crying	Being prone to accidents
Irritability	Being preoccupied
Forgetfulness	Susceptibility to minor illness

If you responded with a "yes" to any of these symptoms, read on!

Chill Out! — Relaxation Skills

What do you do on a daily basis that that calms and quiets your mind and body? Do you enjoy listening to music, an easy jog, yoga stretches, or meditation? All of these activities can shut down the fight-or-flight response and have a positive effect on your health and your handling of life's stressful events. Try these mini relaxation exercises. Just a few minutes of relaxation each day can have a profound effect on your body and your overall health.

Take a deep breath. As you slowly exhale, let your eyes close. To relax a little more, think "calm" with each exhalation.

Have a good stretch. Clasp your hands behind your neck. Gently lean to your left until you feel a gentle stretch up your right side. Hold for a count of five. Repeat with your right side.

Take a deep breath. As you let it out, let your eyes close. Take a few moments to quiet yourself. Then recreate a favorite scene that is associated with calm, peaceful feelings. Go there in your mind for 15 seconds to a minute.

Raise your shoulders as if trying to touch your ears with them. Then, move your shoulders back; then let them drop. Up, back, down, and around. Do this about five times.

Look for the funny and silly things in life and laugh!

Changing the Way You Think About Stress

Sometimes how we think about what is happening to us can make our stress worse. We create stress in our own minds. If you think something is going to be awful, it will be. If you say to yourself, "I'll never get through this," you probably won't. These are called automatic negative thoughts or ANTS. ANTS either totally ignore reality or distort what is really happening. How can you get rid of your ANTS? Try to look at reality by asking yourself, "where is the evidence for my negative thought?" Then shift your thinking over to something more positive, more based on reality. So rather than saying, "This is awful" try saying, "This is a problem, and let's see what I can do about it." Rather than an attitude of, "I'll never get through this," replace your thought with, "This is going to take some time, but I'll make it."

Look for a Solution

Another way to cope with stress is to view the stressor as a problem to be solved, rather than a personal threat. Problem-solving consists of several steps. Here are some tips for becoming a better problem solver.

- Define the problem you want to solve.
- Distinguish between the changeable and unchangeable aspects of the situation.
- Set realistic, concrete goals.
- Generate a wide range of alternatives.
- Imagine and consider how others might deal with this problem.
- Evaluate the pros and cons of each alternative.
- Try out the most acceptable solution.
- Expect some failures, but reward yourself for having tried.
- Reconsider the original problem in light of the attempt at problem-solving.
- Does the problem look different?
- Can you see anything positive about the situation?

Take care of yourself

Let's not forget the basics. In order to cope well with stress you need to take care of your health. Eating a nutritious diet, getting a good night's sleep, and exercising regularly are all very important for maintaining a healthy body and a positive outlook on life. Having a good support network of family and friends also helps you in managing life's stressful events. Starting these healthy patterns now will serve you well throughout life as you pursue your goals.

Amy Anderson, Counselor
Los Alamos National Laboratory
Los Alamos, New Mexico

You Need to be Assertive

What is assertion?

Assertion involves standing up for your rights and tactfully expressing thoughts, feelings, and beliefs in a direct, honest way that does not violate the rights of another person. An assertive person feels good about herself. She is capable of expressing both positive and negative feelings and opinions in an appropriate way. Rather than relying on fate or good fortune, the assertive person acts in a way to get her owns needs met while respecting the rights of others.

What do we mean by passive, aggressive, and assertive behavior?

In dealing with situations in our lives, we have three ways to respond—passively, aggressively, or assertively. Let's look at the differences between these response possibilities. When you are passive, you stifle your feelings; you rely on others to guess what you want, and you hope you will get what you want. An aggressive person responds in whatever way works—uses threats, manipulation, sarcasm, and fighting, often causing bad feelings in others. With assertiveness you speak directly and openly, you ask with confidence and without undue anxiety for what you want, and you have respect for yourself and others.

How assertive are you?

Perhaps you think you are already an assertive person. Read the following statements. Take an honest assessment of how many statements you can answer with a "yes."

- In class, you are unclear about something your teacher has said. Will you ask for clarification?
- A friend has a habit of always finishing your sentences, and this habit is starting to bother you.
- Can you express your anger constructively without exploding?
- Your family is pressuring you to go into a certain career. You have no interest in this field.
- Are you able to discuss this openly with them?
- Your parents have been arguing a great deal. Are you able to express your concern and discomfort to them?
- You have been dating someone for about three months and have decided you'd rather not see him anymore. Will you express your feelings to him honestly?

How can you become more assertive?

Increasing your ability to be assertive may involve examining your belief system. If you still hold a belief that you should never upset anyone or never disagree with anyone, you may have difficulty being assertive. Another belief you may hold is that people will not like nor accept you if you express an opinion that is different from theirs. Or you may be saying to yourself, "expressing my feelings is more trouble than it's worth." You may keep such a tight lid on your feelings that you're afraid you will explode if you express how you really feel.

A new more helpful way of thinking may include some of the following beliefs:

- ✔ My needs are just as important as anyone else's.
- ✔ It is okay to make reasonable requests of other people.
- ✔ If I express myself now, I will avoid more problems in the long run.
- ✔ I am not responsible for how other people feel.

Responding in an assertive manner takes practice. The more you practice the better you will get at expressing your feelings and needs in a calm, controlled way. By being assertive you will get your needs met, allow others the same, and enjoy more satisfying relationships with important people in your life.

Amy Anderson, Counselor
Employee Assistance Program
Los Alamos National Laboratory

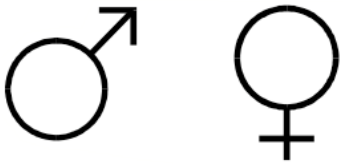
Sexual Stereotyping and Sexual Prejudice

A woman who chooses a nontraditional career may face a largely different set of challenges and problems than those encountered by one who holds a job in a traditionally female field. If you are contemplating a male-dominated profession, you should realize that sexual stereotyping and sexual prejudice may exist. If you are aware of these problems, you will be better able to deal with them effectively. Failure to do so can mean failure in your career and/or personal unhappiness and maladjustment.

Sexual stereotyping and prejudice can cause women to be treated unequally by others, either because of hostility towards women or, less wittingly, because popular attitudes about women make it seem proper to treat them differently than men. Also, social conditioning incorporated into a woman's personality through her upbringing and environment can affect the way she acts and thinks about herself.

Overt sexual prejudice is generally easier to recognize. A female scientist or a businesswoman may find that she is not taken seriously, that her opinions are not as highly valued, and that her career is not considered important by those around her. She may find that some co-workers do not seek her advice and opinion. The more important the solution to a problem, the less she may be sought to provide it. Instead, she may find herself being given "busy work" that a male would not do because it is too dull. In fields such as science, where good ideas and an individual's reputation among her peers are often the main determining factors in being rated by an employer, the effects of this type of prejudice can be overwhelming.

Sexual prejudice can take more subtle but just as devastating forms. A new young male colleague is more readily incorporated into the "old boy" network. Older male co-workers may be happy to include him in their Friday lunch group, an impromptu basketball game, or other social endeavors, but may feel awkward about including his female counterpart. This slight, although not deliberate, can be a serious detriment to a young woman who needs to learn the ropes—the limitations, personalities, and resources of the organization of which she is a part—and who would benefit, just as her male counterpart does, from the casual atmosphere and casual discussions that can result.



Similarly, there may be a shortage of mentors, or role models, available to the professional woman. Mentors are valuable people. They are like professional parents who take more than a passing interest in a younger, less experienced colleague. They offer constructive criticism and help develop professional attitudes. Along with friendly colleagues, they can help you develop your identity as a professional, your professional standards, and your self-confidence. However, an older male can feel awkward being a mentor to a young female. He may be overly protective and patronizing; he may fear that his professional attention will be misconstrued by his co-workers or by her as an indication of sexual interest. If he is her supervisor, he may not offer criticism that can be of value because of his inexperience or awkwardness in dealing with a female professional. He may be afraid that she will react by crying, or he may believe she is not as serious about her career as men are and thus does not welcome criticism.

How do you seek a mentor? How do you get incorporated into the "old boy" network? How do you convince others that you, too, are serious about your career? Learn to spot the people who are in a position to help you and are willing to do so. Let them know you respect their ability and you seek their support. Have something to offer them in return: skills, enthusiasm, and a record of doing good work. Be able to deliver as much as, or more than, you promise and as much as you ask in return.

In the work place, sexual harassment of some sort can be present in the form of unwanted and uninvited propositions or unwelcome verbal comments or physical contact. The casual relationship with your peers that gets you into the "old boy" network may prompt numerous advances, since friendliness on the part of a female colleague can be mistaken for an invitation or, at least, an indication of availability. Travel to meetings or to remote experimental sites with male colleagues can be awkward. Some companies therefore discourage travel by the young female professional. As a result, she may not form valuable contacts with the professional community.

Do not be embarrassed or reluctant to turn down a sexual advance. Treat it matter-of-factly, and do not advertise it to co-workers. The less firm you are in your refusal and the more you make of such advances, the more offense, however unjustified, will be generated by your refusal.

If you believe you are being treated unfairly, it is probably best to assume in the first instance that your difficulties are not the result of sexual prejudice but are normal and surmountable. Then you can begin dealing with them in an assertive and effective manner. Prejudice is often so subtle you can never really know how great a factor it is in any human interaction.

Solving the problem of sexual prejudice

The best way to solve a problem of sexual prejudice or sexual harassment is in an assertive, nonpublic manner. If you have a legitimate gripe against someone, discuss it with that person. Go to a person higher up who will listen seriously to you only after you have failed to resolve the problem in this manner. Try to be aware of potential problems and avoid them or deal with them before they become large ones; try to choose as advisors and employers those who are least likely to act in a prejudicial manner. It does not help to have the "best" professor in the department as your mentor if he works poorly with women or has antiquated ideas about women and is unable or unwilling to change.

If informal grievance procedures with your employer do not prove satisfactory, you are entitled to assert your legal rights by filing a complaint with the appropriate government agency. Title VII of the Civil Rights Act of 1964 prohibits employers and labor organizations with greater than 15 employees from discriminating on the basis of sex in hiring, firing, wages, promotions, or any other conditions of employment. The Equal Pay Act of 1963 states that men and women must be given equal pay for doing essentially the same job. Public Law 95-555 requires that women affected by pregnancy, childbirth, or related medical conditions be treated the same for all employment-related benefits as persons not so affected but similar in their ability or inability to work. New Mexico state law states that "equality of rights under law shall not be denied on account of the sex of any person." Agencies to contact are the Equal Employment Opportunity Commission, 505 Marquette NW, Albuquerque, NM 87102 and the New Mexico Human Rights Commission, 303 Bataan Memorial Building, Santa Fe, NM 87503.

Just as serious as these problems is the social training which creates barriers in the mind of the female professional. Most women do not learn in early childhood to assert themselves. Many do not take criticism easily, and some interpret a challenge to their ideas as a personal insult. Many women may wrongly react by assuming that all their difficulties at work are manifestations of sexual prejudice and that all criticism is undeserved. Many of us may not have played competitive games as children; we did not, as a result, learn to cooperate and compete, to lead and follow, to give and take criticism, to work with people we like and with people we dislike. Furthermore, women may tend to draw a sharper line between their private and professional lives; as a result, they hesitate to ask friends for professional favors or for the advice that men seem to seek almost reflexively. Women need to learn not to be reluctant to compete with men and to be good winners as well as good losers.

Recognize that many of the problems you encounter in your career are also encountered by men to some extent. Some essential ingredients of professional and personal maturation are the ability to accept constructive criticism, the ability to discern your strengths and weaknesses clearly and objectively, and a willingness to improve your strengths and reduce your weaknesses. A woman professional, just like a male professional, must have a sturdy ego to continue to put forth ideas that may be ignored and, particularly in a scientific career, to be able to withstand the fairly frequent questioning of her work that is an important part of the scientific process. You must also develop the confidence to question the work of others when you believe it to be in error; you must develop the ability to work amicably with co-workers while maintaining respect and credibility.

Learn to accept your shortcomings and to make a realistic assessment of them. Do not be embarrassed by evidence of lack of perfection; acquire respect for yourself even when you are fallible. Other women, including your mother, and enlightened male colleagues can be helpful in promoting your self-image.

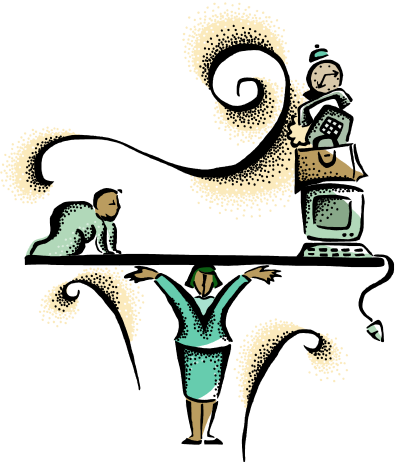
Finally, forget past offenses. Men have to learn, too. For older men, especially those reared in a household where the mother never worked outside the home and whose wives never did either, the adjustment to having a woman as a co-worker can be difficult.

Above all, the goals you should seek in your career are personal fulfillment and happiness. In relations with others, it is important to be yourself, to make decisions and act in a way that is right for you. Giving up your womanhood should not be a prerequisite for success.

Elaine Gorham-Bergeron, Physicist

Member of Technical Staff	Nuclear Regulatory Commission exchange scientist
Sandia National Laboratories	CABRI project
Albuquerque, NM	Cadarache, France

Combining Marriage, Family, and Career



In the 2000's everything is changing even more rapidly than in past decades. What was true ten years ago no longer applies. Nowhere is this more obvious than in the field of the superwoman—the woman who has chosen to combine marriage, family, and a career. Nontraditional solutions have been found in flex time, part-time work, husbands not working outside the home, and even the reemergence of nannies.

By the same token senior female managers may cancel meetings to take their children to medical appointments and attend important school functions. Yes, the working world has become more accepting of working mothers. Conversely, the sisterhood that existed among working women in a male-dominated world is in sharp decline.

Nevertheless, women are subject to the same fundamental pressure that has always existed—not enough time. They are committed to providing support to children and husbands; they often are not their own masters. So, as well as needing dedication, hard work, self denial, and boundless strength, women also sometimes need to be able to put the interests of their families above their own.

The three main hubs around which many women's lives revolve are family, husband, and career, although the emphasis of the three parts varies with time and from woman to woman. Think about the professional women you know. How many make an unqualified success of all three elements? A career woman may work too hard and possibly neglect her family (or at least feel she has neglected them!). Conversely, a career woman may work too little and lose her job or be "laterally displaced" to a new, less arduous (and at the same time less prestigious) position, which results, in turn, on pressures on other elements of her life.

So why do so many women opt for the difficult juggling act of keeping all parts of their lives in equilibrium? Often they think they have no choice; they opt out for security, both financial and intellectual. No woman can rely on being supported by a man for the rest of her life at any age. As life goes on, financial pressures mount, moving through cribs and braces to cars and college. For many women the initial euphoria of working for self-fulfillment, for "making a difference," and for intellectual development and fame becomes buried in the need for paying the bills and preparing for retirement.

Children are the great unknown. One chooses a husband, and if the choice is wrong, one can start again. Jobs (professional or not) come and go. This is not true with a child. A child arrives, helpless and demanding, and suddenly you have a life-long commitment to a new person in your life. This is both the joy and the curse of children. They are nonrefundable, come without instructions, and need you—yes, you—their mother. They get sick when their father is out of town and you are entertaining foreigners or moving to a new house. They get really sick when you have a funding deadline or when you have an important commitment to their father or one of their siblings.

I do not think there are any easy answers. There is no "right time" to have your children, no "right time" to get married, no "right time" to work exclusively on your career. You can make nontraditional choices; single-parent families are not uncommon, and the workplace is more forgiving of the needs of mothers. Many professional women choose not to have children. This may have a positive impact on their careers.

On a personal note, I can't imagine life without my children and husband. They have enriched my life and forced me to grow in ways totally outside my sphere of understanding. Even now, with our new "empty nest" our children continue to provide a never-ending challenge. The complex nature of human interactions is vastly more intricate than the relatively simple and controllable events in a laboratory. I made my decisions over twenty five years ago, and have never regretted them.

Caroline (Cass) Mason
Chemical Science and Technology Division
Los Alamos National Laboratory
E-mail: cmason@lanl.gov

Getting a Summer Job

Job experience in a technical field is an important part of your education and can help you decide where your interests lie. Your success in getting a summer job will be directly related to how you go about it.

Before you even go out the front door, you should have a resume (see the article on resumes). The actual preparation of a resume is covered in a separate chapter. Very briefly, you should include your work experience, your courses in school, your extracurricular activities and hobbies, and your career objectives. Armed with a resume you can start your job hunt.

Everyone you know is a potential source of employment. They may not be in a position to hire you but may know of someone who is, so tell everybody you know that you want a job. If people do not know your qualifications, experience, and goals in life, tell them! It is perfectly all right to say something like the following: "I am a junior in high school with a B+ average. I have received A's in chemistry and math, and I am taking calculus and advanced chemistry next year. When I start college, I am going to major in electrical engineering." Remember that if you do not tell people about yourself, no one else will do it for you.

The best place to start

The best place to start looking for the kind of summer job you want is in the organizations that employ people who are doing what you want to do. If you want to be a doctor, contact doctors' offices and medical labs; if you want to be an architect, contact the architectural firms in your city or town. Any experience or knowledge you can gain about the career you want to enter will be helpful to you.

The term "any experience" brings up the question: "What if they offer me a job as a secretary or clerk?" Unless you have a better job offer, take it, but make sure that everyone you work with knows that your goal in life is to be an engineer, not a secretary. Ask questions about the technical work of the organization, tell people that you want to learn about what the organization does, and volunteer to help with drafting, experiments, and all the other projects that the engineers and scientists are doing. Ask them about their work, ask from what universities they graduated, and what courses you should be taking in high school. People love to talk about themselves and their jobs, so they will be glad to answer your questions.

If you can't find a job

You may not be fortunate enough to find a paid summer job in the field that interests you. If this happens, do not give up and spend the summer in your back yard. Take courses, do volunteer work, spend time at the library; do whatever you can to gain experience in the working world or to improve your knowledge of scientific, engineering, and other nontraditional disciplines. Although you may not receive a paycheck, you will get experience and knowledge that may give you an edge in obtaining a job later.

Where do you go to find out about job openings?

The information given below is by no means all-inclusive. These addresses and phone numbers are just a start and do not include any small, private companies, so do not limit your job search just to these organizations.

Federal government employment information is available from

All NM counties except Dona Ana and Otero:

Federal Job Information Center
421 Gold Ave. SW
Albuquerque, NM 87102
(505) 766-5583

Dona Ana and Otero counties:

Federal Job Information Center
Property Trust Building, Suite N302)
2211 E. Missouri Ave.
E1 Paso, TX 79903
(915) 543-7425

State government employment information is available from

NM State Personnel Board
810 W. San Mateo Rd.
Santa Fe, NM 87505
(505) 827-8190

Private employment information is available from

NM Employment Security Department
P.O. Box 1938
Albuquerque, NM 87103
(505) 842-3105
(Ask for their listing in the Research and Statistics Section entitled, "Large Employers," in NM by County.)

Look in the yellow pages of your local phone directory under energy, scientists, doctors, lawyers, architects, engineers, etc., for smaller employers.

When do you start looking for a summer job?

"Now" is the answer. Once again, tell everyone you know (teachers, parents, friends, and relatives) that you want a job and tell them what kind of job you want. Contact the places where you wish to work and find out when they start accepting applications for summer employment. The federal government, for example, starts their summer employment program in November to fill vacancies for the following summer. Be persistent and follow up on your employment leads.

Don't get discouraged

Almost no one gets a job at the first place they apply. Most people have held jobs that were not exactly what they wanted. However, they learned all they could and worked hard, and the experience they gained helped them later to get a job they really wanted.

Mary V. Bochmann
Federal Women's Program Manager
White Sands Missile Range, NM

Steps to Leadership and Success

Develop Leadership Skills

Today all levels of science and technology are dependent on good leaders and good leadership skills. Leadership does not just happen, and leaders do not just stumble upon leadership opportunities. Leadership is the result of confidence, resilience, knowledge, wisdom, and the guts to step up to the opportunity. True leaders hold a deep love and respect for people, team collaborations, and teaching. In business, leadership skill is useful in uniting people and helping them move toward a common goal. In the greater society, leaders are the driving force toward manifesting justice. In the world of science and technology, leadership skills often determine the success or failure of research by determining its direction and its outcome. Simply put, leadership skills matter.

For young women, leadership skills begin at home. In your home you encounter your first exposure to justice and injustice. How you choose to react and respond to family dynamics can greatly impact your confidence and ability to trust yourself and others. Are you going to just get mad and walk away from problems, or are you going to try to help fix problems and not let a bad situation get you down? Family dynamics often cannot be predicted or controlled, but it is up to you to ask for help from your parents, teachers, and friends, and to continually seek out ways to develop your confidence. Confident young women always excel.

Beyond confidence, three specific things in your life can give you a strong foundation for nurturing leadership skills in the future: creativity, the independent pursuit of interests, and financial independence.

Be Creative, Even If It's Crazy

Creativity is a key component of successful leadership, self-awareness, and drive. Leaders often need to think outside the box to solve problems and go in new directions. All creativity begins with curiosity, and curiosity starts in the very early years of life. Einstein once said, "I have no special talent. I am only passionately curious." Curiosity and creativity go hand in hand. When you have an interest in a subject and begin to see questions, you should do all you can to find answers. Girls, especially, love to role-play, and you should take curiosity into your games. Allow yourself to go wherever you like with your imagination. Go ahead and pretend you are the Queen of Sheba or Captain of the Starship Enterprise! Let your artistic creations be as crazy as you like. Creativity is about thinking outside of the box and dreaming as big as you can!

Pursue Your Interests

It is important for girls, especially by the age of 12, to pursue several interests seriously and in depth. If you have interests in things like fashion, makeup, or dance, take lessons on how to sew or how to dance, and then show off your work. Learning to design clothing is a serious skill and can be a basis for good engineering and for understanding the mechanical side of projects. If your interest is ballet, you should perform, learn the proper French ballet terms, and understand the reasons behind moves, the mechanics. The key is to approach your interests with commitment, hard work, and keeping in mind the pursuit of excellence.

Work Now Toward Financial Independence

One of the most difficult transitions all women make is the one from the home of their nuclear family to independence. Most women in this world never make this transition and instead continue dependence with a husband. Financial independence is the single most important reason Western women have reached (relatively) equal status in society. With financial independence comes true confidence, the ability to make choices based on inherent desire and drive, and the freedom to define one's own values and quality of life. The most important thing you can do to prepare yourself for a dignified and happy life is to establish a healthy relationship with money. It is not about becoming rich, but rather about pursuing your true passion and serving society with this passion while making a decent, dignified living. You should never secretly hold a desire to be rescued or obtain money that you did not earn. The Cinderella story, a princess waiting to be rescued, has created great unhappiness for women. It is un-

likely that you will be rescued by a man, so think about the steps you can take today to become as independent as possible. Some steps you can take to foster financial independence:

- Start a bank account, even if you have no need or interest. Deposit all gift money in your account and withdraw your money with your own debit card or checks. Balance your own account, and ask about ways to help it grow. Being comfortable managing your money is an important first step to adulthood and leadership.

- Start earning money through small jobs like babysitting or additional chores around the home. If babysitting and paper routes are out of the question, consider selling unwanted items on eBay. An occasional job (especially when school is not in session) is important while growing up, even if you have to create it.

- Take risks with money and time by learning to invest in a project, or a stock, or even your own little company. Sell your crafts, or compete in a science competition. It is all about learning to take resources and time to create a positive result.

- Volunteering can help you become exposed to many different work environments, learn the importance of service, and define your interests.

The world needs as many female leaders as we can nurture and create. Let it be you!

Lena Hakim
Environmental Scientist
Santa Fe, NM

Women as Leaders

What do we mean when we call someone a leader?

There are plenty of lists on what makes an effective leader. Rather than list those, let's look at some **real** leaders and see what we can learn from them.

Women are leading an economic revolution in this country. Nearly 10.4 million American companies are female-owned, and women are starting businesses twice as fast as men. These women-owned businesses generate $1.9 trillion in annual sales and employ more people than all the *Fortune 500* companies combined. Women already employ 12,800,000 workers and are hiring more each year.[1]

The official portrait of Lynn Martin hangs in the Department of Labor.

Lynn Martin, former US Secretary of Labor (1991-1993) said "One hundred years from now, people will talk about this time as the second period of women pioneers in America. Like the settlers of old, we will change the landscape for generations to come."

Let's see what we can learn from some of these pioneers. These are women who have made it to the top in the business world and women leaders who are making a difference at the local level.

Let's look at some impressive business leaders. The book *On Our own Terms -Portraits of Women Business Leaders*[2] gives us some insight into 15 women who have made it to the top in the business world. This book targets diverse business fields, ethnic backgrounds, ages, and ways of achieving success. The 15 women include 4 immigrants, 3 minorities, 5 who started or purchased firms, 3 who broke barriers within corporations, 2 who lead major social service organizations, and 4 who inherited business. The business areas include computer software and networking, food production and services, communications, charities, lingerie, healthcare, sheet-metal fabrication, a railroad, and the Cherokee Nation.

Lets take a look some attributes of these leaders:

- Their lifestyles vary -- divorced, widowed, single, full families
- They all struggled through difficult periods in their personal lives (death of parents/spouse, poverty, health problems, divorce, . . .)
- None of them are "superwomen." On any given day, none is the perfect CEO, perfect mother, perfect spouse, perfect friend, perfect citizen, or perfect housekeeper.
- These women met tough challenges, made some difficult choices, and faced changes in their lives.

Dr. Yolanda King currently heads the Space Based Sensing Branch of the Space Vehicles Directorate at the USAF Research Lab in New Mexico.

In our characterization of **real** leaders, let's include some impressive New Mexico women. These include Mercedes Agogino, the first woman physics Ph.D. graduate from UNM and physics professor (retired) at Eastern New Mexico University; Margaret Dike, a much honored pioneer educator and volunteer; Nancy Archuleta, who, when her husband died, borrowed money to start a small company in Las Cruces, NM, and built it into a $140M professional technical services firm; and Yolanda Jones King, a Ph.D. in chemical laser kinetics who has served the US Air Force (USAF) for twenty years in research and development programs, resource management and program planning, holds a patent in beam sensing techniques, has numerous publications in directed energy and space technologies, and is the first female chair and US Lead for a NATO Technology Panel.

1 Center for Women's Business Research, Women-Owned Businesses in the United States, 2006: A Fact Sheet (Washington, DC: Center for Women's Business Research, 2006).

2 *On Our Own Terms; Portraits of Women Business Leaders* by Enkelis, Olsen, & Lowenstein (San Francisco: Berrett-Koehler, 1995).

Looking at these 15 business leaders and our own New Mexico women leaders, we find some common characteristics in their approaches to leading. We can also glean some advice because, while men share their war stories, women tend to share their secrets of success.

- ✓ Without exception, all have the passion to experience direct results from their own actions. They want to make a difference whether it's being a female role model, teaching young people, creating a better salad dressing, or improving the bottom line of their own company.

- ✓ They set both long and short-term goals. They each have a vision of where they should be. When opportunity knocks, these women open the door!

- ✓ They believe in what they are doing and just don't give up. They won't accept failure; instead they create opportunities for success.

- ✓ These women all work hard and are not only willing, but seek out additional responsibilities.

- ✓ They accept that stress goes along with succeeding and learn how to use stress positively. The secret is to manage stress and not let it manage you.

- ✓ Those in senior manager positions demonstrate creativity in overcoming the fact that all senior managers, men and women, lose leisure time -- they combine business and pleasure in meals, theater, travel, and other activities - career and family are intertwined.

- ✓ These women set their own terms. They take charge of their lives. Wilma Mankiller, the principal chief of the Cherokee Nation from 1985 through 1995, said that you soon realize that "you're either going to live somebody else's dream or live your own dream." Carol Betz, Executive Chairman of Autodesk, Inc. a software and services firm adds, "You know best what you're supposed to do. Don't pass control (of your life) to someone else."

Looking at the approach these women take to leading others, we also find some common characteristics:

- ❖ Most of these leaders reflect the "feminine" consensus management style (collaborative decision making, in which trust and inclusion are valued) rather that the directive style more characteristic of male managers.

- ❖ These women create what could be called "families" in otherwise anonymous environments; they reach out to strugglers to help them become useful members of the workforce. Ms. Archuleta's employees even referred to themselves as family.

- ❖ Those in management have a real desire to relate to their employees on a personal level and all share a similar concern for customers. Serving the customer (inside or outside the organization) is their number one priority. They treat people as individuals; they have genuine interest in their lives.

- ❖ Many place a strong reliance on the use of intuition. They trust their instincts.

- ❖ These leaders exhibit positive attitudes and high self-esteem, labeling obstacles as challenges to be met.

- ❖ Perhaps the characteristic that comes out the strongest is that they are all risk takers. They were willing to take a chance to do what they wanted. As Karen Panko, an award winning real estate broker puts it, "You have to have passion for what you do and not be afraid to go out of your comfort zone to make your dreams come true."

The lives and experiences of these leaders lead to ten small bits of advice to all of us looking to be leaders:

1. Believe in yourself and what you aspire to do. Never give up. You can make a difference.

2. Don't run from change or let yourself stagnate. Anticipate, prepare, and eagerly adapt to change; look at it as a chance to succeed.

3. Follow your head; do what you want to do. Have the courage to change if a situation isn't working out.

4. Know yourself well enough to give yourself options. Know your strengths and play to them. Know your weaknesses and strive to improve.

5. Be clear about what you know and what you don't know.

6. Be someone who can be trusted. Stand up for your beliefs; don't shift directions with a change in the wind. As you want to be trusted, display trust in others. Once you say what to do, let them do their job.

7. COMMUNICATE: Let people know what is going on. If you don't know something, say you don't know. Let people know what the goal is and get behind that goal.

8. Take time to be good to yourself; stay fit - if you don't have your health, then nothing else will matter.

9. Set priorities, be flexible, and realize that everything in your life doesn't have to be perfect.

10. Recognize that lifelong learning is essential; upgrade yourself and continue your education. Participate in training programs, read, and learn from other people in your industry.

It is clear from these women leaders that leadership isn't a job; it's a set of skills, a positive approach, and a belief in yourself. Today the only job security is our continuing ability to perform, and leadership skills are critical no matter where you are in an organization. Look for opportunities to nurture those skills and build the attitude that may just help you attain more in your life.

As said by Harvard economist, Claudia Goldin, it is highly probable that the women of the future "won't see the ceiling, but the sky."

Where do I get more Information?

On Our Own Terms; Portraits of Women Business Leaders by Enkelis, Olsen, & Lowenstein.

Women in Business Magazine articles:
Opening the Window of Opportunity, Jan/Feb 96
Voices of Women Entrepreneurs, May/Jun 96
Keeping a Balance, Jan/Feb 97

Secrets of Executive Success, Golin, Bricklin, & Diamond

Women Managers, Strategies For Success, The Economics Press, Inc.

http://www.powersource.com/gallery/people/wilma.html

Barbara Torres
Torres Consulting
Albuquerque, NM

New Mexico Network for Women in Science and Engineering
P.O. Box 1360
Los Alamos, New Mexico, 87544 USA

Adobe acrobat PDF files and Internet HTML files available at:

http://nmnwse.org/careers