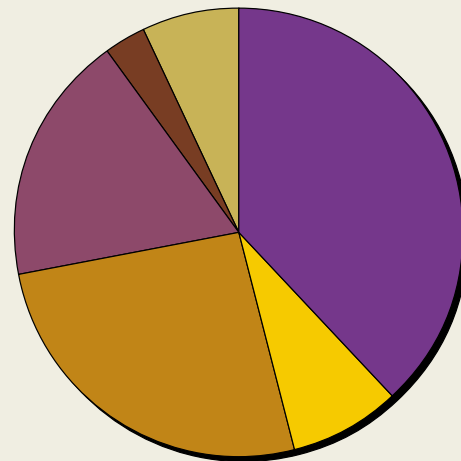


Cover image: This SEM picture depicts a dividing prostate cancer cell. Biochemists study the growth and replication of cancerous cells in order to develop possible new treatments for cancer patients. The image, taken by Stephen Gschmeissner, is reproduced courtesy of the Visions of Science Photographic Awards. The image was an award winner in the 2001 Novartis/Daily Telegraph Visions of Science Competition (see www.visions-of-science.co.uk for further information and details of how to enter the 2002 awards.)

### What do biochemistry graduates do?

The information on first jobs after graduation shown below was obtained from the annual survey performed by the Biochemical Society on first degree students who graduated in biochemistry in 2000 from colleges and universities in the UK. More details can be found on the Biochemical Society web site at <http://www.biochemistry.org>

The largest proportion of new graduates moved on to further biochemical study or training, mainly registering for M.Sc. or Ph.D degrees. Experience suggests that the majority of these will eventually make a career in scientific research. Of students completing M.Sc and Ph.D degrees in 2000 less than 2% were unplaced.



- Biochemistry Training (38%)**
- Non-Biochemistry Training (8%)**
- Biochemistry Employment (26%)**
- Other Employment (18%)**
- Seeking Employment (3%)**
- Other (including overseas, year out etc.) (7%)**

Those entering careers based directly on their biochemical training composed the second largest group. Many went into industrial research in the areas shown overleaf. However, about a quarter of the total graduates entered non-laboratory work requiring a biochemical background, such as management, sales or marketing in science-based industry, information science, editorial work, or patenting.

A significant number either trained for, or took, graduate jobs requiring no specific scientific knowledge, such as accountancy, retail or general management or the Civil Service, showing the good general employment prospects.

Only 3% of students were known to be unplaced 8 months after graduating and were actively seeking employment. Others were taking time out, for instance, to travel, to bring up a family, or working in temporary jobs whilst evaluating their longer-term careers, or were overseas students returning home.

Training in biochemistry opens the door to an exciting and rewarding future with a broad range of career possibilities and excellent employment prospects.

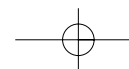
### Think about it!

For more information contact  
**The Education Section,  
The Biochemical Society,  
59 Portland Place, London W1B 1QW  
Telephone: 020 7580 5530**



BIOCHEMISTRY

what?  
why?  
& how?



## What is biochemistry?

Biochemistry is the 'Chemistry of Life' and is central to all areas of the Biological or Life Sciences. Biochemistry offers the tremendous challenge of seeking to understand the most fundamental of life's processes at the molecular level, and to utilise this knowledge for the benefit of mankind. It is a practical laboratory science that applies the molecular approaches of chemistry to the vast variety of biological systems.

Biochemistry is closely linked with other specialist life sciences, such as Cell Biology, Genetics, Microbiology, Molecular Biology, Physiology and Pharmacology. In fact, in many cases the distinctions between these disciplines are becoming increasingly blurred. They use biochemical techniques and biochemists work in all these areas.

Biochemists, working with colleagues in other disciplines, have developed advanced technologies that have enabled the Human Genome to be sequenced. Other important applications of genetic technologies include the production of therapeutically important human proteins such as insulin and blood clotting factors by cloning procedures; the identification and possible remedying of genetic problems; and the use of DNA fingerprinting in forensic science. The increased knowledge being obtained on how stem cells can be encouraged to differentiate selectively into various cells in the body offers the promise of being able to replace or regenerate damaged cells, for example in brain or spinal cord injury.

## What does a biochemist do?

Biochemists work at all levels of complexity from single molecules, through to cells and whole organisms. With knowledge of the most essential molecular mechanisms, biochemists study how life processes are integrated to allow individual cells to function and interact to form complex organisms. They work with all sorts of organisms, from viruses and bacteria to plants and man.

Biochemists identify biological problems then develop and apply appropriate techniques to solve these problems at the molecular level. For example, they might study the way in which DNA, which carries the genetic information, is transferred between cells and can be manipulated in order to provide a potential remedy for a genetic disorder.

Or they may study the way in which a particular gene affects the organism as a whole. The way in which DNA directs the production of proteins within a cell is also an important field of study for biochemists. Proteins have diverse functions, such as catalysing biological reactions (enzymes), carrying oxygen around the body (haemoglobin), protecting against infection (antibodies) and providing structure for the body (collagen). Using both simple and high-technology methods, biochemists work out how these proteins function. Biochemists also develop methods for making use of proteins, such as enzymes in biotechnology and antibodies in hormone analysis. These are just a few examples of the areas in which biochemists work. It would take a whole book, in fact many books, to do justice to the multitude of roles of biochemists.

- Want to contribute to future life science research?
- Want to contribute to the future of medicine?
- Want to contribute to the future of the environment?

If so, biochemistry could be for you.

## How do I become a biochemist?

Biochemists are employed at all levels, from school leavers to experienced researchers with Ph.D. degrees. It is possible to enter as a laboratory technician straight from school, but in this case you would usually continue to study part-time (e.g. for a BTEC qualification on 'day release') while working.

A degree, however, is now becoming the norm for employment. After studying science — chemistry, but not biology, is essential — at school or college (e.g. AS/A2, vocational A-levels, Scottish Highers) you can enter a degree course in biochemistry or a closely related subject. Most universities in the country offer a degree course in biochemistry, or one in which biochemistry is a major component. It is important to read the prospectuses carefully to find out what each course involves. The emphasis can be quite different depending on factors such as the other science disciplines taught by the university and the research interests of the staff. Many universities offer sandwich courses, which give the opportunity to spend a year working in industry, and are considered to be very beneficial for a student.

Because biochemistry is a research-based discipline many graduates continue into post-graduate training. This can involve taught courses, such as a specialist M.Sc.

(usually one year, e.g. in Clinical Chemistry, Forensic Science or Molecular Parasitology), or research for writing a thesis for an M.Phil (one or two years) or a Ph.D. (three or four years). Holders of these degrees usually go on to be the researchers of the future.

## Who employs biochemists?

Biochemists work in many walks of life — in industry, hospitals, agriculture, research institutes, education and associated areas. There are many aspects of everyday life as diverse as medical products and diagnostics, new food and its safety, crop improvement, cosmetics and forensic science that owe their development or even existence to biochemists.

## Industry

Pharmaceutical, food, brewing, biotechnology and agrochemical companies all employ biochemists to develop new products and to monitor the production, quality control and safety of existing ones.

## Medicine

Hospitals, public health laboratories and medical research institutes, as well as the pharmaceutical industry, all require biochemists. Here they provide a diagnostic service, carrying out tests on blood, urine and other body fluids, alongside researching the underlying causes of disease and the methods of treatment.

## Agriculture and the environment

Biochemists and biotechnologists working in agriculture have been responsible for many developments, such as pest-resistant crops, improvements in crop yields and foods that keep better. Environmental biochemists often work with marine organisms as well as look at the biochemical effects of chemical pollutants on plant, animal and marine life. Employers in agriculture and the environment include seed companies, environmental agencies, local government, the Civil Service, and water authorities.

## Education

The combination of biology and chemistry, along with the training in numerical and analytical skills that is given in any area of science, makes biochemistry ideal for teaching throughout the school age range. At present school science teachers are in great demand. There are also opportunities for more advanced teaching, usually associated with research, in universities and colleges, and medical, dental and veterinary schools.

## Away from science

A science background can be an excellent starting point for many other careers. Biochemistry is a numerate subject that develops analytical thinking, creativity in problem solving, and the ability to handle large amounts of complex information - skills required in jobs in all walks of life including, for example, sales and marketing, accountancy and finance, journalism, and patent work.

Biochemists have become successful popular authors\* and even a national president†!

## Why study biochemistry?

Those who make a career in science find it endlessly fascinating and very rewarding intellectually. There is a large demand for scientists - the Government wants more scientists and technologists in all walks of life to take advantage of recent advances in knowledge.

Job prospects are good - the low unemployment rate of new biochemistry graduates compares well with that for biological sciences as a whole and for new graduates overall source: (*First destinations of students leaving higher education institutions, 2000/01* Higher Education Statistics Agency).

\*Isaac Asimov the science fiction author

†Chaim Weizmann the first president of Israel