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IAgrE Professional Journal www.iagre.org
Volume 73 Number 4 **Winter 2018**

Landwards

COLLABORATION

80TH ANNIVERSARY CONFERENCE REPORT

1938 2018 IAgrE

In this issue

TECHNICIAN GRADE

NEW ROUTE INTO IAgrE FAMILY

The recently introduced Technician grade of IAgrE Membership is for those who are qualified at a vocational or technical level and have completed an apprenticeship or extended diploma.

To qualify, you will be working in the industry and will have built early experience and career development in the workplace.

You will also be keen to be part of the IAgrE family and seeking a cost-effective way of getting involved and benefiting.

The IAgrE Technician Grade may include

- Farm machinery service engineers with manufacturers, suppliers or dealers
- Those people working in precision farming
- Those working in soil science as technicians, instructors and trainers.

IAgrE Technician members will have a technical qualification in agricultural engineering, land-based technology or related engineering or scientific subject at Level 2 and above.
This will include, for example, an extended diploma, advanced apprenticeship or equivalent in an appropriate subject.

To apply or find out more:
Go to the IAgrE website and complete the Application Form and Guidance Notes. With your completed application form, you will also need to provide a current full and detailed CV which describes in detail your working history and experience. We will need copies of academic certificates and details of education/training.

For further information contact Alison membership@iagre.org or 01234 750 876

EDITORIAL: WHAT IS AN ENGINEER?

As we approach the end of the year in which the Institution celebrated its 80th Anniversary, I cannot think of a more apt way to mark the occasion than reprinting the poem written by Varun Narayanan and read by Yewande Akinola at the Service of Thanksgiving held at Westminster Abbey in November to mark the end of the Year of Engineering.

What is an Engineer?

What is an engineer? Well, look around:
Our monuments are everywhere – we make
and speculate, design, create, and build,
then bridge the continents or search the stars,
bring information into every hand,
shape air and fire, sea and land – each one
an element with which we innovate,
imagining how lives might be improved.
To generate the new, the future now,
ingenious, from backgrounds of all kinds,
inventing at all ages, for all time,
with individual spirit and joined minds,
to tackle any challenge, far or near-
is what it means to be an engineer.

To add more would be superfluous, so I simply thank all the members, contributors and staff at IAgrE for their help and support in the production of Landwards during the past 12 months – and wish everyone a Very Happy Christmas and Peaceful New Year

Chris Biddle FIAgrE
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IAgrE is a founder member of EurAgEng, a licensed body of the Engineering Council and a founder constituent of the Society for the Environment

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OTHER FEATURES

LANDWARDS PRODUCTION TEAM
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PUBLISHED ON BEHALF OF IAgrE BY:
Chris Biddle Media

ISSN 1363-8300 Company Registration # 648041
Charity # 257303

TECHNOLOGY SHOWCASE

Future of agricultural vehicle design and technology on show at iVT Expo

A new, highly focused event for those that manufacture or specify agricultural, off-highway and construction vehicles will launch this (13-14) February in Cologne, Germany. Featuring four specialised pay-to-attend conferences that address the critical issues shaping future industrial vehicle development, and a free-to-attend exhibition showcasing the latest components and technology, iVT Expo will offer exclusive insights into how best to reduce emissions, increase electrification, improve operator safety and comfort, and boost vehicle autonomy and efficiency – all under one roof.

There will be no vehicles on display, or for sale. It will exclusively cater for those who build the machines, by showcasing the new components and technologies they need, while providing some vital clues as to the future direction of vehicle development.

Four pay-to-attend symposiums – Autonomous Industrial Vehicle Technology Symposium; Electric & Hybrid Industrial Vehicle Technology Symposium; Industrial Vehicle Powertrain Technology Symposium; and Industrial Vehicle Cab Design & Technology Symposium – will bring together over 80 experts to address the critical trends shaping future vehicle development.

The introduction of both the new Cab Design & Technology and Powertrain Technology events further expands the range of expertise and insights available, as well as boosting the number and diversity of off-highway designers, engineers and decision makers attending in order to exchange ideas.

Leading speakers confirmed to date include Mel Torrie, founder and CEO, Autonomous Solutions Inc, who will explore state-of-the-art technology for driverless industrial vehicles; Bill Van Amburg, executive VP, Calstart, who will present on 'Beachheads for change – the global urban drive to zero and impact on industrial vehicles'; Brett McClelland, autonomous vehicles product owner, CNH Industrial, who will address the challenges and opportunities for automation in agriculture; and Elza Marisa Paiva de Figueiredo, autonomous system manager for Europe, Danfoss Power Solutions, who will provide an introduction to off-highway autonomous machine design.

With so many important OEM thought-leaders in one place, iVT Expo offers the perfect opportunity to make new contacts, source new ideas and discover the latest components and technologies.

Visit www.ivtexpo.com for further updates and to register for your free entry badge.

ENGINEERING SAFETY

Royal Academy of Engineering and Lloyd's Register Foundation announce partnership

The Royal Academy of Engineering has announced a £15 million partnership with the Lloyd's Register Foundation to address critical challenges in engineering safety around the world. The partnership will build on the Academy's network of global alliances to tackle the most pressing engineering safety and sustainability problems and develop these into practical and accessible outputs for the engineering profession and affected communities.

Over five years, the partnership will allocate £15 million in funding to create communities of best practice and build global research collaborations to develop practical solutions. The partnership will initially focus on three topics: safer complex industrial and engineered systems; enhanced safety in decommissioning and end of engineering life; and developing engineering skills where they are most needed. The partnership may result in new standards, or codes of conduct, or even new approaches to engineering education, and will support programmes that have the most impact upon engineering practice globally.

Professor Dame Ann Dowling OM DBE FREng FRS, President of the Royal Academy of Engineering, said: "Our world increasingly relies on complex interconnected systems and our safety is at risk when localised issues result in wider, often unanticipated consequences. This global partnership seeks to make these complex systems safer. We hope to see engineering companies, universities, research centres and professional institutions in the UK and from around the world joining us to identify where and how the most impactful interventions can be made."

Professor Richard Clegg FREng, Chief Executive, Lloyd's Register Foundation, said: "This partnership is an exciting new vehicle for high impact engineering programmes that promote engineering knowledge, innovation and skills for the benefit of society. The first programmes recognise that there are new and emerging safety challenges, which we can make a distinctive contribution towards addressing"

THE YEAR OF ENGINEERING

Service of Thanksgiving at Westminster Abbey

Past President of IAgrE, Dr Geoff Freedman was amongst leading representatives of the engineering profession who participated in a Service of Thanksgiving to celebrate The Year of Engineering 2018 at Westminster Abbey on 22 November. The service was led by the Dean of Westminster, the Very Reverend Dr John Hall who said "We recognise the work engineers from the beginning of civilisation and the transformative power of engineering in whatever realm, including mechanical and civil, electrical, chemical, and bio-medical", Addresses were given by Roma Agrawal Associate Director, AECOM and Colonel Deborah Porter Deputy Commander, Defence Medical Group. This was followed by readings by Andrew Wyllie, (President, Institution of Civil Engineers) and The Right Honourable Chris Grayling MP, Secretary of State for Transport and prayers led by Dr Freedman (Past President IAgrE), Katie Cresswell-Maynard (Chief Executive, Engineers without Borders UK) and Tony Roche (President, Institution of Mechanical Engineers).

Dame Ann Dowling gives address

The Address was given by Professor Dame Ann Dowling OM DBE FREng FRS, President, Royal Academy of Engineering who quoted HRH Duke of Edinburgh when asked to describe our profession "Everything not invented by God was invented by an Engineer". "Engineers throughout history have shaped our landscape, improved our lives and made the world a better place for humans to inhabit. They play a remarkable role in creating and shaping the world around us. We must now work together to create and shape the future of our profession, placing engineering at the heart of a sustainable and prosperous society, improving lives and opportunities for all" she said. Yewande Akinola, Engineer and Innovator, Laing O'Rouke, IET Young Woman Engineer of the Year 2012 read What is an Engineer? by Varun Narayanan.

CONNECTING WITH TEENAGERS

Lack of information on food and farming

More than a third of British teenagers would consider a career in the food and farming industry if they were provided with more information. Commissioned by LEAF Education and supported by Rothamsted Research, a survey of over 1,000 12-18 year olds across the UK revealed that 35% of young people would consider a career in food and farming, but only 22% have received relevant careers information.

The research said that despite teenagers feeling disconnected to farming and having limited understanding of what it delivers, many young people are interested in how their food is produced and the work farmers do.

In particular, they hold strong views around the environmental impact of farming and, furthermore, they would like to know more about career opportunities available in the sector.

Not surprisingly, when it comes to finding out more, teenagers are turning to social media, specifically, Instagram, Snapchat and YouTube and identify with 'older' food celebrities, such as Jamie Oliver, but there is also an increase in young bloggers, vloggers and chefs. Following the outcomes of the research programme, a new road-map for teenager outreach is being drawn up by LEAF Education in consultation with the agri-food industry, based on five key priority themes: Outdoor Inspiration; Community Hub; Fit for Life; Farming Futures and Careers and Let's Connect.

Carl Edwards, Director of LEAF Education, said that engaging young people in farming and food production is "vital" to the future of the agricultural industry.

"We know that strengthening that connection can help promote healthier lifestyles and nurture a lifelong interest in the natural world". "Over the past year, we have led a pioneering research programme, which has put teenagers at its very heart. We have listened to their views and concerns, learnt about the issues that matter most to them, gained fresh perspectives and involved them directly in developing strategies to help transform the way the agricultural sector communicates with them and, crucially, addresses their needs and concerns."

Professor Angela Karp, Director for Science Innovation, Engagement and Partnerships at Rothamsted Research, who helped shape the teenager research study added: "Today's teenagers are the farmers, consumers and scientists of tomorrow, and what they think about farming will have a huge impact on the wider industry over the coming years.

NEW CEO FOR ENGINEERINGUK

EngineeringUK has announced the appointment of Dr Hilary Leevers as its new Chief Executive. Hilary, who will join the organisation in January, is currently Head of Education and Learning at Wellcome, where she has led a programme to improve science education and position it as an organisational priority for the charitable foundation.

Before joining Wellcome, Hilary was Assistant Director at Campaign for Science and Engineering (CaSE) advocating for policy change to improve STEM education, policies and investment across the UK. She previously worked in academia following her studies in Natural Sciences at Cambridge University and DPhil in Experimental Psychology from Oxford University. Hilary is a governor of a comprehensive school in Lewisham. Her appointment follows the departure of Mark Titterington, who is leaving EngineeringUK to take up two Brussels-based roles in the new year.

Commenting on the appointment, EngineeringUK Chairman Malcolm Brinded said "I'm delighted to welcome Hilary to EngineeringUK at a very exciting time for the organisation. Building on the strategy developed over the last year, which puts inspiring tomorrow's engineers and increasing the talent pipeline into engineering at the heart of everything we do, Hilary's deep understanding of STEM education, together with her experience in building consensus in policy areas affecting science and engineering, mean that she is ideally suited to work with partners throughout the engineering community to make that strategy a reality"

ENVIRONMENTAL IMPROVEMENTS ON FARM

98% of farmers have measures in place

Almost all farmers in the UK have measures in place to drive environmental improvements, with two-thirds planning further investment, according to new research.

The research shows farmers are taking action on the environment, with an overwhelming 98% saying they have measures in place to drive environmental improvements on their farms.

Two thirds say they plan further investment in the environment over the next 12 months, with improving soil and water health top priorities.

The latest Farm Forward Barometer – part of an ongoing research programme commissioned by McDonald's UK and conducted by the National Farm Research Unit – found 62% of farmers also plan further green investments in 2019.

It found farmers' current priorities are improving soil management (84%), preserving the countryside (84%) and better water management (70%).

Asked why the environment is such a focus, farmers are driven first by a sense of personal responsibility with more than half (53%) saying they believe improving environmental standards is the right thing to do.

Andrew Francis, Farm Manager at Elveden Farm Estate, said: "We take action to preserve habitats for rare species by managing field corners and headlands to enhance habitat, and monitor inputs like fertiliser to produce our crop as efficiently as possible. As an industry, we need to take a cross sector approach to evaluate our impact and address concerns together."

The research also highlights many challenges farmers face when it comes to driving environmental standards.

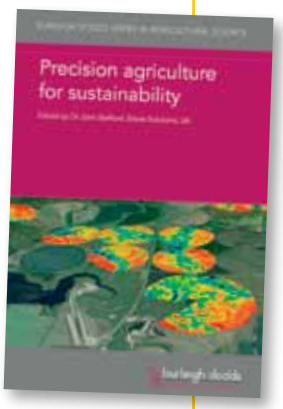
79% cite high production costs, 68% say it is difficult to find viable alternative farming methods and 60% say they struggle to raise funds to make improvements.

A further 40% say they cannot get access to the right skills, advice and expertise.

Technology could be part of the solution. 94% of farmers say they are keeping tabs on soil testing equipment like moisture and organic matter sensors to help with soil health, while 87% are interested in satellite technology and 78% in self-driving tractors which can help to apply nutrients and harvest fields more accurately.

BOOK REVIEW

Precision Agriculture for Sustainability



Dr John Stafford CEng CEnv FIAgrE is the editor of a new book, ***Precision agriculture for sustainability*** published by Burleigh Dodds. Formerly a scientist at Silsoe Research Institute, Dr Stafford is Co-Editor of the journal ***Precision Agriculture*** and a Past President of the International Society of Precision Agriculture (ISPA)

The book reviews key advances in precision agriculture technology and applications. Chapters summarise developments in monitoring techniques, including proximal crop and soil sensors and remote sensing technologies.

The book then goes on to discuss how this information is processed to identify management zones and input targets. Chapters also assess advances in delivery mechanisms such as variable rate application and targeted spray technologies.

The final part of the book surveys the wide range of applications of precision agriculture, from controlled traffic farming to site-specific nutrient and water management.

An international team of subject experts include contributions from Professor Paul Miller on Spray Technologies and James Lowenberg-DeBoer from Harper Adams University on the Economics of Precision Agriculture.

The book will be a standard reference for crop scientists and agronomists as well as all those concerned with improving the efficiency and sustainability of agriculture.

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CEO

Reflections on a changing world

REFLECTING ON IAgrE AT 80

Harnessing inspiration and innovation

Alastair Taylor *IEng CEnv MIAgrE*

It has been my pleasure and privilege to be holding the IAgrE helm in its eightieth year. As I reflect on it, we have had a good year. There remains some real challenges but now is not the time to dwell on those.

The awards ceremony at Wrest Park was wonderful – a nod to the past at the same time as looking to the future. The presentation from Paul Miller and Dick Godwin was a real highlight and it is so good that we were able to record their words of wisdom which you can access on the IAgrE website if you so wish. My enduring memory will be all those past presidents standing in a row on the steps outside Wrest Park – such commitment, such heritage and such a breadth of skills and experience.

With this edition of Landwards you will have a copy of Horizons, a special celebration booklet which delves into various aspects of our discipline. Again we have tried to balance that look at the past with a focus on the future. We enjoyed compiling it and I hope you enjoy reading it. I am eternally grateful to those who contributed to its publication through providing fascinating articles or through advertising sponsorship. It makes the process much more rewarding. It would be remiss not to mention Landwards editor Chris Biddle and his designer Martin Hebditch for putting together Horizons. A job well done and a wonderful way to mark eighty years.

Our conference was a different celebration altogether. Those of you who attended had a great time and we have had many positive comments. Those who didn't attend missed a real treat. All of that said, we understand that a trip to London was never going to be everyone's cup of tea. From my perspective, the Royal Academy of Engineering was a wonderful venue for a superb event. In this edition of Landwards you will be able to read the conference report. The theme of the conference – Collaboration – proved interesting and thought provoking. I am struck that only through collaboration will we succeed.

So where do we go from here?

Looking to the past and learning from it is a good thing. I am constantly amazed by the innovation and skills of past generations. They had so much less than us yet they achieved such wonderful results (perhaps there was something to be said for smoke filled drawing offices and a world free from e-mails, distractions and that "noise" which too often stands in the way of our progress). It was a "can-do" world and from what I can see, a time of great innovation and confidence.

How will we feed the growing world population and reach Global Food Security?

But we can't live in the past and when you look back to 1938 when IAgrE was formed, and the immediate Second World War years and post war period, living in the present and looking to the future was the only way. Out of that came great innovation – perhaps through necessity.

That urgency remains as important as ever. How will we feed the growing world population and reach Global Food Security? How will automation and robots help us to make progress in a different labour market? How will we look after our soils and deal with the impact of climate change? These challenges are every bit as complex as those which faced our forefathers eighty odd years ago and in some respects, even more so!

If the theme of our conference was collaboration for success, then collaboration it will be if we are to address these challenges. In reality, it has always been collaboration which has led to success so I have no truck for those with a narrow mind and inward focus.

I am optimistic that the next generation of Agricultural Engineers will be every bit as successful as their forefathers.

I am optimistic that the next generation of Agricultural Engineers will be every bit as successful as their forefathers. They will communicate and collaborate in a way which my generation just does not comprehend. Our challenge is to harness that inspiration and innovation and put it at the heart of the institution. Bring on the next eighty years!

In the meantime, very best wishes for 2019

Feedback

Responses to **Landwards** Feedback to the Editor chris.biddle@btinternet.com

Direct injection spraying

In the 1970's when I was a young lecturer at the Royal Agricultural College, Cirencester I would return from an agricultural engineering conference or farm machinery demonstration full of excitement for a new technique or machine I had seen that day.

My colleague and mentor, the late Harry Catling, FIAgrE, based upon his vast experience, would rifle through a well-ordered filing cabinet and produce a brochure or paper describing a similar machine of 10-30 years earlier. The major difference would be a different manufacturer, different colour and a much lower price!

The recent paper on direct injection sprayers by Adam Clarke (2018) in the Institution journal, Landwards, reminded me so much of my PhD research in the area of direct injection and precision spraying. In the late 1980's, I worked with my old student, Alexis Aminoff and his Swedish colleagues on the development of the AgriFutura Dose 2000 direct injection sprayer.

We took precision dosing pumps from the water treatment industry, attached stepper motors to control piston stroke length and application rate, and applied electronics to control the units. We took this injection machine to the marketplace in the early 1990's.

During my research I came across a paper by Amsden (1970), describing his work with direct injection in the 1960's. Ron Amsden had developed a number of interesting injection systems whilst working for Fisons, a pesticide manufacturer, including the Spray Train for use on railways to control weeds.

The challenges Ron faced in designing an injection system in the 1960's were exactly the same as those I faced 25 years later.

In 1992 I published two papers on the subject in the Institution journal, then called The Agricultural Engineer.

The first paper outlined direct injection developments at the time, including a number of systems by commercial sprayer companies. The shining light on the horizon in 1992 was the standardisation of container neck dimensional thread size to 63mm and 45mm by members of GIFAP to allow further development of standard connectors and probes. Alas, in 2018, we still have a major container issue; packaging size is still a challenge.

Container size has changed considerably, large-scale farmers are sometimes able to utilise the larger "returnable keg" for certain products but a number of products arrive on the farm in extremely small containers. My plea for 30 years has been for refillable, returnable pesticide containers; if it is good enough for the brewing industry it must be good enough for the pesticide industry.

My second paper described how direct injection sprayers could be used in conjunction with information technology to provide an answer to falling margins and increasing legislation. In 1990, at the Royal Agricultural College farms, we had a GPS system, a combine harvester fitted with yield monitor and location device, and a direct injection sprayer used for pesticides and liquid fertiliser.

The challenges in the adoption of an integrated system are the same today as they were 25 years ago! The advantages of current research are better, more accurate technology, a larger group of well-funded researchers and better-educated farmers who understand the advantages of such systems. In spite of 50-plus years of research and development, we still don't see many injection systems on farms. I hope the current interest in precision farming will herald a new era of adoption.

This recollection of the development of direct injection sprayers over the past 50 years is an excellent example of how agricultural engineering can provide solutions to improve food production and safety. I am encouraged by the article from Adam Clarke, although I wish we were reading about the adoption of this technology rather than its potential.

Direct injection systems are just one area of technology which is constantly undergoing development. IAgrE is an excellent organisation not only for providing professional contacts and conferences but also for publishing new developments via the journal.

Dr Andrew Landers,
CEng CEnv FIAgrE
Faculty Fellow, Cornell University, NY, USA

No-Till

The Groundswell No-Till Show at Weston Farms, Baldock this year directed its primary attention to the soil-health of the world but seems to have been missed by key members of the Press. This work at Weston is an excellent example of No-Till in the temperate agricultural conditions of Northern Europe.

The new Soil-Health Institute of USA (Formed in 2016) means that the farming system at John Cherry's farm has to be a part of the worldwide changes that the No-Till system involves.

There are 32 million ploughing tractors used per day in the farming world and now tractors have to be both lighter for fuel-use and soil-compaction reasons and faster, for productivity reasons.

Changes to the design of Direct Drills, Farm Trailers, Combine Harvesters (such as that done by Tony Reynolds of Thurlby Grange), Fertiliser-Spreaders (trailed not mounted – for soil-compaction reasons) and also the use and adoption of trailed herbicide, pesticide and fungicide sprayers.

All of which must not be mounted (if soil-compaction is a possibility - like the ponding of some time ago).

Of course, the trailer working alongside the combine-harvester has to be as light as possible and as fast as the law allows.

I do not think that the Ministry of Agriculture were present at any of the 3 events organised by Groundswell. Otherwise, why would Michael Gove MP, Minister of Agriculture, in Parliament in October 2017, have confused No-till with Min-Till?

This revolution in farming is a revolution that changes the design of all, if not most, of the farm tractors and the many Ag-implements used in No-Till if you have already read "The Quiet Revolution" (July 2008) in the Scientific American magazine.

In the context of soil-health I look forward to seeing your forthcoming explanation in a No-Till article.

Graham Edwards, FIAgrE
Co-founder, Trantor Tractors

KNOWLEDGE EXCHANGE

Let's celebrate collaboration in the landbased industries

IAgrE President
PROFESSOR JANE RICKSON CEnv, FIAgrE

President's Musings

I was so sorry to miss the Annual IAgrE Landwards Conference on collaboration and knowledge exchange (due to a badly injured back - on the mend now). I'd like to thank the Secretariat for all their hard work organising the event, the presenters, delegates and particular thanks to Alastair for standing in for me at the very last moment. We hope participants enjoyed the 'elevator pitches' (sounds a bit more professional than 'speed dating'!) where speakers were given the chance to share their ag eng challenges, present their expertise or offer their solutions, all within 5 minutes!

As an academic, I am all too aware that universities and research organisations are sometimes accused of being 'ivory towers', with little connection to the 'real world'. To paraphrase the chair of the British Science Association, Lord David Willets, academic research often focuses too much on the 'what', rather than the '…so what?'.

One response is to develop collaborations between academics and government, commercial and industrial partners, whether they are large retailers and agrochemical companies, levy boards, small manufacturers of specialist instruments and machinery, or individual farmers and growers.

Ultimately, the unique strengths of each partner bring synergies to create innovative solutions to specific challenges that no one part of the sector can address alone.

Through collaboration, projects that carry a level of risk (such that industry are unlikely to fund the research) can be supported.

Forging collaborative relationships also helps access the research and development funding opportunities from organisations such as the AHDB, BBSRC LINK and Innovate UK. Industry has to find around 50% of the full project cost either in cash or in-kind. Benefits for company partners include financial support for the project, forging closer relationships with the science base and the possibility of recruiting appropriately trained staff at the end of the project.

In my own area, the LEAF organisation (Linking Environment and Agriculture; https://leafuk.org/) is an exemplar of partners working together throughout the food chain. Improving agricultural sustainability through their 'Integrated Farm Management (IFM)' and LEAF Marque initiatives requires collaboration between farmers, growers, NGOs (e.g. RSPB and FWAG), food processors, packagers and distributors, retailers, academics (collectively all agricultural engineers!), policy makers and finally the general public (often through LEAF's popular 'Open Farm Sunday', where over 2.2 million people have visited farms since the scheme started in 2006).

> The need for knowledge exchange between industry, government and research has never been stronger.

The new Agri-Tech Centres (https://www.agritechcentres.com/), set up under the recent AgriTech Strategy are another example of collaboration between government, academia and industry. Their purpose is to drive greater efficiency, resilience and wealth across the agrifood sector. So far, these collaborations have attracted £90m of investment from Innovate UK to harness leading UK research and expertise as well as build new infrastructures and innovation in agritech.

So what can the IAgrE do to foster collaboration (beyond the conference itself!)? One of the benefits of being a member of the Institution is access to a broad range of professionals working in the land based sector. For example, did you know the IAgrE website has a section devoted to Knowledge Networks? This includes a range of information sources including details of consultants, technical specialists, mentors, regional groups and specialist groups. You can 'Meet a Member' and use the 'Find a Member' search tool.

The need for knowledge exchange between industry, government and research has never been stronger. Some of the world's greatest challenges - food security, coping with climate change, protecting our environment and sustaining rural livelihoods - require scientific and technological solutions that will increasingly rely on agricultural engineers working together.

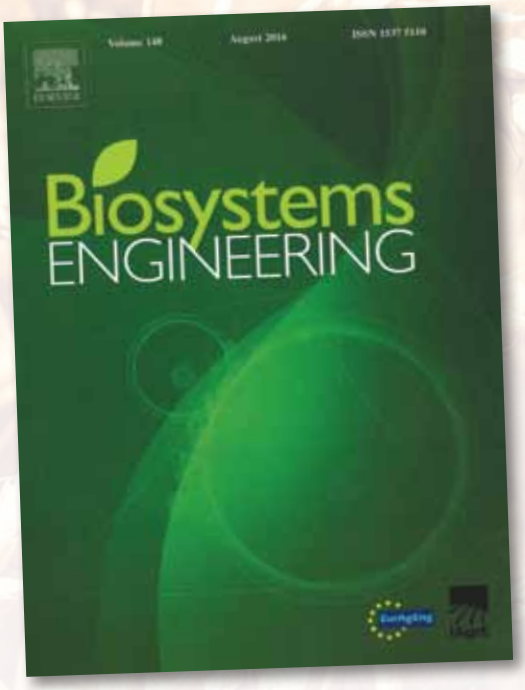
Finally, I came across some collaboration 'top tips' for researchers on a UK Research and Innovation (UKRI) website:

- Start talking to people as soon as you can
- Make sure you are talking to the right people
- Make sure you know what people want to talk about: identify goals and be prepared to negotiate and compromise
- Be flexible: base your level of research on the context and objectives
- Digital dissemination tools such as twitter, blogs and podcasts can be an easy way of disseminating your research and creating impact. They also enable potential partners to feedback to you and ask questions.

Simple and concise, that really sums it up for me.

Biosystems Engineering

Biosystems Engineering, owned by IAgrE, and the Official Scientific Journal of EurAgEng, is published monthly with occasional special issues.



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For further details of the depth and breadth of articles accepted for publication in Biosystems Engineering, visit:
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For details of the preferential rates for members for subscriptions to both the paper and electronic versions of Biosystems Engineering, visit the IAgrE website at:
www.iagre.org/biosystemsinformation

The Managing Editor of Biosystems Engineering, Dr Steve Parkin, has kindly summarised a selection of papers published during the last three issues which he thinks will be of interest to IAgrE members

Biosystems Engineering
Volume 172, August 2018, Pages 29-48
A discrete element model (DEM) for predicting apple damage during handling
Otto C.Scheffler, Corné J.Coetzee, Umezuruike L.Opara
University of Stellenbosch, Matieland, 7602, South Africa

The discrete element method (DEM) allows for individual particle contacts and the dynamic behaviour of a group of particles to be studied. Successfully applying this method to apples allows for future investigations into postharvest mechanical damage to be performed on a range of fruit and vegetables. Bruise formations resulting from multiple impacts and variable time durations between impacts were studied. A detailed multi-sphere particle shape representation along with a realistic contact point loading scheme was implemented. Overlapping bruises were studied and accounted for on a post process level. Qualitatively the model accurately predicted the dynamic bulk behaviour of the apples. Quantitatively, the model succeeded in predicting the contact forces experienced by apples to within 11%. The model predicted the mean bruise damage of a single apple for realistic situations within an accuracy of 47% in terms of mean bruise volume, 35% for bruise area and 30% for bruise depth.

Biosystems Engineering
Volume 173, September 2018, Pages 176-193
(Special Issue: Engineering Advances in Precision Livestock Farming)
Precision fish farming: A new framework to improve production in aquaculture
Martin Føre, Kevin Frank, Tomas Norton, Eirik Svendsen, Jo Arve Alfredsen, Tim Dempster, Harkaitz Eguiraun, Win Watson, Annette Stahl, Leif Magne Sunde, Christian Schellewald, Kristoffer R.Skøien, Morten O.Alver, DanielBerckmans
SINTEF Ocean, Trondheim, Norway; NTNU Department of Engineering Cybernetics, Trondheim, Norway; KU Leuven, Belgium; University of Melbourne, Victoria, Australia; University of the Basque Country, Spain; University of New Hampshire, Durham, NH, USA

As the scale of production increases, so does the likelihood that the aquaculture will face emerging biological, economic and social challenges that may influence the ability to maintain ethically sound, productive and environmentally friendly production of fish. The concept of Precision Fish Farming (PFF) is introduced whose aim is to apply control-engineering principles to fish production, thereby improving the farmer's ability to monitor, control and document biological processes in fish farms. PFF will contribute to moving commercial aquaculture from the traditional experience-based to a knowledge-based production regime. Existing technological solutions that could represent important components in future PFF applications are reviewed. To illustrate the potential of such applications, four case studies are defined aimed at solving specific challenges related to biomass monitoring, control of feed delivery, parasite monitoring and management of crowding operations.

Biosystems Engineering
Volume 174, October 2018, Pages 219-230
Trajectory planning for robotic maintenance of pasture based on approximation algorithms
Christophe Cariou Zoltan Gobor
Irstea, Aubière, France; Bavarian State Research Centre for Agriculture, Freising, Germany

The problem of trajectory planning of a mobile robot for pasture maintenance is addressed. Based on the sensor-based acquired data (points of interest), the proposed approach is to first use an approximation algorithm for data clustering in the form of non-convex and convex hulls. These hulls are then delimited by stair-shaped limits with respect to the working width of the robot, and their centres of gravity calculated. To minimise the travelled distance between the centres of gravity of the defined areas, the Travelling Salesman Problem is addressed via an evolutionary algorithm. Finally, kinematic and dynamic properties of the robot are considered in order to generate the final trajectory. The capabilities of the proposed approaches are highlighted through the processing of several datasets.

2018 IAgrE LANDWARDS CONFERENCE

COLLABORATION IS THE KEY

It was fitting and wholly appropriate that in the year of its 80th Anniversary, that the 2018 IAgrE Landwards Conference should be held in the august setting of Prince Philip House, home to the Royal Academy of Engineering in the heart of St James, London. The event was tinged with major disappointment however that our President, Professor Jane Rickson had to pull out at the last minute due to a back injury. There was no one more disappointed than Jane that she had to miss a conference that she had been played such a part in the planning.

IAgrE CEO, Alastair Taylor stepped into the Chair at the 11th Hour and welcomed delegates by reminding them that the theme of the Conference *'Engineering Collaboration for Success'* was really another phrase for the importance of 'joined-up thinking'.

"The need for knowledge exchange between industry, government and research has never been stronger" he said,"Some of the world's greatest challenges - food security, coping with climate change, protecting our environment and sustaining rural livelihoods - require scientific and technological solutions that will increasingly rely on agricultural engineers working together."

There followed presentations by a wide cross-section of speakers, all coming at the *Collaboration* theme from different angles. Each of the presentations were concise, full of interest and relevant. Staging a conference on such a broad subject can be difficult to promote in advance to a diverse audience, although the 'joined-up thinking' concept must apply to every engineer whether in business or research. Where is the 'end-game', where are the benefits? Collaboration has to be in-built into every stage of development of a product or practice.

There is no doubt that virtually all the content of this year's IAgrE Conference would have been relevant to every IAgrE member. What was apparent from the networking and from the searching questions and comments from delegates was that they were given plenty of food for thought.

Writing up a conference report rarely does justice to the nuances, the inspirational moments, indeed the vibe of a conference. All one can say is to those who were not there "you missed a cracking conference!"

BENCHMARKING FOR SUCCESS

Cost and time analysis essential

"Let's face it, farmers like driving tractors" ***said Dr Susannah Bolton, Knowledge Exchange Director, Agriculture and Horticultural Development Board (AHDB)*** "and that's understandable, but they need to put practical applications into the context of a profitable business model for their farm".

"A tractor driver can command £10 an hour, but a farmer who embarks on forward planning could justifiably cost himself at £100 an hour. It's a question of priorities. It means making the right decisions to improve performance by understanding the key performance indicators (KPI) that can dramatically improve their business".

She asked "What are the top-performing farmers doing differently to the others? Why can two neighbouring equally sized farms on similar soils with the same fundamental farm systems make radically different amounts of money?

According to research, only 5% of factors affecting farm performance are out of the farmers' control, she said, and this suggests almost all the determinants of success are down to the individual. She added that not all farms are prepared or realise the need to change if they want

to improve, so settle instead for the status quo. Farmers that specialise also do a better job than those with many enterprises as they can focus their time and resources on one thing and enterprises can be scaled.

A recent Farm Business Survey identified some useful patterns. The top 25% of farmers make approximately £100,000 per year more than the bottom 50% of farms – and specialist farms outperform their peers.

Dr Bolton said that farmers should focus their analysis of their business on 8 inter-related areas:

1. Minimise their overhead costs
2. Set goals and compile budgets
3. Compare themselves with others and past performance and gather information
4. Understand market requirements and meet them
5. Give each detail the attention it deserves
6. Have a mindset for change and innovation
7. Continually improve people management
8. Specialise

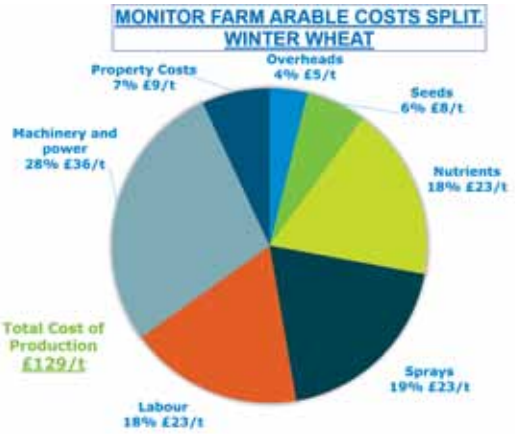
Most farmers are hard-working, but to raise performance requires change, which often involves bravery and self-belief to do well, she added.

Dr Bolton also talked about an AHDB initiative, FARMBENCH, which enabled farmers to get to grips with farm costs by highlighting business strengths and weaknesses in order to make informed decisions.

She said "Our industry will experience significant change over the coming years and the knock-on effect from exposure to fluctuating prices, currency swings and adverse weather events.

FARMBENCH is a web based tool that allows farmers to input their data and importantly split costs between all their enterprises on the farm. A report is then generated that breaks down the costs to clearly show exactly what is being spent and where.

This tool enables farmers to compare where they are in comparison with others, and is done ideally at AHDB on-farm business groups where they can safely share aggregated and anonymised data".



TECHNOLOGY TRANSLATION

Incentives for scientists and engineers?

"Why, oh why is knowledge transfer so complex in Agriculture?" asked ***Keith Norman, former Technical Director of Velcourt***. "Part of the problem lies in its sheer diversity, farm types, output, profitability, technical understanding and geographical mix – and it doesn't help that the average age of a farmer is 59".

"Translation and knowledge exchange must be multi-directional in order to be effective, involving farmers, scientists and engineers at its very heart. The users of new innovations must be involved from the early stages of development in order to adapt it to their actual needs. Technology Translation is an integral part and is a skill – and should be recognised as such.

All innovators should heed Albert Einstein's view that "If you cannot explain it simply, you don't understand it well enough".

Mr Norman said that agriculture is well-served with demonstrations and open days that are ideal for getting across often complex ideas or innovations with a simple demonstration model or plot.

He presented two examples of possible future collaborations between farmers, scientists and engineers.

Electronic Weeding: by using ground penetrating radar and variable cultivation depths, subsoiling can be undertaken at critical depth thus resulting in higher work rates, less fuel useage and less wear and tear on wearing parts.

Differential Application Sprayers: the opportunity to change irrigation rates on the move leading to more accurate irrigation scheduling, a differential irrigation rate within the same field leading to energy cost saving and water saving.

"What we need is more formalised interaction between Government, its funding agencies, levy bodies, scientists and industry"

As well as more demonstration farm networks, Mr Norman thought there should be incentives for engineers and scientists to reward them for the uptake of their research into industry.

RESEARCH PARTNERSHIPS
AMRC: From coal to high engineering

Professor Keith Ridgeway CBE provided conference delegates with a fascinating insight into the work and development of the Yorkshire-based AMRC (Advanced Manufacturing Research Centre), part of Sheffield University.

AMRC specialises in carrying out world-leading research into advanced machining, manufacturing and materials, which is of practical use to industry. Its 100-plus industrial partners range from global giants like Boeing, Rolls-Royce, BAE Systems and Airbus to small companies.

It employs around 500 highly qualified researchers and engineers from around the globe, on the Advanced Manufacturing Park and Sheffield Business Park in South Yorkshire.

Founded in 2001, AMRC became the anchor tenant on the Advanced Manufacturing Park at Catcliffe, South Yorkshire in 2003 and in 2015, opened the doors to its first facility on a new Advanced Manufacturing Campus on the nearby Sheffield Business Park.

Research projects fall into three categories:

Generic research carried out on behalf of the AMRC partnership, with results distributed to all members.

Specific research for individual companies.

Collaborative projects into technologies and processes at earlier stage of development, usually funded by EPSRC, Innovate UK, European Commission or other external bodies.

The group has specialist expertise in machining, casting, welding, powder metallurgy, composites, designing for manufacturing, testing and training.

"Our groundbreaking manufacturing techniques are helping customers like Rolls-Royce transform the production of components for some of the world's most advanced passenger jets".

He gave an example of how the weight and costing of aircraft landing gears have been dramatically reduced through innovative use of new materials and innovative machining techniques.

Professor Ridgeway described how the land, formerly occupied by the Orgreave Colliery for coal production was previously worth 'around £1 an acre, was now valued at over £750,000 an acre!.

One of the main impacts had been improving job opportunities for young people in the region. "We have trained over 1000 apprentices in four years, who are employed by more than 250 local companies – and we are now pioneering degree apprenticeships".

Looking to the future, Professor Ridgeway described AMRC's Factory 2050, one of the most advanced factories in the world, a glass-walled "reconfigurable factory" at the heart of the University of Sheffield's new advanced manufacturing campus on Sheffield Business Park.

"We aim to make Factory 2050 the most advanced factory in the world, built to carry out collaborative research. It has been designed to ensure the UK's advanced manufacturing supply chain can access the expertise it needs to make the most of new challenges and opportunities.

Factory 2050 will be home to the AMRC's Integrated Manufacturing Group (IMG), which is installing the manufacturing and assembly technologies, advanced robotics, flexible automation, next generation man-machine interfaces and new programming and training tools that will drive its research".

PROMOTING TOGETHERNESS
Collaboration across the sectors

The process by which collaboration between a network of businesses, universities, funders and investors can provide expertise, marketing and finance for innovative new ideas and processes was outline by ***Dr David Telford from the Knowledge Transfer Network (KTN***)

"We aim to make friends and influence people" he said "and it is satisfying that two-thirds of companies who are introduced by KTN go on to collaborate. Not only that, almost half of the collaborations we facilitate involves at least one partner from a different sector".

Dr Telford presented two recent examples from KTN that helped agri businesses by facilitating new connections between different sectors **Image Technology**. The dairy research based consultancy, ***Kingshay*** had identified a market opportunity for an unobtrusive measurement and decision support tool for cow condition and lameness monitoring in dairy cattle that could reduce costs whilst boosting health, welfare and productivity. They were looking to develop an automated technology solution, but did not have the full range of technical skills to develop this 'in-house', and turned to the KTN for help.

KTN introduced Kingshay to Professor Mel Smith at the Centre for Machine Vision in the Bristol Robotics Lab at the University of West of England.

The collaboration has led to cutting edge 'machine vision' imaging technology (more routinely used in other industries, such as defence) to be used in agricultural innovation. Once fully developed, Kingshay anticipate the potential for multi-million pound sales for the technology.

Remote monitoring. In the second case study, IceRobotics has developed cutting-edge technology for the dairy industry with the support of KTN and Innovate UK. In order to improve profitability and sustainability, dairy farmers need to continuously monitor their cattle's health, welfare and productivity.

Cattle behaviour, such as the amount of time spent lying or standing, can provide a timely and effective measure of health and fertility.

Traditionally this has been achieved by visual assessment of cattle, which is subjective and time-consuming. Intelligent remote monitoring enables precision management of dairy farming. The global value of such technology is estimated at over £1bn annually.

In 2004 IceRobotics designed a research tool (now sold in over 30 countries) to monitor cattle behaviour on a second-by-second basis. By optimising sensor placement, results indicated that automated detection of lameness should be feasible. Further Innovate UK supported research has subsequently enabled a world-leading system to be developed and validated.

The system is being marketed under the product brand name of "CowAlert", which is now being sold to dairy farmers worldwide. It has already been installed in over 200 farms and fitted to over 50,000 cattle across Europe.

BEST PRACTICE – IN PRACTICE

The afternoon programme featured three presentations on collaborative initiatives that are ongoing. First up (and perhaps inevitably for an agri-tech conference) ***Kit Franklin (Harper Adams University) and Clive Blacker (Precision Decisions***) reprised the background, the planning and the execution of the highly publicised Hands Free Hectare project. Kit told how the initial idea was sparked by the NASA Curiosity Rover that had taken a year to travel from Earth to Mars, landed safely and gone on to perform numerous scientific tasks. "I was sure that if you could robotically control a vehicle from almost 980 million miles away, we could handle farming a field in Shropshire".

Clive Blacker (left) and Kit Franklin

Clive Blacker added "There is no such thing as a daft idea, you never learn until you try. Here was an opportunity to bring in new skills and upskill existing staff in new and emerging areas".

The project was fully supported by Innovate UK and involved a dozen different partners, and right from the start the team decided to get news of the progress of the project into the public arena. "As it evolved we kept on telling the story, and made sure that we connected with some important people (Michael Gove and Jeremy Corbyn had both been on site). The project won the team plenty of publicity, a hatful of Awards and is now embarking on a second season.

Professor Simon Pearson from the Lincoln Institute for Agri-food Technology (LIAT) told how the Lincoln University-based division had become a world ranked global centre for agri-food research, innovation and training in 5 years.


Professor Simon Pearson

"We have established a cross-disciplinary organisation that connect the University to key agri-food challenges" he said.

He described how the team had worked on a 24-month project with Tesco Stores to tackle the high cost of retail refrigeration which totals more than 14% of the UK's electricity usage which represents roughly a third of a typical food and drink retailer's energy cost.

Supermarkets across the nation currently utilise thousands of refrigeration units, not only to keep our food and drink chilled, but also to prolong the shelf life of produce and prevent the growth of harmful bacteria. The team built a real life simulation of a supermarket's 'cold and chilled area' at Lincoln's Riseholme facility. "We were able to undertake the project using the Internet of Things having identified funding and partners established through the Knowledge Transfer Network (KTN)".

Finally, ***Cranfield University PhD student Dr Iain Dummett and James Molden of Frontier Agricultural*** presented a practical example of industry working closely with academia. Iain worked closely with Frontier to provide practical applications and research results from his work on Strip Tillage.

"Using the facilities at Cranfield we were able to provide the science behind my research using controlled conditions as found in our Soil Bin, but were then able to test and evaluate in field trials where conditions are often high risk due to weather, disease etc. It is important that we incorporate field trials because they often simulate conditions that industry encounters in the field".

"As a company that needs to be at the forefront of innovation" added James "it is important that we are able to translate research at the farm gate as farmers need both reasons and a return".

Dr Iain Dummett (left) and James Molden

Elevator Pitches

The conference gave the floor to a number of innovators to provide a five- minute presentation on their ongoing projects which covered many sectors of agri-tech.

They were:
Richard Johnson: Oxentia Ltd

Linsey Cresswell: CHAP

James Molden: Frontier Agriculture

Ilan Adler: EcoNomad Solutions

Bruce Grieve: Manchester University

Jonathan Lodge: City Farm Systems

Round Table discussion

The 2018 Landwards Conference was kindly supported by **OXENTIA, AGRI-EPI-CENTRE, EURAGENG** and **DOUGLAS BOMFORD TRUST**

Keith Geary: Axomap

PERSPECTIVES

1938 2018 IAgrE

Selected extracts from latest UK's professional engineering journals.

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JOINING THE DOTS

For nearly 20 years ISObus has enabled agricultural machinery compatibility, but now it faces the competing challenges of an accelerating rate of innovation and OEM demands for more stringent certification. Can the much-respected protocol survive? Jack Roper reports (Reprinted from iVT International)

ISObus is the universal protocol that allows cross-branded tractors, agricultural implements, sensors, displays and farm management information systems (FMIS) to communicate and work together. Named after international standard ISO 11783, it is developed and certified by the Agricultural Industry Electronics Foundation (AEF), an independent organization where engineers from member companies work together in project teams, each with a specific technological challenge. The AEF exists to provide farmers with industry-wide plug-and-play compatibility of multibranded components and maintains an online database of products that have passed its conformance tests. IMAGE X2 ISOBUS Connector

ISObus-compliant modules can form a single onboard system on a tractor in the field. "There's one wire from the implements through to the tractor," explains AEF Steering Committee member Carsten Hühne, who also works in ISObus business development for attachments manufacturer Kverneland. "The connector in the middle – now a symbol for ISObus – is standardized. Each implement has an electronic control unit submitting information to the bus system, as does the tractor." Modules such as a joystick or GPS receiver can be added and all functionalities can be controlled through a single universal terminal, so the cab need not be cluttered by multiple monitors linked to what Hühne calls "island solutions".

OEM COOPERATION

ISObus is so important to the agricultural machinery industry that vehicle OEMs have been heavily involved for many years. John Deere's Hans Jürgen Nissen, who has worked at the leading edge of ISObus for 20 years, remembers being pulled into his first ISO meeting as a fresh-faced engineer in 1998, when the internet was in its infancy and the gathered engineers relied on paper documents. He is now standardization

and partnering manager for Deere's Intelligent Solutions and was honored with the VDI-MEG *(Society of German Engineers Max-Eyth-Gesellschaft Agrartechnik*) Award in 2012 for his career contribution to agricultural electronics.

Since its inception, Nissen has led the AEF's Project Team 5: ISObus Automation and Tractor Implement Management (TIM) – tasked with facilitating cross-branded functionality for implements capable of guiding tractors – and, through wireless TIM, combine harvesters that can drive tractors running alongside them.

TIM will soon enable intelligent implements to assume control of tractor power outlets over an ISObus connection for precise, automated cooperation of the two machines.

"The first product John Deere identified for this type of interface was a round baler," Nissen recalls. "The tractor has sensors measuring windrow mass and the implement can control the tractor's ground speed accordingly. When filling sensors, see that the chamber is full, the baler can stop the tractor and activate its hydraulic flow to start the tying process, before opening and closing its rear gate." At high flow-rates, manual operators perform an arduous cycle of swivelling, filling, stopping, tying and working the gate every 40-50 seconds. "Now the operator simply monitors the process, while automation brings the whole system to the edge of its capabilities."

MULTIBRAND COMPATIBILITY

TIM works across brands on a plug-and-play basis, such as a Kverneland spreader controlling a John Deere tractor. "Grimme has a potato planter to put soil down in perfect dams, where the potatoes grow," Nissen continues. "It controls the height of the tractor's rear hitch. If there's a ditch and the tractor dips down, the implement maintains its height so that the dam is perfectly even."

Tillage implements equipped with sensors and hydraulic drives can perform automated depth-control using the tractor's hydraulic outlets and valves. Krone or Pottinger loading wagons can control a tractor's ground speed using windrow sensor data. Steering manufacturers Trimble and Topcon offer interfaces that can commandeer a vehicle's steering system.

"A tractor and loading-wagon are competing with a self-propelled forage harvester," Nissen points out. "The difference is, it's a modular system. Modularity is important in agriculture because field conditions and the details of cultural practice vary so widely. Through TIM, we can increase productivity in a modular system."

ACCIDENT LIABILITY PROTECTION

However, multibrand TIM functionality gives rise to new and complex liability ramifications. "If someone gets hurt when an implement is controlling a tractor's power outlets, as long as it's John Deere with John Deere, then it's John Deere who pays. But when it's different brands and the tractor believes the implement told it to brake or speed up or lift or lower the implement, then who is to pay? Is the

tractor guilty? Or the implement? Or both? It's a question of which way the pendulum swings."

Such uncertainties prompted John Deere to introduce a security layer on top of the ISO specification for TIM functionalities, rendering it a proprietary solution. "Competitors accused us of excluding them from an ISO function, but we did it to protect ourselves," Nissen says. "You have safety, security and liability – a triangle, if you like. We put in some security to make sure only trusted products can work together. Only when we know a manufacturer has taken all appropriate steps to fulfill our safety specifications will we open up our tractor so that they can access the power outlets. Only then can we swallow this joint liability."

To avoid implement vendors having to submit products for separate testing with every tractor manufacturer across an insupportably vast matrix, in 2012 AEF Project Team 5 started work on a standardized security layer for TIM. "We developed a system like https on the internet," Nissen explains. "When you access your internet banking, you add an 's' to your 'http' and suddenly you trust it. Something magical happened in the background, right? We do something similar over CANbus. When manufacturers follow the safety rules and pass the AEF Conformance Test, they get an electronic security certificate to put in their software. Their products can come together in the field, exchange certificates and say 'OK, now I will switch on my automation.'" The technology is currently in its testing phase and Nissen expects it to be showcased in a crop of new products at Agritechnica 2019.

AEF Plugfest

Plugfest is the AEF's gathering of engineers from across the agricultural equipment industry who are engaged in ISObus standardization. Meeting in the USA in the spring and in Europe in the autumn. Lincoln in Nebraska and Bologna in Italy were this year's venues.

"They are doing a kind of 'speed-dating' there!" laughs the AEF's Carsten Hühne. "Around 300 come together with their terminals and new implements – but only the ECUs, not the physical implements. You see a lot of desks. The implement people get a set time limit of 30 minutes – and they are 'speed-dating' with the terminal. They plug in their implement, and see if the whole system works. If not, they make a protocol of that and then they can go home and do some more work."

Testing cross-branded combinations of tractors, implements, terminals and other attachments for compatibility in the field can be an involved process entailing negotiation, air travel and finding a farmer – after which only one combination is tested. Plugfest, by contrast, allows over 1,000 possible combinations to be tested over a three-day period. "At Plugfest you present products nearly ready to be certified," says Hühne. "You meet competitors there and it's a good opportunity to make contact and find solutions."

"The speed of innovation, based on proprietary solutions, makes it hard for standardization to come alongside," he continues. "But it has to keep pace, otherwise companies cannot profit by selling to a wider market, because farmers will no longer accept island solutions. ISObus development has to be quicker. The AEF is the platform for that but, despite agriculture being a big industry, we have limited resources. We are a club of enthusiastic engineers across all brands, working voluntarily."

Originally published in iVT International magazine

REMOTE SYSTEMS

The AEF is also working on wireless in-field communication between two machines in the field, whereby a combine can control the steering and ground speed of a tractor running beside it, moving the grain cart into optimum position beneath its auger.

"This is the new puzzle-piece," says Nissen. "We are working on a standardized interface so that multibrand tractors and combines or forage harvesters can control each other. Sounds like TIM, doesn't it? It's just wireless TIM. We add another module – the wireless connection of two networks – and suddenly the combine looks like a client, like an implement, to the tractor. These modules open out new possibilities for

functionality."

And right now, communication over even greater distances is possible via ISObus. Kverneland's Hühne is excited about the potential for satellite biomass imaging to inform precision farming.

Kverneland Group already produces fertilisers and sprayers that, by linking with a FMIS (farm management information system) and a tractor-mounted GPS controller via ISObus, can perform automated section control. This involves turning given sections of the fertiliser on or off as needed, eliminating overlap and reducing costs by an estimated 10%.

"Now we are talking a lot about variable rate control, where you use a colored map of your field and define, for each location, a different amount of fertilizer to spread. Providers are using Sentinel satellites' biomass images, to get a new view of their field every fifth day."

NEXT-GENERATION ISOBUS

But multiplying functions are beginning to overwhelm ISObus systems that use CANbus 250Kbps wiring, with the AEF now exploring options for the next-generation, high-speed ISObus.

"The physical layer today is reaching its edge," explains Nissen. "We're looking at Ethernet solutions, to provide space to live in for the data volumes ahead."

Meanwhile, standardization toils to keep pace with new capabilities created by the rapidly accelerating growth of electronics.

"In the past you wrote a specification for a three-point hitch on a tractor, standardized, published it, and it was done. But the ISO11783 series of standards can never be done," says Nissen. Standardizing physical connections – involving hydraulics or PTO – merely had to be written and published but electronics, which are evolving and becoming more sophisticated at an accelerating rate, mean ISO 11783 will never be written and finished in the same way. It must constantly evolve.

Is there an inherent tension between standardization and the impulse to innovate?

"Innovation won't happen within the standard," Nissen maintains. "It happens on top of the standard. But it needs to be done carefully so as not to disturb the standard and other functionalities running in the network."

New products emerge first in proprietary form and, for a time, manufacturers will want to protect their market, earning money from their own innovation, but eventually they work with competitors on standardizing similar solutions.

"There's the tension: when do they do that?" Nissen continues. "You want to have your market advantage, of course, but as an implement vendor you need a tractor, and vice versa. Only a few have both and can leverage the whole value of an innovation."

LEADING THE WAY

In 2015, Nissen was invited to speak about ISObus at an automotive conference and was afterward approached by delegates from Audi, agog with disbelief at what agricultural technology has achieved across brands. While vehicle-to-vehicle (V2V) communication is heralded as the next big thing in the automotive sector, the road remains unclear, with rival brands all using closed, proprietary CANbus.

"On German autobahns today, car-to-car works between Mercedes and Mercedes or BMW and BMW, but when you want the cars to talk to each other we are light years ahead. For their whole industry, they need a system similar to what we are already doing with the security layer. You saw their eyes grow wide at what we, as an industry, do across manufacturer borders for the sake of our customers."

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When IAgrE is100

It's the year 2038 – the food we'll grow and eat
A science-fiction look at the next two decades of food developments, from robot farmers to 3D-printed meals to government monitoring of your daily calorie intake.
(Marius Robles, Fast Company)

It's the year 2038. The word "flavour" has fallen into disuse. Sugar is the new cigarettes, and we have managed to replace salt with healthy plants. We live in a society in which we eat fruit grown using genetics. We drink synthetic wine, scrambled eggs that do not come from chickens, grill meat that was not taken from animals, and roast fish that never saw the sea.

Was this what we had in mind when we started seeking transparency, traceability, and sustainability of our food system many years ago in the early aughts? About a decade ago, we lived through an agricultural bottleneck caused by warm temperatures that caused plagues and diseases, which severely compromised the food sources we were cultivating and consuming.

By the end, three quarters of the world's food was derived from just 12 plant and five animal species.

We learned from this mistake and started to embrace true biodiversity, grew meat in labs, and put robotics into farms. But the technological advances that have made clean, sustainable food possible have also created some horrifying scenarios.

Traditional farmers were left with no choice but to reinvent themselves, although very few had the capacity to adapt to the new kind of agriculture. Most of them were eliminated by robots. Vegetables like cauliflower, cabbage, and broccoli had seen soaring prices due to a lack of workers available to harvest them. The robots cut cost by 40%.

YOUNG GENERATION OF FARMERS

Agriculture is now mostly in the hands of the young generation, 70% of whom are college graduates and refer to themselves as "urban farmer-scientists." They grow all kinds of plants in containers placed throughout cities, using efficient hydroponic setups and the latest technology to narrow the gap between citizens and their food. Farms are now located in cities and can be readily visited, but they now resemble an Apple Store more than a traditional farmstead.

In addition to this technology, the fields that remained for cultivation became sites for regenerative agricultural practices, a series of steps beyond what is required to obtain an organic label and which could contribute to combat climate change by locking carbon into the ground.

All of our nutrition follows a plan, there is practically no freedom of choice. The initial trigger was China's pilot program–based on the launch of its big data and artificial intelligence system that assigned a rating to each Chinese citizen, what they called the social credit plan.

Once Chinese businesses entered the food market en masse, they applied their technology and control model throughout the world. The focus on climate change and food safety led the EU to create a kind of food police. This organization uses technology and the ongoing carbon footprint left by each citizen to trace everything we eat and monitor our level of food waste. The sum of all these elements results in our CFS (Citizen Food Score).

They are able to analyse everything, from the sandwich we take from a vending machine–1,441 grams of CO2 equivalent, equal to the emissions generated by driving a car for 10 miles–to our overall eating habits. This means that when you try to use your fingerprint on a vending machine, sometimes it will withhold the product, either because it would exceed your predetermined carbon level or because you have already ingested the necessary calories for that day.

An algorithm calculates our level of consumption and the waste we generate without needing to check the bags in our garbage containers, simply based on what we buy at the supermarket, the number of people in our household, and their consumption and habits. This is then used to impose significant fines when a high level of waste is detected.

We have ended obesity, but we are still analysing the health effects of new food products coming from laboratories. As a preventive measure, we now have the Food Consumption Tax Agency, which analyses the way we eat by means of a digital implant or tattoo, depending on the category.

The government makes everyone ingest an edible nanorobot every six months to assess our food's risk for our health and the environment. Insurance companies have started to offer policies with premiums that vary

according to our health habits.

Thanks to those implants, they are able to track almost everything in real time.

SMART COOKING

Kitchens have completely changed. We now have bioreactors in our kitchens, together with a whole series of smart cooking devices that do not simply manipulate or process food but can prepare any dish or recipe. We have gone from having urban gardens at home to robotic greenhouses that produce food at high speed, 500 times faster than that grown from the soil. We even have the ability to produce hybrid foods.

We can now tele-transport food. The method of transportation that brought meals into our homes went from the motorcycle, bicycle, and robot, to a broadband connection. Instead of sending the food, we send its data. We can acquire recipes and dishes made by top chefs in their restaurants. Once we have "purchased" them, our 3D food printers can replicate them at home in a matter of seconds. Powdered food synthesizers can create simultaneous and changing snacks, with 10 or 20 different flavours in each bite.

This happened after companies digitized every foodstuff in the world, making it possible to 3D print them. They created a digital food database that stored information about the flavour, color, shape, texture, and nutrients of different kinds of foodstuffs. The user just had to select the type of food they wanted from the database and their 3D printer created small cubes in the shape of that food, which were then injected with the corresponding flavours, colors, and nutrients.

Artificial intelligence became completely enmeshed in our lives, and also in our kitchens. Each citizen is assigned a flavour-predictive algorithm, akin to culinary DNA, which logs every memory and taste linked to food from our earliest childhood. Since it perfectly understands our every culinary need, it can even anticipate our moods and instruct our cooking devices to prepare the most appropriate dish. Everything we need is recorded in a single database.

VIRTUAL RESTAURANTS

The few remaining restauranteurs have the same level of responsibility as doctors in terms of caring for their patrons' health. Restaurants used to cater to emotions, instead of exclusively to stomachs. Back then, they didn't just feed diners, but also served as a setting for reconciliations, negotiations, conspiracies, declarations of love, intellectual gatherings, deep conversations, and a very long and indescribable etcetera. Nowadays, most restaurants have become virtual. They still prepare dishes, but they send them to your home. They no longer have tables and chairs for diners to sit at. The progress made in food preservation allows us to enjoy any menu, from the best haute cuisine to the cheekiest snacks, in the comfort of our own homes.

Any customers who still visit restaurants in person find a space full of sensors that track operations in the kitchen and diners' movements. Most restaurants download their diners' FCS (Food Citizen Score) and flavour predictive algorithm (culinary DNA) as they walk through the door, to obtain information about weight, height, dietary requirements, and physical condition goals. Their applications will then provide personalized nutritional advice and recommend meal options. Customers also provide a saliva sample, so that the restaurant can cross-reference their genetic makeup against updated studies, in order to let them know if they have a significant probability of a genetic predisposition to food intolerances and also to inform the specific dietary contents of the perfect menu they will put together.

Abundance, coupled with artificial intelligence's ability to anticipate every decision, has emptied our minds and lives of any concerns related to food. But as a result, we have destroyed the pleasure of eating: We never lick our lips in anticipation.

Marius Robles is the CEO and cofounder of Reimagine Food, the world's first disruption centre focusing on anticipating the future of food. He is currently finishing his book Eatnomics: The New Food Economy, which provides a new perspective on where the future of food is heading, along with the opportunities and challenges that will come within.

This is a work of fiction. Characters, businesses, places, events, and incidents are either the products of the author's imagination or used in a fictitious manner. Any resemblance to reality is purely coincidental.

Soil and Global Warming

Low-tech ways of improving soil quality on farms and rangelands worldwide could pull significant amounts of carbon out of the atmosphere and slow the pace of climate change, according to a new University of California, Berkeley, study. *(ScienceDaily)*

The researchers found that well-established agricultural management practices such as planting cover crops, optimizing grazing and sowing legumes on rangelands, if instituted globally, could capture enough carbon from the atmosphere and store it in the soil to make a significant contribution to international global warming targets.

Their initial aim was to determine if such practices could reduce global temperatures at least 0.1 degree Celsius (0.18 degrees Fahrenheit). This is one-tenth of the Intergovernmental Panel on Climate Change's goal of limiting the average global temperature increase between now and the year 2100 to 1 degree Celsius (1.8ºF), or 2" degrees Celsius (3.6ºF)" above temperatures before the industrial revolution.

When combined with aggressive carbon emission reductions -- the best scenario for limiting warming from climate change -- the study found that improved agricultural management could reduce global temperatures 0.26 degrees Celsius -- nearly half a degree Fahrenheit -- by 2100.

"As someone who has been working on carbon sequestration for a long time, I have always had this question in the back of my mind, 'Will sequestration in soils make a difference with climate change at a global scale?' " said study senior author Whendee Silver, a professor of environmental science, policy and management at UC Berkeley. «We found that there are a wide range of practices deployable on a large scale that could have a detectable worldwide impact. A big take-home message is that we know how to do this, it is achievable.»

By throwing in biochar, a controversial soil additive -- essentially charcoal -- obtained by burning crop residue in an oxygen-free environment, these practices could offset even more warming, potentially as much as 0.46 degrees Celsius (0.7ºF).

The caveat, Silver said, is that this "is only achievable if you couple sequestration with aggressive emissions reduction." If carbon concentrations increase in the atmosphere, then sequestration becomes less effective at reducing temperature. We would have to pull much more carbon out to realize the same reductions.

She and her colleagues, including lead author Allegra Mayer, a UC Berkeley graduate student, will publish their findings Aug. 29 in the online journal Science Advances.

STORING CARBON IN SOIL

The IPCC has established carbon-reduction goals to limit average global warming in 2100 to 2 degrees Celsius ("3.6°F») above global average temperatures before the industrial revolution, or about 1760. Earth is already halfway to that limit, having warmed 1 degree Celsius since 1880.

Silver studies various ways to sequester carbon in soils, including composting, to remove some of the carbon dioxide from the atmosphere and slow the greenhouse-driven warming of the planet.

For the new study, Silver, Mayer and their colleagues -- Zeke Hausfather of UC Berkeley›s Energy and Resources Group and Andrew Jones of Lawrence Berkeley National Laboratory -- used global data on agricultural management approaches that are already known to increase soil carbon storage, along with a climate model that determined the potential impacts on climate if these approaches were widely adopted.

They initially calculated how much carbon would need to be sequestered from the atmosphere into soils to reduce temperatures 0.1 degree Celsius under four different scenarios, from business-as-usual emissions through 2100 to aggressive reduction of carbon dioxide emissions. For the most aggressive reduction scenario, they calculated that soils would have to sequester about 0.68 petagrams of carbon per year worldwide, or 750 million U.S. tons. That is equivalent to 2.5 petagrams of carbon dioxide. One petagram is 1015 or a million billion grams.

SIDE BENEFITS

Their meta-analysis of existing studies of land management practices showed that improving soil quality could reach and even exceed this goal, largely from the improvement of degraded agricultural and grazing lands that are in use but producing less than optimally. Improved management tends to increase the biomass of crops, grass and their root systems by capturing carbon dioxide via photosynthesis, which results in more carbon storage in the soil.

"These are very commonly used approaches, though people don't use them to sequester carbon -- they are doing it for other reasons. Anytime you increase the organic content of soils, you are generally increasing the fertility, water-holding capacity, sustainability, decreasing erosion and general resilience to climate change," said Silver, a biogeochemist who holds the Rudy Grah Endowed Chair in Forestry and Sustainability. "Sequestering carbon is a side benefit."

The researchers did not consider newer practices, such as composting, that are not studied as widely, nor did they consider the effect of improving soil on abandoned land, both of which could increase soil carbon sequestration even more. Newer climate models also could simulate how carbon uptake will change as temperatures rise and rainfall patterns change.

"The point of our paper was to look at the temperature effect of implementing existing low-tech technologies already practiced within agriculture, in developing as well as developed countries," Mayer said. "There could theoretically be an immediate and widespread adoption of many of these practices."

With aggressive emissions targets, improved land management could pull about 1.78 petagrams of carbon from the atmosphere each year, while adding biochar to the mix could raise the yearly sequestration rate to 2.89 petagrams.

«Agriculture is often portrayed as the villain in climate change,» Silver said. «What is exciting is that, not only can agriculture contribute to solving the problem, but it can do so in a way that actually improves agricultural soils.»

The project was funded by the Rathmann Family Foundation with additional support from the U.S. Department of Energy›s Office of Science.

Allegra Mayer, Zeke Hausfather, Andrew D. Jones, Whendee L. Silver. The potential of agricultural land management to contribute to lower global surface temperatures. Science Advances, 2018; 4 (8): eaaq0932 DOI: 10.1126/sciadv. aaq0932

DOUGLAS BOMFORD TRUST

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Alan Plom, Secretary to the Douglas Bomford Trust (DBT) reports on the latest round of DBT Awards and Events.

AWARDS

I was at **Cranfield's** Prize Giving Ceremony on 28 June to present the DBT Award for the ***"Best student on a land based course within the Environment theme"*** to **Elizabeth Case**.

Next it was **RAU's Awards Ceremony** on 18 July with Trustee Paul Miller to present our Prize for the "**Best application of engineering to solve a problem in Agriculture, Food or the Environment**" to **Martin Wozencroft**. Entirely coincidentally, Martin described his project at our own **IAgrE** South East Midlands Branch Student Competition in February. We hope Martin will continue to develop his mechanism for an autonomous litter picker to work in dangerous locations, such as verges and central reservations on busy highways. Similar to sensors for auto-weeding, this is another good example of cross-fertilisation of ideas and technology originally developed by agricultural engineers. We have given Martin some ideas, encouragement and industry contacts - part of the useful mentoring role of our trustees.

On 21 September, it was Paul Miller's turn to present the DBT Prize at HAU's Graduation Ceremony to **Alexander Galla**.

Alan Plom (DBT Sec), RAU DBT Prize Winner Martin Wozencroft, Paul Miller (DBT Trustee) and Karen Rial-Lovera (DBT-funded Chair of Agricultural Engineering)

WOMEN IN ENGINEERING

In my last report I mentioned **Amy Boothby** (one of DBT's 2017 HAU Scholars) who's mission is to encourage women to consider a career in (agricultural) engineering. She is now on IAgrE Council. DBT has also agreed to help **Anita Woolf,** another 2017 HAU Scholarship recipient, to develop a network for women engineers. We have also recently interviewed students at HAU and awarded 7 DBT Scholarships.

ARKWRIGHT ENGINEERING AWARDS

Another highlight was the **Arkwright Engineering Scholarship Awards ceremony** held at IET in London on 25 October, where I met one of our latest DBT-funded A-level students, **Barnabas Pickford** who has already had work experience at Twose and our newest Trustee **Richard Robinson** will be helping him gain further experience at his own company. We are also arranging for our Arkwright Scholars to receive IAgrE Student membership and encourage them to attend local IAgrE meetings. Our other recipient lives in Northern Ireland and was unable to attend the similar Ceremony in Edinburgh, but we hope to meet her soon.

TRAVEL AWARDS

DBT also helped a group of 7 **HAU** students to travel to the **International Agricultural and Gardening Machinery Exhibition (EIMA)** in Bologna, 6-9 November. Showcasing some 50,000 machines from 1900 companies in 40 countries, **James Vining** (a final year Agricultural Engineering Masters student) reported how they were all left with the strong impression how "many different and unique technological solutions of varying complexity and effectiveness are developed for a single task". Their "inspiring" discussions with manufacturers expanded their knowledge and furthered their "understanding of the future direction of the agricultural technology industry, which is vital to the progression of our careers as Agricultural Engineers." – and is exactly what the Trust aspires to do.

IAgrE CONFERENCE

On 6 November it was back into London for the **IAgrE Landwards Conference: *Engineering Collaboration for Success'***, held at the prestigious Royal Academy of Engineering. DBT was a sponsor and it was good to see one of our recently successful co-sponsored PhD students **Dr Iain Dummett** speak about his project at **Cranfield** on Strip Tillage and giving a student's perspective on working with commercial sponsors and Universities.

TRUSTEE MEETINGS

Our Trustees have had several interesting meetings to review progress on projects co-funded by the Trust. These included a meeting at **Aston University**, on their interesting desalination project attended by Trustee Dr Paul Miller. The Project Leader gave a presentation on their work at the EUROMED Conference in Athens in May, and it has attracted favourable attention from the British Council and UK Government as it has brought together students from different universities in Israel, Jordan and Palestine.

This is also an opportunity to publicly thank our retiring Chairman, **Malcolm Crabtree**, for his support and leadership over the past 10 years and also to **David White** who has served us well for 6 years as a Trustee. The Trust's AGM and half-yearly Management Meeting was hosted by AGCO HQ at Stoneleigh, and all were present:

DB Trustees clockwise from front left: Mark Kibblewhite, Paul Miller, John Fox, Mark Moore, Elizabeth Stephens (Admin Officer), standing are Nick August (new Chair) and Malcolm Crabtree (retiring Chair), Jonathan Bomford, David White (retiring Trustee), Keith Hawken and Richard Robinson (new Trustee)

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COUNCIL MEETING

Staged at the Agri-EPI Centre hub at Harper Adams University

The IAgrE Council Meeting held on 18 October was staged at the Agri-EPI Centre at Harper Adams University and provided members with an opportunity to look around the new agri-tech innovation and research facility.

The Council Meeting chaired by President Professor Jane Rickson and opened with CEO Alastair Taylor providing an overview of current activities and priorities which included the ongoing improvements in content of Landwards – and a short preview of the upcoming Horizons publication to mark the Institution's 80th Anniversary. He added that the Secretariat was working hard to ensure that they had up-to-date contacts for all the land-based universities and colleges.

Further Council discussion involved the establishment of a Professional Registration Panel perhaps with two 'divisions', one for Engineers, the other for Environmentalists. A lively debate also resurrected the discussion on the relevance and understanding of the term 'Agricultural Engineer' in the Institutions name.

There followed a presentation by the new Secretary General Dr Ivo Hostens who has taken over the EurAgEng Secretariat from David Tinker. Dr Hostens outlined the core activities and his vision for the future.

Following the meeting, Lee Williams the manager of the AgriEpiCentre hub at Harper Adams showed Council members the facilities on-site which included a large 500 sq m workshop space for prototyping which included a flexible mix of double height bays with overhead crane service, and single height private bays.

The Centre also includes serviced office space, already being used by a variety of clients and businesses. The space gives clients the opportunity to work alongside other innovative organisations.

CPD: WHY ME?

IAgrE's Sarah McLeod answers your questions

Continuing Professional Development (CPD), words that for some reason strike dread into the hearts of IAgrE professionals! In fact CPD is nothing to be worried about, everyone is constantly adding to their professional skills, one just needs to learn to identify these practices as CPD and to record them.

What is CPD?
CPD is life-long learning; it is any skill, meeting, research, reading that develops your understanding, knowledge or skills. Activities that may be included cover Training, Work Experience, Academic Study, Volunteering, Events & Seminars and Self-study.

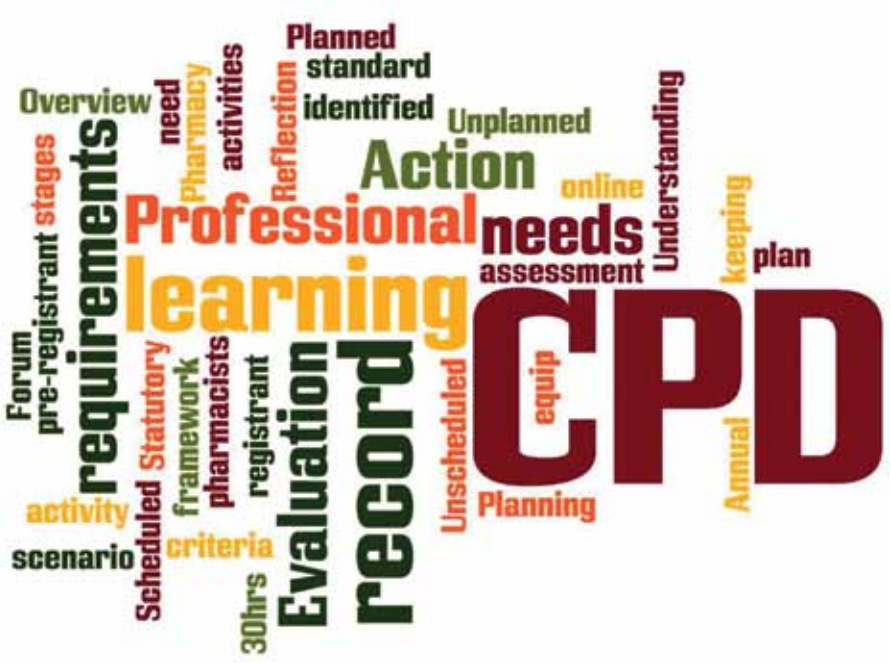
Why should I do CPD? Let's look at this another way, would you trust a Doctor or Lawyer who completed University in 1998 and had not made any effort to keep up to date? Engineers, Environmentalists and Technicians are professionals, often working on cutting edge projects and the public need to be able to trust that you know what you are doing. Membership of IAgrE requires you to demonstrate your professionalism and it is therefore expected that all IAgrE members, who are still working professionally, undertake annual professional development to demonstrate that their skills are current. IAgrE set a guide of approximately 30 hours per annum but it is quality rather than quantity that counts.

CPD demonstrates your: Competence, keeping you up to date; **Confidence**, knowing you are competent will improve your confidence and that of your colleagues and clients; **Career Progression**, presenting a CPD record to your manager will demonstrate your professionalism and skills and help your career; **Resilience to Change**, keeping up to date with new technology, new legislation, new processes and procedures will help you complete your CPD and make you better prepared to overcome other changes and challenges.
In an ideal world we would have you consider your training needs or areas in which you would like additional support at the beginning of each year and make a plan of how you will achieve those needs. Then you can target your weaker areas and ensure you strengthen these. For example you may know that you are not great at time management and are easily distracted, you may therefore decide to research information on how to improve this area of your professional life, perhaps reading books or articles on the subject or taking an on-line course of study.
Whenever you have completed an activity that would count as CPD, whether attending a Conference or reading a specialised article it is good to record that event straight away, this saves so much time.

How can IAgrE help?
IAgrE offers a selection of events, Conferences and Branch & Group activities to all its members. We also highlight other events that may be of interest to members on our Event pages and through our fortnightly eNews bulletins. IAgrE also has various committees, panels and groups that offer volunteering opportunities for members. You can sign up to be an IAgrE mentor, assisting other members through their professional journey; a wonderful way to enhance your CPD.
IAgrE provides all members access to **my**careerpath a CPD recording tool created by Engineering Council to assist your CPD recording. The tool allows you to describe an event and the activity and then asks you to reflect upon how this has impacted your working life. This reflective aspect of CPD recording is considered to be the most important area and is often very helpful to share with your employers. **My**careerpath is compatible with all current technology and you can use it on a PC, Mac, Smartphone or tablet. You can upload supporting information, copy and paste and create reports to share with your manager, mentors etc as well as with the IAgrE Secretariat.

Feedback & Guidance. When we receive CPD submissions we are able to review and provide feedback, giving you ideas about CPD opportunities you had not previously considered and suggesting ways in which you can grow your skills.

Summary:
- CPD helps to demonstrate your competence, which enhances your professionalism in your career
- CPD improves your confidence, improved confidence benefits your employers and customers as well as your career
- CPD gives you the opportunity to learn new skills, enhancing your career prospects and demonstrating your competence
- Even if you are no longer interested in progressing your career, CPD enables you to keep up to date with industry changes and ensures your skill set is refreshed.



OBITUARY

Reginald F Norman CBE CEng BSc MSc FIAgrE
President IAgrE 1981-82

The death has been announced of Reg Norman, President of IAgrE 1981-1982 who passed away peacefully on Tuesday October 30th, 2018 at home in St Albans. Born in Eyam, Derbyshire, he lived most of his life in Cambridge before moving to St Albans to be nearer family. He is survived by his three children, Alan, Diana and Brian and three grandchildren. The funeral took place on Thursday 29th November at Cambridge Crematorium. He had attended the IAgrE AGM and Awards at Wrest Park in May.

Reg Norman trained in agriculture at Nottingham University and obtained an MSc in Agricultural Engineering at Durham. After lecturing in Agricultural Engineering at the Edinburgh College of Agriculture, he joined Fisons Pest Control as a development engineer concerned with agrochemical application and designed a number of tractor mounted and trailed machines sold through dealers and to OEMs as own-brand machines. The standalone sprayer business was subsequently sold to Ferguson. During his 15 years with Fisons, he was responsible for agrochemical marketing and for agricultural contracting activity including aircraft. His responsibility took in Africa and other overseas territories.

He joined CIBA Agrochemicals as Managing Director and after the merger of CIBA and Geigy, was appointed Managing Director of Ciba-Geigy Agrochemicals.

He was closely involved in the establishment of the 'Spray and Sprayers' event and the Operator of the Year competition. He was a director of BASIS and later chairman of its 'Continuous Development'.

Reg Norman was awarded the CBE in 1989 for 'Contribution to Agriculture and the British Crop Protection Council.

Nick Foster MIAgrE
His son, Patrick Foster-Devaney writes

Nick Foster, has passed away suddenly, aged 61, in Magwe, Myanmar, on the 21st July 2018.

An Agricultural Engineer, he devoted his life to working on and leading irrigation, water supply, and sanitation projects across the developing world.

Born George Nicholas Foster in Eccleston, St. Helens, on 24th May 1957, he got his first taste for agriculture working on a local farm whilst still at West Park School in St Helens. At the University College of North Wales, Bangor, he studied Agriculture with Agricultural Economics BSc., graduating in 1978.

He then went on a two year VSO placement in Sri Lanka to work on the Tank Irrigation Modernisation Project, Anuradhapura; a time that would serve to ignite his passion for overseas development. He returned from Sri Lanka with a newly realised sense of direction, and went on to gain an MSc. in Soil and Water Engineering from Cranfield in 1983.

Then it was off to Nepal for what would be 2 years from 1984 to 1986. First working with KHARDEP as the Assistant Irrigation Engineer, rehabilitating small scale irrigation canals in the middle hills of Nepal as part of an integrated rural development project; then with the DCA, where he headed the Water Management and Engineering Sector of the IHDP (Integrated Hill

Development Project).

He was involved in the planning, construction and follow up of drinking water supply schemes, irrigation schemes and public buildings including health posts and schools. This would form the basis of most of his work for the rest of his life; implementing, maintaining and improving sustainable irrigation, water supply, and sanitation projects, in Oman; Somalia; Kenya; Zanzibar; Rwanda; Cambodia; Slovenia; Dubai; China; Afghanistan; East Timor; Nigeria; Tanzania; and finally Myanmar.

In Nigeria, Dad worked with WS Atkins as Team Coordinator on an EU funded project to reform the water sector in six states, to benefit 1400 rural communities and 60 small towns. This involved the revision of Federal and State Law to bring changes to water policy, and brought about the enactment and implementation of the National Water Resources Bill.

He was devoted to improving conditions for rural areas throughout the developing world from the ground up. Empowering communities' by encouraging participation and education, along with the establishment of farmers' associations to lead to communal management of infrastructure so as to maintain and sustain the schemes autonomously. A lifetime of dedicated work in overseas development earned him fierce respect, with many regarding him as an "unflappable" Team Leader and father figure.

Away from work, Nick maintained his love of sport. He was a "formidable prop forward" during his playing days, and wherever he was in the world, he would always find time for a game, as well as when he returned to his home club, West Park RUFC. Later, he enjoyed golf and watching and reading about all sports.

Nick's gentle, unassuming manner and beaming smile put people at ease in any environment, both at work and at home. A calming presence, his good humour and level head could diffuse and resolve most issues, earning firm friendships and high regard from many throughout his life. He will be sorely missed.

He leaves his life partner of 33 years Helen; children Patrick, Rachel and Laura; siblings Phil, Andrew, Sara, and Mark; and many friends and colleagues around the world.

FOREST ENGINEERING GROUP

FEG Symposium 2018
6 September 2018
Newton Rigg College
Report by Malcolm Cattermole

The Forestry Engineering Group held its symposium "***Engineering Forest Access For All"*** at Newton Rigg College in September. The event was well attended with over 60 delegates hearing presentations from experts from diverse backgrounds, discussing the challenges of balancing commercial forestry and land management operations with the demands of public access. David Henderson-Howat presented the key note address, exploring the differences in legislation over public access across the UK, highlighting the complexity of legal access which can be confusing for the public, and how that right of access has to come with personal responsibility.

Paul Mudway highlighted his work with the National Trust at some of their visitor attractions in the South of England where the NT have had to work hard to justify, to the planning authority and locals, the merits of developing infrastructure to provide a better access to the countryside for visitors, whilst protecting the local heritage.

Chris Cairns from Mcgowan Ltd and Tom Wallace from The Mountains and the People gave two different perspectives to work they have been doing in Loch Lomond, the Trossachs and the Cairngorm National Park in Scotland, demonstrating ways which the work of contractors using the right machinery can work and compliment the work of volunteers using hand tools to construct new and repair existing infrastructure.

After lunch we had two presentations from Forest Enterprise Scotland staff, John Ireland and John Ogilvie. Firstly looking at the risks to members of the public from poorly designed and maintained infrastructure on the forest estate, and the need to ensure that robust systems are in place so that maintenance is carried out, thereby minimising the risks to people, and then also for landowners to keep good records so that they can defend against claims for damages. John Ogilvie then presented a case study of a project where a new access road was built to design out risks to the public by segregating timber haulage away from the forest visitor centre, together with all the background work needed to deliver the project.

Kirsty Adams from Tillhill talked about a recent accident involving a member of public within one of their forests and showed how Tillhill are working with FISA and looking at ways to improve signage and communication with forest users to reduce the risks to all forest users.

John Everitt brought a completely different perspective to the day, with a brief outline of the diversity of visitor interactions at the Chatsworth Estate, both at Chatsworth House in Staffordshire and at Fountains Abbey in Yorkshire.

The symposium was wrapped up with an excellent summary of the day by Geoff Freedman, one of the founding members of the FEG, and past president of IAgrE.

WEST MIDLANDS BRANCH

A visit to the Frederick Lanchester Interactive Archive
11 September 2018
Report by William Waddilove

Frederick Lanchester is one of those over-looked pioneers, possibly because his car manufacturing business got 'absorbed' a long time ago and a lot of his time was spent as a consultant. Lanchester cars had always been at the high quality end of the market and therefore in the more select lower volume end of the motor industry and so there were never very large numbers around. He never seemed to get his name on the front line. He is credited with many developments including the building of the first wholly British made four wheeled car, many developments in aeronautics including a classic text book on design, but what a wide history he has.

He moved from Birmingham to establish a factory in Coventry where there was more space. The library of Coventry University has been lucky enough to gain a lot of his engineering drawings as well as 43 of his notebooks. All this material is available on line in the interactive archive. They are still working on the full indexing but it is all there for you to browse through. The archive is housed in a dedicated corner of Coventry University library. With a small support team lead by Cathryn Thompson-Goodwin the Project Manager.

Catheryn greeted us and we were given a talk about FWL's life and work including the aeronautic design work and boats. At the time of making his car he was hampered by the 'fed flag act' and limited to 4 mph on the roads and so he installed the engine in a boat where he could test the engine at speed and under load. The engine was an interesting single cylinder model with twin connecting rods linked to two contra rotating flywheels linked by a bevel gear.

It is clear that he was concerned by dynamic in balance and used these contra rotating elements to provide smooth running. On the aeroplane he designed it also had two contra rotating propellers. Among his over 400 patents is one covering dynamic balancing for crank shafts as an answer to the breakages that many engine manufacturers were experiencing.

If you are able to visit Coventry University Library the archive room and its interactive displays are open all normal daytimes. (Just ask permission at the entrance desk for access).

What an inspiring evening. Visit http://www.lanchesterinteractive.org/ I knew the Lanchester car that my parents owned in the 1950's was special, I hadn't realised how special.

WREKIN BRANCH

Visit to Innogy Gwynt-y Mor Wind Farm
10 October 2018
Report by Bill Basford

Daffyd Roberts welcomed Wrekin members on a brilliant October day and gave everyone a powerful and relevant description of the function of Gwynt -y -Mor Wind Farm which when commissioned in 2015 was 3rd largest in the UK and now ranks 5th largest in the world with regards to power.
It includes 160 Siemens turbines each of 3.6MW output which are installed 13 km offshore in Liverpool Bay and which have been operation since 2015.
The statistics were impressive, the wind farm occupies 80 km^2 and can produce 576 MW power, equivalent to 400,000 homes use or some 40% of Wales' energy need at 1950 GWh per annum.
Each tower is supported on a monopole base 45m-64m long and some 6 m diameter with a wall thickness approx. 75mm standing in some 12-28 m of water. Each 3 bladed turbine has a vertical swept area of 0.9 ha (2.2 acres) and rises 138m above the water in total with a hub height of 84.4m. Supply to the grid is via 2 sub stations at sea, then to the main substation to the national grid at St Asaph, all involving 148 km of subsea cable.
Whilst the visit was firmly on shore it included an excellent presentation which Daffyd related each turbine output to that of a John Deere 8400R tractor. He indicated that each turbine was equivalent to 12 x JD8400 in output. Recalling the specifications of the tractor
Rated Power - 400Hp (294kW), Rear Axle Torque – 215,000 Nm Torque @ 13rpm / ~3mph
Weight 13t, Length 6.8m, Lowest Gear ratio ~300:1, he showed a useful comparison as in chart
On a walk around at the control centre members saw where all materials had been stored during construction on the site of the old Port of Mostyn ferry port. Storage and movement of various components highlighted the clever use of weather resistant transfer bags of various sizes and weight capacity allowing some protection during ship to tower transfer. Perhaps these could be useful for component transfer in agriculture?
Each tower nacelle contains a 1 tonne crane which generally meets most service issues. Fortunately for the group there was a jack up barge moored at Mostyn which allowed a degree of scale as such a unit with crane on board is needed to lift major components – up to 36 tonnes when servicing the 80 + m to the nacelle. At £600,000 per 24 hours hire charge for the barge, members were glad not to be asked for a viewing charge.
Considerable attention was outlined to all forms of Safe Working from procedures on shore, on pontoon, on board the support vessels; transfer to the towers and within the towers.
Visiting the control room highlighted the massive use of data interchange in managing each turbine function to monitoring staff position from many companies working together in both maintenance and development of the turbines. Wind farm and individual turbine function can be viewed on land by image and data interrogation with some 12,000 alarms per turbine installed.
A more mundane matter, but which was exercised within considerable safety control was the need to keep the tower external surfaces and components clean – basically removing bird droppings continually by the specialist 'guano' team who are in operation every day.
Access routines from shore to tower climbing were described within certain prescribed weather and sea state limits with weather forecasting key to prediction of non-water days. 8 support vessels generally transferring 8-10 workers each supporting the wind farm operation-all were in action during the visit.
During a fascinating visit, members appreciated exceptionally well the many different types of engineering involved all working in synergy with each other in a challenging environment to allow the wind farm to be built, operated and maintained. Certainly it was an opportunity offering many challenges to engineers, young or old alike.

NORTHERN

Soils science lecture
CAFRE / DAERA at Greenmount Campus
22 October 2018
Report by Terence Chambers

Staff, guests and visiting members of the Northern Ireland Branch were present at the CAFRE Greenmount Campus in Co. Antrim, to welcome and hear IAgrE President, Professor Jane Rickson, deliver her lecture, on the subject of ***"Innovation in Soil and Water Engineering at UK Agritech Centres".*** Professor Rickson is now Professor of Soil Erosion and Conservation there where her role includes running research programmes around soil degradation topics for both Government and Private Sector clients.
Her presentation underlined the fundamental importance of healthy soil in supporting the lives of 9 billion people on this planet by 2050, and how our finite soil resources are subject to challenges and threats. The public concept of soil, with the use of terms by some people for it like "dirt" and "mud", does not reflect its immense true value to society.
Soil is the basis for our landscape and all of the ecosystems. It is vital in terms of water regulation, energy demands and climate change control. There is a clear and urgent priority now to reverse losses of biodiversity and ecosystems. Land covers 26% of the earth surface but only half of this is suitable for an agricultural production. Only3% is suitable for arable cropping.

Soil degradation takes place as the result of erosion, compaction, loss of organic matter and soil carbon, salinisation and acidification. The loss of this natural asset through erosion by water and wind is mainly an irreversible process estimated to result in grain yield decline of around 20 million tonnes annually.
Good land management aims to maintain a fertile seedbed and root zone, whilst retaining maximum resistance to soil degradation. To demonstrate soil conservation practices there are field trials to evaluate the effects of various cultivation and and crop rotation regimes on soil health. One example is a study to compare the effects of various proprietary minimum-tillage seed drilling systems in

IRELAND BRANCH

continuous cereal rotations. Comparative measurements were recorded of soil health indicators such as compaction, carbon content and earthworm population density. Another recent research programme has monitored the incorporation of various types of organic matter to improve soil condition.
These included mushroom compost, green waste compost, poultry manure and anaerobic digestate. All were effective (especially the latter two) in boosting the available water holding capacity. There is also ongoing work around the use of cover crops and buffer strips to control run off and erosion.
Professor Rickson's take home messages were:-

- Food production has to increase by 3%, on existing finite land resources, to satisfy world needs.
- Healthy soils provide multiple ecosystem benefits but can be irreversibly degraded.
- Informed soil management techniques are effective.
- Cost-effective treatments are site specific and have to fit with and be acceptable to current farming practices.
- We must aim for sustainable intensification to maintain economic, socially and environmentally acceptable food production.

Thanks were expressed to Professor Rickson for her most informative and enjoyable presentation.

FROM THE EDITOR: Could I thank all branch representatives for their excellent reports during the year. Due to pressure of space we have had to edit some reports in this issue and hold over others to our next issue.

In the Autumn issue we incorrectly assigned a report from the Pioneering Technology Special Interest Group (PTSIG) to the West Midlands Branch - apologies.

EAST MIDLANDS BRANCH

Visit to Burdens Group Ltd
Sutterton, Boston, Lincolnshire
8 October 2018
Report by Phil Spencer

The first meeting of the winter sessions started with a trip to Burdens group offices at Sutterton.
Established in 1972 by Norman Burden, the group provide a range of equipment and services.
The business started in Swineshead and continual expansion necessitated a move to Sutterton where they were a part of the John Deere Franchise. From that time a range of franchises were added, and in 2011 a new partnership with New Holland was created within Lincolnshire. In 2012 Agrifac sprayers were added along with Baroness Golf course equipment, Polaris commercial, Utility Vehicles, Struik Cultivators, Walthambury robotic systems and the Appego range of equipment.
Burdens group also have branches in North Kyme, Wrangle and have recently acquired Lincolnshire Motors Ltd.
Our evening commenced with an introduction by Shaun Taylor, Group Sales Director.
After a warm welcome our party of about 24 visitors divided into four separate groups each to receive a 30-minute presentation on the various areas of their work.
Group 1 enjoyed a walk around the yard area to have a brief over view of their main products. This included examples of the new range of New Holland Tractors.
Also, on display were the latest Agrifac self-propelled ground crop Sprayer, Appego Power harrows with folding 6 metre systems and 2 brussel sprout Harvesters awaiting some service repairs.
Group 2 had a presentation on the latest range of specialised vegetable equipment available through the group, these included potato, carrot, bulb planting/ harvesters, specialised leek, onion, cauliflower and broccoli handling systems. Our host explained how some of the machinery was currently going through significant research and development work, in so much as the uncertainty over the possible lack of migrant workers in the vegetable growing areas due to Brexit.
Group 3 had a presentation on the latest innovations with the New Holland range of Combine Harvesters. Starting with a film showing the Guinness world record breaking attempt on the most grain harvested in eight hours with the CR10.90. machine. An impressive 797 Tonnes! The CR 10.90 known as the Revelation is a twin rotor machine. This flag ship machine's latest cleaning system is known as the "INTELLISENSE". This is designed to automatically adjust the position of the sieves, dependant on ground speed and amount of grain on the pan, this will also even out distribution of the grain on slopes. The electronic fan housing blades and deflectors are automated too.
Group 4 had a presentation by Adrian Harrison. Adrian focused on the specialist vegetable handling system. Burdens support many local packing houses and vegetable Distribution sites over Lincolnshire and have helped, advise, design and install a wide range of systems. This included a multi-million pound carrot sorting factory, which is able not only to sort for size and length, but also recognise internal damage or rot.
The question and answer time for everyone was completed while we enjoyed soup and a roll, pork pie, sausage rolls with tea and coffee.
Our first meeting turned out to be not your usual machinery dealership visit, but a company tackling the continual challenges of the food chain from field to table. Our thanks to Shaun Taylor and his team.

MEMBERSHIP CHANGES

ADMISSIONS
FELLOW
Mr T Burnhope (East Midlands)

MEMBER
Mr W S Campbell (East Midlands)

ASSOCIATE MEMBER
Mr C Drumm (Ireland)

AFFILIATE
Mr B Wilson (Scotland)
Mr S Pattenden (East Anglia)
Mr P Clarke (S Eastern)

STUDENT
Cranfield University
Miss S Davidson
Miss S Edwards
Miss A Nyiri
Mr R Shittu
Miss B Adejoh
Mr E Whitmore
Mr M Aljafarawi
Mr G Choraria
Mrs H Anwar
Mrs G Alegbeleye
Mr D Ferrere
Mr R Metz
Miss A Franco Flores
Ms L Feng
Miss Y Cho
Mr D Baisla
Miss A Pujol
Miss X Wen
Miss J Tian
Mr B Kariuki
Miss C Johnson
Miss T Phamornsuwana
Mr B Ababio
Mr I Dzemwa
Mr J Prout

Harper Adams University
Mr B Acton
Mr O Baird
Mr A Beaumont - Jones
Mr C D Behrendt
Mr J P Blake
Mr J Boeg
Mr F Bonner - Davies
Miss I Bourassa
Miss R A Brown
Mr J Crutchley
Miss B J Curtis
Mr J Daley
Mr R J Dillon
Mr S Donnelly
Miss J Evans
Mr A E R Evans
Mr W Evans
Mr W B Feeney
Ms T Foroud
Mr R S Geary
Mr G T Gittins
Mr G J Goodchild
Mr T Griffin
Mr T N T Hales
Mr D J Hall
Mr A Hall
Mr J Haycocks
Mr O Hills
Miss R Hinton
Mr T Hughes
Mr F Jones
Mr T Jones
Mr C Kelsey
Mr T W Kelsey
Miss R Kimber
Mr O Lewis
Mr W T Marley
Mr G Miles
Mr O Moffitt - Clarke
Mr J D K Morgan
Mr G T Morley
Mr M E Muus
Mr P O'Regan
Mr J Pattison
Mr W Pearson
Mr J Perry
Mr R D Pinder
Mr M T R Porter- Keel
Mr K Reed
Mr M J Robinson
Mr J C H Sisson
Mr A D Slvijmers
Mr E Speller
Mr F Sudden
Mr J Talbot - Smith
Miss A M F Taxis
Mr M O Torok
Mr R Ward
Mr B J M Wettern
Mr R Wilkins-smith
Mr J Yeomans

Ulster University
Jason Crozier

Pre Professional
Mr I Dummett (S E Midlands)

DEATHS
We have recently learned of the death of the following members and we send our condolences to their family and friends:

Mr R F Norman
CBE CEng BSc MSc FIAgrE

Mr David Calverley CEng

Mr GN Foster MIAgrE

TRANSFERS
FELLOW
Mr DA Smith

MEMBER
Dr K Anyaoha
Mr TG Sutton

Associate Member
Mr M Giannitsopoulos
Mr A Patterson (Ireland)

Technician
Mr C Heeps
Mr M Briggs
Miss JE Adams
Mr T Browne (S Western)
Mr H Thorpe

ENGINEERING COUNCIL REGISTRATIONS
CEng
Mr D Hefft

IEng
Mr D Job

SOCIETY FOR THE ENVIRONMENT
CEnv
Mr N Corker

LONG SERVICE CERTIFICATES (1 October to 31 September 2018)

IAgrE extends warm congratulations to the following members on reaching significant milestones

Name		*Date of Anniversary*
60 years		
William Hugh Mackenzie	MIAgrE	14-Oct-18
Robert Wells	MIAgrE	05-Dec-18
50 Years		
Ian Matthew Urwin	MIAgrE	10-Oct-18
Christopher John Baker	FIAgrE	10-Oct-18
John Alexander Douglas MacCormack	MIAgrE	10-Oct-18
Ian Charles Smeaton	MIAgrE	10-Oct-18
Christopher Rupert Garner	FIAgrE	10-Oct-18

Name		*Date of Anniversary*
35 Years		
Roger Ian Murdoch	AMIAgrE	30-Nov-18
Martin Arthur Ede	FIAgrE	13-Dec-18
John Edward Langley Boyd	MIAgrE	21-Dec-18
25 Years		
Vaughan Paul Redfern	MIAgrE	01-Oct-18
Stewart John Dicks	MIAgrE	19-Oct-18
Andrew Ian James Heather	MIAgrE	30-Nov-18
John Robert Jones	AMIAgrE	09-Dec-18

ACADEMIC AND COMMERCIAL MEMBERS

ACADEMIC MEMBERS

Berkshire College of Agriculture
Hall Place
Burchetts Green
Maidenhead
Berks SL6 6QR

Bishop Burton College
York Road
Bishop Burton
Beverley HU17 8QG

Brooksby Melton College
Asfordby Road
Melton Mowbray
Leics LE13 0HJ

Coleg sir Gar
Gelli Aur Campus
Llandeilo
Carmarthenshire SA32 8NJ

Cranfield University
Cranfield
Bedfordshire MK43 0AL

Duchy College
Stoke Climsland, Callington
Cornwall
PL17 8PB

Easton & Otley College
Easton
Norwich
Norfolk, NR9 5DX

Greenmount College
CAFRE
22 Greenmount Road
Antrim, Northern Ireland BT41 4PU

Harper Adams University
Newport
Shropshire TF10 8NB

Institute of Technology
Tralee Clash, Tralee
Co Kerry, Ireland

Lincoln Institute of Agri-Food Technology,
Lincoln University
Lincoln LN6 7TS

Manchester University
School of Electrical and Electronic Engineering
C39, Sackville Street Building
Sackville Street
Manchester M1 3WE

Myerscough College,
Bilsbarrow
Preston
Lancashire PR3 0RY

Newcastle University
King's Gate
Newcastle Upon Tyne NE1 7RU

Pallaskenry Agricultural College
Co Limerick
Ireland

Plumpton College
Ditchling Road
Lewes
East Sussex, BN7 3AE

Reaseheath College
Reaseheath,
Nantwich
Cheshire, CW5 6DF

Royal Agricultural University
Cirencester
Gloucester, GL7 6JS

Sparsholt College
Sparsholt,
Winchester SO21 2NF

SRUC – Auchincruive
Auchincruive Estate
Ayr, KA6 5HW

University of Manitoba
Winnipeg
Canada
MB R3T 2N2

Warwickshire College Group
Warwick New Road
Leamington Spa CV32 5JE

Wiltshire College Lackham
Lacock
Chippenham
Wiltshire SN15 2NY

COMMERCIAL MEMBERS

Agricultural Engineers Association (AEA)
Samuelson House
62 Forder Way, Hampton
Peterborough PE7 8JB

AGCO Ltd
Stoneleigh, Abbey Park
Kenilworth, Warwickshire CV8 2TQ

Alvan Blanch Development Co
Chelworth, Malmesbury
Wiltshire SN16 9SG

Autoguide Equipment Ltd
Stockley Road, Hedington, Calne,
Wiltshire SN11 0PS

BAGMA
225 Bristol Road
Birmingham B5 7UB

Briggs Irrigation
Boyle Road
Corby, Northants NN17 5XU

City and Guilds
1 Giltsput Street, London EC1A 9DD

City Farm Systems Ltd
25 Hepplewhite Close
High Wycombe
Bucks HP13 6BZ

David Ritchie (Implements) Ltd
Carseview Road, Suttieside
Forfar, Angus DD8 3EE

Douglas Bomford Trust
The Bullock Building
University Way, Cranfield
Bedford MK34 0GH

DSL Systems
Adbolton Hall
Adbolton Lane, West Bridgford
Nottingham NG2 5AS

FEC Services
Stoneleigh Park
Kenilworth, Warwickshire CV8 2LS

Fullwood
Grange Road, Ellesmere
Cheshire SY12 9DF

Household Sprayers
Roughton Moor
Woodhall Spa, Lincs LN10 6YQ

HSS Hire
25 Willow Lane, Mitcham
London CR4 4TS

JCB
Rocester, Staffs ST14 5JR

John Deere Ltd
Harby Road, Langar
Nottinghamshire NG13 9HT

Marks & Clerk LLP
90 Long Acre, London WC2E 9RA

Mastenbroek Ltd
83 Swineshead Road
Boston, Lincs PE21 7JG

National Fluid Power Centre
Carlton Road
Worksop, Notts S81 7HP

Orby Engineering
Craigmore Road, Newry BT35 6JR

Reesink Turfcare UK
1-3 Station Road
St Neots, Huntingdon PE19 1QH

Shelbourne Reynolds
Sheperds Grove Ind Estate
Stanton, Bury St Edmunds
Suffolk IP31 2AR

SSAB Swedish Steel Ltd
Narrowboat Way
Hurst Business Park
Brierley Hill
West Midlands DY5 1UF

Teagle Ltd
Blackwater
Truro, Cornwall TR4 8HQ

TeeJet London Ltd
Headley House
Headley Road, Hindhead
Surrey GU26 6UK

Witham Oil and Paint Ltd
Outer Circle Road
Lincoln LN10 6YQ

FORTHCOMING EVENTS

IAgrE EVENTS

All enquiries regarding IAgrE Events, contact Sarah McLeod
Tel: 01234 750876 secretary@iagre.org

BRANCH EVENTS 2018-19

EAST MIDLANDS
CONTACT: Richard Trevarthen
01509 215109
richard.trevarthen@gmail.com

Tuesday 11 December 2018 7pm for 7.30pm
Technical Talk: Kirk Walker, MITAS UK
Quorn Lodge Hotel, 46 Asfordby Road, Melton Mowbray LE13 0HR

Tuesday 15 January 2019 7pm for 7.30pm *Visit to N J Froment & Co Ltd*
N J Froment & Co Ltd, Easton on the Hill, Stamford PE9 3NP

Tuesday 12 February 2019 7pm for 7.30pm
Technical Talk: Kit Franklin, Hands Free Hectare
Quorn Lodge Hotel, 46 Asfordby Road, Melton Mowbray LE13 0HR

Tuesday 12 March 2019
***Visit: Belvoir Brewery* 7pm for 7.30pm**
The visit includes a tour of the Brewery, followed by a buffet supper,
Belvoir Brewery, Station Rd, Old Dalby, Melton Mowbray LE14 3NQ

Tuesday 9 April 2019 7pm for 7.30pm
East Midlands Branch Annual Dinner & AGM
The AGM will be followed by a two course Dinner, Quorn Lodge Hotel, 46 Asfordby Road, Melton Mowbray LE13 0HR

NORTHERN IRELAND
CONTACT: Ian Duff
028 8673 6977 duffi@iagre.biz

Thursday 31 January 2019
"The Electric Race - why it's so hard to make an electric vehicle battery":
Talk by Jaguar Land Rover
CAFRE, Greenmount

Wednesday 20 February 2019
Silage Science: Speaker Dr Conrad Ferris
AFBI, Hillsborough

SOUTH EAST MIDLANDS
CONTACT: John Stafford
01525 402229
john.stafford@silsoe-solutions.co.uk

Tuesday 11 December 2018 7.30pm
Technical Talk - Smart Machines:
Speaker: Deep Mukherjee, Bosch Rexroth
Meeting Room, The George Inn, George Street, Maulden MK45 2DF

Monday 7 January 2019 7.30pm
Technical Talk - "Advanced vehicle technologies in agricultural engineering"
Speaker: James Brighton, Cranfield University
Cranfield University (TBC)

Monday 4 February 2019 7.00pm
AGM & Student Presentations
Maulden Church Hall, Church Road, Maulden MK45 2AU

Tuesday 12 March 2019 7.30pm
Technical Talk - "The application of drones in agriculture"
Speaker: Ben Smith, Hummingbird Technology
Meeting Room, The George Inn, George Street, Maulden MK45 2DF

Monday 8 April 2019 7.30pm
Technical Talk - "Engineering for Pesticide Application – the science and the politics"
Speaker: Clare Butler Ellis
Maulden Church Hall, Church Road, Maulden MK45 2AU

WESTERN
Contact: Mike Whiting
07751 345580
mike.whiting@newmac.org.uk

Wednesday 23 January 2019
Film Night: "Blockbuster evening with Jim Wilkie"
The Greyhound Pub, High St, Bromham, Chippenham SN15 2HA

Wednesday 20 February 2019
Visit - German U-Boat Display - TBC
Venue and Time TBC

Wednesday 13 March 2019 7.00pm
AGM & Talk - "Hands free harvesting journey, concept to evolution"
Royal Agricultural University, Cirencester

Sunday 26 – Thursday 30 May 2019
Trip to France & Belgium
Dates and timings to be confirmed
Kubota Factory, Dunkirk and New Holland Factory in Zedelgem, Belgium

WEST MIDLANDS
Contact: Ian Moore
0121 704 5700 ianm@whale.co.uk

Tuesday 9 April 2019 7.30pm
AGM 2019
Friends Meeting House, Stratford on Avon

WREKIN
Contact: David Clare
01952 815087
dclare@harper-adams.ac.uk

Tuesday 11 December 2018 7.30pm
Technical Meeting: TBC
AIEC, Harper Adams University

Tuesday 15 January 2019 7.30pm
Technical Meeting: TBC
AIEC, Harper Adams University

Tuesday 12 February 2019 7.30pm
Technical Meeting: TBC
AIEC, Harper Adams University

Tuesday 19 March 2019
AGM and Technical Meeting 6.30pm
AIEC, Harper Adams University

Tuesday 30 April 2019 7.30pm
Technical Meeting: TBC
AIEC, Harper Adams University

INDUSTRY EVENTS

Wednesday 2 – Friday 4 January 2019
Oxford Farming Conference
Oxford University

Tuesday 8 – Wednesday 9 January 2019
LAMMA 2019
National Exhibition Centre, Birmingham

Tuesday 5 February 2019
Doe Show
Ulting, Maldon, Essex

Wednesday 6 February 2019
Dairy Tech
Stoneleigh Park, Warwickshire

Wednesday 6 February 2019
Energy Now EXPO
Telford, Shropshire

Wednesday 6 February 2019
Yorkshire Agricultural Machinery Show
Murton, York

Thursday 7 February 2019
Norfolk Farming Conference
Colney, Norwich

Wednesday 13 – Thursday 14 February 2019
iVT EXPO
Cologne, Germany

Tuesday 26 February 2019
Lincolnshire Farming Conference
Lincolnshire Showground, Lincoln

Wednesday 6 March 2019
SmartHort
Stratford-upon-Avon, Warwickshire

Wednesday 6 March 2019
Farm Expo
Kent Showground, Detling, Midstone

Dates and details are correct at time of going to press.

Further information and updates on www.iagre.org

24/7 Out of Hours

Our feature looking at the hobbies and pastimes of IAgrE members when not engaged in their day-jobs. CHRIS BIDDLE reports

LAND ROVER SERIES 1 RESTORATION

Former IAgrE President Peter Leech HonFIAgrE spent 42 years with John Deere UK in senior training and customer support roles. He is now able to give more time to his interest in restoring historic vehicles and has just completely rebuilt a Land Rover Series 1 – with a Jaguar XK150 next

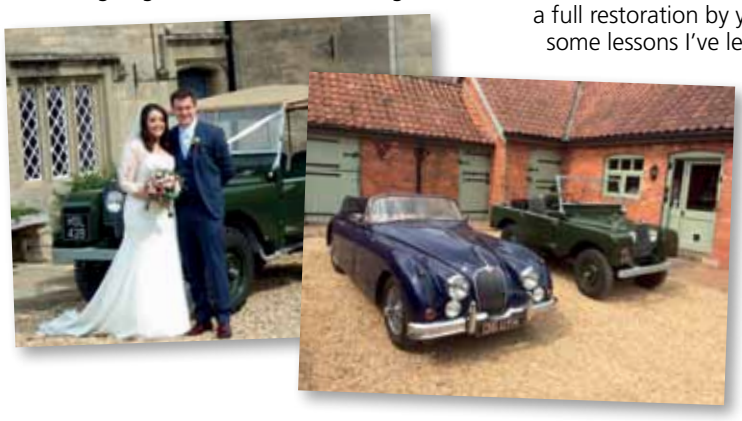
He says "I have just completed the total restoration of my Land Rover 1951 80 inch which we acquired 24 years ago.

We had just bought a new property in the country with 7 acres of land and in order to help maintain the land, pull chain harrows on horse paddocks, transport logs etc I needed a utility vehicle. Being an engineer, a classic car collector and restorer and a serious Land Rover fan, I decided that an early Land Rover would be ideal as a utility vehicle. As a bit of background, I had been driving farm vehicles since the age of seven after my father bought us a Land Rover to run around off-road.

After a search, I found one near Cambridge which had just come straight out of a barn on the farm where it had been delivered new in 1951. I bargained it down to £800 even though it didn't run, had seized brakes and some large holes in the chassis, it came complete with a non-original, probably farm made hard top.

I got it going and fixed the brakes relativity easily and had a local garage do some basic welding to the chassis to get it through the MoT. It didn't run very well and over the years many minor repairs were carried out to keep it going. It was that it had seen considerable service on the farm and was essentially worn out in almost every item. The speedometer that came with it had about 60,000 miles showing and as I dismantled it read 73,911, so had probably been round at least once! I ran it for over 20 years and taught both of my children to drive in it around the fields, adding only about 10,000 miles.

Many times, I thought about restoring it but what with work, children, property maintenance and other vehicles such as a vintage Alvis and a Jaguar XK150 time was against me. I also couldn't decide if I should eventually just restore it mechanically and put the heavily battered body back on or to do the whole thing. Constantly watching adverts and auction prices I eventually decided 2 years into my retirement I would start on the full restoration.



LESSONS

So what does it take to undertake a full restoration by yourself? Here's some lessons I've learned along the way.

First you need a vehicle that is worth doing. Mine, although dog rough, was an early (lights in the grill 80 inch) original RH drive UK delivery, it has all its original matching numbers components and I am only the second owner so if done properly it should have a value of circa £30k and thus is worth investing time and money.

Secondly you need a reasonably high level of workshop skills or be prepared to spend even more money using additional outside expertise. I only used external help for machining, some welding, grit blasting and galvanizing.

Third, space, once dismantled you need workshop space roughly equivalent to the space of 3 vehicles, one an assembly bay, second your workshop area with bench, tools, etc and a third area for components and parts storage. The body and ancillary parts take up a lot of room when dismantled.

Fourth, you need information and contacts. Be a member of a Land Rover club and garner really useful information on suppliers names and numbers. I have the workshop manual and the parts book which I referred to constantly and two specialist reference books both packed full of useful information and photographs. Take plenty of photographs along the way to remind yourself how it was but also as an aid-memoir of how to reassemble

Fifth you need a plan. Knowing the condition of each major component and the troubles, wear, leaks etc. you have experienced with each one helps decide to what level of reconditioning is needed - and in what order you will tackle each of them. You need patience and determination and a reasonably unlimited budget for parts and services.

Finally, don't set yourself a deadline that it must be done for a certain date or even the time you can devote to the job. The speed of specialists to turn work around tends to set the pace.

I started the restoration in March of 2015 and I have recently just completed it, got through the MOT - and have used it for my first wedding. Now for the XK150 . . . "

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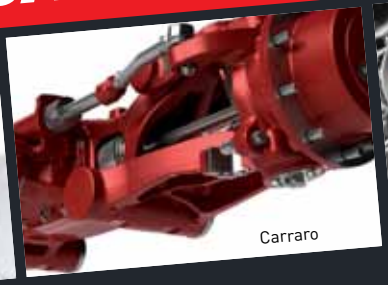

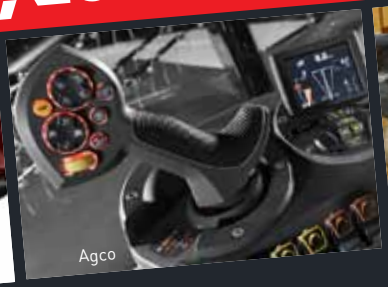

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