

Panellists:

- **Professor Enrico Coen** FRS, John Innes Centre, Norwich
- **Professor Peter Coles**, University of Nottingham
- **Dr Kevin Fong**, University College London
- **Dr Madeleine Humphreys**, University of Cambridge
- **Professor Martyn Poliakoff**, University of Nottingham
- **Professor David Russell**, University of East Anglia

Demonstrations and other entertainment:

- Puppets in Education – **John Dabell** (with Benny)
- Science in a Suitcase – **Dr Ken Farquhar** and **Ian Walker**
- Dry Ice Comet – **Mark Thompson** and **David Provan**, Norwich Astronomical Society

Host: **Quentin Cooper**

Madeleine Humphreys had given a press conference that day regarding her recently published paper on volcano research. Quentin started the discussion by asking what the paper was about.

Dr Humphreys described how her team have been studying what magma does underground leading up to and during volcanic eruptions. She commented that this 'represents something of a Holy Grail in volcanology'.

Dr Humphreys explained that explosive volcanic eruptions are difficult to model. However, her team used a new technique to study two active volcanoes: Mount St Helens in Washington State, USA and Shiveluch in Russia. They studied the contents of droplets of fluid in solid lava, called melt inclusions. They looked at the water content, the chemical composition and the proportion of crystals in the melt inclusions and showed that as it rises, magma becomes more crystalline and gets hotter - up to 100°C hotter.

Magma crystallises because of a change in pressure. The change in pressure forces water out of the magma and into bubbles, which drive the eruption. So, the more water there is in a melt inclusion, the more water there is to create bubbles and the more explosive the eruption could potentially be. Recognising the effects of water is helping to make volcanic eruptions a little more predictable.

The PUPPETS project research has identified the impact of puppets when teachers use them in primary science lessons. John Dabell explained the power and methods behind using puppets for science education. The alternative style is designed to promote excitement and therefore increase engagement and interaction in the classroom.

Quentin asked if there was not a hint of immaturity in the method, but John Dabell argued that the project was, of course, aimed at school children of a certain age group. However, it had been used in for people in their late teens with great success. Dabell noted that the use of the puppets changes not only the attitudes of the children, but also the teachers as they are prompted to approach science in a more spirited way.

They use reasoning questions ('how come Benny's shadow is shorter than this morning? Has Benny shrunk?') rather than recall questions ('what causes shadows to be different sizes at different times of day?'); they use more narrative; they provide less information and ask children to think more; they offer more encouragement. He described how, as teachers take a back seat in the classroom, many school children feel they are being informed rather than taught.

When asked about the future of his project, Dabell described how, with the necessary funding from GSK, the plan is to train teachers and convince them of the value of puppets in learning.

The x-change team then presented the 'Freebie Countdown' a top ten list of the free gadgets and accessories available at the festival, expertly gathered by the team themselves during the course of the day.

David Russell then explained how minute gold particles have been designed that directly measure events within cells and can initiate cytotoxic reactions in cells. These are capable of inducing cancer cells to commit suicide – apoptosis – and can be used as a new form of cancer therapy. This non-invasive cancer treatment uses a combination of harmless near-infrared light and benign gold nanoshells to destroy tumours with heat. The treatment does not affect healthy tissue.

There are a range of cancers with which this method can be used for treatment. The most effective is for skin cancer, as the infra red light can easily reach the tumour beneath the skin. However, a light can easily be passed down the gastrointestinal tract, so this treatment has potential for GI cancers.

When asked about the root of his interest in gold, Professor Russell described a 17th century Norwich scientist who among other things investigated supposed medicinal properties of gold. It passes straight through body does not harm or trigger an immune response. Professor Russell then surprised Quentin and the audience by revealing that gold nanoparticles are intense red in colour.

Following this, Martyn Poliakoff described how solvents used primarily in chemical manufacture are largely derived from oil. He described the significant environmental problems of their use and notes the increasing supply and demand for such chemicals in the developing world. Since resources on earth are limited and we need an alternative supply that is more environmentally acceptable, Professor Poliakoff suggested the use of supercritical fluids (SF), gases compressed until they are nearly as dense as water.

Finishing on a positive note, Professor Poliakoff stated that if social pressures for a 'green revolution' persist and economic and political legislations are put in the appropriate place, then it is possible.

At this point, Mark Thompson and Dave Provan from Norwich Astronomical Society wowed the crowd with their dry ice comet, formed using nothing more than some dry ice, some water, and a handful of mud.

Once calm had been restored, Peter Coles underlined the importance of looking at the universe as an entire system. There is a lot that we know about the universe. However, he stressed that it is important to concentrate on what we do not know. One such phenomenon is that of dark matter. We are currently unsure what it is but know that, like gravity, it is crucial for the orbit of Earth. Professor Coles explained that up to 75% of the universe is made up of dark matter – producing a pushing force rather than a pulling one.

Continuing on the space theme, Dr Kevin Fong stressed that it will be a long time before Britain ventures regularly into space. He highlighted the 56% decrease in physics students and lack of chemistry enthusiasts. He thinks that the low standards in education are leading to reduced space innovation and desire for exploration. Fong also finds that we suffer from a lack of inspiration. In addition, the risks of space travel are mammoth, slowing the process.

Finally, Enrico Coen, a professor of plant science, summarised the huge *Making Faces* exhibition. It featured specially commissioned art exploring how our faces play a special role in both our personal and our national identity. Alongside it the festival featured a series of talks about face recognition, and our obsession with the faces of others, particularly celebrities. Professor Coen believes that our ability to shape our looks makes us both painter and canvas.

In the last 10 – 20 years we have learned a lot about human biology and the entire image of science is changing. The mechanistic and reductive rhetoric is changing and artistic styles can help to promote the change. One such example used by Professor Coen was that of sculpture – a 4-D Bronze Charles Clark sculpture was on display at the exhibition featuring numerous flowing stages of the process are on display. The dynamics involved in the making of sculpture are how we should observe the dynamics that are found in science – flowing and influential, and the use of colours, style, creativity, and meaning highlight individuality.

Jenna Caldwell