

A Salute to the Royal Institution (RI) Christmas Lectures

Christmas wouldn't be Christmas without the RI Lectures!

These Lectures were first held in 1825, and have continued on an annual basis since then except during WWII. They have been hosted each year at the Royal Institution itself, except in 1929 and between 2005–2006, each time due to repairs in the building. They were created by Michael Faraday, and he went on to host the lecture season on nineteen occasions. In 1966 the BBC televised the lectures and these have been broadcast in the days after Christmas as family education and entertainment. With very few gaps I have made a point of viewing the RI lectures and each time I have never been disappointed; the 1966 series with Professor Eric Laithwaite was truly a masterpiece.

Some of the other notable lecturers have included [Desmond Morris](#) (1964), [Sir David Attenborough](#) (1973), [Heinz Wolff](#) (1975), [Carl Sagan](#) (1977), [George Porter](#) (1985), [Richard Dawkins](#) (1991), [Baroness Susan Greenfield](#) (1994), [Dame Nancy Rothwell](#) (1998), [Monica Grady](#) (2003), [Sue Hartley](#) (2009), [Alison Woollard](#) (2013), and [Danielle George](#) (2014).

The most recent series, Dec. 2017, given by Professor Sophie Scott, was concerned with COMMUNICATIONS: 1. Say it with Sound, 2. Silent Messages and 3. The Word.

There was a nice mix of neurology and physics in this series and the demonstrations were excellent. These props for the lectures are designed and created by the RI's science demonstration technicians and must require a substantial amount of preparation work. The technicians are informed of the general subject of the lectures during spring, but the specifics aren't finalized until September, with the recordings made in mid-December. It was usual to have five or six sessions each year. However, in 2010 the Royal Institution cut back on costs as it had become over £2 million in debt. These cost cutting measures included the budget allotted to the Christmas Lectures and this resulted in a reduction of the sessions to three rather than the five or six.



The first session in the 2017 series contained a fair amount of physics in that it was about the production of sound in animals and humans. An opera singer bravely allowed her vocal chords to be examined as she was hitting the high notes. In another demonstration an **acoustic camera** showed how easy it is to locate sound sources and demonstrate the resonance effects of a tea chest with a one-stringed instrument attached to it. The illustration (to the right) shows that Sophie is speaking and the loudness in dB is given by the coloured contours.



With **Schlieren cameras** the visualization of sound is very spectacular and there were a number of demonstrations involving this technique.

Quite a few of the demonstrations involved using strobes to view movements and so I'll close these few words by saying how easy it is to demonstrate this effect. One does not need a special strobe unit as high intensity LED's are more than adequate. An oscillator powers the LED and the light from this shines on a small fan. At various frequencies the motion of the fan is frozen in time and details of the blade are clearly shown as in the illustration above.

The frequency of the oscillator was 90 Hz (read off the scale) which is approximately double the "mains" frequency of 50 Hz. Hence the flash of light illuminates the fan blade at precisely the same special location so the eye sees the blade as being stationary. Clearly, multiples of 50 Hz will freeze the picture and the lower multiples will appear brighter.



In summary, thanks must be given to the BBC (4) and Prof. Sophie for stimulating the young people in the audience who attended the lectures and for providing a very interesting series to a much wider audience via TV.