Can you be ‘green’ and in favour of cutting edge biotechnology? The world’s population is expected to rise to 9 billion people by 2050, and we need to produce enough food to feed them. We are also facing issues such as climate change and environmental damage. How can we innovate to conserve the human population, food sources and our environment?

To raise awareness of these issues, the Biochemical Society and the Royal Society of Biology partnered with Glasgow Café Scientifique to hold a panel discussion as part of Glasgow Science Festival. Speakers Professor Helen Sang (Roslin Institute), Dr Louise Horsfall (University of Edinburgh) and Dr Donald Bruce (Edinethics Ltd) discussed and debated whether technology such as genetic engineering could be used to solve some of the world’s biggest challenges, and whether this could be considered a ‘green’ approach.

Dr Louise Horsfall opened the event discussing her work using synthetic biology to engineer bacteria which extract dissolved copper from the nutritious waste left over from distilling whisky, gin and vodka. Using synthetic biology, she is able to harness the processes used by microorganisms and use them in conditions they have not naturally evolved to exist in. Louise suggested that this application of biotechnology can be viewed as ‘green’, as the use of genetically engineered bacteria would end the current process which uses high temperatures, high pressure and toxic materials. She reminded us that we already consume food and drink that have been created using products derived from genetic engineering. For example, 90% of the cheese we eat is made using enzymes that have been produced by genetically modified bacteria.

Next Professor Helen Sang introduced her work on chickens at the Roslin Institute, famously the birth place of Dolly the Sheep. One of the challenges of breeding chickens is their susceptibility to bird flu, and the current methods of controlling bird flu. For example, in a recent series of outbreaks of the H5N2 strain of bird flu in the United States the cost of controlling the outbreak amounted to approximately $191 million. Researchers are looking to genetic modification to protect chickens from bird flu by inserting an artificial gene that mimics the virus into the chicken’s genomes. The bird flu virus recognises this artificial gene as itself, and stops replicating inside the bird. This process also stops the virus spreading to other birds. Helen explained that although there are obvious benefits to this work for agriculture and food production, the perceived lack of acceptability of genetic modification (GM) is a barrier to conducting further experiments.

Dr Donald Bruce then described the ethical background to the GM debate, and the criteria taken into account by ethicists when looking at new technologies. One of the major concerns for the public with GM is the possibility of moving genes between species and that this is often perceived as unnatural. Another problem with the acceptance of the technology is the perceived risk, and that where the technology is being developed is often not where the need is. In the UK the majority of us are not starving so the possible risks of this technology appear to outweigh the benefits. However, in countries with high amounts of poverty, the benefit of the technology is more likely to outweigh the risk. He suggested...
we may be more accepting of technologies such as CRISPR-Cas9, which edits genes within an organism’s genome instead of moving genes between species.

After a short bar break the audience and speakers reconvened for questions from the floor, some of which are outlined below.

**The public’s perception of genetic engineering is a hindrance to any further work in this area. Is policy and regulation also a hindrance?**

“Synthetic biology has been described as genetic engineering on steroids, which is wrong. Synthetic biologists are trying to improve current processes, using engineering to predict what is going to happen when we develop new processes. Social scientists are involved from the beginning, to ensure this technology considers the point of view of the public, policy makers and meets regulations.

However, the current restrictions on this technology mean that only big companies are able to take on projects and people do question their ethics. One project that has been stalled by regulations is the arsenic biosensor, which detects levels of arsenic in contaminated wells. This technology has been developed for use in poverty stricken countries, such as Bangladesh, but has not been approved by the EU Commission. The scientists working on the project would like the technology to be accepted in their own country, the UK, before it can be used in other countries. It has been with the EU Commission for a long time and still hasn’t been approved. So yes, the policy and regulations can also be a hindrance.” – Dr Louise Horsfall

**Could we use the copper extracted from the distilling industries waste?**

“The current challenge is to upscale the extraction of the copper. The copper extracted by the genetically engineered bacteria will not dissolve again, so there is potential for it to have new functions. If we were able to upscale the process, we may be able to use it. This would solve some of the ethical issues surrounding where we source our metals from.” – Dr Louise Horsfall

**What is the biggest barrier to generating a positive public perception of genetic engineering, and how can we overcome it?**

“Consumers need to see a benefit which will overcome the risks of this technology. Currently, some of the products being developed in the UK are not needed here, so the public do not see the benefits in accepting them.” – Dr Donald Bruce

“I would like to have the choice to buy GM foods, as currently they are not sold in our supermarkets.” – Professor Helen Sang

**How have the media contributed to the public’s perception of genetic engineering?**

“The press have had a huge impact on the public’s perception of genetic engineering. For example, during the GM debate there were GM scandals being reported every day which contributed to the public’s loss of trust in the UK regulatory system. In the US they have been eating GM foods for 20 years and people are more accepting of them, as they trust the regulatory process there.” – Dr Donald Bruce

We then saw a role reversal at the event, where Donald asked the audience if they thought banning the cultivation of GM crops was the right decision. Some audience members thought it was a good marketing move, as people might spend more money on their food if they thought it was ‘green’. The majority of the audience agreed that genetically engineered products should be judged on a case by case basis. Helen seconded this approach and reminded the audience of research into genetically engineering the omega 3 long chain fatty acids needed in salmon feed, which would end the need for using wild fish to feed salmon. Using this technology would have a huge environmental benefit.

We would like to thank our brilliant speakers for taking part in this event and Glasgow Café Scientifique for hosting this event as part of Glasgow Science Festival 2016.
Learning Curve

Quantitative proteomics: it’s all about training, of course!

The fourth iteration of the Biochemical Society training course on “Quantitative Proteomics” took place from 4–5 April 2016. The first time we delivered the course was to precede a conference in Chester in 2010, supported by the Biochemical Society as an Independent Meeting. Subsequently, the course was delivered as one of the first Biochemical Society training events, held at Charles Darwin House in 2012, attached to a workshop on the same topic. In both instances, these were oversubscribed and hugely successful. We continued to deliver this Biochemical Society course in 2014, and most recently, earlier this year.

As in all previous iterations, demand for the 80 places in 2016 considerably exceeded availability. It is easy to see why – real practicing experts as tutors, small group teaching and a friendly environment, all at low cost, particularly for Society student members. Delegates are surrounded by peers who are equally new to the field, creating an environment where questions are tolerated (and positively encouraged). They also receive informal advice and guidance during breaks and the reception, and often in follow up exchanges after the course is over.

The first session comprises an intensive afternoon of talks, providing a grounding in the principles, best practice and pitfalls in quantitative proteomics. The speakers are all experts in the field and establish the overall context of the work that will be further developed in day two.

The second session takes on a very different flavour. Delegates divide into groups of about 10 and over the course of three hours, attend three different round table sessions, each focused on one area of quantitative proteomics data analysis. The attendees express preferences for tables that resonate best with their particular interests. Topics covered included statistics, SILAC (stable isotope labeling by/with amino acids in cell culture), selected reaction monitoring and data analysis and visualisation. These ‘round table’ tutorials, delivered on specific topics by experienced tutors, are particularly popular.

Speakers and trainers all volunteer their time for the course, and so many of them come back year after year because it is such a rewarding experience. We hope to organize many more courses and maintain our commitment to keep the content cutting edge in this rapid developing field.

“**I really enjoyed the training course, it was one of the most useful I have been to. It was really good to keep reinforcing the ideas and I came away feeling like I had learned no end of information,**”

2016 course delegate.

Robert Beynon (University of Liverpool), Victoria Harman (University of Liverpool) and Hannah Russell (Head of Education and Training, Biochemical Society)

Day 1: The lectures

Could you support the Society and provide a training course?

If you are thinking of offering a training course through the Society, here are some of the reasons why you should. Mostly, it gives you, as a member of the Society, the opportunity to give back to the membership in the spirit of collegiality and to help support the next generation of biochemists – the best reason. Additionally, it can be great fun and hugely rewarding, working with a group of delegates who are keen to learn about your specialist area. Lastly, designing and delivering a training course can support your own learning and development, providing valuable experience, for example, to support applications for HEA Fellowship.
The application process is very straightforward, and is now settling into a new model. There are four open calls for proposals each year, and in addition, the newly formed Training Theme Panel can commission courses on particular topics. Training events can also be proposed by other Theme Panels, particularly where the event will be tied to specific scientific meetings that involve the Society. The application paperwork is straightforward (please see the Biochemical Society Training Events webpage for more details), and mostly asks you to think about demand, delivery, cost, content and tutors (see checklist above). If it is associated with a Biochemical Society meeting this will be known in advance. You may have some suggestions about venue and you will need a clear grasp of the teaching material you might generate. It is helpful to have some understanding of the need for sustainability and in this regard, suggestions for sponsorship are always welcome.

Offering these training events provides a valuable way for the Society to support its members, especially the postgraduate and postdoctoral communities. It also supports the Society’s aim to build closer links with the biosciences industry.

Lastly, the benefits of the course extend well beyond the purely academic. The atmosphere of our proteomics courses has always been friendly and engaging and at the end of the first day the attendees have enjoyed a sponsored reception in the heart of Chester that has always been good fun. This breaks the ice and encourages animated discussion on the subsequent round table day. The value of this type of peer-networking should not be underestimated.

We are delighted to record the selfless engagement of the following tutors in 2016: Philip Brownridge, Claire Eyers, Dean Hammond, Stephen Holman, Andy Jones (University of Liverpool), Simon Hubbard, (University of Manchester), Laurent Gatto, Kathryn Lilley (Cambridge University), Stefan Tenzier (University of Mainz), Sara ten Have (University of Dundee) John Cottrell (Matrix Science), Agnes Corbin (Nonlinear Dynamics), Sybille Heidelberger (Sciex). Participation of many of the UK tutors was made possible with support from the BBSRC. We wish to record our appreciation of the substantial sponsorship provided by Waters plc who have supported this course, and its forbears, for many years.

The next two deadlines for training event proposals are 15th August 2016 and 31st October 2016. For more information and to submit an application, please visit www.biochemistry.org/training