



CHAIRMAN
Dr Bob Giles

Lichfield Science & Engineering Society

PATRON
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PRESIDENT
Professor Peter Lambert
BSc, PhD, Dsc.

Dear Member,

April 2018

Welcome to this Chairman's newsletter which comes with the papers for the 2018 AGM and is my third report to the society documenting most of the activities.

Together with this newsletter come the following documents.

- The AGM Calling Notice with details of the date, time and Agenda
- Minutes of the previous AGM in May 2017
- Notice of the Summer Supper
- Notice for coming visits.

The activities of the LSES depend upon the members of the committee and I thank them all very sincerely on your behalf. They plan, publicise and run our events, keep our finances in order, keep our records and do the many other tasks which are required - easy to say but it requires a great deal of work and organisation. Without their willing commitment and your regular attendance we would not be the successful society which we are, with a membership of about 360, and about 150 members coming to each lecture.

Thank you all, committee and members.

Monthly Lectures

The Paul Bettson Lecture on **Precision Farming** was delivered by Professor Richard Godwin from Harper Adams University on 10th January 2018.

Richard introduced us to the use of high precision GPS, accurate to about 2cm, to track the position of harvesters and tractors. Coupled with measuring the rate of collecting grain, this can allow the production of yield maps on individual fields – but what to do with them?

Across a field there are variations in soil type, water, nutrients, pests and disease and the aim must be to manage areas differently. Mapping of the paths taken by heavy tractors, causing destruction of the soil and crops, shows that 85% of the field area can be damaged by tracks. Better traffic management can reduce coverage to 60% and sometimes 40%, by ensuring the same track is used every time.

Soil surveys which used to be done manually, at intervals using an auger, can now be monitored by conductivity. The vegetation can be surveyed from above, either locally by cameras on drones or on a larger scale by satellite examination to produce a digital vegetation index. With this information field data cards can be prepared which enable variable seed spacing (remember the onions) and selective spraying of fertiliser which reduces waste and minimises excess runoff into rivers.

Controlled field drainage, using digital topography, to ensure good drainage of pools is another example where precision farming is working.

The take up of many of these ideas depends on the successful training of an ageing farming population.

Training of young farmers is one of Richards skills, long may it continue.

There were 40 minutes of questions ranging from Brexit, to our place in world farming with so little support from government, who seem to regard farming as a minor commercial activity, and who have failed to fund so many of the excellent farming research centres.

135 members and 8 visitors came to hear this lecture.



The Schools Lecture was Genetic Fingerprinting given on 14th February 2018 by Professor Mark Jobling, Professor of Genetics, University of Leicester.

About 90 students attended this lecture. Professor Jobling explained that within our DNA there are blocks of repeating patterns of base pairs the lengths of which are characteristic of an individual. These blocks can be cut out of the DNA chain and separated using electrophoresis to produce a pattern which shows longer fragments moving more slowly than smaller fragments. Comparison of the patterns with samples from other individuals or from DNA left at crime scenes can be used to confirm familial relationships or prove a crime connection.

The first example of the use of genetic fingerprinting was in an immigration case where a mother could prove that her son was indeed hers. The original methods are now much improved by being able to work with much smaller samples of DNA, using shorter repeat fragments and by amplifying these by up to 28 times, which allows separation of enough fragments by electrophoresis. The location of these repeats lies on different chromosomes and by selecting 13 or more repeats the method can achieve very high certainty of identification.

The UK has a DNA database containing about 10% of the population, but it does not seem to be a deterrent to crime. But is the database a good thing? – it depends on your view of whether it protects the individual or could be used to target individuals under a corrupt government.

Several other examples of the use of genetic fingerprinting were given. With developments in technology, DNA profiling can now analyse the whole DNA structure of a person for about £1000.

Gravitational Waves was the title of the lecture given by Dr Christopher Berry from the Department of Physics and Astronomy, University of Birmingham on 15th February 2018.

We can observe the starry sky by the light it emits and by the radiation in other wavelengths that can be analysed. but how can we observe massive objects which emit no radiation like black holes, could gravitational waves be possibility?

Starting from Newton's simple explanation of gravity and how it works on earth and the motion of the, planets, to the universal description of gravity by Einstein as the distortion of space-time around objects of large mass like black holes, Dr Berry showed how 2 black holes rotating around each other would generate gravitational waves.

These waves had been predicted from Einstein's theory, but it was only in the last 2 years that interferometers of sufficient accuracy (LIGO) had been built, that would detect gravitational waves arriving from distant galaxies. These LIGO observatories have two high vacuum arms each four km long at right angles, and compare the times it takes for a laser beam to traverse each of the arms. If gravity waves pass it will detect them but the precision required to detect such movement is smaller than a hydrogen atom. In 2015 two such instruments detected gravitational waves coming from black holes rotating and merging into one and for this work the authors were awarded the Nobel Prize for Physics.

Since then several other rotating black holes and neutron stars have been detected using LIGO and other types of observations. Gamma-ray and x-ray bursts and radio frequency radiation, have now been shown to originate with the coalescence of these large masses. So many observatories were part of this coordinated effort that the scientific paper had 3500 authors. The colours showing in these explosions of energy verify that gold and other heavy elements are being formed – gold, what a good choice for the Nobel prize medal. 129 members and 17 visitors and students attended this lecture.

Space Travel and its Effect on Human Physiology and Psychology on 13th March 2018 was the lecture given by Dr Martin Braddock from AstraZeneca who is leading development in respiratory drugs, is also taking a MSc in Space Science and is a Fellow of the Astronomical Society.



Martin asked us to speculate on space travel to planets and beyond. The nearest star system with a habitable environment (likely to have water) is 4.2 light years distant, but journeys to planets like Mercury would still take several years. The main effect on the human body due to loss of gravity in space would be loss of bone density (like osteoporosis) and it can take 3-4 years to fully recover on earth after 6 months in microgravity. Loss of muscle is also well known and can be partly counteracted by 4-6 hours a day on a treadmill in the spacecraft.

But there are other challenges to the human body, radiation in space is much higher than on earth and protection is required to prevent radiation sickness. Astronauts often feel nausea for the first few days in space and experience poor coordination in movement as lack of gravity disturbs the balance canals of the ear. The shape of the eye is distorted due to the lack of gravity so vision is distorted. Hence it is important for space travel to develop methods of providing simulated gravity to counter these problems.

For long distance space travel, with many people in a confined spacecraft for many months or years of boredom, there is likely to be problems of law and order and leadership. Many people would be required to populate such a space craft, to land, form a base and return to earth.

Data from submarines and other service personnel show the rate of illness is 0.06 incidents/year that require sick bay care and 0.03 incidents/year requiring intensive care treatment. Extensive medical facilities would be needed with medical teams being able to carry out drug treatments and surgery.

It is clear that simulated gravity is required for long term space travel but that is just the start. Nations of the world need to decide if the costs and benefits of space travel justify the risk, just to satisfy our curiosity.

140 members and 9 visitors and students heard this lecture.

Visits

HS2 Head Office, Snow Hill on Thursday 22 February

On a cold Birmingham afternoon, 19 members were warmly welcomed to the National Headquarters of the HS2 Project. We received two interesting presentations, the first by Jonathan Lord, Senior Engagement Manager and the second by Ed Ashcroft, Senior Project Engineer. Jonathan gave details of the current status of the Project and timings of the various phases, with serious construction planned to commence from 2019 onwards. 25 stations will be on the route, giving direct access to half the UK's population.

Ed, who is responsible for engineering aspects of the Delta Junction to the north of Birmingham, which takes in the triangular routing into Curzon Street Station, explained the various bridging options available to cross the substantial motorway and major A roads within the Delta Triangle. Ed emphasised that the key feature of the HS2 Project was to increase railway capacity, rather than the widespread misconception of reducing travel times

Hatt Kitchens, Kidderminster on Thursday 15 March

This family owned Company, formed in 1978, specialises in high spec bespoke kitchens for the contract property development and retail markets, but with a focus on the former (95%/5% split). The Company differentiates itself from its competitors by providing a complete service - design, manufacture, assembly, transport and installation.

Fourteen members were given a thorough introduction and tour of the Company by two enthusiastic Senior Managers, who were clearly highly customer driven. The business had made considerable investments in new plant, including an innovative panel storage area, which can automatically select the next day's production, during the previous unmanned night shift. The profile cutting of the panels was computer controlled, providing the maximum possible yield from each large base panel and minimising waste. Further investment is planned, largely around automating three currently independent production processes.

Discussion Lunch, 28 March 2018

Twenty members enjoyed a superb lunch followed by an interesting discussion lead by two experts from South Staffs Water Seedy Mill Water Treatment Plant. Ade Harvey and Rob Harris gave us a talk on water treatment and how a new process of UV light sterilisation has been installed at Seedy Mill to replace



chlorination of water as the final stage of purification. They then answered questions on our water supply and revealing that about one quarter of treated water is lost through leaks

Data Protection

With the impending arrival of General Data Protection Regulations in May 2018, LSES is working to ensure that all your personal data kept by the Society meets the requirements of the Regulations.

The membership database is where we record and store all the information you send us in the application forms and renewal forms. These forms make a contract between Members and the LSES and we cannot run LSES without it. This database is administered securely by the Membership Secretary. The email addresses of Members are used only by the Publicity Secretary to inform members of events, and the names and postal addresses are used by the Treasurer and Membership Secretary to collect subscriptions, surnames are used to prepare the lecture attendance list,

The published Membership List contains only those members who agree to their names, addresses and past or present occupation being on that list. The list is confidential to Members and must be treated as such. Out of date lists must not be kept as membership is changing all the time.

We ask permission to use email addresses to contact Members as this reduces our costs, but we do not publish Members email addresses as we have been told by the Information Commissioner's Office that this is open to easy misuse and the Membership Secretary is responsible in law for data breaches. If you want to know a Member's email address the best way is to ask them directly.

GDPR requires LSES to ensure that all Members know that they have the right to be kept informed on what data we hold, to ensure it is correct and to erase parts of the data if requested. Members have a right to know how it is used and to object if they think personal data is being mishandled, as well as some other rights not relevant to LSES.

LSES does its utmost to keep all your personal data secure, it will not be passed to third parties. Will members please ensure they keep their copies of the Membership List document secure. Thank you. You will see a few changes when you renew your membership.

FUTURE EVENTS:

This session September 2017 to June 2018.

1. Wednesday 5th May 2018, "Delivering Innovation in Waterfront Support to the Royal Navy", Steve Pascoe, Babcock Naval Marine. Lichfield Garrick Studio 8pm
2. Tuesday 12th June 2018, "Rail Accident Investigation Branch", Andrew Hall, Deputy Chief Inspector RAIB. Lichfield Garrick studio, 8pm
3. Wednesday 20th June 2018, Summer Supper at Mabel's, Curborough Hall Farm, with a talk on "Sandfields Pumping Station" by David Moore, Chairman of Lichfield Waterworks Trust.

ADVANCE NOTICE for Next Session September 2018 to June 2019

1. Wednesday 17 October 2018, Annual Dinner at Aston Wood Golf Club. With a talk entitled "The Lichfield Canal" by Peter Buck, Engineering Director, Lichfield & Hatherton Canal Restoration Trust.
2. Wednesday 14 November 2018, The ERASMUS DARWIN MEMORIAL LECTURE, "Pulsars", Dame Jocelyn Bell-Burnell DBE, FRS. Visiting Professor of Astrophysics, University of Oxford. Lichfield Garrick Main Theatre, 8pm. This is a ticketed event and Members can purchase tickets in advance and at reduced price from the Lichfield Garrick Box Office. The date when these will be available to Members will be announced later.

The full programme card will be sent with your subscription renewal letter in late July 2018.

With very best wishes

Bob