

## Innovator of the Year

*From bioinformatics tools for plant breeders to discussions about animal welfare and the effects of lifestyle on health, finalists in BBSRC's Innovator of the Year competition are ensuring their research has a significant impact on the economy and society in the UK and beyond.*

Since its creation in 2008, the BBSRC Innovator of the Year competition<sup>1</sup> has celebrated and rewarded researchers who have taken the outputs of their research from the laboratory bench to benefit wider communities and utilise commercial opportunities. The competition also gives formal recognition to the value and quality of their impact activities, provides valuable feedback and helps them think more broadly about the outcomes of their research.

This case study explores the impact of the innovations from five Innovator of the Year finalists.

### Raising awareness of lifestyle and health links

Professor Mark Hanson, Director of the Academic Unit of Human Development and Health, and the Institute of Developmental Sciences at the University of Southampton<sup>2</sup>, and colleagues, created 'LifeLab Southampton', a programme that encourages adolescents to think about how their lifestyle now affects their health in later life



*Innovator of the Year 2009 finalists, judges, and BBSRC staff.  
Credit: BBSRC*

and the health of any children they may have<sup>3</sup>. Adolescents from local schools are invited to spend a day in a laboratory in Southampton hospital, talking about some of the issues, meeting scientists and using the hospital's equipment to examine their own health. Running the events in Southampton Hospital takes participants out of their comfort zones and makes the learning context-specific.

An evaluation of the programme, which ran from 2008 to 2012, has shown that LifeLab has had a sustained positive effect on the attitudes of participants six months after they attended an event<sup>4</sup>. By comparing the views of 37 children who had attended the LifeLab programme with the results of a survey of 597 children in Southampton, the evaluation showed that attendees had a

### Impact Summary

BBSRC's Innovator of the Year competition encourages and rewards impact activities in the academic community. It has given researchers the opportunity to demonstrate their impact activities; receive feedback from industry representatives and other stakeholders; and helps them think differently about the impact of their research.

Finalists from Innovator of the Year have also had significant impacts on UK society and the economy. Examples include:

- Public engagement on the links between health and lifestyle raised awareness of the effects of diet on health.
- Over 145 schoolchildren and 2,400 members of the public engaged with the 'Inside Chicken run' event about animal welfare.
- Spinout Ai2 secured £multimillion deal for anti-infective contact lens coating.
- Spinout company Tissue Regenix produced replacement cartilage for vascular surgery.
- TraitTag Bioinformatics and sequencing methods aiding crop breeders around the world.

significantly higher awareness of the impact of their diet on long-term health.

“The other interesting thing was we had a significant increase in the number of students who said they might consider a career in science, that they were interested in this sort of science and that they had more feelings of trust in scientists and doctors,” Hanson adds.

*“The Lifelab intervention created a wider appreciation among students that food they eat now could affect their long-term health and the health of their future children.”*

From Grace et al. (2012). Developing teenagers' views on their health and the health of their future children

LifeLab arose from research by Hanson and colleagues into the effects of the environment on the risk of ill health in later life. Earlier BBSRC-funded research in animals had shown that early-life influences like diet had a long-term impact on the cardiovascular and metabolic function and body weight of offspring. “It was a logical move to link those BBSRC-funded projects to some MRC-funded work, which had included epidemiological studies and population studies showing early life was linked to risk of human disease,” explains Hanson.

In particular, the health of the mother before and during pregnancy can affect the health of her child in later life, and Hanson and colleagues realised that any attempt to raise awareness and influence behaviour would need to reach people before they became parents. As a result, they decided to target adolescents.

“The more we thought about this, the more we realised we need to promote health literacy, empowering people to take ownership of their health. Waiting until adulthood or even pregnancy ... might be too late. We need to work with adolescents to not only make them healthier but to improve the health of the next generation.”



A healthy diet. Credit: [WordRidden/Flickr](#)

## Competition Winners

Each year, the judges choose three winners from the handful of finalists in the competition; one each in the Commercial, Social and Most Promising categories. One of these is also chosen as BBSRC's overall Innovator of the Year. The winners have been extensively profiled on the BBSRC website, and you can find out more about them at the links below.

### 2009

Winner: [Professor Stephen Jackson](#)  
Runners-up: [Dr Luke Alphey](#), [Professor Jeff Errington](#)

### 2010

Commercial and Overall Winner: [Professor Shankar Balasubramanian](#)  
Social: [Professor Dave Goulson](#)  
Most Promising: [Dr Michael McArthur](#)

### 2011

Social and Overall Winner: [Professor Jason Swedlow](#)  
Commercial: [Professor Chris Lowe](#)  
Most Promising: [Professor Keith Waldron](#)

### 2012

Most Promising and Overall Winner: [Professor George Lomonosoff](#)  
Commercial: [Professor Jim Murray](#)  
Social: [Professor Russell Foster](#)

## Exploring the science of animal welfare

The Inside Chicken Run event designed by Dr Siobhan Abeyesinghe<sup>5</sup>, Lecturer in Animal Behaviour and Welfare at the Royal Veterinary College and a finalist in the Social category in 2010, also sought to influence the views of children and teenagers. Inside Chicken Run explored the scientific and ethical issues surrounding animal welfare while giving children the opportunity to learn about chicken biology and behaviour, and interact with the animals.

Over 850M broiler chickens are raised by the poultry industry in the UK every year<sup>6</sup> and, according to Abeyesinghe, consumers can play an important role in ensuring they are kept in appropriate conditions. “As consumers we are able to drive standards of farm animal welfare through our purchasing decisions, but that really requires us to have the right knowledge about what those standards are and what labelling means,” she says.

“We were very interested in trying to set up an educational event that wasn’t telling people what is right and wrong, but getting the adolescents to really think and form their own opinions in an evidence-based manner. People don’t often realise science can be applied to animal welfare, that we can have an evidence-based approach to legislation about animal care,” Abeyesinghe adds.

In particular, Inside Chicken Run was aimed at ado-



*Children taking part in the Inside Chicken Run event. Credit: Dr Siobhan Abeyesinghe/RVC*

lescents from urban areas to address the increasing disassociation of urban-dwelling consumers from food production; few of these children had ever had contact with farm animals or agricultural practices. At the event, Abeyesinghe and colleagues talked to them about chicken biology, their needs and perceptual and cognitive capabilities. They also explored food production systems and the political positions of different groups of stakeholders involved with chicken production, before

## Culture Change

The Innovator competition not only rewards excellent examples of impact, it also encourages academics to think differently about the potential impact of their work. “We were interested in how [our innovation] would measure up, and we were demonstrating as a college that we were trying to achieve impact with our science,” says Dr Siobhan Abeyesinghe.

Entering Innovator encouraged Abeyesinghe to think about the impact of her work in a different way. “Applying for Innovator gave me a chance to reflect on what I had been doing and what I could do with it in the future, in a slightly different way than I had when I originally developed it,” she explains. “It’s certainly made me think more about the end goal of what I could do with the research and getting to the end users. When I’m making grant applications I think a lot more about outreach and routes to impact than I would have done before.”

2011 finalist Dr Curtis Dobson also appreciated the opportunity for reflection and the chance to receive feedback on his innovation. “You do these things in isolation and you get very focussed on getting to the next stage. It’s nice to step back for a little while and think about the broader context of what you’re doing,” he says. “It’s good for these longer-term beneficial activities to be formally recognised by the Research Councils.”

the participants carried out a role-play exercise and a debate.

An evaluation of the event<sup>7</sup> showed that adolescents who had attended had a greater knowledge of chicken biology and welfare than their peers, although the effect had lessened after three months. The researchers also found that the behavioural intent of attendees – the likelihood of them acting in a certain way relevant to animal welfare in future, measured as their willingness to donate to animal charities, relative to environmental and human charities - was slightly higher when thinking about poultry.

Inside Chicken Run was initially developed for local children from inner-city schools and run during National Science and Engineering Week<sup>8</sup>. Following the success of the first event, the researchers were asked to repeat it six months later. In total, 145 children attended Inside Chicken Run across both school days.

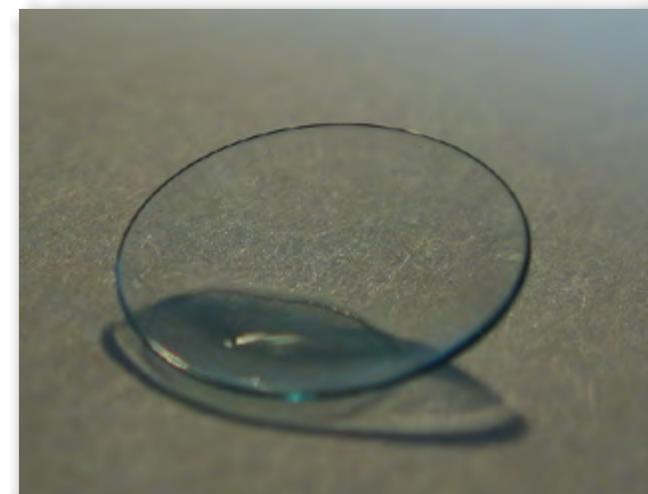
Following the initial success of the event, the researchers modified it for a Defra open farm day. Here the researchers were able to talk to the general public of all ages. In total, Abeyesinghe believes around 400 people engaged with the Inside Chicken Run materials at the farm day. More recently, Abeyesinghe and colleagues were invited to participate in Jimmy Doherty's Science Festival, where around 2000 people saw the event<sup>9</sup>. Abeyesinghe has since used the materials in an event at a primary school.

## Alzheimer's research aids contact lens manufacturer

A discovery made by Dr Curtis Dobson at the University of Manchester during his research on Alzheimer's disease has led to a multimillion pound deal with contact lens manufacturer Sauflon Pharmaceuticals<sup>10</sup>. Dobson was a finalist in Innovator's Commercial category in 2011.

In 1999, Dobson was studying a protein called apolipoprotein E, which could help protect against viral infections associated with Alzheimer's disease. He found that a peptide related to apolipoprotein E, which was being used as a research tool, had broad, strong anti-infective activity<sup>11, 12</sup> comparable to some of the most commonly used chemical biocides such as triclosan. As it is related to a human protein the peptide is also much less toxic than triclosan and related biocides. "We thought it was quite an interesting lead, which no one had noticed before," says Dobson.

Dobson started to investigate whether the peptide could be used for anti-infective coatings on medical equipment. Through discussions with colleagues, he became aware that the contact lens industry could use a technology like this to reduce the number of eye infections amongst contact lens wearers. Around 3.7M people wear contact lenses in the UK, an industry worth more than £231M in 2011<sup>13</sup>.



*A contact lens. Credit: Bryan Tong Minh/Wikimedia Commons*

Small Business Research Initiative (SBRI) funding from BBSRC helped Dobson to develop his idea and, in 2005, he founded spinout company Ai2 to commercialise the technology<sup>14</sup>. In 2010, Ai2 announced a major licence deal with UK-based contact lens and aftercare manufacturer Sauflon to use the anti-infective coating in their products<sup>15</sup>. "We're on course for products fairly soon, which is very exciting to see the full circle from effectively a pure science discovery in Alzheimer's disease to, eventually, a product on shelves," Dobson adds.

Other companies are also interested in the technology, and Dobson is continuing to develop it for other applications such as domestic hygiene products and for use

on medical devices. “There’s a lot of interest. People are waiting for the technology to hit the market; that will open the flood-gates,” he says.

*“Ultimately there’s no point making discoveries if you’re not making use of them.”*

Dr Curtis Dobson

Success in the innovator competition has had other benefits for Dobson. “It helps in a practical way with convincing investors or potential licensees that what we’re doing is worthwhile and recognised at a national level,” says Dobson. “It shows what we’re doing is technically and commercially interesting and competitive. There are clear benefits there in furthering the technology and the company.”

### Spinout develops replacement body parts

Spinout company Tissue Regenix<sup>16</sup>, founded by 2009 Innovator finalists Professors Eileen Ingham<sup>17</sup> and John Fisher<sup>18</sup> from the University of Leeds, uses a novel technique to remove living cells from tissues, leaving a scaffold that can be transplanted between different people without risk of rejection.

The company’s first product, the dCell Vascular Patch<sup>19</sup>, is used to repair peripheral blood vessels during vascular surgery. This may be needed to treat a range of



*Surgery in progress. Credit: Andy G/Flickr*

conditions such as peripheral vascular disease, which affects around 2.5 per cent of people below the age of 60 in the UK, and 19 per cent of the over-70s<sup>20</sup>.

The dCell Vascular Patch received a CE mark in 2010, which shows that it conforms to relevant EU Directives and allows the product to be put on the market. So far, the patch is marketed in Europe and the company is using the patch to demonstrate to potential investors that it is able to develop a successful product and take it to market. In June 2010 Tissue Regenix joined the AIM market of the London Stock Exchange through a reverse takeover of another company, Oxeco Plc<sup>21</sup>. In December 2011 the company raised £25M on the stock exchange to allow it to develop several other products based on Ingham’s unique process.

Ingham and colleagues developed the technique to produce the tissue scaffold during the early 2000s. “With the advent of tissue engineering and working with people creating tissue engineering scaffolds in the lab, it occurred to me that you could develop processes that took a human or animal tissue and treated it in a way to remove all of the living cells and antigens associated with them... You would be able to create a cell-free scaffold that would be freely transplantable from one individual into another,” she says.

As a result, the researchers developed a novel process to remove the cells and antigens gently from tissue, leaving a scaffold made mainly of collagen and elastin proteins. As elastin and collagen differ very little between people, or between humans and pigs, scaffolds of human or pig tissue could be transplanted without risk of rejection by the recipient’s immune system. Ingham initially demonstrated the technique for heart valves<sup>22</sup>, but decided to target something simpler for commercialisation. “We realised starting off with a heart valve was ambitious and there were simpler tissues you could apply this to. The cardiac surgeons we worked with said ‘why don’t you do this with membranous tissues, like pericardium?’ because cardiac surgeons use pericardium all the time for repair.”

“So we applied the process to pericardium as well, and it worked<sup>23</sup>, and then we began to get a little bit more ambitious and applied it to other tissues. We applied

it to ligament tissue, meniscus tissue, which is fibrous cartilage found in the knee joint, and bladder. We did the work on the bladder under a grant from BBSRC.” The researchers also worked in collaboration with the research and development team at NHS Blood and Transplant Tissue Services, who were interested in using the scaffolds. By 2006, the researchers had four patient families maintained by the University of Leeds, and independent reports on the technology recommended that they found a spinout company to commercialise the work. “It was May 2006 that Tissue Regenix was born,” says Ingham.

Several rounds of investment since then have enabled the company to hire more staff, including a chief executive. It outgrew the Leeds Biocubator and moved to the Biocentre in York in early 2009. Later that year the first patient was implanted with the dCell Vascular Patch.

Ingham has also found the prestige of being an Innovator finalist beneficial. “When [the company] had investor’s days I would go along as a founding academic and give a presentation. They would introduce me as a finalist in BBSRC Innovator of the Year. So I think for both aspects, the profile of the company and the research we do, it has been very helpful,” she says.

## Faster, cheaper tools for crop breeders

Innovator 2010 Commercial finalists Professor Ian Bancroft<sup>24</sup> and colleagues at the John Innes Centre (JIC) have used modern DNA sequencing and novel bioinformatics procedures to aid crop breeding, particularly in crops where conventional techniques are ineffective. Bancroft is working with bioinformatics company Eagle Genomics<sup>25</sup> to deliver the service, called TraitTag<sup>26</sup>, to crop breeders around the world.

“TraitTag turned out to be a particularly powerful approach, and relatively low-cost to set up and establish large-scale resources, which means it is of more general interest than just my own research programme,” explains Bancroft.

Crop breeders use a technique called marker-assisted breeding to introduce new traits into crops, such as pest resistance, more efficient use of nutrients, or increased levels of omega-3 fatty acids. Marker-assisted breeding depends on the identification of molecular markers – small changes to the plant’s DNA – that are closely linked to genes controlling the traits of interest. By identifying these markers, breeders can use them to incorporate valuable new traits into their crop varieties.

However, it is difficult to identify markers in some important crops such as wheat or oil seed rape. These crops are ‘polyploid’ – they contain several copies of their genome – meaning that the usual methods of identifying



*Wheat fields in Wiltshire, UK. Credit: Tony Butterfield/ Flickr*

the most common types of molecular markers called single nucleotide polymorphisms (SNPs) are ineffective.

TraitTag takes advantage of next-generation DNA sequencing together with bioinformatics tools and procedures developed by Bancroft and colleagues at JIC to allow breeders to identify large numbers of markers more reliably than existing methods<sup>27</sup>. It is also much faster and cheaper than previous methods, and it can be used to identify SNPs in polyploid crops. “In essence you can use the approach for any type of crop. Some of them have got a relatively simple genome and genetics, but this will work even in the more complicated, like oil seed rape or wheat, which is polyploid,” Bancroft says.

Bancroft now works as a consultant for Eagle Genomics

to help them deliver TraitTag as a service for breeders around the world. “It’s know-how, understanding how to do genomics and how to apply these computational methods, so it doesn’t fit in a conventional licensing approach,” he explains. “Eagle Genomics provide the service to clients. They’ve just completed one job for a European breeder, Limagrain, as part of a Technology Strategy Board project.”

TraitTag can also help breeders working with crops that have not yet been well-characterised. For instance, Eagle Genomics is about to start working for a client in Malaysia to look at oil palm, and with an Indian client interested in a different oil seed brassica. “Its biggest advantage is where people realise they don’t have much of a genetic basis to work with,” explains Bancroft.

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