



Queen Mary
University of London

**OnQ: Special Edition
Science and Engineering**

on

Issue 2

Letter from the Editor

In this second special Science, Technology, Engineering and Mathematics issue of OnQ, we hope to be able to give students information on what's it's like to study these subjects at university. We are often asked what careers students can go on to once they have graduated with one of these degrees. In this issue you will find information on the wide career opportunities available and you will be able to read some profiles of our science and engineering graduates, giving information on their careers.

We hope that you will photocopy these articles and circulate them to your students.

Laura Jackson
Outreach Officer

A new course from the School of Biological and Chemical Sciences (SBCS)

We are pleased to announce the launch of the BSc Biology with Psychology degree which is recruiting through Clearing for 2008 entry. Two thirds of the course (UCAS Code C1C8) will be concerned with biological topics with psychology taking up the remaining third. There are a number of intriguing modules available. They will study modules such as *Cognitive Psychology* which considers some unique properties of the human mind such as spatial cognition, memory and language and *Personality & Individual Differences* which looks at why people differ, personality types and will discuss intelligence controversies such as the race and IQ debate and sex differences in cognition. Students will also have the chance to gain practical lab skills in the SBCS as they are embedded into the modules and they will complete a psychology-based research project in their 3rd year.

Members of SBCS who work in this area cover topics such as understanding social and physical cognition in crows and primates, insect cognition and the biology of sex difference/sexual orientation in humans.

For entry to this course students will need 300 UCAS points including Biology at A2 (a qualification in Chemistry is desirable).

Further information on this degree programme: www.sbc.s.qmul.ac.uk/admissions

Queen Mary shares in £12.5m funding for top-flight physics

Queen Mary, University of London's Physics Department leads a consortium that will benefit from £12.5m in Government funding to support vital UK science research, teaching and development.

The money will fund the creation of the South East Physics Network (SEPNet), a consortium of six physics departments: Queen Mary, University of London; Royal Holloway, University of London; University of Sussex; University of Kent; Southampton University; and University of Surrey.

The SEPNet initiative aims to promote Physics in the south east of England, both nationally and internationally.

Professor David Dunstan, Head of Physics at Queen Mary, explained: "This award will enhance work taking place across the Department, including research in physics, astronomy and materials, as well as strengthening outreach projects and links with industry. Materials research in particular will benefit from a new collaboration in solid state theory, and our Astronomy Unit is especially excited by work on LOFAR (the Low Frequency Array), which is part of a significant step towards building the largest radio-telescope ever known."

The SEPNet grant comes from the Higher Education Funding Council for England (HEFCE), which announced the cash award at its annual conference in April. The announcement marks the latest stage in the Council's strategy to boost science research, learning and knowledge transfer nationwide.



Science and Engineering career prospects

Looking ahead

How would you like to earn £40,000 a year on graduation, as a Product Controller for Deutsche Bank? Or how does £32,000 as a Principal Analyst Programmer for Sainsburys grab you? Or maybe you would prefer to earn £29,000 as a contractor for Metronet, £26,000 as a Pharmaceutical Product Adviser for Baxter Healthcare or £36,000 as a Rate Fix Analyst for the Bank of New York? These are just some examples of the diverse range of well-paid jobs that graduates from Queen Mary science and engineering courses have secured over the last year.

Choosing a degree in a science-related subject doesn't necessarily mean a lifetime of test tubes and lab coats. Did you know that science and engineering graduates are among the most employable – and not just for jobs in science and technology, either? Few subject areas are as challenging and interesting or put as many of your skills to the test, which is why graduates from these subjects are so highly sought after in the job market and so frequently feature among the highest earners.

In the money

Graduates are likely to earn more during their career than someone who doesn't have a degree. In fact, statistics show that graduates can, over a lifetime, earn up to £150,000 more than someone with two or more A-levels. In a report into the economic benefits of HE qualifications by Price Waterhouse Coopers, commissioned jointly with the Royal Society of Chemists and the Institute of Physics, graduates in Chemistry and Physics were shown to earn up to 30 per cent more than those with just A-levels.



In the Destinations of Leavers from Higher Education Survey (or the First Destinations Survey as it is more commonly known), the average starting salary for graduates from 2005 (the most recent year for which we know the figures) was £18,501 but this rose to £20,212 for Maths graduates, £21,277 for graduates in the ICT industry and £22,041 for Engineering. Graduates in science and technology subjects have the highest earning potential among graduates because their numeracy skills are in such great demand.

Job prospects

Naturally, some science and technology graduates will opt for further study or a job in a science-related field after they finish their degree. Irrespective of the area of science or technology that they study, many graduates find jobs that are directly or indirectly relevant. For example, many environmental scientists become environmental officers or technicians, or Electronic Engineering graduates become broadcast engineers or go into the field of electrical supply and distribution.

Other directly relevant jobs for science and engineering graduates include manufacturing engineer; metallurgist; research scientist; quality controller; analytical chemist; meteorologist; toxicologist; nature conservation officer; web designer; multimedia programmer; network engineer; medical physicist – to name but a few!

Indeed, studying science can open up opportunities unavailable to those studying other subjects – you can't be a forensic scientist without a Biology or Chemistry background, while a degree in physics is an ideal starting point for budding sound engineers.

Two thirds of graduate jobs are open to all graduates, whatever their degree subject. Even so, research shows that where a subject is specified, IT graduates are in most demand. A recent report by Microsoft which featured in Computer Weekly in 2007 showed that the IT industry is growing 5-8 times faster than other sectors and needs 150,000 new entrants each year. Demand for higher level jobs in IT, such as software engineers and project management is on the rise in the UK.

Transferable skills

What makes science and engineering graduates so highly sought after by employers? It is all about 'transferable skills': throughout their degrees, students in these subject areas will develop qualities such as communication skills (both oral and written – you will have to give presentations and produce lab reports and so on), interpersonal and team-working skills (most Science and Engineering degrees involve group projects), analytical ability and logical thinking, time management, attention to detail, numeracy, decision-making and the ability to think independently. These skills, plus the fact that you are intelligent enough to succeed in an academically challenging subject, are what make science and engineering graduates so employable.

Commercial awareness

Finally it is worth bearing in mind that employers like students who have, what they call, "commercial awareness." Universities are keen to make their graduates as employable as possible and therefore many now offer degree courses with an opportunity for some real work experience.

Recent research by the sector skills body E-skills revealed that 40 per cent of employers considered the level of business and non-tech skills of IT graduates they recruit to be inadequate (Computer Weekly 14 June 2007). So if you choose to do an engineering or computer science degree, you should definitely consider courses which offer you the opportunity to do a sandwich year working in the relevant industry. If this is the case, then you will gain valuable experience – working on real projects using practical engineering or computing skills and being involved in managing time and resources – all of which will prove very useful for your CV.



Science and Engineering graduate profiles

Crazy about biology? Love physics? Does mathematics fascinate you, but are you unsure about the sort of job that you will be able to get with such a degree?

Fear not! We have been in contact with some of our science, technology, engineering and mathematics graduates to find out what they have been doing with their degrees since they graduated from Queen Mary, University of London. All the graduates below studied towards a degree in one of these subjects, though some of them ended up following careers in different areas. That just goes to show that most employers simply love the skills you can gain from completing a science or technology course.

Mazdak Alizadeh



Graduated in 2007 in Mathematics

"I am an elected sabbatical officer at Queen Mary Students' Union, meaning I am a full time student representative. My role is 'Vice President Student

Activities', which covers our sports clubs and cultural societies, as well as overseeing our volunteering and fundraising arms.

"As a mathematics graduate I believe I have gained valuable logic and problem solving skills, which can be applied to almost any problem I face in working life. More generally, studying for a degree has taught me excellent time-management and has improved my written and verbal communication skills.

"I had literally no idea what kind of career I wanted to go into. One of the advantages of taking a mathematics degree is that I knew I would have a wide range of options upon graduating, so I was not worried about the fact that I was unsure about my future career."

Mr Payam Adib-Samii

Graduated in 1998 in Genetics

"I am now a Business Analyst and Support Engineer for an Energy Trading and Risk Management Software-house called Sakonnet Technologies.

"It doesn't matter what you study, it is the grade that counts. Do something that you enjoy, learn something new, enjoy college because not everyone is lucky to work in a field that they love. My degree has given me the ability to be flexible and never to think in a predictable straight line."

Rashida Pramanik



Graduated in 1999 in Biochemistry

"I work as a Research Associate for Kings College London in Oral Pathology. I joined in 2000 as a graduate in response to an advert in a scientific

journal. My initial post was on a contract basis and was funded by a drugs company. I have remained with the same research group since then, but on different projects.

"Doing a degree is a big undertaking and there are lots of skills to be gained. As a graduate I was able to manage and organise my workload, integrate with people of all backgrounds, research information, present my work both in writing and verbally, and be motivated enough to carry on until the end!

"When looking for a graduate job be positive and confident! Prepare a good CV – University careers advisers can help with this as they hold CV/interview surgeries. They also advertise job vacancies and can provide information on companies."

Mikel Alonso

Graduated in 2006 in Aerospace Engineering

"I am a design engineer for Mott MacDonald Ltd working primarily in underground tunnel ventilation design. My job ranges from doing aerodynamic and noise calculations, to fluid mechanics simulations and co-ordinating mechanical and electrical systems. I also take on design work with civil and electrical engineers, manage CAD work and lead site surveys. My clients have been Cooling the Tube (LUL), BAA, and the Athens, Budapest and Amsterdam Metros.

"My career advice is: be proactive, care about what you do, don't wait for things to happen, make them happen; talk to people, network. Be technically sound; don't expect and aspire to manage projects too early. Be ambitious but patient; know your limitations and work on them.

"What I learned from my degree was a sound foundation for the skills I use daily: engineering, managerial, communication skills, etc. I found I was inclined towards the civil infrastructure world rather than the aerospace industry. "

Mark Stanbrook

Graduated in 1996, Physics

"I work as a support engineer for an email appliance company (Mirapoint Inc). The technical aspect of the job requires wide and deep knowledge but the biggest challenge is managing customer expectations. I have been fortunate enough to land a fantastic job in the e-mail sector of IT with a great international company and in a few months I will be moving to Australia to be the technical lead in our new Asia-Pacific office.

"My degree enhanced my invaluable analytical methods of problem solving. I was fortunate enough to be at QMUL when the internet took its first real faltering steps and when IT in business was about to explode from a few word processors on desktop computers and the odd fileserver, into the monster that it is now. Such opportunities were everywhere. Today there is just as much demand for staff but the requirements are much different."

Alexander O'Neill

Graduated in 2007 in Mathematics

"I'm currently a PhD research student. Studying mathematics can at times be very challenging but thankfully throughout my studies I have had great support from my friends and have been able to work in groups to complete coursework. These communication skills have been invaluable in my various work experiences, as being able to communicate well is a key asset for today's graduates.

"Many people do have a career in mind when picking a degree, I did not, so I studied the subject that I enjoyed the most and the subject that I believed would hand me the most opportunities once I graduated."

Science and Engineering, BSc or MSci?

Bewildered by the array of degree qualifications on offer? Let us explain...

When glancing through a university prospectus at the different degree programmes on offer you will notice that for scientific topics they are generally listed as a BSc or an MSci, and for engineering disciplines you have the option of a BEng or an MEng. What's the difference?

In university prospectuses you will see the following:

BSc – Bachelor of Science

BEng – Bachelor of Engineering

MSci – Master of Science

MEng – Master of Engineering.

The Bachelor degrees run for 3 years whilst the Masters courses run for 4 years and are consequently a higher level qualification. In the final year of Masters study you generally look at advanced topics and complete an extended

research project. The MSci is recommended for students who are considering becoming professional scientists. If you have an interest in the subject and want to find out a bit more about the most recent advances then this could be the qualification for you.

The MEng degree is recommended if you're interested in becoming a Chartered Engineer. Many engineering employers will prefer you to have this higher qualification. It is also valuable if you are thinking about a career in teaching or in industrial research. However, the BEng (3 years) would be appropriate if you intended to complete a postgraduate degree.

The first two years of the Bachelor and Masters degrees run parallel to each other, therefore it is possible that you may be able to switch

between the two once at university. We recommend that you apply for the four year course initially and then finalise your decision once at university. You should also note that the entry requirements for the Masters courses are higher than the for Bachelor degrees.



Science and Engineering final-year projects

If you take a science or engineering degree you will put together a final-year project in an area of your degree subject that you are interested in. It is a chance for you to gather together all the skills you've learnt over the three years at university, and produce a piece of work completely independently.

Here are a few examples of the final-year projects Queen Mary Science and Engineering students have come up with this year...

- Genetics student Sonia Ahmed decided to genetically sequence African mole rats, to find out how many species there are and the differences between them. The School of Biological and Chemical Sciences provides a great chance for students to use their imaginations to produce a really individual piece of work.



- Shanaz Aktar studies microbiology and has been testing antibacterial resistance and efficiency. She has used two antibacterias which are used in everyday life to see how they compare and whether there are any controversial outcomes. As well as doing three months of lab work and submitting a 10,000 word dissertation, Shanaz was also interviewed about her project – something that she feared the most. However, this type of assessment helps develop great communication skills – which are very desirable to prospective employers.
- Biochemist Samerah Saeed tested the effect of neuropeptides on starfish. Recent research found that sea urchins have very similar neuropeptides to humans and Samerah investigated if this is also the case with starfish by performing tests on muscle to find out what their function is.
- In the Department of Electronic Engineering student Shakib Shameze focussed on the visualisation of telecommunication networks using a technique called adjacency matrixes. He has designed a piece of software that telecommunication engineers can use which graphs out networks points, or nodes, and shows the density of connections, what properties the networks have and displays statistics on all the information it gathers. This software can be used around the world.
- In our School of Engineering and Materials Science Jannath Chowdury looked at motorcycle design and then designed his own. He assessed different designs to establish the current industry standard and looked into whether it could be moved forward in any way. He found that improving bike design depended on the invention of new materials – something that has yet to happen.
- The Department of Computer Science has attempted some very ambitious final-year projects. One student constructed a robot that reacted to the sound of his voice. The robot would either get upset or happy depending on how it was being spoken to by the student.
- Bruno Ehrler is carrying out a project supervised jointly by the Department of Physics and the Department of Materials in the School of Engineering and Materials Science. This reflects the fact that a lot of the research carried out in reality is collaborative and interdisciplinary. He has joined a programme in which the Departments are studying how materials properties change in very small structures. Bruno has made good progress, and as a result, will be co-authoring several research papers with department members.

Research in Science and Engineering

Teaching from experts

As a research-led university, all academics at Queen Mary who teach students also undertake their own research. This has many benefits for students, not least being taught by experts, but also because they learn about the latest developments in the subject. Science and engineering research stretches from the large scale – solar systems and galaxies – to the smaller – nanoparticles and bacteria.

In some cases, departmental research leads to the development of innovative technology which has the capacity to change industry on a global scale. For example, ApaTech, a Queen Mary spin-out, is a world leader in bone graft technologies. ApaTech is now one of Britain's top 20 fastest growing technology companies with its products being used in 18 countries.

The Queen Mary's School of Biological and Chemical Sciences has continued with its award-winning research in Botany with Professor Jeff Duckett receiving the 2008 Linnean Medal. This is an annual award made to a biologist for their contribution to science. Professor Duckett focuses on the sex determination of mosses and ferns and other lower end land plants. He enjoys a world-class reputation for his innovative research on cell biology, morphology, development, physiology and evolution of lower land plants. The School also looks at a range of other topics, from the behaviour of social animals to the degradation of proteins in the process for cell survival.



The Department of Electronic Engineering has been progressing its understanding of different aspects of antennas and electromagnetism. In March 2008 a group was awarded a £1.2 million grant for work in the healthcare and imaging industry. The aim of this 5-year grant is to provide the means to make the Department's research accessible and mainstream. It concentrates on established research activities in millimetre-wave antennae, metamaterials, on-body communications and bioelectromagnetics.

The Department of Computer Science is also focusing on the healthcare industry with its research into whether it's possible to turn it into a digital economy. Researchers are looking into whether intelligent modelling and real-time (or online) analysis of medical data, assessable directly in the doctor's surgery, can drive individual diagnosis and treatment decisions. The plan is to focus on exploiting techniques for data analysis and understanding, using techniques that are not currently applied in the medical discipline and analysis of novel data.

In January 2008, Queen Mary launched the NanoVision Centre, a multimillion pound, state-of-the-art microscope unit, which brings together the latest imaging technologies to open up new avenues for research. The Centre will combine existing microscopy techniques in unique ways for the first time in the UK. The new capabilities will help medical researchers to reveal the interactions of chromosomes in the nucleus of cancer cells; investigate how bacteria invade cells in infectious diseases; and enable targeted drug delivery strategies to be developed by watching nano-particles being absorbed by nerve cells – work which informs neuroscience research.

In Biology, detailed molecular studies will help to unravel how plants trap light and turn it into energy in photosynthesis. Nanoscale materials research has huge potential in molecular electronic materials for flexible screens and affordable solar panels; and future computer processing based on semiconducting carbon nanotube molecules. It will also allow the development of biosensors for detecting biological molecules.

The Department of Physics has become host to the LHC@home computing project – this allows people to run the LHC@home program on their home or office computers to help scientists discover the secrets of matter. Over forty thousand people have already taken

part in this volunteer project. The large Hadron Collider (LHC) is the world's largest scientific experiment to date. It is a particle accelerator which allows scientists to study the outcome of particles colliding. For the LHC to crash these tiny particles together inside its cathedral-sized detectors, more than 9000 magnets around its 27km circular tunnel have to be aligned precisely. LHC@home runs a program that simulates bunches of protons travelling around the ring up to a million times, to make sure their orbits are stable and that the particles don't hit the walls.

So far, users in more than 100 countries have contributed the equivalent of about 3000 years on a single computer to the project. Lyn Evans, head of the LHC project, says; "the results from this initiative are really making a difference, providing us with new insights into how the LHC will perform".

The LHC@home program could also be used to help sift through the 15 million gigabytes of data a year that will pour out of the LHC to look for telltale signs of new fundamental particles. A worldwide computing Grid with dedicated high-speed networks and huge data storage and processing capacity is needed to deal with the information which will be produced, and 17 UK universities and research centres are contributing computing capacity to this Grid. In this way, people around the world can help particle physicists in their search for signs of the elusive Higgs particle, and contribute to a potentially Nobel-Prize-winning discovery.

You can find out more detailed information on the research activities of the various Queen Mary Science and Engineering departments on their websites:

Biological and Chemical Sciences:

www.sbcs.qmul.ac.uk

Computer Science:

www.dcs.qmul.ac.uk

Electronic Engineering:

www.elec.qmul.ac.uk

Engineering and Materials Science:

www.sems.qmul.ac.uk

Mathematical Sciences:

www.maths.qmul.ac.uk

Physics:

www.ph.qmul.ac.uk