



Environmental Chemists

... Are concerned with environmental impact

What happens to the chemicals in an industrial cleaner after you pour it into the sink? When you see black smoke pouring out of the chimney at an industrial complex, what impact is it having on the atmosphere? These are the types of questions environmental chemists seek to answer.

The fate of chemicals in the environment and their effects are matters of increasing concern to specialists in environmental management. "Fate" involves studying where chemicals show up in streams, rivers, and air. Such pollution contains molecules that have not been removed in water treatment plants, caught by the filters in industrial smokestacks, disposed of properly, or successfully sealed in containers.

As concerns about geochemistry and the natural environment increase, environmental chemists also study the processes that affect chemicals in the environment. Gases emitted by a pine forest may create a mist when mixed with car exhaust, for example. In other instances, the environment may have effects on chemicals that can be toxic. Environmental chemists examine the ways both chemicals and the environment are changed by interacting.

... Manage our environment

Until about 20 years ago, those studying environmental contamination focused almost exclusively on the fate and effects of chemicals because the technology to measure the damage did not exist. As the technology for measuring leakage from landfills was developed, for example, industry recognized the potential for chemicals to negatively impact the environment—and the attendant social, political, and economic ramifications. As a result of these new data, chemists were able to help design pollution abatement systems that minimize the unwanted elements escaping into the environment. They also applied their knowledge to develop remediation systems to clean up contaminated areas.

As industry takes an increasingly proactive approach to environmental management, chemistry's role should continue to grow. For many chemical companies, this may involve redeveloping a chemical product to come up with functional groups or compounds that are more compatible with the environment. For example, one major corporation

has used catalysts to develop a new production process for methylisocyanate, a highly flammable and hazardous material that is dangerous to transport. The new production process allows the chemical to be manufactured at the site where it is used, avoiding the risks of shipping and storing.

As waste disposal has become increasingly expensive, industry also has grown more interested in finding ways to solve waste problems. Many solutions involve making industrial processes more efficient, which cuts costs. In addition, environmental chemists study the effects of chemicals other than pollutants on the environment.

... Work in a broad-based discipline

Because our environment is so complex, environmental chemists always underscore the interdisciplinary nature of their field. Environmental chemists must be able to understand and use the terminology of a range of other disciplines, including biology, geology, ecology, sedimentology, mineralogy, genetics, soil and water chemistry, math, and engineering. They may be involved in analytical testing, new product development in the lab, fieldwork with users of chemicals, and safety and regulatory issues. Many opportunities exist to move into different areas of expertise, often outside the lab. Many chemists return to school to study public policy, law, or business—applying their chemistry know-how in new ways. For example, knowledge of chemical processes is often vital for an individual who works in a corporation's regulatory affairs department and must ensure compliance with government regulations.

Environmental management is becoming a popular career track. Students who hold degrees in environmental sciences are finding jobs throughout the chemical industry, often working alongside geologists, biologists, and chemists.

Most environmental chemists emphasize that a solid foundation in chemistry is important to this work. Chemistry students interested in applying their training to an environmentally oriented job are encouraged to take courses in environmental studies. Potential employers look favorably on this as an indication of interest and ability to think in an interdisciplinary manner.



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FACT FILE: Environmental Chemists

WORK DESCRIPTION ► “Environmental chemist” is a general term. In fact, most chemists in the field would probably describe themselves more specifically by the work they do. This work may focus on collecting and analyzing samples, developing remediation programs, changing production processes to yield a more environmentally friendly product, providing expert advice on safety and emergency response, or dealing with government regulations and compliance issues.

WORKING CONDITIONS ► Work is often done in an indoor lab environment. However, when studying chemicals in the environment, a riverbed or stream may become the lab. Some companies have sophisticated indoor ecosystems in which they test their products. Others collect data outdoors and miles away from their own production sites.

PLACES OF EMPLOYMENT ► The chemical industry employs a huge number of environmental chemists to ensure that a given company is in compliance with government regulations. Government agencies such as the U.S. Departments of Agriculture and Defense and the U.S. Environmental Protection Agency hire chemists for environmental work. In addition, waste management companies and consulting firms employ such chemists to do consulting or remediation work. Colleges and universities are hiring more environmental chemists as they establish programs in environmental chemistry.

PERSONAL CHARACTERISTICS ► Because environmental chemistry is so interdisciplinary, it requires excellent interpersonal and communication skills along with the ability to express ideas efficiently to a nonscientific audience. The importance of the latter becomes apparent when chemists deal with regulations or with a company’s sales and marketing staff. As the field of environmental management expands globally, chemists who speak other languages may experience additional success.

EDUCATION AND TRAINING ► Environmental chemists come from various backgrounds, and there is no one path into the field. However, your college or university may have an ACS-Approved Chemistry Program with an Option in Environmental Chemistry, which is a good starting point. Experienced professionals emphasize the competitive advantage of obtaining advanced degrees. However, because the field is growing so rapidly, opportunities exist for individuals with an associate’s degree. Also, students are encouraged to take courses outside the traditional chemistry curriculum, such as advanced math and engineering courses.

Companies often hire graduates from schools with well-established programs. Employers also look for candidates who demonstrate the ability to broaden their skills and think in an interdisciplinary manner. Course work in subjects such as biology, geology, hydrology, or toxicology would be indications of such abilities.

JOB OUTLOOK ► Because of increased government regulations, job opportunities for environmental chemists continue to grow. Despite downsizing, companies are placing greater emphasis on compliance and environmental processes. Opportunities exist for chemists to move into various areas of expertise outside a traditional job in the lab. For those also studying law, business, or public policy, opportunities can be found in the regulatory area as well as in health and safety.

The field is expanding to include nontraditional employers. Opportunities are expected to grow in contract labs and consulting, because businesses are increasingly outsourcing this work.

SALARY RANGE ► The starting salary for a Ph.D. chemist is in the \$70,000-per-year range in industry. For master’s chemists, \$40,000–\$50,000 is an average starting salary. Bachelor’s chemists can earn from the mid-\$30,000s to the low \$40,000s.

An individual going into the regulatory side of environmental chemistry is likely to start at a higher salary and continue to be paid more because these jobs are more high-profile and require taking responsibility for a company’s liability. Although the work an analytical chemist does to reduce contamination is important, the chemist–regulator who negotiates a company out of trouble will receive more recognition and better compensation.

FOR MORE INFORMATION

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U.S. Environmental Protection Agency Regional Offices
(Check the government section in your local telephone book.)

WHAT YOU CAN DO NOW ► Because career choices abound, students should think about the type of work that interests them and what discipline, besides chemistry, they want to emphasize in school. Since many colleges have environmental sciences or environmental engineering programs, students can investigate potential employment areas before entering the job market. Environmental chemists in industry also suggest reading environmental journals such as the American Chemical Society’s *Environmental Science & Technology* and taking courses in industrial chemistry and chemical engineering.