



**BIOCHEMICAL
SOCIETY**



BIOCHEMISTS IN INDUSTRY



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INTRODUCTION

Deciding what to do after graduating can seem overwhelming with the wealth of opportunities available. Some graduates may decide to remain in education and pursue a post graduate degree whilst others may move into employment. There are many science-based careers where you can use your specialist skills and knowledge; some of these careers can be found in industry

What is industry?

INDUSTRY is a broad term that refers to companies and organizations which produce goods that can be sold for profit, one of the most well-known being the pharmaceutical industry. For a biochemist (bioscientist), there are a wide range of different careers available in various industries, ranging from research and development to sales, marketing and management.

Biochemists can be found working in numerous areas of industry. These are the eight areas defined as industry by the Industry Strategy and Working Group:

- Drug discovery
- Consumer goods
- Diagnostics industry
- Clinical biochemistry
- Service providers
- Biomaterials
- Agrochemicals
- Food formulation

Within these sectors there are many opportunities for biochemists to be part of cutting-edge research and to develop the next life-saving medicine, superfood or product. Research and development in industry differs from that done in academic research institutions; traditionally in academia the pursuit of knowledge drives the project rather than the desire to create a product. However, this distinction is becoming blurred as collaboration is becoming more common.

The face of industry consists of more than just large-scale companies, such as the drug company giants or well-known food brands. More and more small-and-medium sized enterprises (SMEs) are emerging in every sector and changing industry across the UK and the globe. SMEs will, by definition, be smaller than the large corporations, employ fewer people and have a lower turnover. However, SMEs often fill a niche gap and provide expertise in producing certain products or mastering particular techniques and technologies, meaning they often work with larger companies. If you choose to follow a science-based career in industry, there are many opportunities and environments available to you.

Drug discovery

The role of the pharmaceutical industry is to design and create new medicines to treat a range of health conditions. The pharmaceutical industry employs around 70,000 people in the UK, with approximately 20,000 working in the research and development departments*

It takes many years to create a new medicine so research and development is a vital part of the industry. The drug discovery field in the pharmaceutical industry can be separated into those which produce small molecules and those which produce biopharmaceutical products.

There are many aspects to drug discovery and development that require different expertise and techniques. With changes to drug discovery in recent years, some companies now outsource certain parts of the drug development process to contract organizations. Contract manufacturing organizations (CMOs) assist with optimizing the formulation of a drug and scale up the production for general sale. Another option is to use contract research organizations (CROs) which sometimes conduct the necessary trials to get a drug approved.

As a biochemistry (bioscience) graduate, the knowledge and skills that you will have obtained throughout your degree will allow you to work in many of the stages in the drug discovery and development process (Table 1). This ranges from identifying possible drug targets in a disease to the formulation of a drug and researching the field of personalized – or stratified – medicine. It is important to note that a strong base in developing experiments, practical lab experience and analysis is often required.

Entry into the drug discovery industry requires evidence of good practical research skills. This could be achieved with industrial work experience, either through a summer internship or as part of an integrated degree.

Alternatively skills can be developed by conducting a laboratory-based research project as part of your final-year dissertation

SMALL-MOLECULE DRUGS:

Chemicals with a medicinal effect.

BIOPHARMACEUTICAL PRODUCTS (ALSO REFERRED TO AS “BIOLOGICS”):

Large-protein molecules such as antibodies and hormones with medicinal effects.

project or a Master's degree. In addition, technical knowledge in the key areas of drug discovery will also serve as an advantage. Considering the modules available to you during your degree, and opportunities to learn about enzyme kinetics, pharmacodynamics, pharmacokinetics and toxicology will be beneficial for a career in drug discovery.

The larger pharmaceutical companies will offer highly competitive graduate schemes. These schemes will provide on-the-job training, with some offering rotation through the different departments of the company or extra qualifications. Details can be found on company websites, graduate job websites and recruiting companies.

However, there will be many entry-level jobs available for graduates at a host of different companies, where you will still gain relevant experience.

*Source: ONS Business Enterprise Research and Development, 2012. ONS Annual Business Survey 2012 (provisional), Section C, Manufacturing, Release date 14 November 2013 – From ABPI website

Table 1: Details of drug discovery stages and relevant skills needed for these areas

DRUG DEVELOPMENT STAGE	SKILLS REQUIRED
Target discovery Identifying a target (receptor, enzyme, signalling molecule) in a disease state.	Signalling, enzymology and receptor theory, molecular pathology, biochemical basics, assay design, analytical skills and statistics.
High-throughput screening Determining which compounds affect the target. Can also determine potency and side effects of selected compounds.	Assay design, analytical skills and statistics. There will also be an element of bioinformatics.
Structural biology/computational chemistry Assessing the structure of the compound or the target to find the most appropriate drug candidates.	Structural biochemistry, crystallography and physical techniques, systems biology, bioinformatics and analytical skills.
Pharmacology Consists of both pharmacodynamics (looking at physiological change caused by drug) and pharmacokinetics (looking at what the body does to the drug).	Pharmacokinetics and drug metabolism, biochemical basics, assay design, analytical skills and statistics.
Toxicology Determining any side effects of the drug and whether there are any restrictions on use (such as not during pregnancy). It is also used to calculate the minimum and maximum dose.	Toxicology, biochemical basics, systems biology, assay design, analytical skills and statistics. You will also be working with <i>in silico</i> , <i>in vitro</i> and <i>in vivo</i> models.
Formulation The final form the drug will be in (e.g. tablet or cream, quick- or slow- release, shape, colour, size and taste).	Pharmacokinetics and drug metabolism, biochemical basics, assay design, analytical skills and statistics.
Phase I clinical trials Testing the safety and tolerance of the drug in a small group of healthy people.	Pharmacokinetics and drug metabolism, biochemical basics, assay design, analytical skills and statistics.
Phase II and phase III clinical trials Testing the drug in a large number of patients to determine whether the drug has a beneficial effect on the disease.	Pharmacokinetics and drug metabolism, molecular pathology, biochemical basics, bioinformatics, assay design, analytical skills and statistics.
Pharmacogenomics Determining the individual differences in drug effectiveness and tolerance.	Molecular pathology, bioinformatics, systems biology, biochemical basics, assay design, analytical skills and statistics.



Case studies

DR GISELLE WIGGIN

Principal scientist at Heptares Therapeutics



I always wanted to be involved in medical research and drug discovery, particularly after spending time working in my father's pharmacy. I studied Natural Sciences at the University of Cambridge, specializing in Biochemistry in my final year. My final-year project investigating the role of integrins in platelet activation prompted me to pursue a research career.

Heptares Therapeutics is a structure-based drug discovery company focusing on G-protein coupled receptors (GPCRs). I work as part of the Protein Engineering team, where we develop assays to measure GPCRs thermostability, before stabilizing the receptor in a particular conformation, using mutagenesis techniques, to generate a StaR® (Stabilized Receptor).

One of the best aspects of working at Heptares is the ability to follow the drug discovery process from the very beginning to the end point when successful compounds enter clinical trials. Working in a smaller company is more likely to give you this type of complete overall view than a position in a large pharmaceutical company. I also really enjoy working with other scientists from across the disciplines represented at the company. I need to work both independently and as part of a team.

Skills needed for a job like this include the ability to maintain a clear focus on the goal of each project, with the ultimate aim of working for the success of the company, not just one's own career. Being organized and able to manage one's time effectively are also key qualities.

My advice would be to look at start-up biotechnology companies for a collaborative and interactive working environment. Although young companies can be a higher-risk career option, this can be balanced by more opportunities to progress. Keep an eye on all aspects of the media, including the financial press, to gain information about new biotechnology companies.

Getting as much lab experience as possible is always positive, look for summer research projects or work as a technician to develop skills and confidence.

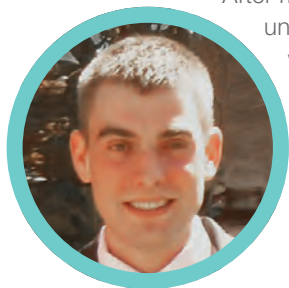




I did my undergraduate degree in Biochemistry as I was particularly interested in understanding the biological process at a molecular level. I was more attracted to the structural biology and enzymology modules of the course and the lab where I carried out my final project developed a physics approach to understand cellular mechanisms. It was a really rewarding experience to work within a multidisciplinary team including physicists and biologists and I enjoyed it so much I decided to continue and carried out a Master's and a PhD.

My PhD was an applied research project at the interface between enzymology and biophysics and it involved collaborating with chemists to progress the project.

After my PhD, I was unsure whether I wanted to remain in



academia or work in industry. I then had the opportunity to work for a biotechnology company where I produced and characterized protein drugs aimed at developing anti-tumour and viral vaccines. However, I did go back into academia to complete postdoctoral training in structural biology to gain experience in protein crystallography. Now, I work for Evotec in the Structural Biology department where I use all of the skills gained throughout my undergraduate and beyond.

My current role involves supporting the Medicinal Chemistry department's efforts in findings new drugs. My role within the Structural Biology department is to provide molecular insight of how the drug binds to a specific protein target by performing protein crystallography experiments. I also produce protein reagents for assays or for biophysics studies. The findings are regularly reported to the other members of the

project, made up of medicinal chemists, assay biologists and pharmacologists, as well as the clients.

Project management skills become important when you have to deal with examining the binding properties of compounds from the chemists, delivering protein reagents to support other activities such as biological assays as well as being responsive to client needs. When you work with scientists from different backgrounds, as well as clients, it is also essential to communicate adequately.

Every project brings its own challenge to solve and it allows you to learn a lot from the talented colleagues you work with. I am always delighted when, as part of a team, a solution or a drug candidate is found so the project can move forward to the next step.



DR EDWARD BEAUMONT
Senior scientist at Evotec

Producing consumer goods



Consumer goods are products which are available in their final form (no further manufacturing or processing required) and can be used by the general public

BIOSURFACTANTS:

A surfactant that is produced by microorganisms. A surfactant helps to bring together a fatty, oily substance with a normal liquid. Surfactants are used a lot in shampoos (making the lathery foam) and biosurfactants are better for the environment than artificial surfactants.

FUNCTIONAL FOODS:

Foods which provide health benefits. These include vitamins, pre- and pro- biotic foods and antioxidants.

There are a lot of sub-sectors within this industry, such as the car industry, production of smart phones and the clothing industry. The main sub-sectors of consumer goods with a biological basis are:

- **home care, such as household cleaning products**
- **personal care, such as cosmetics**
- **food and drink, such as functional foods**

Due to the diverse range of products which fall under these sub-sectors, the nature of research you can be involved with will vary. This gives you the freedom to explore an area which interests you, as the majority of consumer goods employers accept a range of degrees. The research you do can be for any

stage of the product development, from mechanisms of aging for anti-aging products, to the quality control of a cleaning spray which claims to kill 99.9% of germs. In addition, you can also research the components which will be in many products in order to make these more effective; for example, biosurfactants.

Graduate schemes are available with some of the industry leaders, which will focus on a particular part of the consumer good manufacturing process. A good degree (and in some cases A-levels or equivalent) and related experience is desirable, but evidence of innovation and creativity will also be an advantage. This is because you will need to create new products based on the needs of the consumer. In addition to good communication skills, strong analytical skills are a cornerstone in research and development as you will need to make sense of the results you are generating.

Diagnos**t**ics industry

monitoring health
and disease



The diagnostics industry produces equipment, testing kits and monitoring devices to help assess and monitor health and diseases

These range from medical equipment such as ultrasound machines and heart monitors, to testing kits such as pregnancy tests and blood glucose test strips, through to devices such as insulin pumps and pacemakers.

The creation of products within this sector will involve different types of research. An in-depth understanding of a health and disease is vital in order to make testing kits and monitoring devices. Identifying markers in the body (e.g. glucose, hormones or fat) and how they change in diseases allows those working in the sector to create a targeted test. Good lab skills will be important, as will knowledge in biochemistry, immunology and pathology; microbiology and histology may also be an advantage.

The sector consists of many SMEs which assist and collaborate with research institutions to produce testing kits and devices. In addition, validation of a testing kit will require trials, so knowledge of good clinical practice may also be beneficial.

TESTING KITS:

Look for a particular substance in the body to indicate the presence of a disease; for example, high cholesterol in the blood for cardiovascular disease, high blood glucose for diabetes. Kits can also look for the presence of particular bacteria, important for diagnosing superbugs in hospitals.



DR BEN CHAFFEY

Clinical operations and business development manager at Biosignatures

“ I can't remember a time when I wasn't interested in science and technology. When I first came to university I was considering studying medicine and I chose a degree which would both support this goal and build upon my interest in chemistry and biology. My first degree was a BSc in Molecular Biology, a course which gave me a good basic level of knowledge across a broad range of life science subjects.

In my final-year project I investigated chemokine activation of the mitogen-activated protein kinase signalling cascade in leukocytes, a topic which I was fortunate to continue research on during my PhD in Applied Immunobiology. Having completed my PhD and a subsequent academic post-doctoral position I decided to move out of academia and into industry. I applied for vacancies in a wide range of industrial sectors including small biotech, big pharma and *in vitro* diagnostics, finally settling on a diagnostics research and development position.

Currently, I work at Biosignatures Ltd., an innovative medical informatics company which develops products that help improve and guide disease diagnosis and treatment. This is

accomplished through the discovery and validation of protein biomarkers in blood samples which are indicative of disease state. My current range of responsibilities is very varied, ranging from setting up a protein biochemistry and proteomics research laboratory, through to design of clinical studies and grant application preparation, to project management and even writing copy for the company website. I have regular contact with a wide range of professionals from both public and private sectors such as other bio-scientists and clinicians, software engineers, lawyers, real-estate and infrastructure experts plus marketing and PR staff.

As I frequently work with a wide range of people, effective communication skills are vital. Similarly, in an operational management role, good project design and management skills are necessary – as is the ability to know what pieces of work to prioritize when several projects are active simultaneously. Research and analytical skills are also very important when identifying and evaluating potential research opportunities.

As Biosignatures is a small company with a limited number of personnel, I often

contribute to topics such as sales and marketing and investor relations, as well as my core biosciences activities. I've found this variety of activities particularly interesting and it has increased the breadth of my business management experience enormously. However, a downside of working for a smaller business is that there can be considerable time and resourcing pressures, which is why good project management skills are important.

In terms of the future, I hope to grow the business beneath my management level or possibly move to another organization at a similar or more senior level. There is much less of an established career structure in small biotech, which means you are more the master of your own destiny, but it can also make long-term planning difficult!

My advice for anyone wanting to move into diagnostics is to check out the websites of the Bio Industry Association (BIA) and British In Vitro Diagnostic Association (BIVDA). Send out some speculative applications and pick projects that sound interesting. Try to be flexible and don't be too shy!



Clinical biochemistry

Clinical biochemists working in a healthcare setting may come into contact with products from the diagnostics industry

Using automated systems, clinical biochemists carry out tests on blood, urine and other bodily fluids to help diagnose various diseases. In addition to carrying out tests, clinical biochemists are also involved in research to try to identify new biomarkers or to develop new diagnostic tests for a particular disease.

To work as a clinical biochemist you will need to complete an NHS Scientist Training Programme, but there are limited places available so this is highly competitive. Alternatively, you can pursue a career as a biomedical scientist, for which accreditation is needed. The Institute of Biomedical

Science can inform you what extra training you need to complete to become an accredited biomedical scientist. As biomedical scientist is a protected title, you will also need to register with the Health and Care Professions Council (HCPC) in order to be employed.



ERIN MOZLEY

Senior Clinical Scientist St Thomas' Hospital London

“ Like many young people, I wanted to do such a variety of things, and I eventually settled on science when I was deciding what A-levels to take. I accepted a place for an undergraduate Master's degree in Biochemistry (MBiochem) at Oxford University. During my degree, I completed two summer projects; one was in a diabetes research group at the Churchill Hospital in Oxford – this gave me a glimpse of the importance of biochemistry in a clinical setting.

I attended a science careers fair and saw the NHS stand where I discovered clinical science. It was something that really appealed to me because of the satisfying mix of biochemistry and medicine. I applied for the NHS training scheme and was successful at getting a position at Southampton General Hospital. My training period lasted just over 3 years and included a funded MSc in Clinical Biochemistry. Whilst in Southampton, I developed a specific interest in metabolic biochemistry and I applied for a job as a senior clinical scientist in the Inherited Metabolic Disease lab at St Thomas' Hospital.

The main duty of a clinical scientist is applying scientific principles to clinical knowledge, to enable helpful interpretation

of test results to aid the clinician's investigation of their patient. In practice, this involves ensuring that the protocols and machines used in the laboratory are producing accurate and precise results. We interpret the results produced so that the clinicians are given a helpful 'answer' to their enquiry rather than just a number. An average day as a clinical biochemist may include commenting and authorizing results, answering queries from clinicians and colleagues and reviewing machine performance by looking at quality control and quality assurance procedures.

We also attend weekly meetings, attend ward rounds or clinics with clinicians, prepare and give talks to departments, and work in the lab either on routine patient analyses or a small research project. My favourite aspect of the job is the day-to-day variation, including an ideal mix of computer work and interpretation with practical laboratory work. There are new scientific discoveries every day and the great thing about clinical biochemistry is that you are directly involved in how those discoveries are being applied to diseases. There is also a clearly defined career path; you do 3–4 years' training including the MSc, work your way to senior and principal

posts, and many people take further exams to progress up the career ladder. Specializing is also an option, whether this is into a subset of biochemistry, getting involved in academic research, or obtaining a more general managerial position.

Organizational skills are required as the job is often very varied with many different tasks or projects ongoing at the same time. The main focus of the job is to provide the clinicians with the test results within a reasonable time frame, and this takes priority. It is also important to keep up-to-date with recent scientific discoveries and develop better techniques. Communication skills are also required as you interact with clinicians, other scientists, and patients. Presentation skills to a wide variety of people are also key.

I would advise anyone looking to apply for the NHS clinical scientist training programme to look around hospital labs, talk to clinical scientists, and find out exactly what the job entails – it is very important to demonstrate an understanding of what clinical biochemistry actually is. Work experience in a lab is great but not essential as it can be very difficult to organize.



Biotechnology

securing our future

As non-renewable resources run out and the population continues to grow, the way in which we heal, feed and fuel the population needs to be addressed. In order to meet these challenges, biotechnology and its applications are increasingly being turned to

Biotechnology is technology with a basis in biology – this could be cells, proteins or genetics. This exciting and rapidly developing sector brings together many disciplines and may lead us towards a more sustainable future.

Healing – biomaterials

As healthcare and life expectancy improves, developing technologies to keep us healthy and functioning will be vital. Biomaterials are materials which can be used in close contact with the body and their potential uses could revolutionize medicine. Biomaterials can be used to help repair, regenerate or replace a part of the body; well-known biomaterials include hip replacements used to replace a broken hip. There are many different areas of research in biomaterials that you could be involved in (Table 2).

Table 2: Brief description of the research areas in the biomaterials industry

BIOMATERIAL RESEARCH AREA	BRIEF DESCRIPTION
Drug delivery/nanotechnology	Targeting where drugs are delivered and act in the body. Nanotechnology also provides new ways to treat disease.
Tissue engineering	Uses cells and engineering in order to produce tissues or whole organs that can repair or replace a damaged body part.
Artificial tissue/organs	These are tissues or organs that can be created via tissue engineering, or are made completely of synthetic material (e.g. mechanical hearts for patients awaiting a heart transplant).
Prostheses	Replacing a body part with an artificial device (common examples are replacing missing limbs).
Implants/surgery tools	Can be synthetic materials to replace a broken/ damaged body part (e.g. hip bone replacements, spinal discs and teeth).
Surface modification/coating	Altering the properties of a biomaterial to produce a desired result. For example, coatings to reduce infections or promote growth of blood vessels. Important also for implants of engineered tissues to reduce rejection.
Bioadhesives	Investigating biological adhesives to assist with wound closure and healing.
Biological materials	Investigating and creating materials for use in the body which may also give beneficial properties.



Research in biomaterials requires a multi-disciplinary approach as engineers, biologists and chemists will work together to make a suitable product. Therefore, it is advantageous to gain experience or qualifications that are cross disciplinary. There are both Master's courses and PhD courses available which will give you both specialist knowledge and lab skills; note that some 4-year PhD programmes will have an integrated Master's year.

Feeding – plant biotechnology

With the world's population increasing at a high rate, ensuring that there is enough food available in the future will be essential; this is called food security. Problems facing us include climate change, the reduction of farming land and diseases affecting crops. because of this, scientists are working on increasing the amount of food produced,

the ability to grow food in poor conditions (such as drought or poor soil quality) and making food more nutritious.

Research in this area has a large basis in molecular biology as scientists try to identify key genes to assist food production, so having a good understanding of genetics and molecular science is important for those working in the area. Research into nutrition and health needs will also be important as fortified foods also help to reduce deficiencies and illness. There are a range of PhD courses available in food security which cover the entire food production process and health outcomes.

Fuelling – biofuels and replacing non-renewable resources

Finding alternative sources of fuels and materials that are sustainable, renewable

and generate low carbon emissions are a priority for our future. Biofuels are already in use (such as ethanol), but there are moves to try to generate fuel from non-food waste products. In addition to renewable energy, there are also calls to replace fossil fuels as the starting material for most man-made materials (such as plastic) to those which have a biological basis.

Research in these areas focuses on finding and utilizing enzymes or micro-organisms to convert substances into products that we need, or to increase the efficiency of industrial processes. Molecular skills and an understanding of cellular reactions and protein functions will be advantageous. There are a range of Master's courses which will provide both practical skills and specialist knowledge in the area.

Service providers

making lab supplies

Everything that you find in a lab, in both industry and academia, will be produced by a service provider. Service providers produce the equipment (e.g. pipettes, plastic-ware, centrifuges, spectrophotometers), chemicals and biological reagents (e.g. enzymes, antibodies, DNA) that are needed to carry out research

Biochemists will primarily be involved in producing biological reagents, and may work with engineers if equipment and reagents are sold together. Exceptional lab skills are needed in order to create the reagents that will be used in research. Entry into this area will often require prior work experience in industry and a higher degree, such as a Master's, in order to create the specialized products. Some larger international companies offer internships, and these may be outside the UK.

In addition, a range of companies also accept speculative applications, so contacting these companies with a CV and cover letter is a good idea.

As with other consumer focused industries, showing an understanding of the needs of the consumer will be an advantage.



Case study



DR KATHERINE LAU Application scientist



At 17, I got introduced to stem cells and wanted to be a stem cell researcher because of the enormous potential to use stem cell technologies to provide cures for a whole host of diseases. My first degree was in Biological Sciences and I specialized in Developmental Biology. I did an MSc in Biomedical and Forensic Studies in Egyptology, which was a fascinating course. After my MSc, I realised that a PhD could help me further my career in science.

For my PhD, I worked on developing a novel method to identify stem cells involved in wound healing using vibrational (FTIR and Raman) spectroscopy. I then started working at Renishaw plc as a Raman spectroscopy application scientist, specializing in life sciences applications. I was particularly attracted to my position as they were looking for someone with biological sciences and vibrational spectroscopy knowledge. I get to combine

all of the skills I have previously acquired, put them to use and also contribute to business development and marketing.

I have several main responsibilities in my role: developing new applications, marketing, assisting sales, training and product development. I carry out research to demonstrate how Raman spectroscopy can benefit life sciences research. I work to help make sense of the biochemical information obtained by Raman spectroscopy for biological research. In addition, I generate promotional literature, such as videos, and flyers, for our sales force to use, and also advise them on how to approach customers in the life sciences arena.

By understanding both the biologists' language and the engineers' requirements, I can help bridge the gap between the end users and the engineers. I enjoy most of the aspects of my job, in

particular the research and collaboration elements. I like that I can use my scientific knowledge and analytical skills. I also enjoy presenting my results at conferences and promoting the benefits of our technologies. I am in a great position to go out and exchange ideas with other scientists and come back to relay the ideas to our engineering teams to make things happen. It is also great to travel to different countries with work as I get to see places that I would otherwise not have thought about visiting. In addition, I enjoy learning the commercial aspects of the spectroscopy business.

My advice for those wanting to move into the field is to talk to different people in the industry at shows or conferences to get more insiders' insight. Getting experience in scientific techniques and using opportunities to polish your presentation, scientific writing and time management skills will be an advantage.





Skills and work

Graduating from university with a biochemistry degree provides you with a great skill set and knowledge base to enter many different careers, and choosing a career path is not a decision that you make only once in your lifetime. As you move through different jobs, gaining and developing knowledge and skills, you may reassess which direction you wish to take. To help focus your search, it is important to evaluate both your experiences and transferable skills, remembering that you are unique in what you can offer a company

Relevant work experience can help to develop your specialist skills and knowledge, and allow you to see whether you like a job role. It will also equip you with a good base of experience to reference as examples of work in answers to interview questions. Finding work experience can be challenging, but talking to your university careers service and looking online for internships or placements is a good place to start.

Approaching smaller companies and showing interest may be easier than with a larger organization, so research the companies near you and be proactive.

However, any work experience – such as a part-time job during your degree – will still provide you with valuable skills that you can apply to any job role.

Transferable skills are those which can be used in more than one job role or setting. These skills will often be listed in job descriptions (sometimes referred to as competencies), and certain key skills come up frequently. Therefore, it is important to understand what the skill means (Table 3) and give an example to show an employer that you have it. If you lack a particular skill, or it is underdeveloped, there are ways to gain them without having to do related work experience.

At every stage of your career, consider which skills, or aspects of your job, that you enjoy the most. Guiding your career to suit both what you like and what you are good at will make it a more rewarding experience and you will be more likely to excel. Your career path is not fixed, and this is why an understanding of transferable skills will enable you to change and develop your own path

Table 3: Transferable skills with examples

TRANSFERABLE SKILLS	DESCRIPTION OF SKILL	EXAMPLES OF SKILLS IN ACTION
Communication	Verbal or written, it is the transfer of information. An important part of communication is also listening.	Outreach work with the local community, customer service based roles such as retail, working on a student newspaper/blog, writing reports.
Problem solving and creativity	Being able to think logically, and creatively approach a task to successfully complete it. This also helps to show that you are independent.	Developing new procedures to streamline a project, thinking on your feet when things don't go to plan.
Analytical and research	Being able to gather and critically assess information.	Assignments at university. Final-year project in your degree, lab reports.
Initiative and self-motivation	Thinking about a task and taking action without instruction at every step. The self-motivation will indicate that you are a hard worker and keep to a task.	Organizing a study group, organizing a fundraising event, practising a musical instrument.
Leadership and management	Taking responsibility for a team and keeping members on task and meeting deadlines.	Running a sports club or society and managing a committee or group.
Teamwork	Being a reliable and supportive member of a team in order to deliver an output.	Part-time job, group assignment, volunteering, getting involved in sports teams or university societies.
Planning and organizational/ time management	Being able to plan, manage and prioritize multiple tasks and complete them by a deadline.	Coursework deadlines, organizing an event, managing extra-curricular commitments and your degree.
Interpersonal	Also called "people skills". Ability to interact with a range of people in a professional manner, and to be approachable.	Mentoring, dealing with customer requests, being part of a team, outreach work within your community, working with different groups of people for a project.
Computer and technical	Confidence in using IT and particular scientific techniques.	Using Excel to manage budgets, producing a blog, lab experience gained through your degree.



Future career paths

Your career and the path it takes will be unique to you. From the basis of biochemistry, you have the potential to excel in industry, potentially becoming the head of a research department, or even your own company. As you progress you will gain skills and knowledge that you can lend to companies in the form of consultancy, seminars or outreach work. If you choose to move away from science, the transferable skills you develop will allow you to apply for communication roles, marketing and sales, management and finance, to name a few. Your potential and the possibilities open to you are far-reaching, and biochemistry is a great starting point

Case study



DR JON DAY

Director of Cerebrus Associates

“ I studied Applied Zoology BSc (Hons) with Agriculture. The degree programme included modules in biochemistry and physiology which provided a foundation of knowledge that I have applied throughout my career. After graduating, I completed a PhD in the behavioural nutrition of pigs. The research enabled me to gain my first postdoctoral position studying the psychobiology of eating behaviour in humans. Afterwards, I moved back into agricultural research for 6 years, where I conducted pig production research in support of UK and EU policy making. At this point I became highly interested in working in the animal feed sector and made a career move into industry.

Industrial research and development is a fast-paced and well-resourced environment. The results of the science are often applied very quickly and can have a very large impact. My first role of this type was as a Technical Manager for

a global feed manufacturer. I supported customers in the UK, EU and far eastern markets. This job acted as a spring-board to apply for a much more senior role in the pet food sector as the Head of Behavioural Science for another global company. Throughout my career, I had always wanted to set up my own business and I left my job to start my own research and consultancy company. Today I work as the Director of Cerebrus Associates Limited.

Within Cerebrus Associates I oversee the management of the business, win new contracts and interact with our key clients. I often work at quite a strategic level; deciding what should be done and why rather than doing it myself. Much of my work for clients involves helping them manage risks and get the best return on their research investment. One of the key areas of value that we offer to our clients is the large network of contacts the business possesses. My work brings me

into contact with scientists, policy makers, politicians, business leaders, and managers from across the globe.

To run your own business successfully, a broad portfolio of skills are required. However, the top skills include scientific knowledge, leadership, communication skills, interpersonal skills, customer focus and drive for results.

The favourite part of my job is the personal interaction. Consultancy is best conducted face to face and I enjoy working in a number of different environments with a range of different people. The most difficult part of setting up a new business is that it can be financially challenging in the first few years; profits are often reinvested to help the company grow. This does mean that you have to work long hours without much immediate financial gain. Working with clients in other time zones can sometimes lead to antisocial working hours.



Resources

General career websites

TARGETjobs

targetjobs.co.uk/

Prospects

www.prospects.ac.uk/

Milkround

www.milkround.com/

The Job Crowd

www.thejobcrowd.com/

New Scientist Jobs

www.newscientistjobs.com

Comprehensive list of science recruiters

www.kent.ac.uk/careers/sitephar.htm

General career websites (continued)

New Scientist careers advice:

www.newscientist.com/topic/careers

National careers service

<https://nationalcareersservice.direct.gov.uk>

Graduate employers

www.graduate-jobs.com/gjs/js101.jsp

Find a Master's

www.findamasters.com/

Find a PhD

www.findaphd.com/

UK science park association

www.ukspa.org.uk/

Drug discovery

The Association of the British Pharmaceutical Industry careers information: www.abpi.org.uk/our-work/careers

The Association of the British Pharmaceutical Industry members list
www.abpi.org.uk/about-us/membership/Pages/default.aspx

Biochemical Society “Biochemistry Skills for Drug Discovery” statement
www.biochemistry.org/Portals/0/SciencePolicy/Docs/Skills_for_Drug_Discovery_Position_Statement.pdf

Bayer Pharma “From Molecules to Medicine” booklet
www.bayerpharma.com/html/pdf/forschung_und_entwicklung/110713_BayerPharma_Brosch_en_web.pdf

Contract manufacturing organizations
www.bcmpa.org.uk/guide-to-services

Jobs in pharmaceuticals
www.pharmiweb.com/

Producing consumer goods

TARGETjobs advice on consumer goods industry
targetjobs.co.uk/career-sectors/consumer-goods-and-fmcg

The Job Crowd Top 10 consumer goods employers
www.thejobcrowd.com/top-companies-to-work-for/top-consumer-goods-companies-work

Guardian UK 300 top employers
targetjobs.co.uk/uk300

Careers at L’Oréal YouTube videos
www.youtube.com/playlist?list=PLsAig6bPVJxJK9stdfv7ol1Blpi3sK5L7

An interactive game by L’Oréal
www.reveal-thegame.com/

Diagnostic industry: monitoring health and disease

Report with links to diagnostic companies
www.nihr.ac.uk/documents/industry/Brochures/Medical-device-and-diagnostics-industry-partnerships.pdf

British In Vitro Diagnostics Association
www.bivda.co.uk/home.aspx

Clinical biochemistry

Institute of Biomedical Science

www.ibms.org/

Health and Care Professions Council

www.hcpc-uk.org.uk/

NHS scientist training programme

[www.nhscareers.nhs.uk/explore-by-career/healthcare-science/education-and-training/nhs-scientist-training-programme-\(stp\)/](http://www.nhscareers.nhs.uk/explore-by-career/healthcare-science/education-and-training/nhs-scientist-training-programme-(stp)/)

NHS careers – clinical biochemistry

www.nhscareers.nhs.uk/explore-by-career/healthcare-science/careers-in-healthcare-science/careers-in-life-sciences/clinical-biochemistry/

TARGETjobs Clinical Biochemistry Job Description

targetjobs.co.uk/careers-advice/job-descriptions/278965-clinical-biochemist-job-description

Prospects clinical biochemistry job description

www.prospects.ac.uk/healthcare_scientist_clinical_biochemistry_job_description.htm

Biotechnology

Useful PDF about different areas of biomaterials in EU

ftp://ftp.cordis.europa.eu/pub/hmp/docs/biomaterials_web.pdf

List of biology companies

www.bioindustry.org/home/

Overview of biotechnology (in USA)

www.bio.org/sites/default/files/ValueofBiotech.pdf

Rothamsted work experience

www.rothamsted.ac.uk/learn-with-us

Biofuels UK

biofuel.org.uk/

Skills and work experience

Biochemical Society summer vacation studentships

www.biochemistry.org/Grants/SummerVacationStudentships.aspx

Biochemical Society internship and placements information

www.biochemistry.org/Education/Highereducation/Internshipsandplacements.aspx

Transferable skills table

www.biochemistry.org/LinkClick.aspx?fileticket=LgzuE6NI84U%3d&tabid=791

Next steps booklet

<http://bit.ly/1wOuTr7>

Cogent

www.cogent-ssc.com/

Quick test to evaluate your skills

www.kent.ac.uk/careers/sk/skillstest.html

TARGETjobs skills and competencies advice

targetjobs.co.uk/careers-advice/skills-and-competencies

Society of Chemical Industry (SCI) case studies showcasing early career scientists

www.soci.org/news/sci/early-career-case-studies

Service Providers

Agilent Technologies

www.agilent.com/home

Abcam

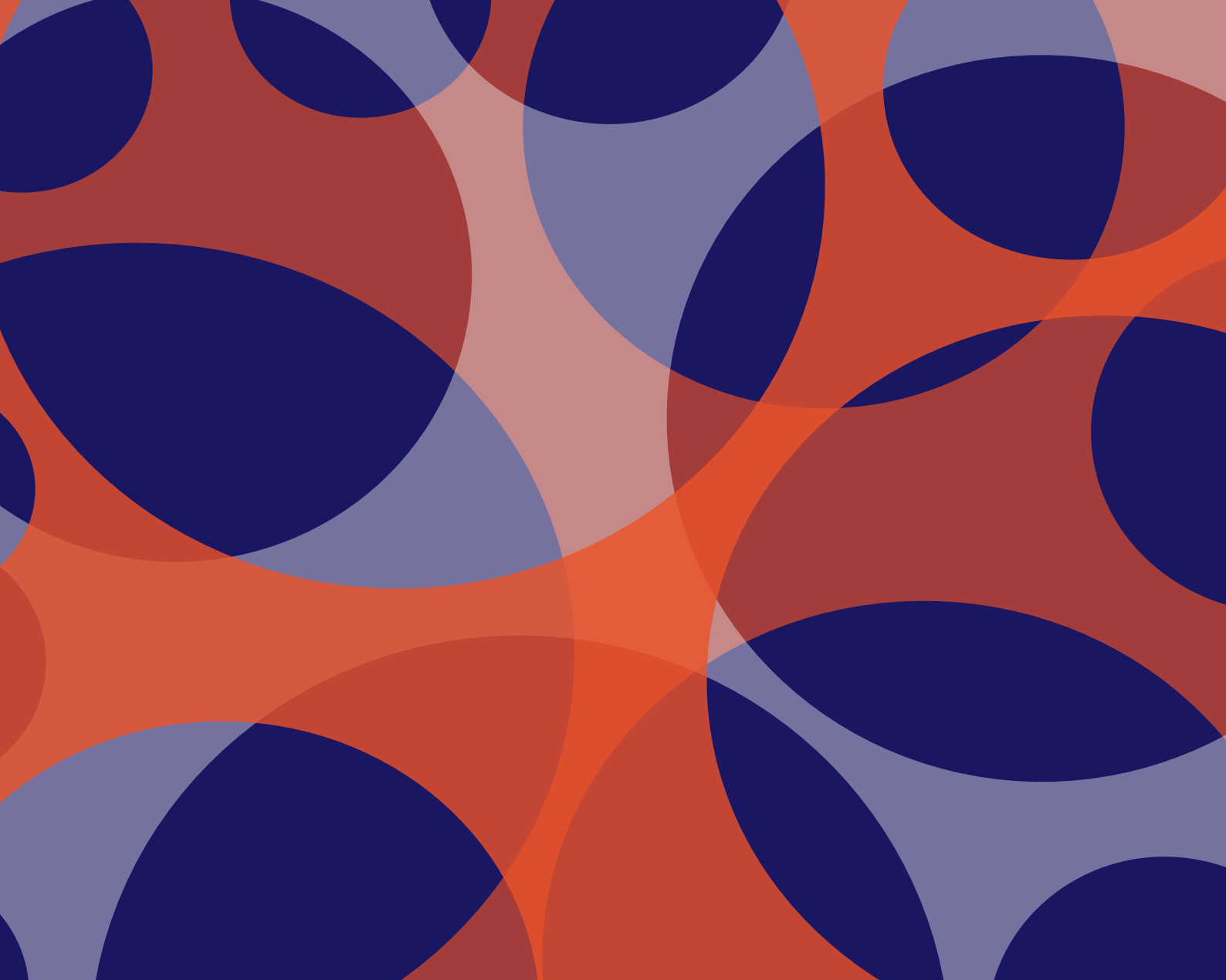
www.abcam.com/index.html?pageconfig=careers

Promega

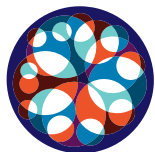
www.promega.co.uk/

Eppendorf

www.eppendorf.com/UK-en/about-us/careers/jobs/



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