



# Lichfield Science & Engineering Society

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11 December 2017

Dear Member,

Today is a good day for finalising my newsletter to you, it is cold and snowy outside. I have tried to summarise each of the lectures, the day following the meeting, while I still remember. If I have failed to remember your bit of content, or misunderstood, I can only apologise.

We have had four good lectures this session, a well attended annual dinner where we changed Presidents, three interesting visits and a free discussion at our lunch, all of which worked well.

I am most grateful to all LSES committee members who do so much to make each event work so well, it takes a lot of time and sometimes much patience, on your behalf I thank them all.

Christmas and New Year are coming soon, I wish you all a happy and healthy time and look forward to seeing you next year.

## Monthly Lectures

**“Harnessing the Immune System to Eradicate Cancer”** was the first lecture of the new season, given by Professor Roy Bicknell, Professor of Cell Biology and Genomics at the University of Birmingham.

At the start of this revealing lecture, Roy outlined how the huge continuous replacement of the body's cells sometimes goes wrong and the stop signal which normally controls the process is ignored and a tumour starts. The fact that one in three of us will develop cancer and one in four die from it mostly as we age, emphasises the importance of research and funding to find cures.

Roy's area of research is in the understanding of how the level of blood supply dictates whether malignant growth will start. The process of forming tiny blood vessels is called angiogenesis and is triggered by lack of blood supply which causes molecules (eg CLEC14) to be generated at the endothelium wall. These can be targeted by antibodies which have a drug attached and in an elaborate procedure a 90% success in killing the tumour can be achieved but for a huge financial cost.

The new vision that Roy is developing is that vaccination offers a cheaper route to attack molecules such as CLEC14. By attaching a protein and introducing this back into the body by vaccination, this induces an immune response by the body to reject this angiogenic molecule, and hence kill the cancer. So far he has not got funding for this new approach but hopes he will get cancer charities to support his research.

This was a most interesting and important lecture, amply demonstrated by the quality and number of questions.

**“Healthy Ageing: Is it Possible and How?”** was the striking title given by Professor Janet Lord for her lecture in October.

That we are an ageing population there can be no doubt. In 1917 there were nine adults over 100, in 2017 there were 14,500. Life expectancy is increasing by about two years every decade in men, and about one year every decade in women, but neither are living their later years in good health.

What can be done to improve our ageing? Firstly, eating less can be shown to extend lifespan and drugs may soon be available to support that effect. Secondly, exercise such as cycling, dancing, and in the gym has been shown to slow the ageing process as seen by many medical evaluations. The sedentary lifestyle which many of us have leads to poorer ageing. Standing and standing desks help reduce our inactivity.

Janet said that correct doses of Vitamin D, Zinc, Vitamins B12, and B3, and leucine were important for health, and that statins can reduce inflammation in the body resulting in better immune response.



The four factors which Janet identified as beneficial to ageing were: non-smoking, moderate alcohol intake (<14 units/week), physical activity and five portions of fruit and vegetables/day. On average this may increase lifespan by up to 14 years.

Janet answered 45 minutes of detailed questions superbly, many aspects of ageing were covered in a most authoritative and interesting manner. I cannot hope to summarise fully, so if you really want to know about the questions, then go onto the LSES website Members' area where you will find a recording of the whole proceedings.

### **Annual Dinner**

103 members and their guests attended an excellent Annual Dinner at Aston Wood Golf Club on 18<sup>th</sup> October 2017.

After a good meal, I thanked the retiring President Dr Zsuzsanna Nagy on behalf of the society for her two years in office, reminding us all of the three outstanding lectures she has given, and presenting her with an engraved paperweight as a token of our appreciation. Her husband Professor Roy Bicknell was presented with a bottle of red wine which Zsuzsa said they would both enjoy.

The Chairman and the assembled company welcomed our new President Professor Peter Lambert and he was presented with the LSES jewel to wear during his term in office.

After these formalities, Dr Ian Dillamore gave an interesting talk entitled "John Ray – The English Aristotle". Ian showed us, through a series of circumstances, how it was that John Ray's work had been lost in history, and that his contribution to science, and especially the system of naming of plants had been largely forgotten.

He mentioned three books that recognise John Ray's importance. "The Wisdom of Birds" by Tim Birkhead, "Naming of Names" by Anna Pavord, "The Great Naturalists" by Robert Huxley. These three all recognised the importance of Ray's own book "The Wisdom of God Manifested in the Works of Creation" available from the Ray Society, e-versions can be downloaded from [archive.com](http://archive.com).

After a vote of thanks to Ian and to Roy Foster for organising a successful dinner the evening finished about 10:15.

### **28<sup>th</sup> Erasmus Darwin Memorial Lecture: "Seeing is Believing; 100 years of Visualizing molecules".**

The Lecture was given by Venki Ramakrishnan. President of the Royal Society and joint Nobel prize winner for chemistry in 2009.

Venki delighted the audience with an excellent lecture which started with the early lens to study small organisms and cells, through to the much smaller molecules on which they are based. Crystals of molecules can be studied using x-rays to produce diffraction patterns which are analysed based on the interference between x-rays bouncing off adjacent layers of the crystal. The structure of penicillin and vitamin B12 were worked out with this method. Larger molecules with many thousands of atoms require the interposition of some heavy atoms into the crystal which allow a preliminary structure and then by computer analysis the final structure can be found.

Work on the ribosome started in 1967. Based mostly on RNA it has two components which come together to read the transfer RNA chain using the three bases which form the codon to attach each amino acid in the protein chain. Venki showed a short movie simulation showing the continuous movement of transfer RNA, the arrival of amino acids and their combination to form the required protein.

Many members commented on the simplicity and clarity of the lecture which led us through some difficult topics and made us feel we understood without too much detail, which we are sure underlies the understanding.

After several questions Venki encouraged young people to develop a broad base of science in order to be able to join multi-disciplinary teams which is where most development makes progress.

The audience of 434 people included, 16 honoured guests, 178 members of LSES, 114 students and 126 visitors.



“**The Francis Crick Institute and the First Ten Hours in the Life of the Frog**” was the December Lecture given by Sir Jim Smith FRS, Director of Science at The Wellcome Trust and Senior Group Leader at the Francis Crick Institute. This was held in the Main Auditorium

Jim explained that founding the Crick institute had taken him, and others, about eight years to complete. It is the combination of the National Institute of Medical Research, and the Cancer Research UK, together with The Wellcome Trust and three London Universities, to make an integrated organisation now housed in a huge new innovative building next to Paddington Station and behind the British Library. The £690 million building was designed to encourage broad interactions between the scientists, and encourage collaboration between the many groups working there.

The strategic aim of the Crick Institute is to understand how life works and through that to improve human health. To provide training to scientists in many disciplines and after twelve years to encourage them to move on to other organisations to maintain the cooperation. Also to encourage children and the public in their interest in science.

In the second section of his lecture, Jim discussed the beginning of human life which starts with a single cell which is fertilised and replication begins. After nine months there are 200 types of cells in the human body, a total of  $3 \times 10^{13}$  cells have been produced with an enormous length of DNA equal to 80 times the distance from the earth to the sun, all of which is susceptible to damage from the sun's rays and other sources like pollution and must be constantly repaired by the body's systems

The importance of the early stages of pregnancy were outlined, ie 15% of couples have difficulty conceiving. 23% of pregnancies are lost within the first two months. 2% of babies have genetic defects, so the early stages of embryo growth are very important. The embryo development of animals has been shown to be the same as humans, The order in which the chromosomes are switched on to develop head, body and legs are identical in all vertebrates and Jim's work has used frog embryos to examine the first stages of life.

The work he presented was the first few cycles of cell division of the frog embryo, each taking about 30 minutes, all happening like clockwork, but after twelve cycles the cell division ceases to be synchronous and RNA synthesis begins. What causes this transition is the change in the ratio of DNA to cytoplasm, four factors in the cytoplasm are used up as the twelve cycles proceed and when these are all used up the transition to RNA synthesis begins. Slides showing the decline of each factor confirmed this hypothesis, with some complications from another factor. It is from the design of the experiments that is possible to understand the regulation of cell replication in the early embryo. This knowledge helps with understanding how cancer cells replicate,

There had been a problem showing some videos of the Crick building and the synchronous replication of frog embryos (frog spawn) and how it stops, these were shown after the break and then Jim answered questions.

## Visits:

### **Visit to Warwick Manufacturing Group (WMG) on Tuesday 26 September 2017 –**

WMG was founded in 1980 to help reinvigorate UK manufacturing and is based at the University of Warwick. It employs over 500 people and has an annual turnover of £75m. It receives only 10% government funding, the balance coming from collaboration with industrial partners – Jaguar alone have invested over £75m – and postgraduate courses for overseas students.

The afternoon's visit commenced with our group of 22 members receiving an introductory presentation on WMG, after which we were shown around most of the seven dedicated research and education centres. These included materials development, metrology, nanotechnology, 3D scanning and the Energy Innovation Centre, which is focussed on the development of batteries for automotive applications.

### **Visit to Fiennes Restoration Ltd on Tuesday 10 October.**

34 members and guests travelled to the depths of rural Oxfordshire to receive a warm welcome and tour of the largest renovator of pre-war Rolls Royce and Derby Bentley motor vehicles in the UK. The Company was formed in 1976 and currently employs 35 specialist staff.



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We were given an extensive tour of the facilities, which included a machine shop, where new spare parts are manufactured, the reconstruction and restoration of coachwork area and vehicle storage department. We also were privileged to view other marques including a 1930s V12 Lagonda and a reconstructed 1901 Curved Dash Oldsmobile.

### **Visit to the Lichfield Canal on Thursday 2 November**

A fine Autumn morning greeted the goodly number of 58 members and guests, as they assembled at Darnford Park. The main guide was the highly experienced and interesting Peter Buck, Engineering Director of the Lichfield and Hatherton Canals Restoration Trust. Peter took the group on an informative and detailed tour of the "Heritage Towpath Trail of the Lichfield Canal", starting at the Darnford Park "Trench" and finishing at the Birmingham Road, where Peter explained details of the proposed canal tunnel under the nearby railway embankment.

On the way, we stopped at Gallows Wharf, where on the 1<sup>st</sup> June 1801, the last death by hanging in Lichfield of three men took place, which in their case was for forging banknotes. Peter explained that the Restoration Project was completely managed by volunteers and that whilst the Trust is regularly able to muster eight or nine work parties per week, new volunteers are always warmly welcomed.

### **Discussion Lunch**

There was one discussion lunch, which as an experiment was held as an open discussion. The topics considered ranged from;

The blight of the environment with plastic waste especially in the sea, with no clear answer.

The fall in sperm count in males which is causing inability to achieve pregnancy, of unknown cause but thought to be connected with modern life styles and chemicals in our diet.

Thought of sending our waste into space.

Most people contributed to a very open and often amusing discussion and all enjoyed a very good lunch.

### **Finally**

I wish you all a happy Christmas and a healthy 2018.

Take care and best wishes,

Bob