



Professor Saiful Islam challenges Professor Richard Dawkins to recreate his 1991 swinging-cannonball demonstration.

HANGING AROUND
In the 2010 lectures, Mark Miodownik gave his final speech in a harness suspended above the stage. He got stuck and it took a while for the stage crew to get him down.

Christmas Lectures celebrate 80 years

The Royal Institution's Christmas Lectures are annual science events for children in which famous scientists perform exciting experiments in front of a live audience. The Royal Institution is a world-famous scientific organisation and its Christmas Lectures began in 1825. This year is the 80th year that the lectures have been shown on television. They have taken place every year except 1939–1942, during the Second World War, when it was too dangerous for children to travel to London.

Over the years speakers have used all sort of props during their lectures, including sloths, lions, hens, donkeys, worms and rockets.

In 1938 Professor James Kendall conducted an experiment using molten lead. Kendall covered an audience member's hands in petroleum jelly before pouring the boiling metal over them. It sounds horribly dangerous, but the jelly acted as a protective layer and stopped the child's skin from burning. We don't recommend you try this at home, though.

ANIMAL ANTICS
In the 2009 lecture, *The 300 Million Year War*, animals caused a few problems. A donkey was too scared to go up in a lift so a second sloth was so relaxed that it tumbled off its branch.

This year Professor Saiful Islam will give a lecture on energy and try to break a world record for the most powerful battery made from lemons. He will use more than 1,000 lemons in his experiment. If you want to know how that works – and whether Islam sets a new world record, you'll have to watch the lectures on BBC Four on 26, 27 and 28 December at 8pm.

We've highlighted three particularly memorable lectures below. You can watch these, and other past series at rigb.org/christmas-lectures

1973: The language of animals

Sir David Attenborough was faced with trying to get animals to display certain behaviours at the correct time in front of a live audience. During the show, he cuddled an orangutan, fed a lemur and spoke to some birds. However, not all the animals stuck to the script. Just after Attenborough told the audience how fierce an insect called a mantis was, the creature bit his finger. See what happened at tinyurl.com/animals1973



Animals can mean trouble.

1998: The body in balance



In this lecture Dame Nancy Rothwell explains how the human body works. To demonstrate how the body steadies its temperature, Rothwell asks a volunteer to sit in a bath of ice water for seven minutes. During that time the outside of his body got cold but his core temperature stayed the same. This is because his body did things like shivering to keep the heat constant inside his body. Take a look at tinyurl.com/temp1998

2014: How to hack your home

Professor Danielle George looked at how technology has advanced over the years. In the show she turned the Shell Centre in London into a giant games console to play Tetris by controlling the lights inside the skyscraper. The building's lights were turned on and off by computer in a special sequence to make it look as if shapes were moving down a screen, just like in Tetris. See it at tinyurl.com/bulb2014



Saiful Islam grew up watching the lectures.

Meet the professor who loves energy

Professor Saiful Islam is a chemistry professor at the University of Bath. Speaking to *The Week Junior*, Islam tells us how he will prepare for his lectures this year and what he finds so interesting about energy.

What's your favourite thing about science?

It allows us to solve the mysteries of the universe through investigation, experiments and observation. It is full of wonder and exciting discovery.

Have any experiments you've done gone horribly wrong?

We planned to have a cow onstage but the cow had a calf the week before filming, so we had an extra guest on the show!

Which is your favourite Christmas lecture and why?

Carl Sagan's in 1977, because that's when I became really aware of the Christmas Lectures. It was about that most exciting of topics – the planets. The Christmas Lectures were a big deal. After I became a professor in chemistry, I enjoyed Peter Wothers' lectures from 2012. I really liked the way he used the children in the audience to recreate the periodic table.

What interests you about energy?

Energy, and having enough of it, is one of the biggest challenges for the human race. Currently we get it mostly from fossil fuels: coal, gas and oil. The problem with that is that it causes lots of CO2 emissions. This results in global warming, leading to climate change. So, my interest is looking for cleaner alternatives such as solar cells to help protect our planet.

Will you do anything before the show to calm your nerves?

Nerves can be quite nice to get the energy levels up. I'm feeling a bit more pressure with the Christmas Lectures compared to my university and school lectures. Not only is it for the BBC, it's going out to a TV audience of millions of people all over the country.

Which scientist inspires you the most?

Michael Faraday, who was a great scientist at the Royal Institution and was the father of the lectures. Faraday was inspirational because he came from humble beginnings. He also discovered so much about the nature of electricity that we know today.



Saiful Islam will be talking about energy.

Rubber-band cannons

What you need

- Scissors
- A Pringles tube
- 2 elastic bands
- Sticky tape
- A pencil
- A 500ml empty bottle



How it works

The cannon device transfers energy from one thing to another. When you pull back the bottle, energy from the pulling motion is stored in the rubber bands. When you let go, the energy then transfers to the movement of a ball or scrunched-up paper, making it travel over a long distance. This movement energy is called kinetic energy.

Instructions

- 1 Cut off the bottom of the crisp pot. This can be tricky, so get an adult to help.
- 2 Cut two one centimetre long strips about a centimetre apart at the bottom of the pot. Do this again on the opposite side. Leave the cardboard flaps; these will act as anchors for the rubber bands.
- 3 Slide your rubber bands on to the flaps of cardboard, making sure most of the band is on the outside of the tube. Secure with sticky tape.
- 4 Pierce two holes towards the top of the bottle, one on each side directly opposite each other. Slide a pencil through the holes in the bottle so the ends are sticking out each side.
- 5 Slide the bottom of the bottle into the top of the tube. The pencil should stop it sliding all the way. Secure the bottle by stretching the bands over the pencil ends.
- 6 If you pull on the bottle top, you should now have a working cannon.

Static magic

What you need

- A balloon
- Woolly jumper
- A pencil
- A 500ml bottle

Instructions

- 1 Blow up the balloon and then rub it on your woolly jumper.
- 2 Balance an ordinary pencil on the bottle.
- 3 Without touching the pencil, hold the balloon near it. The pencil should slowly start to spin.
- 4 You can chase the pencil with the balloon to make it spin faster.

How it works

When the balloon is rubbed against the woolly jumper, it becomes charged with something called static electricity. When things are charged with static electricity, they can attract (bring together) or repel (push away) other things.



TRY IT!
Find more fun science experiments to do at home, on the Royal Institution's Experimental website rigb.org/expeRimental