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Landwards

2018 AGM AND AWARDS

REPORT AND PICTURES OF 80TH ANNIVERSARY CELEBRATION

In this issue

1938 2018 IAgrE

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: BACK TO THE FUTURE

What a splendid occasion at Wrest Park on 24 May, thoughtfully chosen for the 2018 IAgrE AGM and Awards to coincide with the very day in 1938 when the founding fathers of IAgrE agreed to form the Institution of British Agricultural Engineers. The word 'British' was retained until 1960, not because of some early xenophobic leanings (heavens forbid!), but because another group had registered the title of The Institution of Agricultural Engineers and were unwilling to relinquish their legal right.

Fittingly, the Institution's 80th Anniversary was marked with a return to Wrest Park, the spiritual and practical home of agricultural machinery research and innovation from 1946 to 2006. For many of the guests, it was like rolling back the years. Cries of "This was my office", "I used to have my lunch here" and "Do you remember. . .?" punctuated the day. It was clear that during the splendid memory-jogging, historical, image-laden presentation by Dick Godwin and Paul Miller that emotions were stirred amongst many of those present.

But quite rightly, history only underpins the present – and it's the future that counts.

Despite the impressively high combined age quotient of the membership present, the stars of the show quite rightly were the new breed of engineers such as the highly successful Hands Free Hectare team from Harper Adams University and budding innovators such as Thomas Mathias from Coleg Sirgar who picked up two Awards.

The focal point of the event was the election of Professor Jane Rickson as the 40th President of IAgrE – the first soil scientist to the hold the post. The roll-call of those who have held the highest office has been dominated largely by engineers in the sense that most people would understand. One of the exceptions was a journalist, the redoubtable Jim Priest in 1963, editor of *Farm Implement and Machinery Review* - and one of my early mentors in this industry.

Each new President brings something new to the post. Just as Rob Merrall provided knowledge and insight into the technical requirements of presenting a compelling case for engineering innovation, so Jane Rickson, who regards herself as an engineer and soil scientist in equal measure, will bring a new and fresh perspective to the Presidency at a time when agriculture is about to enter a new era post Brexit.

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OTHER FEATURES

LANDWARDS PRODUCTION TEAM
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AGCO ACADEMY APPRENTICES

Eleven apprentices collect their Awards in 18th year of scheme

A focus on continued professional development and career progression was the key message as 11 AGCO apprentices collected their awards having successfully completed the industry focused courses during a lavish presentation and dinner at the Forest of Arden Hotel, near Birmingham.

In the 18th year of AGCO's industry recognised dealer apprenticeship scheme, in partnership with WCG (formerly known as Warwickshire College Group), the award ceremony was combined with presentations for the Vehicle Parts apprenticeship programme, run in conjunction with Reaseheath College in Cheshire.

Independent consultant, David Kirschner welcomed apprentices and guests to the event saying "This industry provides one of the best engineering apprenticeship schemes, providing the foundations to build your career."

"The standard cost to bring a new apprentice through is £75,000. That is how much is invested, so it demonstrates the value and significance of apprenticeships," he said

The awards were presented by William Judge, the Massey Ferguson National Sales Manager for UK & Ireland, and once again saw success for AGCO dealer B&B Tractors as Bradley Smith became the third employee in a row to collect the Apprentice of the Year award.

Mary Wallbank was awarded the Best Parts Apprentice of the Year, commenting, "Completing the AGCO apprenticeship has really helped me deepen my knowledge in the agricultural industry but also enabled me to establish new links within the industry itself, this has been a huge benefit in my current job but also will help when it comes to moving forward in my career."

Anthony Linfield, AGCO's training development manager said, "The AGCO apprenticeship schemes offer a real opportunity to gain knowledge and skills at college as well as gaining valuable hands-on experience in the workplace.

"Time-served land-based engineers that progress and demonstrate high levels of expertise are a tremendous asset to all of us in the industry."

All the apprentices also received a specially dedicated toolkit supplied by the awards sponsor, Draper Tools, as a lasting reminder of the skills they have developed on the course.

TOP RIGHT: AGCO Apprentices

CERES AGRITECH PARTNERSHIP

Linking five universities and research centres

The newly created Ceres Agritech Knowledge Exchange Partnership links the universities of Cambridge, East Anglia, Hertfordshire, Lincoln and Reading, as well as the John Innes Centre, NIAB and Rothamsted Research, to enable effective sharing of commercialisation expertise.

Ceres will work with business partners to identify, build, invest in and run the most commercially viable development projects focused on the innovation needs of the agritech sector. The result will be technologies that can be exploited through licences, start-up companies and partnerships with SMEs and large agritech corporations, it says.

The partnership has also secured funding commitments of over £15 million from corporations and technology investors for further investment.

Cambridge Enterprise head of life sciences Dr Iain Thomas said: "The time is ripe for catalysing early stage technology transfer in the globally critical agritech sector.

"Advances in nutrition, genomics, informatics, artificial intelligence, remote sensing, automation and plant sciences have huge potential in precision agriculture and food production. Farmers, food processors and producers are eager to explore and adopt new technologies to improve their competitiveness and efficiency."

The Ceres approach "builds on models of collaboration, technology acceleration and effective commercial demonstration of proof-of-concept from other technology sectors, such as the pharma-biotech cluster currently flourishing in the Cambridge region", he added.

Lincoln Institute of Agri-food Technology director Professor Simon Pearson added: "The agri-food industry is the UK's largest manufacturing sector and with our track record for innovation we are well-placed to emerge as a global leader.

"The Ceres network enables us to take the next step. For the first time it brings together all the world-class agricultural research infrastructure located across the East of England. It offers opportunities for new collaborations and puts together the expertise needed to tackle key challenges that will underpin future food security."

ABOVE: Dr Iain Thomas

FARM SAFETY PARTNERSHIP SETS TARGETS

50% reduction in farm accidents by 2023

The Farm Safety Partnership (FSP) has set a target to reduce the number of farming fatalities by at least 50% by the summer of 2023, in its latest initiative to transform the safety record in the farming industry.

The move came as over 20 representatives from all areas of the industry gathered at NFU headquarters under the FSP banner to discuss this year's health and safety campaign.

The FSP will be focusing on four key areas over the next twelve months:

- Summer 2018: Children on farm
- Autumn 2018: Falls from a height and falling objects
- Winter 2018: Transport and machinery
- Spring 2019: Livestock

NFU Vice President and Farm Safety Partnership Chairman Stuart Roberts opened the meeting. He said: "Our ultimate ambition is to reach a point where there are no deaths in the farming industry.

"Our target on the way to achieving this, is to at least halve the number of deaths over the next five years. To do this the FSP has to up the ante. We must be bold and ambitious and push the farming industry to enact change quickly.

"With FSP organisations delivering a co-ordinated campaign and looking at specific actions each season, we can really focus our approach and save lives in our industry."

The FSP includes representatives from IAgrE, AEA, BAGMA, Landex, AHDB, NFU, NFU Mutual and Unite.

ABOVE: Students at Reaseheath learn about farm safety

VERTICAL FARMING FACILITY FOR YORK

£18m *development due to open in two years*

The UK is the "obvious choice" for a Taiwanese company looking to invest substantially in vertical farming in Europe and the Middle East, its president has said.

YesHealth Biotechnology, which already operates a 14-storey vertical farm in Taoyuan City, plans to establish the facility at the National Agri-Food Innovation Campus (NAFIC) in York over the next two years.

Announcing the move during a visit to Taiwan, Department for International Trade minister for investment Graham Stuart said it would "bring the next generation of food production to UK shores".

He added: "Our cooperation on the green economy is a perfect example of how Taiwan and the UK can work together, sharing knowledge and expertise to build a brighter global future."

Next year the company also plans to build a mass production facility in the UK, yielding 20 tonnes of vegetables within five years.

Company president Winston Tsai said: "YesHealth has proven that vertical farming is a profitable business that can create new jobs in a farming industry that is finding it increasingly challenging to attract young workers.

"The vertical farming industry in the United Kingdom is still developing, and this, together with attractive market conditions, makes the United Kingdom an obvious choice for YesHealth Group."

2018 YOUNG ENGINEERS COMPETITION

Easton and Otley sweep the board at Perkins Engines

Two teams from Easton & Otley College have won first and second place in IAgrE's annual Young Engineers competition. A team from the Royal Agricultural University came third.

The competition is open to all UK training and education providers and involves creating a remote or radio controlled vehicle. Teams are given a standard set of wheels, a battery and maximum vehicle dimensions and the challenge is to produce the top performance vehicle of the competition. The vehicle that powers its way to the highest point up a curved ramp is the winner.

A team from Perkins Engines won the Class 2 section of the competition.

Fantastic hosts of the event this year were Perkins Engines Company Ltd based in Peterborough, one of the world's leading providers of diesel and gas engines.

Alastair Taylor CEO of IAgrE, presenting the prizes said, "I was very impressed by this year's event. The students were very engaged and the standard of competition excellent. Students and staff thoroughly enjoyed the day and the facilities at Perkins were impressive, everyone appeared to enjoy the factory tour and the networking opportunity."

The event was sponsored by Autoguide Equipment and Bosch Rexroth. Cash prizes were awarded to the winning teams by IAgrE plus power tools from Bosch Rexroth.

£10m TO 'SAVE OUR SOILS'

WWF claim that third of farmers non-compliant with water protection regulations

£10 million pounds a year in England is needed to ensure the agricultural sector is still productive at the end of the century, according to a new report.

The agriculture sector, which is responsible for £8 billion of UK GDP and employs almost half a million people, is at risk due to "poor farming and land management practices", the joint-report by the WWF, the Angling Trust and the Rivers Trust warns. This is causing soil to be destroyed at approximately 10 times the rate it is being created, costing £1.2 billion a year in England and Wales.

Research by WWF UK has also shown that up to a third of farmers may be non-compliant with England's current water protection legislation.

This has been made worse by lack of enforcement; new data found that the Environment Agency's current resources only allow for visits to less than 1% of farms each year.

Non-compliance with current water protection legislation has resulted in widespread soil degradation, river pollution, increased flood risk and increased costs for local authorities.

The report argues that benefits could be generated for nature and society if farm subsidies were redirected to incentivising farmers to change land use in small areas of farmland.

Soil quality is increasingly causing concern at a national and global level. In March, the government announced it will introduce a new bill mandating measures to improve the UK's soils amid concerns that some areas are just decades away from the «eradication» of soil fertility.

The report says the estimated costs of rolling out effective enforcement in England, to prevent soil erosion and pollution of watercourses, would initially be £5.8m per year, but this would decrease after the first five years.

It explains that a 0.5% reduction in soil degradation costs would cover this and would pay for a "two strikes" model which includes proactive – rather than reactive - checking of farms; issuing warnings and offering advice to correct problems; and following up with sanctions and prosecutions for failure to address issues.

Creating a properly funded, locally coordinated advice service is critical to help farmers implement rules and manage the environment, the report urges. It is estimated that increased advisory presence in England would cost £3.2 million per year.

Tony Juniper, Executive Director of WWF said healthy soil is "vital to national security", but it still continues to be "immensely damaged".

"We could have a farming system that restores soils and wildlife, while at the same time stopping agricultural run-off polluting our rivers," Mr Juniper explained. "To do this we need not only the right legislation, however, but also robust enforcement and proper advice for farmers, otherwise new policies simply won't work. The good news is that this will cost only about 10 million pounds a year."

The government has already signalled its intention to phase out direct payments to farmers and move to a new land management usage system where public money is put towards the provision of public goods.

The report estimates that payments to fully reimburse farmers for changing land-use on small areas would cost less than £500m per year in England.

IAgrE AT MIDLANDS MACHINERY SHOW

Opportunity to promote career opportunities

The Midlands Machinery Show is taking place on Wednesday 22 and Thursday 23 November 2018 at Newark Showground in Nottinghamshire and the Institution of Agricultural Engineers will be in Crocker Hall 3 promoting the importance of professionalism.

The team will be advising people about career progression and attaining qualifications such as Chartered Environmentalist, Incorporated Engineer, Chartered Engineer and Engineering Technician.

"IAgrE is a registered charity working for the public benefit through bringing together academics, practitioners and industry to share knowledge and promote professionalism. We want to talk to agricultural businesses at the show about the advantages of becoming a commercial partner of IAgrE. Benefits include keeping up to date with the latest industry developments, free advertising of jobs on the IAgrE jobs board, access to branch and technical meetings and an online presence on our website, to name but a few," said Alastair Taylor, CEO of IAgrE

George Taylor, Midlands Machinery Show manager said: "Technology is advancing at a fast rate within the agricultural industry, and it is really important farmers invest their time in attending events, such as the Midlands Machinery Show, to determine how this can be used to increase productivity and improve efficiency on their farms."

The Midlands Machinery Show is an event to do business and a great opportunity for farmers and contractors to network with other farmers from across the region and beyond.

CEO

Reflections on a changing world

TECHNOLOGY: FRIEND OR FOE?

Creating problems leading to risk-taking

Alastair Taylor *IEng CEnv MIAgrE*

Those of you close to the subject of Health and Safety will be aware that there were over 30 fatalities across the agricultural industry in 2017. This is an appalling statistic by any measure but even more so to realise that although farming only employs about 1.5% of the working population, it contributes to 20% of all work-related deaths.

IAgrE is a partner in the National Farmers Union led Farm Safety Partnership. This brings together a variety of industry players with a view to working collaboratively to focus on a number of key health and safety issues. At a recent meeting it was agreed that the challenges of child safety, falling from heights, machinery, and animals should be top priorities. Who wouldn't agree with that?

It was an interesting meeting with some inspiring people and many good ideas. I was left wondering if technology is the solution or part of the problem.

Take child safety for example. Someone made the very valid comment "you wouldn't let children loose in a factory would you?" A fair comment and obvious; but as another retorted, "yes, but most children don't actually live in the factory". This is also true. I well remember as a child growing up on the family farm in Lincolnshire, my mother (now aged 91 and still going strong) making it very clear what the boundaries were and I can recall being reeled in when I over stepped the mark. Clearly my mother truly cared for my health, safety and welfare as the majority of good mothers do (she still does by the way!).

Health and Safety is about a mind-set.

This left me wondering if there was a technological solution. A simple sensor with a Bluetooth connection to a mobile phone. Add to this some GPS co-ordinates and hey presto, you have a way of alerting mum, via a mobile phone alert that "Young One" has gone off-piste. All of this is possible now. A few of you will have some sort of health and fitness sensor which measures your steps, tells you where you are and send you alerts to say that you have met your target. Why don't we utilise this technology to clip some sort of badge to the child which provides all the necessary alerts. The same technology might be adapted to alert a machine operator when the sensor wearer (who might be anyone vulnerable – young or old, even a farm visitor) is within say 20 metres of the machine. What's not to like about a technological solution to a problem like this.

At the other end of the health and safety challenge is operators failing to safely stop a machine before making an adjustment or dealing with a blockage. The Safe Stop campaign is well established and acts as a useful reminder of the importance of stopping the engine, removing the key and engaging the hand brake. Too many people are run over or crushed when vehicles roll away - often by their own tractor! With the correct mind-set, any good operator will know that it is plain common sense to apply the Safe Stop approach.

However, one farmer made the point that when he gets off the seat of his ride-on lawn mower, a pressure switch cuts out the engine, but on tractors, such safety systems are not available. "In any case" he added, "with all the complex GPS and control systems, if I stop the engine, it often takes 10 minutes for the systems to re-boot". Has technology created a problem which leads to operators taking risks?

I was surprised by the latter point and asked a technical specialist from a large manufacturer if this was true – especially the point about the time taken for GPS and control systems to re-boot. He confirmed that it does take time for things to reboot and that the way these are wired means that all power is lost when the key is turned off. We joked about the days when you could leave the ignition on and stop the engine by pulling a red knob! At the same time he made the point that leaving the GPS and control systems live was also a health and safety risk and that with the use of electric motors and the like, a machine is still armed and dangerous. His point was that Health and Safety is about a mind-set and those people who truly understand its importance should accept that a few minutes delay is much better than the alternative.

My lasting thought is that we Agricultural Engineers have an important role in promoting health and safety. Good technology has a role to play but in some cases technology might have a potential negative impact but more than anything, the right attitude is the most vital component.

FOOTNOTE

IAgrE supports innovation and is trying to encourage engineering students to think about 'safety' at the start of their careers by offering a prize for the best projects demonstrating a safety (or health) improvement. As Alan Plom MIAgrE and member of the Farm Safety Partnership Board said at the meeting: "Some of the simplest ideas could have a major impact, eg finding ways to clean machinery safely whilst under power. We need more Colleges and the Universities to encourage their students to enter this annual competition."

Feedback

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

SMART – AND GETTING SMARTER

Technology fighting the regular threats of fuel theft and high-jacking in South Africa

Jim Ward IEng, MIAgrE, Group Managing Director, Technical Services for South African-based Imperial Logistics responds to an article in the Spring 2018 issue of Landwards.

I read avidly the recent article authored by Anthony Furness "Why farmers should be interested in the Internet of things".

Having worked in the commercial transport sector for 32 years now, both technically, in operations and then back in technical management, I have seen many parallel developments in this related field. If agriculture produces the product, transport is the derived need that simply put, moves it from where it is plentiful to destinations where it is needed.

When I started work, we did not have cellphones, were just beginning to use computers, and trucks were still fitted with card type tachometers. In the past decade technological advances have been relentless.

Trucks now monitor themselves for services due and faults, identifying and diagnosing these, and then signalling ahead via satellite to the nearest dealership, alerting them to make ready spares needed for that vehicle type, and then directing the driver to the closest dealer via his dashboard GPS for maintenance.

There is constant tracking of engine load, rpm, fuel consumption and flow, braking patterns, speeds, throttle position, use of retarder, and all engine and transmission parameters both by satellite and cellphone, providing both operational data, and protecting the manufacturers against abuse of vehicles on maintenance agreements and leases, by flagging things like over rpm events, over loads, excessive brake applications per 100kms and so on.

Braking systems can be fitted on trailers that monitor ABS signals and the relative difference in wheel rpm, and run complex algorithms that determine when a trailer is on the point of tipping over due to the combination of speed and its turning radius, and then apply their own brakes, independently, with increasing degrees of severity, thus preventing a capsized vehicle.

These smart braking systems then store this as an event, and report back to the operator exactly where such an event took place, and how far along the route, so that other drivers can be warned, or that individuals can be counselled about their driving habits.

There are proximity linked braking systems, collision avoidance, lane alert systems, EBS, ABS, EBD, mapping linked to 'smart' cruise control optimising the use of gears, terrain and utilising vehicle momentum, or maintaining precisely controlled descent speeds on downward inclines, all through use of the retarder, all recent developments.

Highjacking

In our local market here, where fuel theft and vehicle hijacking has become such a wide spread problem, South African tracking specialists have developed some of the most sophisticated anti-theft systems in use anywhere in the world, providing, tracking systems that will frequency hop, or emit a special alert, or increase their transmitting power the moment they detect jamming, and highly accurate real time fuel quantity data relative to distance and fuel use.

We routinely use Google earth mapping to identify precisely quiet little 'off route' places where there has been a sudden rapid fuel drop without the corresponding engine usage…

There is also 'platooning' where one driver operates several trucks, all running nose to tail and electronically linked. It's being tested in Europe already but is fortunately not here yet (the thought terrifies me).

Feedback

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

And with this, a continuous improvement in accuracy, more intuitive dashboards, user friendly scroll down menus and controls, driver coaching, and faster calculating speeds, coupled to extracting more and more Kw from the engines, and much improved fuel efficiency with reduced emissions.

Engine development and exhaust treatment is another essay on its own!

Coded keys

Our trucks today usually have three ECUs or ECMs (electronic control units), one for the engine management systems and mapping, one for the automated manual transmission (also mapped for different performance criteria), and a third for the chassis, truck electrics, suspension, load levelling and braking systems, all communicating to each other and to the trailer/s, and measuring and combining data on load, torque, ambient temperature, speed, air pressure, oil pressure, coolant temperature, exhaust temperature, braking force required, accelerative force required and from these even the payload - as well as multiple other data channels.

They do this continuously and blindingly quickly. We may no longer fit four pole isolator switches to the vehicles, as one used to, because the computers have to go through a sequential shut down, or the ECUs become upset with you and refuse to restart, or go into limp mode and sulk.

Our technicians and mechanics must attend to roadside breakdowns these days with diagnostics tools and laptops, as well as all the old traditional tools. When we run live day-olds, or frozen foods, multi temp or refrigerated loads, the trailers and fridge units are constantly monitoring ambient temperature, inlet air temp, return temp, and in some cases even CO2 levels.

Doors are monitored for opening and closing, fuel tankers have electronically protected locking valves with coded keys, so one sends coded signals to the client in neighbouring states, which they require before they can open delivery valves and offload. The sheer number of channels being monitored and evaluated, either feeding operating data to the vehicles owners or to its maker, or to the customers, or tracking data to security firms is quite extraordinary.

We are really living in a different world to the old Mercedes Benz 2628s of 40 years ago, with spur gear reduction final drives, bull nose cabs and crash gearboxes, and just as I fondly remember working on the old John Deere 2130s, and MF135s, or lying on my back in the wet entrance to a milking parlour, with a dead tractor and muck spreader above me, I have similar memories of recovering trucks and trailers in far gone places, stuck in unusual circumstances.

None of us could imagine all those years ago, when I completed my City and Guilds final exams at Rycotewood and went out into the brave new working world of large scale agriculture and transport in Southern Africa, what these industries would look like 36 years later.

Agricultural Engineering – what a remarkable, diverse, multi skilled and rapidly changing industry!

Jim Ward, IEng MIAgrE gained a Diploma in Transport and Logistics at RAU University in Johnannesburg before gaining an MBA in Business Administration at Henley Business School.
He spent 20 years with Unitrans, a major transport and logistics company before taking up his present role with Imperial Logistics, a South-African based company specialising in transportation, warehousing, distribution and synchronisation management.
The company operates in specific industry verticals – consumer packaged goods, specialised manufacturing and mining, chemicals and energy, healthcare, automotive, machinery and equipment and agriculture.

CONTINUING PROFESSIONAL DEVELOPMENT

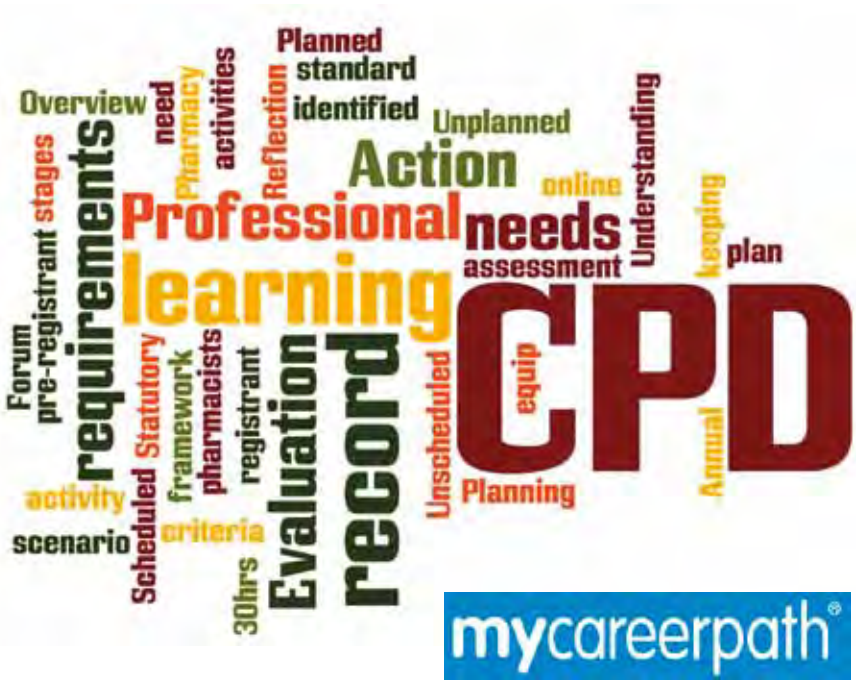
As a professional society, IAgrE has a commitment to providing a wide range of Continuing Professional Development (CPD) events. We also offer a system for you to be able to register your CPD with IAgrE in order that we provide suitable feedback and support.

For those members registered with the **Engineering Council** and **Society for the Environment**, you are required to maintain CPD records and IAgrE is required to conduct an annual sample of those records.

IAgrE promotes CPD to all its members and has adopted what it considers to be a pragmatic approach to the registering and recording of members CPD. Evidence of CPD will be required from any member applying for an upgrade of membership and/or registration.

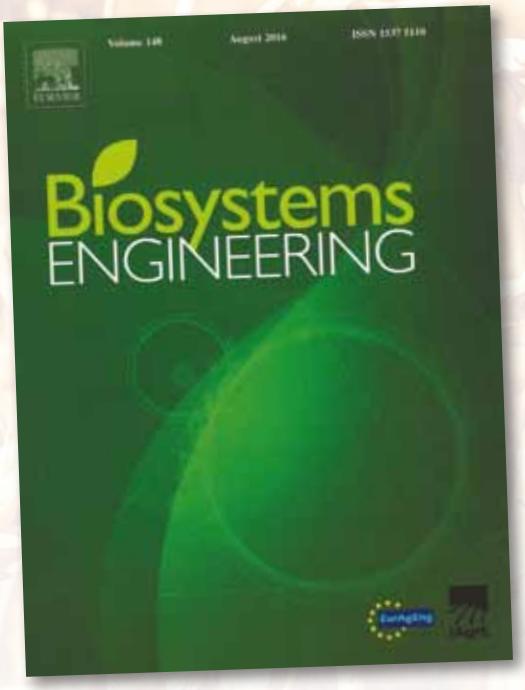
AN online CPD Planning & Recording Tool (mycareerpath) is provided by IAgrE as a service to members. It is available to all members at any grade and stage of their careers and can be used to record all CPD activities.

Further details http://iagre.org/cpd



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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www.iagre.org/biosystemsinformation

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

Biosystems Engineering
Volume 168, April 2018, Pages 42-53
Special Issue: *Numerical Tools for Soils* - Singularity maps applied to a vegetation index
Juan J. Martín-Sotoca Antonio Saa-Requejo Javier Borondo Ana M.Tarquis
Universidad Politécnica de Madrid (UPM), Spain

Quantification is one of the most important tasks in characterising of agricultural drought. Recently, several vegetation indexes based on remote-sensing data have been applied with being the Normalized Difference Vegetation Index (NDVI) the most widely used. Some index-based drought insurances define a drought event through the comparison of actual NDVI values in a given period with a NDVI threshold based on historical data of that period extrapolating this result spatially to the surrounded areas. Hence, the spatial statistical approach is very relevant and has not been deeply studied in this context. Drought can be highly localised. Therefore, it is important to delimit areas that will share NDVI statistical distributions and in which the same criteria can be applied to define the drought event. In order to do so, we have applied for the first time in this context the method of singularity maps commonly used in the localisation of mineral deposits.

Biosystems Engineering
Volume 167, March 2018, Pages 137-143
The use of an electronic nose to detect early signs of soft-rot infection in potatoes
Massimo F. Rutolo, John P. Clarkson, James A. Covington
School of Engineering, University of Warwick, Coventry, UK
Warwick Crop Centre, University of Warwick, Wellesbourne, UK

The detection of soft-rot in potatoes caused by the bacterium *Pectobacterium carotovorum* is investigated through the use of an array of low cost gas sensors. This disease results in significant crop losses in store (circa 5%) with associated negative financial impacts. No commercial technological solution for soft rot detection in such stores, with store managers regularly inspecting large volumes of potatoes. As soft-rot is associated with a strong odour and there is forced air movement through potato stores, our aim was to investigate the potential of an array of low-cost gas sensors to detect the disease. In the laboratory, 80 potatoes with and without soft rot (evenly split) were analysed by an array of 11 different gas sensors. These were tested at both pre-symptomatic and symptomatic time points. Results indicated that 100% detection accuracy could be achieved at both time points with only 3 sensors. The sensors therefore offer promise for an automated in-store monitoring system.

Biosystems Engineering
Volume 166, February 2018, Pages 76-89
Development of a linear mixed model to predict the picking time in strawberry harvesting processes
Farangis Khosro Anjom, Stavros G. Vougioukas, David C. Slaughter
University of California, Davis, CA, USA

In manual fruit and vegetable harvesting, picking time statistics can be used to improve labour management and optimise the design and operation of harvest-aiding machines, such as conventional cross-row conveyors or recently proposed robotic transport carts. In this study, a dataset of 161 picking times from 18 workers was collected in commercial strawberry fields in Salinas, California, and a set of conditional linear mixed models (LMMs) was formulated to model the amount of time ("picking time") required by a picker to fill an empty tray with harvested crop. The proposed methodology and model structures offer a practical tool for strawberry picking time modelling, which could also be applied to other manually harvested specialty crops such as raspberries, cherry tomatoes, and table grapes.

2018

ANNUAL GENERAL MEETING

The 2018 IAgrE Annual General Meeting took place on 24 May, the exact day of the formation of the Institution 80 years ago in 1938 in the ornate setting of the Library of Wrest Park, Silsoe which was adorned by an array of tractors from across the ages.

Over 100 members and guests attended the event to witness the handover of the Presidency from Dr Rob Merrall to Professor Jane Rickson who became the 40th President of the Institution of Agricultural Engineers. *(pictured right)* Following the presentation of the Awards (*report page 16-18),* the guests were treated to an entertaining and comprehensive look back at the history of IAgrE as well as a look into its future role presented by Professor Dick Godwin and Professor Paul Miller.

The occasion also provided an opportunity to recognise a group of members who had achieved their 50 year (and more) membership – as well as a photo call of 12 past Presidents present at the 80th year celebration.


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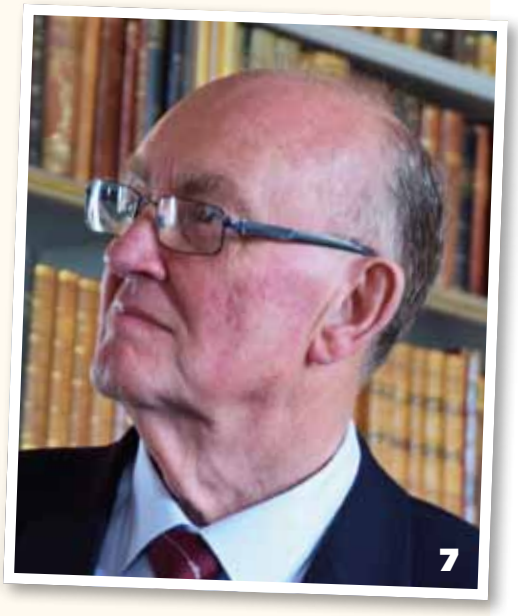
PICTURE CAPTIONS

1. *Welcome from Sarah McLeod, Marion King and Alison Chapman*
2. *Ruth Bailey, CEO and Chris Cooper, President of AEA*
3. *50 and 60 year IAgrE members present were: Bill Basford, Paul Baskerville, Nigel Finch, Paul Hartley, Peter Redman, James Robinson, Brian Sanders, David Wilkinson (all + 50 year), John Sartain and Toniappa Thangavelu (60 year)*
4. *Presidents at the AGM (l – r) Dan Mitchell, Rob Merrall, Andy Newbold, Jane Rickson, Peter Leech, Mark Kibblewhite, Brian Finney, Dick Godwin, Peter Redman, Paul Miller and Richard Robinson. (Reg Norman present but had left earlier)*
5. *Video message from Steve Searcy, President American Society of Agricultural and Biological Engineers (ASABE)*
6. *Dr Vijaya Raghavan, President of Canadian Society of Bioengineering (CSBE)*
7. *Professors Paul Miller and Dick Godwin presented a pictorial timeline of 80 years of IAgrE (also main picture left)*
8. *Malcolm Crabtree and Peter Redman*



MEET YOUR NEW PRESIDENT
PROFESSOR JANE RICKSON
CEnv FIAgrE

Professor Jane Rickson CEnv, FIAgrE succeeded Dr Rob Merrall as the 40th President of the Institution of Agricultural Engineers at the Annual General Meeting in May. She talked to Landwards editor Chris Biddle about her career in soil science and her plans for the two-year term

There's the problem,
feathers, iron
Bargain buildings, weights
and pulleys
Feathers hit the ground
Before the weight can leave
the air

Buy the sky and sell the sky
And tell the sky, and tell
the sky
Opening lyrics to
'Fall on Me' by REM

A few years ago, Jane Rickson was interviewed on a radio programme about her life as a soil scientist, and whilst it was not the Desert Island Discs format, she was invited to choose one record at the conclusion of the interview. Her choice was '***Fall on Me'*** by REM from their 1986 album Life's Rich Pageant.

"To me" she says "it is a song about the environment and the perils of acid rain."However, the lyrics are complex and open to interpretations, such as how we interact with the laws of physics and nature".

Which is almost certainly what attracted it to Jane. "I think my whole career has been curiosity-led" she says "from my days growing up in Kent and Sussex. Taking in the landscape during long walks, wanting to know more about the nature around us, geography and the impact of human interventions".

That interest and curiosity was given full reign by her teachers at school "They recognised my enthusiasm for working out how scientific principles could be applied to solving many of the challenges that faced us in harnessing the benefits and dangers inherent throughout the natural world".

From school, she resisted the usual temptations of a gap-year, or a VSO placement, and in 1980 won a place at Kings College London where she gained a BSc in Geography. That seems an inadequate single word to embrace all the disciplines covered by the course which included geomorphology, climatology, meteorology, biogeography, land use analysis, surveying, cartography, economics and statistics.

"I loved it" says Jane "particularly the practical work. Getting out into the fresh air to undertake fieldwork". Obviously the seeds of her future career were well and truly sown, and most likely in the historic High Weald of Sussex where small farms and woodlands, sunken lanes and ridge-top villages populate an area where rivers such as the Rother and Medway shape the sandstone geology. Jane's dissertation on degradation rates in this Area of Outstanding Natural Beauty would set the tone for her future career.

"It was a serendipity moment" she said "My time at Kings College showed me the importance of how we use and manage the land as a precious natural resource" so In order to build on her growing specialism, by taking a one year MSc course in Agricultural Engineering (Natural Resource Management option) at Silsoe College.

"One of the advantages of being in such a specialist field is that you come across some really inspirational characters. One such is really a hero of mine. Professor Denys Brunsden,

INSIGHT

FAMILY
Jane has been married to Tom, a digital cartographer for 27 years and they have three daughters Lizzy, Harriet and Annie

TRAVEL
Jane loves East Africa where she has undertaken work and family holidays in the South of France

DOWNTIME
A keen tennis player, Jane also is a member of a book club and enjoys the theatre

MUSIC
Eclectic. Loves classical music but admits to letting her hair down sometimes to 80s disco.

SAYING
As befits an enquiring mind, Rudyard Kipling's poem
'I keep six honest serving-men
They taught me all I knew
Their names are What and Why and When
And How, Where and Who'

who had studied geomorphology in the 1950s at Kings College, joined the staff and went on to be Emiritus Professor having travelled the world teaching and advising governments on geological issues. He fell into geology almost by accident when learning how to interpret air photos of seas and landscape whilst in the RAF. Denys went on to be President of the British Society of Geomorphology and was the driving force behind the Jurassic Coast in Dorset (where he lives) being granted World Heritage Status.

Another hero of Jane's is Roy Morgan, Emeritus Professor in Soil Erosion Control in the National Soil Resources Institute (NSRI) at Silsoe College. Roy was a founder member and past President of the European Society for Soil Conservation and, before retirement, was the Deputy Director of NSRI".

Having completed her degree at Silsoe, Jane enjoyed the subject matter so much that she took a job as a teaching assistant in soil erosion and conservation, supporting students, many of whom now hold senior positions overseas. Later she was appointed as lecturer and then senior lecturer at Silsoe in 1986.

In 1995, as a staff candidate, Jane embarked on a Doctorate in Geotextiles for Soil Erosion Control for which she gained her PhD in 2000. This was to resulted in her appointment as Professor of Soil Erosion and Conservation at the Cranfield Soil and Agri-Food Institute; School of Water, Energy and Environment, the post she currently holds.

Having been at Cranfield for over 30 years, Jane Rickson's daily routine is continually changing. "No two days are the same. My job is a mixture of research, teaching and outside consultancy in order to achieve a better understanding of soil functions and their impact on agricultural production and environmental protection".

"Much of it is concerned with the effects of soil degradation and how technology can be used to improve matters. As such I work closely with farmers, growers, land owners, food processors, retailers and consumer groups"

REACTIVE
There is little doubt that Jane Rickson is relishing the opportunities and challenges presented by her appointment as IAgrE President.

"The Institution is a broad church of specialised sectors which is a strength rather than a weakness. For a start, we are small enough to be nimble and reactive to issues that affect not only our industry but the wider world"

"Take Beddington's Future of Food and Farming report in 2011 that inexplicably failed to fully recognise the role of agricultural engineering. IAgrE was quickly able to mobilise a consortium of its various talents embracing engineers, scientists and academics and published a robust and relevant addendum of its own highlighting why agricultural engineering should be a key discipline in delivering global food security"

"I am sure that much larger bodies might have struggled to put together such an effective response so quickly"

It is probably timely that Jane Rickson should take over the Presidency of IAgrE at this moment.

Whilst the wider implications of Brexit are being discussed ad nauseum, the future for farming and food production in this country post-Brexit when it is possible that subsidies will be phased out, is of vital importance to farmers, land owners, environmentalists and allied industries.

Environment Minister Michael Gove has already invited Jane Rickson, along with others with an environmental agenda to meet him to discuss priorities including the importance of soil quality in the light of several reports that highlight continuing erosion of soil across British farmland.

"It seems that Defra is making the right noises" says Jane "and I'm encouraged by Mr Gove's interest and general direction of travel. Soils underpin everything when it comes to food production but we must be understanding of the pressures that farmers are under economically, the timeliness of crop production and the added competition that will surely arise post-Brexit."

DIRECTION
There is understandable pride and passion in Jane's voice about her forthcoming term at the head of IAgrE. She says "I have already mentioned two particular heroes of mine as I was progressing my career, but I would have to say that looking at the roll-call of previous IAgrE Presidents over the past 80 years, they would also count as heroes for guiding the Institution and the industry through periods of enormous change and advancements"

"We are approaching a new era for agriculture, so you will understand how proud we were at Cranfield this year to be awarded the Queens Anniversary Prize for research and education in large-scale soil and environmental data for the sustainable use of natural resources in the UK and worldwide, and to be invited to Buckingham Palace in February to receive the Award from the Prince of Wales and Duchess of Cornwall"

"We are the first university to be awarded an award for soil science – and it was particularly pleasing that other research centres with strong agricultural engineering credentials such as Harper and Scottish Rural College were also recognised with awards this year. That shows that our sector is really putting its head above the parapet"

One of her biggest disappointments, adds Jane, are time pressures. "We always seem to be on a roller-coaster of new discoveries that simply eat up the time. One discipline I'd like to give myself is the time to carefully think about the direction for IAgrE in the future. We have such a potent mix of expertise and talent in membership, so it is a question of planning to make the best use of our rich resources"

Labels can sometimes be misleading – and perhaps none more so than the term agricultural engineer. "I'm an academic working in soil science" says Jane "but I regard myself as much of an engineer as others who work in the design and upkeep of tractors and machinery".

"Our challenge, I believe, is to break down any boundaries, strengthen the joined-up thinking of all the elements within IAgrE so that we speak with an authoritative and credible voice".

She concluded "I think Alastair Taylor's recent quote summed it up best about IAgrE "There are lots more agricultural engineers out there...they just don't know it yet!".

2018 AWARDS

There was a full house for the presentation of the 2018 IAgrE Awards at Wrest Park on 24 May

Pictures by Chris Biddle and Elizabeth Stephens

AWARD FOR CONTRIBUTION TO LANDBASED SECTOR

Two awardees

PETER KETTLEWELL CEng FIAgrE

Peter Kettlewell is an internationally recognised authority on the welfare of livestock during transport. He worked at Silsoe Research Institute in the UK for 24 years leading research projects related to engineering applied to the improvement of animal welfare. He has worked closely with UK and European livestock transport companies in furtherance of research programmes, addressing the transport of farm animals in hot climates and the long distance transport of breeding farm animals. Research has also studied the export of breeding stock including journeys involving air and road transport. He has made consultancy visits to South Africa and Canada.

During 2006 he played a major role as a technical consultant for Defra in the implementation of the new livestock transport legislation arising from the introduction of EC 1/2005. That role involved delivering technical briefings around England and Wales targeted at the livestock transport sector. Further he has accompanied Defra to Brussels for discussions on the introduction of GPS on livestock vehicles.

He has ongoing contacts in the research sector within the UK, Europe, America and Canada.

Peter has been an invited member of the Scientific Panel on Animal Health and Welfare Working Group on Microclimate (related to Standards for the microclimate inside animal road transport vehicles).

RICHARD SMALLEY FIAgrE

Richard Smalley Technical Services Ltd.

Richard has been a member of the Institution for many years and has served on the Wrekin Branch Committee since 2012.

He has over 50 years experience and expertise in machinery design, closely allied to agricultural engineering and the landbased sector and has produced many specialist, niche market machines for forestry, agriculture, construction and water supply applications.

These include the multi-purpose 'Smalley 5' - walking excavator, which is claimed to be the worlds first 'mini' excavator, the 'Smalley 808' - swamp drainage machine, which has ultra-low ground pressure and was designed to work in peat drainage operations, but is also used in the East coast states of USA on mosquito control projects and the Smalley amphibious dredger range – designed to enable the dredger to manoeuvre in a river or canal to effect reed, silt and weed removal to a nearby barge.

He also patented the 'Altos' oscillating track system which improves traction whilst reducing ground damage and operator discomfort. This combined with the tilting table system which allows the engine and hydraulics to work on a level plane whilst the machine is on rough, sloping ground.

More recently he developed the 'Smalley 2730' implement carrier, a radio remotely controlled implement carrier with outstanding climbing ability that is able to operate a range of attachments safely on hillsides, railway, highway and reservoir embankments.

SPECIAL IAgrE BRANCH AWARD FOR INSPIRATIONAL LECTURER

JOHN KILGOUR (1937 - 2017) CEng FIAgrE

John Kilgour's wife Pat with son Robert and daughter Vivien

John was responsible for motivating a generation of agricultural engineering students at Silsoe College. He had boundless enthusiasm for his subject and had a real gift for opening the eyes of the young to the world of engineering for agriculture.

His clear satisfaction at overcoming engineering challenges was matched by his zeal for communicating to youngsters about the world around us. Single-handedly organising student visits, John drove his students literally thousands of miles (at considerable speed), taking groups to tractor manufacturers, tyre manufacturers, abattoirs, truck manufacturers, civil engineering projects, vehicle testing facilities, ball bearing factories, machinery manufacturers, electronics companies and international shows. He was ensuring that we got a well rounded grasp of how the world around us worked, ensuring that we had a practical understanding of the various facets of our discipline – not simply from video resources, but from real life. Students got to appreciate the realities of the meat processing factory, the brick works, fenland drainage as well as the diesel engine production line at Ford tractors. There was even time to appreciate the craftsmanship in coachbuilding and interior leatherwork at Aston Martin.

Lecturing on the finer points of thermodynamics theory, there was always a steam-engine related example, and his students came to value his honest, practical engineering assessments when it came to project work and simply making things that worked well. His experience in developing countries and with the disabled and disadvantaged was inspirational to many. His good-natured humanity and desire to make a difference was a real example to many, and his spirit of 'just giving things a go', has, I know, been an important influence on many lives.

IAgrE BRANCH MERITORIOUS AWARD

RUPERT CAPLAT CEng MIAgrE
Western Branch

Rupert Caplat started his agricultural engineering career with a firm educational footing at Harper Adams College in Shropshire studying for a BEng (hons). This included a secondment to Autoguide in Wiltshire where the die was cast regarding his future involvement in hydraulics.

After graduating from Harper Adams, Rupert worked for 8 years as a development engineer at compact products, JCB. Rupert referred to an incident where Joseph Cyril Bamford and a colleague where heading towards the building where he was working. Unfortunately the test rig exceeded its maximum operating pressure, and in a time before the necessary safety systems where included in the design, the pipework decided to dump its oil unceremoniously on the floor.

Rupert ducked from sight and avoided any embarrassment from Mr JCB himself.

Rupert moved onto a role with Linde material handling for one year, before moving to the hydraulics division. Currently in his 14th year with the Linde Hydraulics UK sector, his responsibilities cover Engineering Management for technical sales. Rupert's experiences have included all elements of construction machinery; noise emissions, cab design, and endurance testing. To add realism to the product development, climatic testing has been undertaken in Spain and Finland.

Rupert has maintained the enthusiasm of the Western Branch through his commitment for engaging visits and speakers.

IAgrE AWARDS OF MERIT
Two awardees

BRIAN KNIGHT MIAgrE
Knight Farm Machinery Ltd

Brian Knight formed Knight Farm Machinery Ltd in 1985 and with his vast depth of knowledge, practical engineering skills, coupled with boundless enthusiasm, saw the company quickly gain a reputation for producing high quality, high tech and precision built equipment. The expansion has reached a point where the company now employs 35 people.

Probably the company is best known for being one of the leaders in very high tech self-propelled sprayers, for which they hold various patents which include their plumbing systems and boom design. The latter patent had licensed booms being manufactured and fitted to John Deere self-propelled sprayers in the USA in the 1990s. However, the company is also well known for producing a range of cultivating machinery and air field de-icing equipment.

Over the years, Knight Farm Machinery Ltd has gained many awards including: 1998 RASE Gold Medal for laser agitation, 1999 RASE Gold Medal for their triple press cultivator, 2002 the Roland Burke Trophy and in 2006 the RASE Silver Medal for their 1830 self-propelled sprayer.

2017 saw Brian awarded the Agric Machinery Trade Excellence Award in recognition of his unique contribution to the design and development of sprayers.

Knight Farm Machinery is now exported to many countries around the world including Japan, New Zealand, Israel and Denmark.

ALASTAIR TULLOCH MIAgrE
CLAAS UK

Alastair Tulloch has been an IAgrE Member for 47 years. He qualified with a National Diploma in AgEng from the Essex Institute of Agriculture at Writtle in 1970. In April 2017 he retired from a 45-year career with Claas UK where he ended his Claas UK career as After Sales Manager.

As a key member of the AEA Training & Education committee he was one of the founding fathers of the Landbased Training Accreditation (LTA) Scheme, when he put aside the notion of brand competition to work with other agricultural machinery manufacturers to establish a recognition scheme for technicians working in Landbased Engineering Service Engineering.

On behalf of Claas UK, Alastair Tulloch has put a great deal of effort into the development of apprentices as well as on-going Continuing Professional Development for service technicians**.** More recently, Alastair acted as the chair for the Trailblazer Apprenticeship development group which pulled together the diverse views of a range of agricultural machinery manufacturers to establish an apprenticeship standard which is accepted across all of industry.

During his last year with Claas UK, Alastair has been closely involved with the redevelopment of a new training centre at the Claas UK headquarters in Suffolk which represents a state of the art training resource utilising twenty first century training methods for twenty first century agricultural machinery technology.

2018 AWARDS

IAgrE PRESIDENT'S AWARD
(formerly Michael Dwyer Memorial Award)

DR ROB SIMMONS MIAgrE
Cranfield University

Dr Simmons is a successful mid-career agricultural engineer, specialising in soil/crop/water / machinery interactions. Throughout his career, Dr Simmons has continued to translate sound scientific research outcomes into practical, field-based solutions to address key soil management problems facing the land based sector.

Dr Simmons gained his Masters in Agricultural Engineering (Soil Conservation option) from Silsoe College, Cranfield University in 1992. He went on to gain a PhD from the University of Kent (Christ Church, Canterbury) on the use of polyacrylamide soil conditioners for soil erosion control in 1998. Prior to taking up a Lectureship in Soil Erosion Control at Cranfield University in 2008, he held a number of overseas positions. These included Senior Researcher at the International Water Management Institute, Hyderabad, India (2005 – 2008); Researcher at the International Water Management Institute, Bangkok, Thailand (2003 – 2005); Post-doctoral Research Scientist in the International Water Management Institute, Bangkok, Thailand (2001 – 2003); and VSO Volunteer, Soil Science Research Group, Institute of Research Development on Agricultural Production Sciences, Department of Agriculture, Thailand (1998 – 2001). His current post is Senior Lecturer in Sustainable Soil Systems in the Cranfield Soil and AgriFood Institute, part of the School of Water, Energy and Environment at Cranfield University.

Dr Simmons is an excellent field scientist and researcher, working with industry, including farmers, growers, agronomists, agri-businesses, NGOs and government agencies. His work addresses some of the fundamental challenges facing UK agriculture today, including practical measures of soil erosion and runoff control in commercially profitable, but environmentally damaging production systems.

80th ANNIVERSARY AWARD IAgrE TEAM ACHIEVEMENT AWARD

Awarded to the Hands Free Hectare Team in recognition of successful teamwork and achievement through collaboration (Pictured left to right are Martin Abell, Kit Franklin and Jonathan Gill).

IAgrE / IVEL AWARD

The Pro-Til Xact strip precision seeder from Mzuri Ltd won the 2017 IAgrE/IVEL Award at LAMMA this year accepted by Ausra Landey.

IAgrE CNH INDUSTRIAL AWARD

Awarded to Michael Giannitsopoulos from Cranfield University for his PhD Thesis "Optimising Conservation Tillage Systems for Wheat & Oilseed Rape Production".

IAgrE STUDENT PROJECT AWARD and SAFETY AWARD

Awarded to Thomas Mathias, Coleg Sirgar for his "Net Lifter for Round Baler" pictured centre with lecturers Colin Jones (left) and Geraint Evans (right).

IAgrE YOUNG ENGINEERS COMPETITION

Teams from Easton and Otley College took first and second places in the 2018 Young Engineers Competition. Collecting the Award is college lecturer Nick Armstrong.

DOUGLAS BOMFORD PAPER AWARD

Marc C. Kennedy, M Clare Butler Ellis (pictured) Probabilistic modelling for bystander and resident exposure to pesticides using the Browse software, Biosystems Engineering, Volume 154, February 2017, Pages 105-121, ISSN 1537-

PERSPECTIVES

Selected extracts from latest UK's professional engineering journals.

NEW FEATURE: By permission, we select and reproduce articles from professional and business journals that we believe are relevant and of interest to IAgrE members

THE AUTOMATION OF DAIRY FARMS

Robotic milking is not a new innovation, but the systems are increasingly being adopted by UK dairy farms. Science writer and broadcaster Geoff Watts learned from John Baines, Technical Director at Fullwood, how these systems are being engineered to do more than just milk cows.

This article was originally published in issue 72 of *Ingenia* (www.ingenia.org.uk), the Royal Academy of Engineering's quarterly magazine.

There is something faintly incongruous about the sight of a dairy cow ambling through a farmyard, entering a barn and, at its own volition and at a time of its own choosing, stepping into a robotic milking machine. Cows are herd animals that mostly follow the actions of the group or, more often, their human herder. The agricultural engineers who first dreamed up the idea of robotic milking machines seem, quite unintentionally, to have given cows an autonomy that allows each one to make decisions for itself.

Robotic milking is still relatively uncommon in the UK, where only around 10% of farms already use the systems and they constitute around 30% of all new milking systems being purchased. However, robotic milking is a proven technology and it has become a core element in a more recent and still expanding web of technologies that are bringing a new rigour to the business of dairy farming. Instruments that can be bolted on to the milking robot, or otherwise used in conjunction with it, are now offering farmers a more

(ABOVE) Automated milking systems are being developed to do much more than just milk cows. Newer systems can test the milk's quality, monitor health and fertility, and feed in to a centralised computer system for the whole farm
© pixabay.com/skeeze

complete picture of their livestock: their animals' health, fitness and fertility, and the quality of the milk they produce.

As a recent report on the state of the dairy industry pointed out, farming is not noted for the speed or enthusiasm with which it has embraced technology. Mechanisation has brought larger tractors and replaced muscle power with machine power, but it has only been near the forefront in one area – the use of GPS to guide unmanned tractors. The industry has now started to adopt automation and begun assembling networks of machines that are able to talk to one another; the internet of things seems set to bring radical changes to the business of dairy farming.

AUTOMATED MILKING

In the short history of robotics, there are few instances of successful interactions between a robot and a living creature. There are fewer still where engineers have designed a machine that is able to take account of biological and behavioural variability in establishing contact between the two parties, which is what milking robots have achieved. The goal was not reached overnight, and today's robots are the product of developments that began several decades ago. Their exact form and method of operation depends on the manufacturer, but the similarities are greater than the differences.

Besides the design problems familiar in the development of any new machine, engineers who devise robots for use with agricultural livestock have to bear in mind that it will operate in an exceptionally mucky environment. The machines have to be animal friendly: robust enough to withstand the occasional kick, but gentle to the animal. The pneumatic or electrical drives that power the sections of the robot that have direct contact with the animals have to be sensitive to any opposing force. The chosen parameters will vary from one function to another but, generally speaking, the rule is to push firmly but lightly, and to back off when experiencing sustained resistance.

The equipment usually comprises a tough stainless steel stall that is slightly wider and longer than the animal, and has gates at both ends. The cow enters the empty stall, lured by a feeding trough mounted on the closed head-end gate, while a photocell detects the animal's presence and the rear gate closes. The cow's identity is established by an electronic ankle, neck or ear tag.

With the cow in place, food starts to pour into the feeding trough from an overhead machine. The cow is likely to keep relatively still while it concentrates on eating. The central portion of the stall's floor is covered with a grid to ensure that the cow stands with its back legs set conveniently apart and adjacent to the sides of the stall.

The robot's arm is mounted outside the stall and below udder level, where it can swing horizontally into the stall, beneath the animal's belly, and move unhindered between the front and back legs. Using stored xyz coordinates to locate itself in roughly the required position, the arm first cleans the cow's teats using a water spray and pair of soft rotating brushes that can help trigger the release of the hormone oxytocin into the cow's circulation, which produces the milk.

Alignment of the robotic arm's four suction cups below the cow's teats calls for more accuracy than the cleaning that preceded it. This extra precision is achieved by a laser or similar optical tracking system directed to the teats. It has to cope with a target that is anatomically variable and prone to move as the cow breathes or shifts the position of its body within the stall. The tracking system guides one of the cups to its correct location and then pushes it up on to the teat. Suction pulls it firmly into place and holds it there. The same procedure is repeated for each of the other three cups.

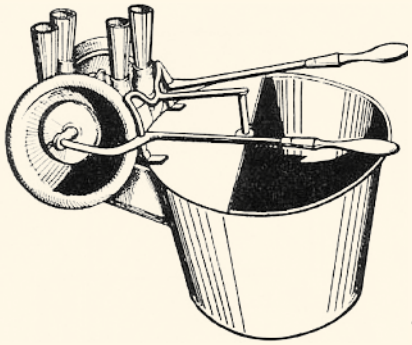
A vacuum sensor located in the tube carrying milk away from the robot signals that the cup is attached. However, the cup might be hanging on to the skin of the udder and not to the teat itself. If this happens, a liquid flow sensor that is electrochemically activated by the presence of milk will fail to send the expected signal and the cup will be detached for a second attempt. The milk sensors also respond when the flow from each teat has ceased. One by one the cups are pulled off, the teats are sprayed with disinfectant, the robotic arm retracts, the front gate of the stall opens, and the cow is free to go.

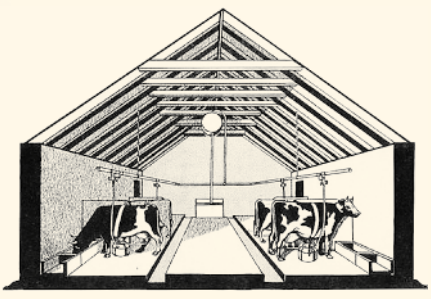
MILK QUALITY

Besides collecting milk, the robot's inbuilt instrumentation can run a series of checks on its quantity and quality, the latter including its fat, protein and carbohydrate content. Optical scanning reveals the presence of any blood that might render it unfit and therefore to be rejected. Data on all aspects of every milking for every cow is collected by the robot and transmitted to the farm computer. Farmers can scrutinise them as and when convenient, and in as much detail as necessary to understand the performance of each cow in the herd.

Analysis of the milk may point to particular nutritional deficiencies in some animals and this can alert the farmer to take remedial action when feeding the cow during milking. The robot could even act on its own initiative if given appropriate instructions. The robot can also make choices about the path to be taken by the cow as it leaves the milking stall. With appropriate gating technology, each cow can be allowed to return to the barn or the field, or be automatically diverted to a pen for a particular purpose, such as a veterinary inspection.

EARLY ATTEMPTS AT ROBOTIC MILKING





Although not robotic, innovative engineering was employed in the Colvin hand-operated vacuum milker in 1860 *(left)* ***and the first commercial milking machine developed by Murchland in 1889*** *(right)* ***© Fullwood***

FERTILITY AND HEALTH

Automated milking offers the opportunity for monitoring each cow's health and fertility. It is a feature that already exists in most systems and seems set to grow. Farmers need to know which cows are ready to breed and when because milk production, which starts when a cow calves, ceases after 10 to 12 months, so the cow must breed again to restart the flow. Cows are also only receptive to insemination for a brief period every 21 days, so timing is important. When cows are ready to breed, they become more active and their step count may increase by around ten times. The ankle or neck tag can be combined with a three-dimensional accelerometer to monitor the cow's activity. This is also critical to monitoring the animal's health as, for example, a cow that repeatedly gets up and lies down may be suffering some kind of discomfort.

The accelerometer can monitor and broadcast this movement continuously and in real time. However, if for some reason the cow has been beyond the range of the system, information stored in the tag can be downloaded when the cow makes its way back to the milking robot. Indeed, the milking robot offers a clutch of opportunities for health assessment. Further measures of the milk flow can flag up disease in the milk glands, such as the bacterial inflammation known as mastitis.

Online cell counting in milk has also been introduced to detect signs of mastitis. Some of the cells in question are shed from the cow's milk-producing tissues, but most are white blood cells that appear in increasing numbers in the milk when the animal has acquired one of the pathogenic microbes that cause mastitis. Cells are detected by the withdrawal of a small sample of milk from the stream, which is mixed with a dye to stain any cells

(ABOVE) Cows are encouraged into the automated milking stall by a feeding trough at one end. The rear gate closes when the animal's presence is detected by a photocell, which also records the cow's identity via an electronic tag *© Fullwood*

present that allows a digital camera to count their number per unit volume of the milk.

The cell counts, for every cow at every milking, are also made available through the farm computer so that infected milk can be automatically diverted away from the main collection tank. The manufacturers claim that this system helps earlier detection, and earlier treatment, of even sub-clinical mastitis, and for the effectiveness of that treatment to be monitored.

Feeding has so far proved a less popular candidate for automation, but a minority of larger farms are already using it. Autonomous feed robots can be programmed to make their way along a preset route to a farm depot where the separate ingredients of the feed are loaded into them in the appropriate proportions. Having mixed them within its hopper while making

(ABOVE) A robotic arm in the milking stall uses stored coordinates to locate the position of the cow's teats, which are then washed by soft brushes on the arm. A laser tracking system is then also employed to improve more accurate positioning of the suction cups *© Fullwood*

its way back to the cows, the robot then moves along each row of animals dispensing feed in a predetermined amount. This allows the animals to be fed day and night.

THE FARM COMPUTER

The farm computer controls all of

The engineers who originally set out to automate milking faced several challenges. The first was simply to get the cows' cooperation. This proved relatively straightforward as with most animals, food is a powerful inducement. A second, and more demanding hurdle, was to devise a means by which the robot could identify the position of the cow's teats and bring its four suction cups into correct alignment with them. The 1990s saw a variety of attempts, some that never left the drawing board and others that began to overcome the obstacles step by step.

For example, a report issued by the Silsoe Research Institute in 1993 outlined the technology used by one prototype milking robot to tackle the attachment problem. The robot relied on three sources of information. First there was 'stored knowledge' that was derived by initially guiding the robotic arm bearing the teats manually into place, and having the machine memorise the relevant coordinates. Added to this was 'inferred knowledge' of the teat position, which was obtained from knowing the body position of the cow as assessed by "linear potentiometers, which are fitted to the stall and connected to links held in contact with the cow by pneumatic cylinders". There were two sets of this equipment: one to detect any longitudinal movement of the animal and the other to detect lateral movement.

The robot's third source of information came from a matrix of light beams generated by infra-red light-emitting diodes that crossed the interior of the machine's teat-cup holder to impinge on an array of detectors. "A teat entering the matrix obstructs one or more of the beams causing the robot to move until the teat is centred over the teat-cup holder, which the robot then raises for attachment."

The performance of this system was not altogether impressive. In one test of 10 cows involving 1,440 attempted teat-cup attachments, almost a fifth were unsuccessful. A different approach relying on ultrasound guidance of the robotic arm was also found wanting. It was the introduction of more sophisticated optical tracking, especially with lasers, that made robotic milking the practicable and effective technology it has since become.

LAMENESS: A FURTHER OPPORTUNITY FOR NEW TECHNOLOGY

Bioengineers at the Royal Veterinary College (RVC) are among several groups to have experimented with automating the early detection of lameness in cattle. Affecting up to a third of dairy cows each year, lameness is not only a cause of pain but of reduced milk yield and lower fertility.

While early detection is self-evidently desirable, it is also time consuming and labour intensive because it relies on observation of the cows' movements and patterns of behaviour. Survey evidence suggests that many stockmen fail to notice what may be subtle indictors of the earliest signs that something is amiss.

Lameness alters a cow's normal pattern of walking, and the RVC team set out to exploit this in a machine designed to identifying such changes. Over a period of two years, they collected data on half a million foot strikes recorded from the sensors fitted to a series of force plates set at the exit from a milking parlour. This provided them with measurements of foot location, the vertical and horizontal forces involved, and other relevant features of every cow and the manner of its movements. Skilled observers also scored each cow for lameness using visual rating, and the team then compared their findings with those of the machine.

The researchers are confident that force plate analysis can pick up the early signs of lameness without human inspection. Their particular system has yet to be commercialised, but at least one other has recently come to market.

these devices and analyses the data that many of them collect. It is a focal point for all the accumulated information about each cow's health and wellbeing, and the milk that it is producing. Depending on the sophistication of the system, the computer can be programmed to act for itself in respect of individual animals.

Farmers new to this arrangement may fear being overwhelmed by the information that they can summon up on their screen, perhaps missing important insights amid a flood of data that will mostly be telling them that things are progressing satisfactorily. In practice, this overload can be avoided by prior selection of a normal range of values, with pre-determined alerts if those values are exceeded.

The most obvious benefits to the farmer of an automated system are the liberation it offers from the twice

(ABOVE) A liquid flow sensor in the system that is electrochemically activated by milk can tell whether the cup is attached incorrectly and when the milk production has ceased, automatically allowing the suction cups to be removed. Inbuilt instrumentation can also run checks on the milk's quality and quantity *© Royal Association of British Dairy Farmers*

daily constraint of milking time and the need for close scrutiny of every animal for signs of disease. However, this latter advantage can also be seen as a drawback; good farmers know their cattle extremely well and may become aware of something that is not apparent to a machine. It is an argument that is already familiar in medicine, which has long since adopted vast amounts of diagnostic and monitoring technology. Doctors have found a middle way in which the use of technology stops short of total reliance on it and farming will surely learn similar lessons.

How the cows themselves feel about automation can only be inferred. It is claimed that milk yield tends to increase following the adoption of robotic milking, which can be an indication of contentment. Machinery that operates quietly, does not shout or wield a stick, and makes no unpredictable demands is certainly calculated to suit a cow's temperament.

THE TECHNOLOGICAL FUTURE

Where technology of this kind will go next is uncertain. Likely candidates for the future of automated milk testing are various reproductive and stress hormones and other yet to be identified biological markers of health and metabolic wellbeing. Less predictable is the role of novel gadgetry that exploits new observations about animals. For example, it seems that when sheep are suffering pain their eyes narrow, their cheeks tighten, their ears fold forward, their lips pull down and back, and the shape of their nostrils changes.

University of Cambridge scientists recently rigged up a camera linked to a computer running artificial intelligence software that can identify and distinguish between these and more normal facial expressions. Their thought was to fit drinking troughs with the cameras, so that farmers would be alerted to any of their flock suffering distress that might otherwise have gone unnoticed. Whether cows display comparable changes of expression is a question for biologists, farmers and vets rather

MEASURING BODY CONDITION

The appearance of the hindquarters of a cow is a useful indicator of the adequacy or otherwise of its diet, which is a major influence on milk production. Farmers usually assess cows by eye, noting how their skin is either stretched tightly over the spine and pelvic girdle, or cushioned and rounded by an underlying layer of fat. Using a standardised five-point body condition scale they can score each cow, which can be more revealing than an animal's body weight alone.

Another recent addition to the health checks that can now be slotted into the pathway to or from the milking robot is the automated assessment of a cow's body condition.

At least one manufacturer has introduced new camera technology that aims to improve the accuracy and consistency of visual inspection. These systems rely on a short video sequence of the cow's hindquarters recorded by a camera mounted above a location that each animal must pass daily, such as the exit of an automatic milking machine. An infrared source on the camera directs a beam of light at the cow and technology in the camera's detector records how long it takes for reflections to reach it. The image-capturing process takes only seconds, and can be completed without the cow needing to stand still.

Software on the farm computer creates a 3D image of the cow's hind quarters from the data, and compares the contours of several areas with a set of standard surface contours seen on animals in conditions ranging from skinny and malnourished to overfed. The final result is presented by the computer as a score on the familiar five-point scale. A daily score for each animal's body condition allows its progress to be checked over time, and action to be taken if it falls outside pre-set limits. Such changes might be caused by a problem with the cow's health or the farmer might need to adjust feeding to take account of its position in the lactation cycle. Either way, the computer will automatically issue an alert.

than engineers.

Even with another decade's worth of engineering advances, an image of a self-governing agricultural internet of things could be seen as fanciful. Although engineering ingenuity will continue to foster change, and not only in dairy farming. Current projects listed by the University of Lincoln's newly created Institute for Agri-food Technology include: an automated selective broccoli harvester; three-dimensional vision-based crop-weed discrimination for automated weeding; the autonomous control of agricultural sprayers; and the quantitative estimation of blemishes in potatoes using machine vision.

A recent survey described agriculture as among the world's least digitised industries, but the use of robots that collect data on the scale now growing apparent in the dairy industry is changing everything. Agricultural data analysis will become increasingly important in boosting the efficiency of the industry, and in planning its future. The popular notion of agricultural engineering as concerned largely with building bigger and better tractors is already out of date, and becoming more so.

BIOGRAPHY

John Baines has been Technical Director of Fullwood since 2003 and has been involved in the agricultural industry since graduating from the University of Aberdeen in 1977. John has been at the forefront of many projects including improving milking technology and introducing automation to the industry, as well as supporting milking system installations across the world.

ROBOTS AND DRONES

ADDRESSING AGRICULTURE'S LONG-TERM STRUCTURE CHALLENGES

As challenges facing the agricultural industry mount up, technological developments around drones and robotics could form part of an effective long-term solution, says Dr Khasha Ghaffarzadeh, research director at IDTechEx

Agriculture is facing major long-term challenges. Some forecasts suggest that world population is set to grow by 2.3 billion by 2050. This, together with rising global income levels that typically increase food demand per capital, would require raising food production in 2050 by 70% compared to 2005 levels.

In parallel, the world continues to urbanize at pace. Indeed, forecasts suggest that 70% of the world population will live in urban environment by 2050 compared with nearly 50% in 2009. This will adversely impact the availability of labour near agricultural lands. Add to this the facts that in many countries, particularly in the developed world, farmer population is ageing fast and that wages are increasing.

Furthermore, many agricultural activities demand seasonal labour. In many instances accommodating this need would require continued flexibility towards migrant workers, an objective that may become more difficult in places in the light of events such as Brexit. It is within this context that automation of agricultural tasks finds its economic purpose.

In parallel to all these structural challenges facing agriculture, our current production processes can often have long-term unintended

environmental and health consequences. In particular, the use of non-selective herbicides continues to be a source of concern in Europe. As we shall explain later in this article, the advent of agricultural robots can accelerate the uptake of ultra-precision agriculture, helping enable farm management on a site-specific, and then later individual planet-specific, basis. This would result in an optimal use of agrochemicals tailored to the needs of individual sites or plants.

It is often assumed that agriculture is averse to innovation and therefore would be no place for the adoption of robotic technology. This would, however, simply be wrong; if we take a long-term view we will find that agriculture was one of the first major industries to adopt technology to boost its productivity. Indeed, employment- as a share of total- has been steadily declining in agriculture for centuries despite the fact its output per unit of labour has been increasing.

This productivity gain is due to new technologies. This gain has stemmed partly from better seed and agrochemical technologies that have boosted the yield per acre, and partly from better tools and machines such as powerful tractors and implements. Indeed, many robotic technologies can simply be viewed as the next incremental evolution in agricultural machinery technology that has over time seen farmers swap their manual sickles with horse-drawn implements and then with mighty tractors.

At IDTechEx Research, we have been analysing the technologies and markets for agricultural robots and drones. In our report Agricultural Robots and Drones 2018-2038: Technologies, Markets and Players, we analyse numerous robotic development taking place in agriculture including robotic fresh fruit harvesting, robotic milking, etc. In this article however, we have chosen to primarily focus on two development axes within the world of robotics that are impacting agriculture: (1) advanced vision and (2) autonomous mobility.

When reading this you might wonder why this is all becoming possible now. Indeed, many ideas discussed here are decades old, but they are only becoming commercially viable now. The short answer is that this is now increasingly possible thanks to dramatic year-on-year improvements in the performance and price of computing power, sensing technologies, energy storage, electric motors, and so on.

ULTRA PRECISION AGRICULTURE

Vision technology is already in use in agriculture. A simple use case is in organic farming. Here, a tractor-pulled implement must be precisely driven along narrow rows to mechanically hoe out weeds. Here, basic vision technology can help: a camera mounted on the implement traces the crop row, identifying objects outside the row as the weeds. It then controls a side shifting mechanism to adjust the position of the mechanical hoe, thus helping alleviate the burden of precision driving of tractors.

The technology is now fast evolving. The later generations are essentially multiple ruggedized computers and camera systems integrated into the tractor-pulled implement. These systems take images as they are pulled along the field and identify weeds vs. crops. The systems then control a precise de-weeding mechanism, e.g., precisions spraying of the right selective herbicide, to take site-specific actions.

The vision technology here is much more powerful than the simple row-following approach. Here, deep learning algorithms are trained to identify crop vs. weed and to later differentiate between various weed types. This is no easy feat and cannot be achieved towards using traditional script-based approach towards programming. Simply put, this is because one is dealing with complex and variable entities that change shape and appearance during their growth. These algorithms can also become trained on smaller datasets than might be required, say, in autonomous passenger car driving since one is not dealing with matters of life and death.

The technology here has already been demonstrated and indeed commercial activity is accelerating. For example, last year we witnessed the first major start-up acquisition with a price tag exceeding three hundred million dollars. These are still early stages: the hardware is

custom built by start-ups without the know-how, the farmers do not have full technology, and companies are offering their robots as a service to de-risk the adoption for end users. These however clearly demonstrate the shape of the near future: ultra-precision agriculture enabled by advanced computer vision.

NEW BREED OF AGRICULTURAL VEHICLES?

Agriculture is the leading adopter of autonomous driving technology despite all the hype around driverless cars. Here, first came tractor guidance, helping drivers drive more accurately and relieving some of the pressure of maintaining driving accuracy. Next came autosteer, giving the operator the ability to programme a map into the tractor and let it navigate autonomously. Indeed, last year we forecast that more than 270k autonomous tractors (level 4 and 5) will be sold in 2018, rising to more than 500k by 2023.

Technology is now evolving towards full autonomy. Master-and-slave (or follow-me) systems are being trialled, enabling one driver to guide a fleet, thus boosting the driver's productivity. Next will come manned yet fully autonomous tractors (level 5). This has already been technologically demonstrated. Here, the vehicle's sensing suite must be expanded to enable it to avoid collision and operate even when the GPS signal is lost.

The next stage will potentially be unmanned autonomous tractors. Indeed, we have already seen early technology demonstrators. Currently, however, the farmers want to stay in charge, thus the cab is likely to be kept in the design. In the long term, however, the meaning of staying in charge will change, transitioning from driving the vehicle to, for example, remote fleet operation/management.

Taking the driver out of the equation can have profound consequences for the way we envisage agricultural machinery. The well-established notion that bigger is better has its origins in the need to enhance the productivity of the driver but this notion loses some of its relevance if farm vehicles become autonomous and unmanned.

This is because autonomous mobility will enable fleet operations by eliminating the wage bill overhead by vehicle. In this case, a few persons will remotely monitor and control the operation of a large fleet. Here, the productivity of individual units may be lower than traditional powerful vehicles such as tractors but the overall productivity- at the level of the fleet- could be higher.

Navigational autonomy can, therefore, initiate a major transition from a few large, heavy, fast and expensive vehicles towards fleets of small, light, slow and inexpensive agricultural robots. These agrobots would move slowly, giving extra attention to plants thus essentially bringing a gardening-like ultra-precision-farming approach to industrial farming.

We are currently at the beginning of this process. Research entities have demonstrated working prototypes and numerous companies have been established to commercialise such agrobots. Indeed, some are already selling a small number of units.

IMPACT

These are major long-term evolutionary changes. They will help address some of the long-term structural challenges facing agriculture: increasing demand for food production, dwindling and ageing workforce, rising wages, environmental concerns, and so on.

These changes represent enormous opportunity for innovation and value creation. In Europe today, the research activity is taking place in small islands and often on a small scale with little funding. European Union should thus increase its research commitment to create integrated large-scaled and well-funded research programmes.

Furthermore, these changes may shift the skills needed in operating a farm. In general, data, analytics and robotics will increasingly take on a more prominent role. The European Union should thus find ways to equip farmers with the right skillsets to best utilize these new technologies.

Finally, these technologies may grow to become a commercially viable alternative to some farming practises today that represent environmental concerns. The increasing availability of a viable substitute will thus make it easier to tighten the regulation and even ban certain chemicals. This action will create a virtuous cycle that will further spur on innovation by providing a major additional commercial incentive.

This article was originally published in Government Europa Quarterly and Industrial Vehicle Technology (IVT).

ELECTRIC MOTORS FOR ELECTRIC VEHICLES

Multi-billion pound confusion

What do golf cars and heavy electric trucks have in common? There is still no agreement on the best type of electric motor to use in either of them.

The changing needs and evolving technology are matched to create forecasts and technology timelines based on intensive recent travel and interviews by PhD level analysts. Rotating electric machines REM propel electric vehicles at least some of the time by land, water and air. In a hybrid the motor may sometimes have to run hotter due to hot engine systems nearby and tougher duty cycles.

This affects motor design as do cost-performance compromises for the very different duty cycles and environments experienced by vehicles on land, water and air. Off-road vehicle REMs are very different from on-road. The second most expensive part of an EV after the energy storage is typically the REM system including its intimately related motor controller. A report reveals how the REM system is taking a larger share of cost over the years as simpler batteries reduce in cost.

By contrast, REM systems are variously being asked to grab regenerative energy, eliminate transmission, provide better speed/ torque characteristics and even form part of the structure such as tucked into the wheel with brake and controller. Crucially, in addition to becoming motor-generators, more REMs are being used per vehicle for reasons explained in the report which has in-wheel forecasts for that form of multi-motor. "Electric Motors for Electric Vehicles 2018-2028" reports that, increasingly, the choice of REM system benefits the unique selling propositions of the vehicle.

Where it eliminates the need for a gearbox it can increase range 15%. Extreme power-to-weight ratio REMs are sought for most vehicles. A pure- electric heavy construction vehicle with several quiet REMs appropriately placed may have vectored traction so it can cross roads without damaging them and be legally used indoors and at night time as needed. It may operate implements with improved precision and response time and create electricity instead of heat when the vehicle or the implements brake. Start-stop is smoother.

Emissions, acceleration, ride, fuel consumption and autonomy of navigation and energy are improved with better REMs. Emissions are reduced or eliminated. New business opportunities, new skills mechanical parts are rapidly becoming replaced by electrical and electronic ones, creating many new business opportunities. For instance there is a shortage of good designers of motor controllers. The variety of EVs is becoming greater so we now have special coreless motors for the multi-billion pound market for drones that has arrived from nowhere. Small agricultural robots are being contemplated for agriculture: "elephants to ants" that will change completely the type of REM system required.

Ten important trends receive particular attention: Multifunction. Proliferation. Integration. Power increase. Voltage increase. Less metal/ more electronics. New technology preferences. Changed location. Less cooling. It is not all confusing. Quadcopters nearly all have an outrunner PM REM and forklifts are largely hooked on asynchronous motors.

Electric Motors for Electric Vehicles 2018-2028" published by IDTechEx www.idtechex.com

FROM THE ARCHIVES

A glance back at moments in the history of IAgrE

40th ANNIVERSARY 1978

DOUGLAS BOMFORD LECTURE GIVEN BY LORD MAYOR OF LONDON

Glittering occasion at the Mansion House

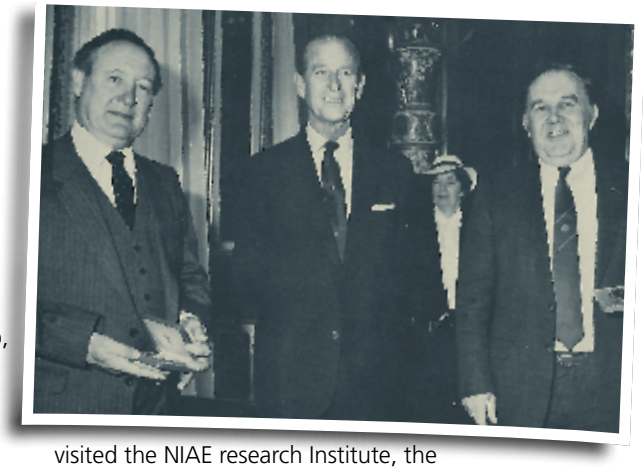
The Douglas Bomford Memorial Lecture in 1978 was given by Sir Peter Vanneck, the Lord Mayor of London – and IAgrE member. The title of his address was ***'British Agricultural Engineering – a Service to the World'*** in which he said that British agricultural engineers had much to offer in the application of electronic and computer techniques in relation to the design and production of tractors, machinery and equipment.
Sir Peter studied at the Royal Navy College, passing out in 1941. He then served on HMS King George V during the operation to sink the Bismark. Further promotions saw him promoted to lieutenant and he commanded a motor torpedo boat until the end of the war.
After the war, he trained as a pilot at RNAS Yeovilton, spent time in the Naval Air Squadron before retiring from the Navy in 1949. He then studied at Cambridge University and at Harvard and gained an MA in Engineering, but kept up his flying career in the auxiliary Air Force, rising to Group Captain and becoming Inspector of the Royal Auxiliary Air Force until 1973.
He then joined, Ransomes and became a member of IAgrE. A move to the City saw him join a firm of stockbrokers and became Deputy Chairman of the Stock Exchange from 1973 – 1975. He was elected a Sherriff of the City of London in 1974 and the 650th Lord Mayor of London in 1977.
When his Mayoral term ended, Sir Peter stood for the European Parliament and gained a seat in 1979 which he held for 10 years. He was High Sherriff of Suffolk from 1974 until his death in 1999.
The 1978 Mansion House Dinner, attended by members and wives was described as a 'glittering evening' with huge praise being given to the President, David Manby, for 'bringing together the various strands to ensure a uniquely happy event in the Institutions history'.

FOUNDING PRESIDENT

At the inaugural meeting of IAgrE held on 24 May 1938 a Council was elected consisting of a representative of the Rubber Growers Association, a farmer, electrical engineer and a Founder-President, Lt Col Philip Johnson, the founder and Chairman of Roadless Traction Ltd who was to hold the post through the war years until 1947.
Born in 1877, Col Johnson went out to South Africa during the Boer War, working with steam transport before taking a post with John Fowler to sell their steam machinery in India.
Returning to England in 1915, he was involved in tank development but in 1919 registered Roadless Traction Ltd to first make tracks for trucks and farm crawlers. During the 1930s, he moved on to design half-tracks for popular makes of tractor.
Roadless then started manufacturing four-wheel drive systems in the 1950's and the company made almost 8000 4WD tractors and kits until 1983 when it ceased trading.
The portrait of Col Johnson, which hangs in the IAgrE offices was unveiled at the Annual Lunch in 1960. Thanking the Institution in a tongue-in-cheek speech, he said "It has pandered to my egotism and boosted my conceit, which is colossal".
Two years later in 1962, the IAgrE Presidential badge was ceremoniously presented to Col Johnson at the AGM and lunch held at Shell-Mex House in London. This was worn briefly by outgoing President, Mr W J Nolan before being passed to his successor, Mr C A Cameron Brown.
Lt Col Johnson died in 1965.

DUKE OF EDINBURGH SUPPORT FOR AGRICULTURAL ENGINEERING

In 1985, the annual MacRobert Award was awarded jointly to the National Institute of Agricultural Engineering (NIAE) and Rolls Royce. The presentation by the Duke of Edinburgh took place at Buckingham Palace with the NIAE Award being accepted by John Matthews, Director of NIAE and President-Elect of IAgrE.
Six years earlier, the Third Douglas Bomford Memorial Lecture was given on 17 October 1979 at the National College, and attended by Prince Philip, the Duke of Edinburgh.
The lecture, An Analysis of Economic Success in Agricultural Engineering, was presented by Dr F E Jones, Director of Unitech Ltd in which Dr Jones was able to show that the best of British companies were very comparable with companies elsewhere in the world.
Earlier in the day, Prince Philip had visited the NIAE research Institute, the college and IAgrE to learn something of the work of each organisation.



ABOVE: Prince Philip with (right) John Matthews (NAIE and IAgrE) and Sir Francis Tombs (Rolls Royce)

ENGINEERING FOR FOOD AND DRINK

IAgrE CEO Alastair Taylor puts the case for establishing a new Special Interest Group (SIG) that would bring together engineers working across the food and drink sector

Engineering is all over the place! You could interpret that comment in many ways but in this context, the point is that wherever you look, there is engineering.

As agricultural engineers we drop in along all the points along the route from "farm to fork". Whether that is a design engineer dealing with the complexities of finite element analysis when designing a new farm machine, or a soil scientist looking to better understand cultivation techniques, or an installation engineer making sure a grain handling system is properly controlled; all of this is our field and bring home the fact that as well as a need to understand engineering in kits purest sense, we also need to have a grasp of chemistry and biologic systems.

Daniel Hefft is a recent recruit to the IAgrE membership and is working towards Chartered Engineer registration. As part of this, he invited IAgrE to his workplace, a company responsible for "the nation's favourite breakfast cereals". It was a fascinating visit and highlighted the multi-disciplinary engineering challenges in that setting. Dr Steve Parkin was appointed as a mentor with a view to helping Daniel build up his portfolio of evidence to support his application.

He made the point that Agricultural Engineers might be viewed as people who deal with food "Field to Grain Silo" and that his discipline was the "Grain Silo to Fork" part of the journey. He also made the point that there are many engineers considering registration as professional engineers for whom IAgrE may well be the best (if not the most obvious) home for their professional life.

Daniel is of the view that *"IAgrE has an open approach which enables many (left out) engineers to find a way into Chartered Engineer status. I believe this is IAgrE's true value that it seeks to help people to get into membership and professional registration without creating hurdles."*

The factory visit was, like all factory visits a wonderful opportunity to see how things are done and a great Continuing Professional Development (CPD) opportunity. At the production end were all the common challenges around measurement, monitoring and control. Energy and heat, often in the form of steam took me back to distant memories of steam tables and associated calculations - years ago but still relevant.

MULTI-DISCIPLINES

Within the research and development setting, where our IAgrE member works were a full range of engineering examples across many disciplines and versatile teams. It seems that determining the point at which a breakfast cereal breaks through tensile and sheer tests is much the same process as for many other aspects of engineering.

Our challenge is in helping engineers and technologists working in the final stages of the Agricultural Engineering journey (who often started out as biologists, food scientists, and chemists) that IAgrE is the place they should be to support their career development and build important networks.

To help achieve this aspiration, IAgrE has decided to reinvigorate its specialist group which focuses on ***Engineering for Food and Drink*** *(EFD)*; a broadly underutilised field which just recently got acknowledged again.

We steered away from the term food engineering given that some might associate that with Frankenstein foods.

Given the important focus on this subject by some of our own education partners, including Cranfield, Harper Adams and Lincoln Universities together with Reaseheath College, all of who have a very significant presence in this area, added to new partners such as Nottingham, Reading and Sheffield Universities then we have a good opportunity to build momentum.

Our ambition is for an active EFD Group which brings together a community of engineers working on the front line of engineering across the food and drinks sector. These might include technicians dealing with the day to day operation of plant through to senior engineers overseeing research and development and seeking to link with those engineers involved with the earlier part of the food chain.

Read Daniels account of a typical day on the opposite page.

What an interesting job! When you analyse it, Daniel is demonstrating so many engineering skills and whether he is working with breakfast cereals or designing a new plough, the skills and knowledge he is using is much the same, albeit in a different context.

More importantly, Daniel is an enthusiastic volunteer seeking to bring those Engineers working with Food and Drink into the IAgrE Community.

Let's make this work!

DAY IN THE LIFE

IAgrE member Daniel Hefft, who works for Weetabix as a Process Development Engineer, outlines his role and a typical day.

Daniel gained a BSc in Food Science and Technology at the University of Applied Sciences Ostwestfalen-Lippe before becoming Head of Production at German cake manufacturer KuchenmeisterGmbH. He then gained an MSc in Food Technology at the University of Reading before taking up his present role.

1. **What does a typical day look like? -** Although a 9 to 5 job, there is not such a thing as a typical day – one of the reasons why I love my job and my profession. One day you will be spending your time on HAZOP (Hazard and operability study) studies, the next day you get called in to the factory for some trouble shooting.
   Many times, you will conduct pilot plant trials to identify and assess process-related risks and conduct scale-up exercises. A good proportion of my time I am doing measurements and link them to mathematical models which are in development or already in place.

2. **How did you get into Engineering for Food and Drink? -** The first time I got into food engineering was in my 9th year at school back in Germany. I was doing private tutoring in Latin for a family whose father works for a food manufacturer. In this year we had to take an industrial placement for a period of 2 weeks.
   The first time I went into the factory I was fascinated how things work and all the technology in there. I was impressed to see how much science, technology and engineering is required to turn a potato into fries, dumplings, hash browns…
   Since then I went in all my school summer breaks into food manufacturing businesses and studied Food Science and Technology along with an engineering qualification in 2010. It is a journey, I have never regretted.

3. **What engineering skills have you used in the last week? -** I had to prepare a factory trial (management skills), including the mass balances for the recipe, trial and H&S risk assessments etc (H&S skills, processing skills). Further, I got called in for some value engineering work where a process needed some tweaking (gathering data and analysing it afterwards), was involved in a pilot plant trial for scale-up purposes (Buckingham ϖ theorem) and had to do some networking with one of our external research partners.

4. **What new engineering skills do you see yourself using in the future? -** Soft skills are gaining an increasing importance. When I started out in university engineers were seen a as sort of semi gods and geeks. To create sustainable and effective workflows and relationships it is important to present yourself to broad audiences and being able to communicate technology and mathematics in a simple manner. Besides those soft skills I will need to get more into IT systems.
   The food industry will shift more and more into industry 4.0 where robots will be in place. I think I have a good understanding about the mechanics of those systems, however, no idea about the "thinking" processes of such systems.

5. **What do you want the IAgrE EFD Group to be doing in three years' time? -** Promoting the food engineering profession, being the first choice to join and home for food and drinks related engineers and to offer broad CPD opportunities and key events for young and senior food engineers. This group is a vivid platform for all food professionals from farm to fork and by doing so create true links for both ends of the equation.

FAR FLUNG MEMBER

A new series profiling the work and times of IAgrE members across the globe

Penguins and Potatoes

Alasdair Wyllie MIAgrE, CEnv, IEng was appointed as Agricultural Adviser to the Government of Tristan da Cunha in 2016 where he lives with his wife Bee and oversees the farming enterprises on the island

In 2016, the worldwide press latched on to an advertisement that had been placed for a two year post offered to a British farmer on an "island paradise". The main responsibilities was to concentrate on food security, self-sufficiency and sustainability. Existing farming enterprises such as cattle, sheep and potatoes were to be modernised and streamlined and the introduction of new enterprises were to be considered. They were looking for a person with a wide range of farming knowledge and with experience of living in remote situations. Alasdair Wyllie decided that the job had his name on it, applied and got the job.

Now in the final year of his post, he has recorded his experiences in a regular post, **Penguins and Potatoes.**

FIRST IMPRESSIONS

By any standards, Tristan da Cunha is an extraordinary place.

It is a volcano, indeed a classic conical volcano. The island is round like a clock face, and it is possible to pin-point features around the coast by reference to the clock. For example, Edinburgh is at 11 o'clock, Sandy Point is at 3 o'clock, Stony Beach is at 6 o'clock, and the Caves are between 7 and 8 o'clock.

Indeed, these four places are the four places where there is flat-ish ground and where there is some form of agricultural activity.

The population is about the size of a small village – currently 254. At times the population of the island can be increased by short-term workers on construction projects such as a team of 25 who built a new hospital last year and another team involved in carrying out repairs to the harbour. Other than that the island population is supplemented by a variable number of expats (12 at present) brought in for specific tasks.

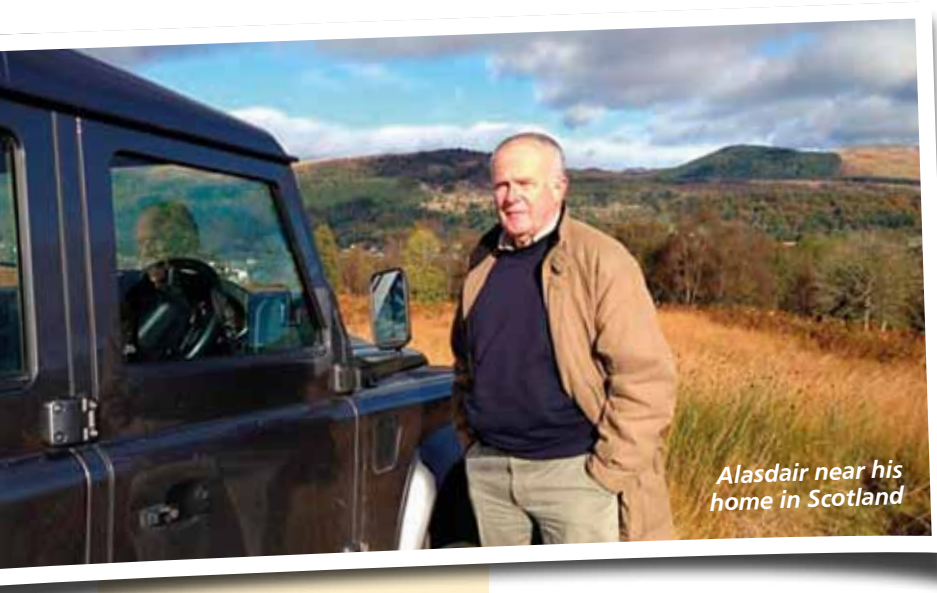
From the start, we saw at first-hand how difficult things can be on Tristan da Cunha. Like all islands, Tristan is entirely dependent on shipping. Most inhabited islands have the benefit of a sheltered bay or natural harbour. Here, a new small-boat harbour was built on an exposed storm-prone coastline in the 1960s.

The main revenue-earning product that leaves the island is crayfish, known in some markets as Tristan Island Lobster. This provides the main revenue stream for the island, and paid employment for a large proportion of the islanders – but this economic and monetary life-line is only as good as the harbour and the shipping links to the outside world via our nearest port of Cape Town (some 1,600 miles to the east).

Machinery, building materials and other capital resources come in via

Northern Rockhopper penguins

The Settlement: Edinburgh of the Seven Seas



Alasdair near his home in Scotland

ALASDAIR WYLLIE

Alasdair Wyllie gained an NDA at the Royal Agricultural College in 1966.
After some 7 years managing farming projects in Scotland, he worked overseas on farm management projects in Oman, UAE, North Yemen, Jamaica, Georgia and Saudi Arabia.
In 1988, he ran his own company, Water-Tech, a rural engineering company in Scotland until 2002, before roles as estate manager in Jersey, Belgium and France
He then owned and piloted a 30-metre hotel barge in south-west France for almost 9 years before taking up the post of agricultural adviser in Tristan Da Cunha.

this route and it is the only route for essential items like fruit, vegetables, flour, sugar, gas for cooking, diesel for the cars, and so on.

'Unloading Day' is a big day here. It is an 'all hands' day, in which all Government departments pool their resources, and all staff concentrate on the task of unloading. When there is a ship to unload, an assessment is made very early in the morning to ascertain whether unloading will be possible, looking at actual weather, up-to-date weather forecast, height and direction of swell, and so on. If an unloading day is deemed to be possible, the community is notified by the ringing of the gong at 5.30 in the morning.

The gong is a suspended gas bottle, sited centrally just at the back of the pub, and twelve strikes on the gong lets everyone know what their priority is for the day – an unloading day has been declared!

AGRICULTURE

The long-existing agricultural enterprises are cattle, sheep and potatoes, plus some vegetables and a little fruit. There is much improvement to be made in all these enterprises. My brief also included the promotion of some quite fanciful ideas, including for example the commercial development of tea, and truffle production. However I have agreement on the abandonment of these peripheral ideas, to concentrate on a 'back to basics' approach in the interests of food security and sustainability.

The main problems we face can be categorised as being Logistical, Technical, Climatic and Cultural. The Cultural issues have developed as a result of the community on the island having very little contact with the outside world for most of its 200 year existence, and because of the isolation, the spread and adoption of new ideas is naturally very restricted.

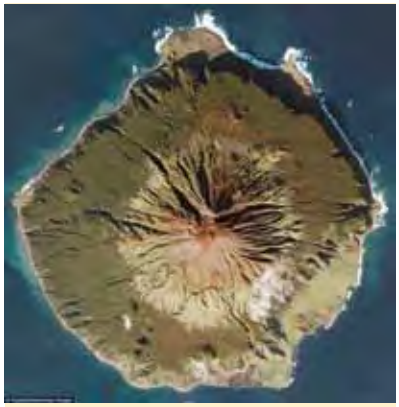
The climate can be described as temperate maritime, but this generalisation does not convey the day-to-day reality of the weather and of the way in which the weather plays a pivotal part in limiting farming options.

Summer temperatures can range from 16 to 28°C, and although the climate is wet there can be prolonged dry spells in the summer. Winter temperatures range from 4 to 16°. There is great variety in the weather, with sometimes a few spring-like days in the middle of winter, and vice versa. However, the island can have 5 or 6 days in which storm-force winds blow without a break, most often accompanied by heavy rain.

Rains in the last 12 months have resulted in some serious flood damage, a combination of erosion and alluvial deposits being washed down from the high ground accounting for the loss of some 10% of the available pasture land, which previously amounted to around 400 hectares. Most crops need shelter from the wind to survive.

The very limited land area is generally poor, boulder-strewn ground which is not ploughable. This has become 'pasture' by the colonisation of kikuyu grass which of course is low in production and low in digestibility, as well as a range of other low performing weed grasses. As with most soils of volcanic origin, the soil pH is very low – now around 4.8

No lime has been applied since the early 1970's. We have now started lime spreading, as the beginning of a programme which should be repeated annually if funds permit. We have also



TRISTAN DA CUNHA

Tristan da Cunha is the most remote inhabited island in the world - the nearest speck of land, St Helena is 1510 miles away, and it's over 1740 miles to the nearest continent, Africa.
The entire population of some 300 inhabitants is concentrated on the only flat bit of this volcanic landmass, the hamlet of Edinburgh of the Seven Seas on the main island. There are a few other islands in the archipelago, all uninhabited.
The summit of this newly formed volcano is called 'Queen's Mary Peak which is at 6765 ft. Close to the shoreline and very close to the Settlement there was a new volcanic eruption in 1961, which forced the evacuation of the entire population of 264 individuals in open boats to a nearby island where they were picked up by a Dutch passenger ship that took them via Cape Town to Britain.

LEFT: Our new Massey Ferguson 268 tractor

started to reseed some of the pasture land – the first time this has been done in 40 years.

During the winter months, the livestock that are dependent on the grazing have a hard time. In round figures we have a total herd of 420 single-suckled cows and followers, and around 800 sheep. There is no grass conservation, and it is illegal to bring in hay because of the high risk of bringing in hitch-hikers, both alien plants and alien insects.

The sheep tend to have an easier time than the cattle do, because they are able to graze the upland areas where there is much less grazing competition. Sheep are kept primarily for meat, but the wool is also important. There is a significant cottage industry of carding, spinning and knitting, with a range of quality woollen items being sent to customers around the world.

In small, enclosed garden areas there is some production of vegetables, and there are two home-made greenhouses that are used for the propagation of seedlings and production of tomatoes and cucumbers. The climate is such that some crops, notably kale and cabbage, will grow throughout the year.

Potatoes have been grown on the island since the arrival of the first settlers. They are grown in small wall-enclosed areas ('The Potato Patches') that closely resemble the 'kale yards' that are to be found in the Orkney Islands and in the Outer Hebrides. Each family has a number of Patches, where they grow their own crop. It would surprise all potato-growing farmers around the world to know that the potatoes are grown on the same ground year after year, with no rotation.

TRACTOR AND TRANSPORT

We have our M1, a three mile stretch connecting the Settlement with the Potato Patches – and the only paved road on the island.

The vast majority of privately owned vehicles on the island are four-wheel-drive vehicles, Land Rover Defenders, Range Rover and Discoveries. Most families that own a 4WD vehicle also own a motorbike. There is a size limit of 250cc for motorbikes, which is quite big enough for the essential needs of personal transport.

You might ask "Is there any form of MOT test for vehicles on the island?". The answer is "Yes"! Whilst no-one would pretend that it is similar to the MOT test in the outside world, it does test and insist upon the main safety elements that are of relevance to driving on Tristan.

There is a bus service that makes several journeys to the Patches every day, but this is largely patronised by the pensioners. For many people, their busy lives dictate the need for their own vehicle, so that they can come and go when they please.

We have recently taken delivery of a new Massey Ferguson268 4WD tractor – and helpfully the controls are largely the same as the old 135's and 240's that are on the island.

The Potato Patches

The evolution of transport on the island went from donkeys and ox carts to small tractors and trailers. Surprisingly, I have been able to find no evidence for 'the little grey Fergie' (TE20) being on Tristan, but most certainly its successors the MF 35 and then the MF 135, were used as work-horses for transport on the island, particularly for shared communal transport to and from the Potato Patches are still to be found, and are still working.

SPECIAL VISITOR

In the early days of January this year, we had a visit from the RMS St. Helena. This vessel also visited Tristan in April 2016 which was supposed to be the last such journey, on account of the new airport on St. Helena making the vessel redundant. However, the well recorded problems with the airport resulted in the ship making another last voyage this year.

On both the 2016 voyage and the 2018 voyage, there was one particular passenger. In 2016, Lisa Phillips (now Lisa Honan after her recent wedding) was able to set foot on Tristan for only a couple of hours, her time being limited because of weather conditions. At the time she was Governor Designate, but this year she arrived on Tristan as Governor.

The Governor is appointed by the British monarch on the advice of Her Majesty's Government.

Previously, governance was carried out by the people of Tristan themselves. However, in 1950 an Administrator was appointed who worked under the direction of the Governor on St. Helena.

Preparations were made for a full 3-day 2-night visit, with a business and social programme that included a meeting with the Island Council and visits to all the places of importance, including the school, the new hospital, the old thatched house and the 1961 volcano, and with a number of receptions, lunches, a community dance, and so on.

On the island of Tristan da Cunha, no planning can be set in stone thanks to the uncertainties of the weather. The ship arrived as planned, but it was not possible to get passengers off. The decision was made that the only people who would be allowed to come ashore would be the people stopping on the island, and the Governor. The Governor's visit started around 10.00 in the morning, and her programme on that first day had to be severely modified and flexible – sea conditions were constantly monitored to make sure that she could get back on the ship and not be abandoned on Tristan!

In the end, the Governor presided over a meeting with the Island Council, visited the school and hospital before we got a message to return her to the harbour for 4.00pm so restricting her visit to one day instead of three.

A perfect example of how living and working on Tristan da Cunha means that you do require a flexible and pragmatic approach at all times!

Read Alasdair Wyllie's complete **blog at www.penguins-and-potatoes.co.uk**

DOUGLAS BOMFORD TRUST

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www.dbt.org.uk enquiries@dbt.org.uk
@BomfordTrust Secretary: Alan Plom
Administrator: Elizabeth Stephens

Alan Plom, The Douglas Bomford Trust's new secretary, provides this update on the Trust's recent activities.

AGRITECHNICA

The Trust helped 9 **Harper Adams University** (HAU) MEng students attend **Agritechnica 2017** in Hanover last November. They provided an interesting report (and perspective) on their trip. In addition to viewing the latest developments they were inspired by the diversity at the show in terms of size of stands, companies exhibiting and high standard of products. It was even more rewarding for the Trust to hear that they "*came away with new knowledge, were excited about the future of the Agricultural Engineering industry, and are eager to take their place within it*". This is a key objective of the Trust.

RIGHT: Agritechnica group included William Coldicott, Peter Hague, Owen Godwin, Christopher Joynt, Joshua Kings, Hubertus Kleuter, Daniel Markham, Megan Platt & Matthew Smith

AGRI-FOOD CHARITIES

DBT was also signposting sources of funding for research and development at a workshop convened by Smart-AKIS with AgriTech East, in Kings Lynn on 22 March. IAgrE President Robert Merrell introduced the event, whilst I spoke about the work of the Trust and the **Agri-Food Charities Partnership (AFCP)**. I was surprised when I was researching my lecture - as was the audience - to learn that there are some 150 charities providing funds in the agri-food sector and 126 of them are listed on the AFCP website: http://www.afcp.org.uk/ . **AFCP charities** have a crucial role to play. Whilst small compared to the larger charities - typically investing less than £100k/yr - together they are significant, investing an estimated £3.5m/yr in new research, skills development and public education for UK Food and Farming.

I also highlighted some of the diverse research that DBT is funding, eg one project is bringing together electronic gaming and security technology, applying the principles of human facial recognition to animal husbandry. Neither of the PhD students involved have agricultural qualifications and are finding their new working environment (a hi-tech dairy unit) and being part of an inter-disciplinary team very stimulating.

THE BIG BANG

DBT also helped another group of Harper Adams students to attend the ***'Big Bang'*** **Careers Fair,** at the NEC on 17 March. They were actively promoting engineering as a potential career, having designed and organised their exhibition stand as a project. DBT funded the large 3m diameter sign suspended above the stand. This landmark was used by many of the 80,000 (yes, *80,000!*) young attendees to help navigate their way around the huge exhibition space. So, it could be said that DBT was a beacon of excellence - or at least a signpost!

MONITORING AND MENTORING

Our Trustees monitor and mentor projects funded by the Trust. Several Trustees recently attended an interesting meeting, together with representatives of co-sponsors, to review the 'Tillage and Traction' projects at Harper Adams.

ABOVE: 'DBT Trustees Paul Miller, Nick August, Prof Dick Godwin and David White hear an update from Harper staff and PhD students.

TWITTERING ON

For more regular updates on projects and other aspects of the Trust's work, please follow us on Twitter: ***@BomfordTrust*** or via our website http://www.dbt.org.uk/. More examples of the wide range of awards and projects sponsored by the Trust will be uploaded over the coming weeks. If you think we can help you, the application forms, criteria for awards (and inevitable forms) are all also available on the DBT website.

ALAN PLOM
enquiries@dbt.org

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2018 ANNUAL GENERAL MEETING

24 May 2018 at Wrest Park, Bedfordshire

In presenting his review of the year and accounts to 31 December 2017, Alastair Taylor, Chief Executive and Secretary of the Institution of Agricultural Engineers said that IAgrE continued to place great emphasis on its five-year development plan and had made good progress on delivering business objectives.

He said that throughout 2017, the IAgrE website had been enhanced and improved to create more accessible information for members. A new membership records system had been introduced allowing for better integration with the website functions.

The IAgrE Memorandum and Articles of Association had been subject to a thorough review and approved at an Extraordinary General Meeting in April 2017. He added that the IAgrE objectives had remained largely unchanged with only minor updates to the content to meet 20th century language.

In 2017 the sampling of IAgrE members Continuous Professional Development (CPD) records was introduced. This had necessitated a wide range of developments to promote CPD, establish recording systems, introduce sampling arrangements, and to agree feedback protocols.

MEMBERSHIP

IAgrE continues to promote membership to students and those immediately out of university and college. A number of universities, colleges and machinery manufacturers have presented themselves for course accreditation during 2017 which has led to a busy schedule for the IAgrE Accreditation committee.

Data protection arrangements have been reviewed in line with the General Data Protection Regulations which are enforced from May 2018.

IAgrE continues to develop a productive working relationship with the Royal Academy of Engineering and is actively involved with a number of Academy initiatives. Partnership working continues to be an important part of the IAgrE remit and in 2017, the Institution engaged with new universities and companies covering topics as diverse as Intellectual Property rights, developments at the Science Museum and work with The Science and Technology Facilities Council (STFC) Food Network (SFN).

IAgrE continues to establish relationships with colleges and universities and provides talks and seminars as required. Membership numbers in 2017 remained generally constant compared to 2016 but with a slight decline identified. At the yeare nd, the membership total across all grades was 2816 (2908 in 2016).

SOCENV

IAgrE continues to maintain a productive working relationship with SocEnv. The total number of Chartered Environmentalists nationally is in excess of 7000 and IAgrE continues to recruit new Chartered Environmentalists. The IAgrE CEO and Professor Mark Kibblewhite represent IAgrE on the SocEnv Board of Directors.

ACCOUNTS

The surplus for the year, including gains on investments is £86,022 which represents a substantial increase when compared to the 2016 figure of £64,009. Charitable income has increased from £364,540 in 2016 to £372,841 in 2017 mainly due to an increase in project income.

The results for the year to December 2017 show an operating surplus of £38,951 compared with a surplus of £19,405 in 2016. This increase is largely due to the decreased expenditure in the year, mainly in relation to website and database development.

ELECTION OF NEW PRESIDENT

The meeting warmly endorsed the election of Professor Jane Rickson

ABOVE: Outgoing President Dr Rob Merrall receives commemorative plaque from Professor Jane Rickson

ABOVE: Alastair Taylor, CEO IAgrE

FIAgrE as President for 2018-2020. In accepting the office, Professor Rickson paid tribute to the hard work and effectiveness of the outgoing President Dr Robert Merrall MIAgrE and presented him with a special commemorative plaque. "It has been an honour to be your President" he said "and I am specially pleased that in electing Jane Rickson as my successor, IAgrE is maintaining that essential link between machinery and the environment. One thing is for sure, we are a relatively small Institution but we consistently 'punch above our weight'".

Alastair Taylor also made reference to the election of Paul Hemingway as President Elect. "Paul was going to take this role 10 years ago but had to step aside due to his work commitments with JCB. Now that he has retired, I am delighted that he is now able to take up the post".

EAST MIDLANDS BRANCH

East Midlands Branch visit,
NFPC (National Fluid Power Centre),
Worksop
14 February 2018
Report by Richard Trevarthen

The evening was hosted by John Savage, Director of the NFPC, and Adrain Hudson, Control Systems Manager.
The evening began with a presentation about the NFPC. In a nut shell, the NFPC is the commercial training arm of the R & N Group of colleges made up of Rotherham College, North Notts College, Dearne College. The NFPC provides commercial training in hydraulic, pneumatic and the associated control systems to commercial companies and in some cases provides training on behalf of some component suppliers. The centre opened in 2001. In addition, they will provide bespoke courses at any academic level and advice and expertise to commercial companies. NFPC is also a CETOP certified training centre, the only one in the UK (Comité Européenes des Transmissions Oléohydrauliques et Pneumatiques).
The NFPC is guided by an Advisory and Strategic Planning Group made up of industry representatives, some of whom sponsor the training facility.
This was followed by a tour of their training facilities which were second to none. They were organised into three modules reflecting their three levels of courses, all geared to provide competency in the roles of maintenance, repair and installation of hydraulic, pneumatic and control systems. A level one hydraulic training area consisted of training rigs that allowed students to build basic hydraulic systems and covered health and safety. The second area covered hydraulic systems and their control modules, the third, control systems and pneumatics. Training courses have a minimum 6:1 student instructor ratio and based on 50:50 theory/ practical.
The NFPC is a prime example of how industry can work with training organisations to produce very professional training material, geared to the needs of the industry, and refreshingly, not only covered the nuts and bolts, but taught the students a system approach including todays fast evolving control systems.
For more information please visit NFPC website.

NORTHERN IRELAND BRANCH

Branch visit to Gilfresh Produce
February 2018
Report by Terence Chambers

Members of the Northern Ireland Branch recently enjoyed a visit to the Gilfresh Produce processing, storage and distribution site at Loughgall, Co Armagh. They were welcomed by Managing Director Mr Thomas Gilpin and his son William who is Production Director. The business, which packs both fresh and prepared vegetables for distribution throughout Ireland and the UK started in 1980 when the Gilpin family started commercial growing of cabbages and scallions for the Belfast wholesale market.

Growing
Mr Gilpin had started vegetable growing, back in 1965, in a 4.5 acre field on the family farm. One of his first crops was white cabbage supplied for coleslaw production at Avondale foods. In 1980 supplies were being sent to a local supermarket chain and by 2003 to the main supermarkets, then known as the "Big 4", in N Ireland. New state-of-the-art pack house facilities were set up in 2006 which have now grown to the present 60,000 square foot factory packing around 520 tonnes of fresh produce per week. 130 people work there as well as 44 others involved in seasonal harvesting work. The farm's vegetable crop rotation still supplies some of the processing requirements and there are more than 40 regular contract growers throughout the island of Ireland. Some have been supplying Gilfresh for more than 20 years. The 14 main separate field crops grown across 2,500 acres, include carrots, swede, broccoli, brussel sprouts, cabbage, cauliflower, celeriac, celery, curly kale, leeks, lettuce, pak choi , parsnips and spring onions. This production is sufficient for most of the year and, depending on seasonal and weather variations, additional fresh supplies are also sourced from growers in Scotland or Spain.

Preparation, processing and distribution
The produce from the above crops is

sorted, cut, washed and packed during a 6 day week for immediate cold storage. Pack designs are either branded for the various retail chain customers or as own brand "Gilfresh" for the local market. They also have a prepared ready-to-cook range based on turnip, carrot, carrot and broccoli, green cabbage, casserole vegetables, soup vegetables or soup mix. To service this demand, production of over 500 tonnes per week relies on a dedicated and skilled workforce. Gilfresh has been awarded "Investors in People" status in recognition of its staff management practices.
The list of major retail outlets supplied now includes M and S, Tesco, Asda, Lidl, Iceland, SuperValu and Spar.
The company is accredited to the BRC (British Retail Consortium) Global Food Standard and has won many awards for its business contribution to the Northern Ireland Agri Food economy such as the Farming Life / Danske Agri-Food Business of the Year Award in 2016.

Machinery aspects

As an engineering group, the IAgrE members were especially interested in hearing about the operation and maintenance of all the specialist machinery in the factory. With the lines inactive during the evening visit it was possible to look closely at individual processing machines and hear how some had been chosen or upgraded on the basis of design suggestions by Mr Gilpin and his staff.
It was also interesting to see how the sloping site, on which the buildings are sited, has been exploited to collect soil and other off-sorted grade materials by gravity thereby reducing the need for some mechanical conveyors.
In 2013, a specialist cold storage and distribution facility was established on the nearby Carn Industrial Estate. Despatch takes place 7 days / week, from this busy

hub, and turn-round time from receipt of an order until delivery to the shops is within 48 hours. Most orders are placed and recorded by the Electronic Data Intelligence (EDI) system which is an industry agreed system for automatic transfer of data from one computer system to another.

Green energy and self-sufficiency

The factory uses a lot of electricity for motors, coolers, pumps, heaters, lighting, power washing and rechargeable fork-lift trucks. It was therefore logical to seek self-sufficiency in the form of renewable energy. In 2016 a WELTEC 500 kW anaerobic digester was installed to utilise all the vegetable waste materials. This is fed in a pre-mix along with other organic material such as the ryegrass / maize silage produced on the farm. The digestion of around 150 tonnes per week provides gas for the engine-driven generator. The gas is pre-cleaned for sulphur removal to minimise engine lubricant contamination and extend service life. Waste heat is captured for glass house heating and the used digestate is all returned as fertiliser to the land. A Vestas 225 KVA wind turbine was also installed on the elevated site during 2017. Between them, the systems now supply all the site's energy requirements as well as exporting excess power to the grid.
Throughout the comprehensive tour of the whole site Mr Gilpin and his staff provided the group with details of the operation and answered all of their many questions. It was a most informative, enjoyable and memorable evening for all. Northern Ireland Branch chairman Padraig O'Kane expressed thanks and best wishes for the future.

WREKIN BRANCH

WREKIN
Wrekin Branch Technical Meeting
23rd January 2018
The JCB Hydradig
Report by JP Metcalfe

Duncan Smith and Ralph Thompson of JCB delivered a tremendous presentation on the development of the Hydradig excavator to a turnout of over 70 Wrekin branch members and guests. An innovative design with improved visibility, stability and manoeuvrability the project started in 2013, acting on market research that identified the dealer led desire to have a product for the 10tonne wheeled excavator market. It was desired to re-engineer a new design that would overcome deficiencies in competitor designs and meet the five customer requirements of:

- Visibility
- Stability
- Mobility
- Manoeuvrability
- Serviceability

Duncan described how the JCB Hydradig P710 excavator had been developed through proof of concepts and pre-production prototypes. The entire team who worked on the project were registered members of professional engineering institutions including IAgrE. In the first two years of production machine sales was more than 1300 units in 2016 rising by over 1700 in 2017 with the two main markets being in European Union partners Germany and France.
In rethinking the entire design the five requirements were integrated. A pyramid envelop of **Visibility** with the cab at its apex was defined with the objective that parts of the machine should remain within this zone. A feature of this is that most of the components of the machine move lower down and further outboard of the centreline. This lowers the centre of gravity with obvious benefit for **Stability**.
Design within this pyramid allows a longer wheelbase with the benefit of visibility of all four wheels, fore and aft stability, control and comfort for transport at speed. Lateral stability is improved by mounting the main mass of components wide and low down with engine and hydrostatic systems with fluid reservoirs hung in pods between the front and rear axles. The greater inbuilt stability enables the mass and dimensions of the counterweight for the rotating cab and arm to be reduced so advancing the objective of visibility out of

CALLING ALL MEMBERS IN EAST ANGLIA

IAgrE member David Seccombe is interested in starting up a branch in East Anglia.
A new branch in this region would help to grow membership and help existing members by:

- Broadening their contacts
- Promoting professionalism
- Knowledge exchange and CPD
- Keep you up-to-date with industry developments

If you are interested in joining this group please contact Sarah McLeod or call the office on 0124 750876

FORESTRY ENGINEERING GROUP (FEG) AGM AND VISIT

The Forestry Engineering Group (FEG) recently enjoyed a visit to the Falkirk Wheel where they boarded a boat for the 50-minute lift up 35 metres to the Union Canal, then a short voyage before returning to the starting point. From the Wheel they travelled to Falkirk Helix to see the Kelpies, horse head structures which they were able to view internally.

the rear of the cab.
The greater stability and driver comfort translates into a machine that is safer for high speed 40km/h driving for class leading Mobility.
Manoeuvrability is enhanced by the elimination of overhang from the counter weigh so allowing much closer positioning where space and clearance is tight.
Enhanced manoeuvrability is achieved by the adoption of the existing proven JCB innovation of four-wheel steering.
The full range of options are provided for; four wheel steer, crab and reverse drive. The latter follows the 360degree cab rotation so that the machine steers normally whichever way the front of the cab is facing. Electronics also enables the cab to be completely oil free. Digital signals to the mechanical and hydraulic systems and hydraulic flows to the boom are provided through a highly advanced rotating coupling. Apart from the essential steering brakes and transmission when in transport mode there is lockout of all other functions (with driver selected override).
Low mounted components and reservoirs means all routine **servicing** can be done from the ground with all round access.
Good design engineering is typified by the steel upward hinging engine and hydraulic pack side panels that provide maximum protection and placement of weight at the outboard extremity for greatest stability.
The use of proven components common to long established JCB models, such as the telehandler range has the benefit that the dealerships are familiar with their maintenance.

Wrekin Technical Meeting
17 April 2018
Heico-Lock Fasteners
Report by Bill Basford

Wrekin branch members enjoyed an update on fasteners presented by Matt Jordan and Paul Windsor of Heico, a relatively unknown firm to most. What really happened was that everyone who thought they understood nuts and bolts had their beliefs and past experiences severely challenged in a masterful demonstration of practical fastener testing. Matt skilfully highlighted the history of Heico in Germany through the development of a drawing pin in 1900 through Wedge lock and ring lock washers to the latest fastener launched in 2016, the Heico-TEC tension nut offering an alternative to large tensioner nuts. The wedge lock unit was described as two 'washers' used as pairs both of which included profiled cams thus allowing rotation on fastening but stabilising reverse rotation.
He described the European market as worth €10,000,000 and that any car currently includes 1000 fasteners. Heico world-wide manufactures in 14 locations producing 200 million items per month involving 10,000 tonnes of metal used per year. Heico's test laboratory function including assessment of components from M6-M30 sizes for friction coefficients, quality control, microscopic, hardness and testing to the massive list of industry and customer's standards was outlined. In addition collaboration with a company Bolt Science, specialising in nut and bolt research and application was described. http://www.boltscience.com/
Heico had recently developed the TEC multithreaded unit as an alternative to tensioners found in large scale applications. This meant that for a secure joint the use of a HEICO-TEC tension nut no electric, hydraulic or pneumatic tools are needed, only a torque wrench. The HEICO-TEC nut was described as unique in the fact that the pre-tension force of the large main thread is distributed to many smaller pressure bolts. As the pressure bolts are smaller a conventional torque wrench can be used to achieve the correct pretension force thus eliminating the need for complex, bulky or heavy tools and making securing large bolted joints more convenient and easy particularly in challenging access applications. The HEICO-TEC unit meets the requirements of ISO 898-2 meaning that any hex nut from the same strength class can be replaced. After consideration of the Heico product range this lead to the peak of the evening's interest, the misuse of joint effects, the effects of full bolted joints, pre-loaded joints, lubrication, vibration etc. All were considered. Suddenly member's experiences of just using a nut and bolt and probably using a torque wrench, if you are lucky, were called into question. The use of a Junker test machine demonstrated under camera use through a computer to the screen and gave everyone the chance to experience 'seeing is believing'. This test unit showed the effect of vibration when using a range of fasteners from simple hexagonal nut, spring washer, shakeproof washer, nylon locknut and then some units from the range of Heico Wedgelock products on single and multiple use, pre-loading or otherwise.
Watching a nut coming loose alongside the image of a graphical trace of kN force developing on screen was a stunning revelation in comparison of products and misapplication or convention.
Rounding up the evening members felt that the rapidity and depth of continuous questions particularly alongside 'conventions' of nut and bolt use had provided a stimulating and challenging experience.
Matt Jordan offered contact for all fastener enquiries and with other IAgrE branches should similar analysis or presentations be required. http://heico-fasteners.co.uk/

WESTERN REGION
UK Agritech Centres for Innovation
Speaker: Prof Jane Rickson
18 October 2017
Report by Mike Whiting

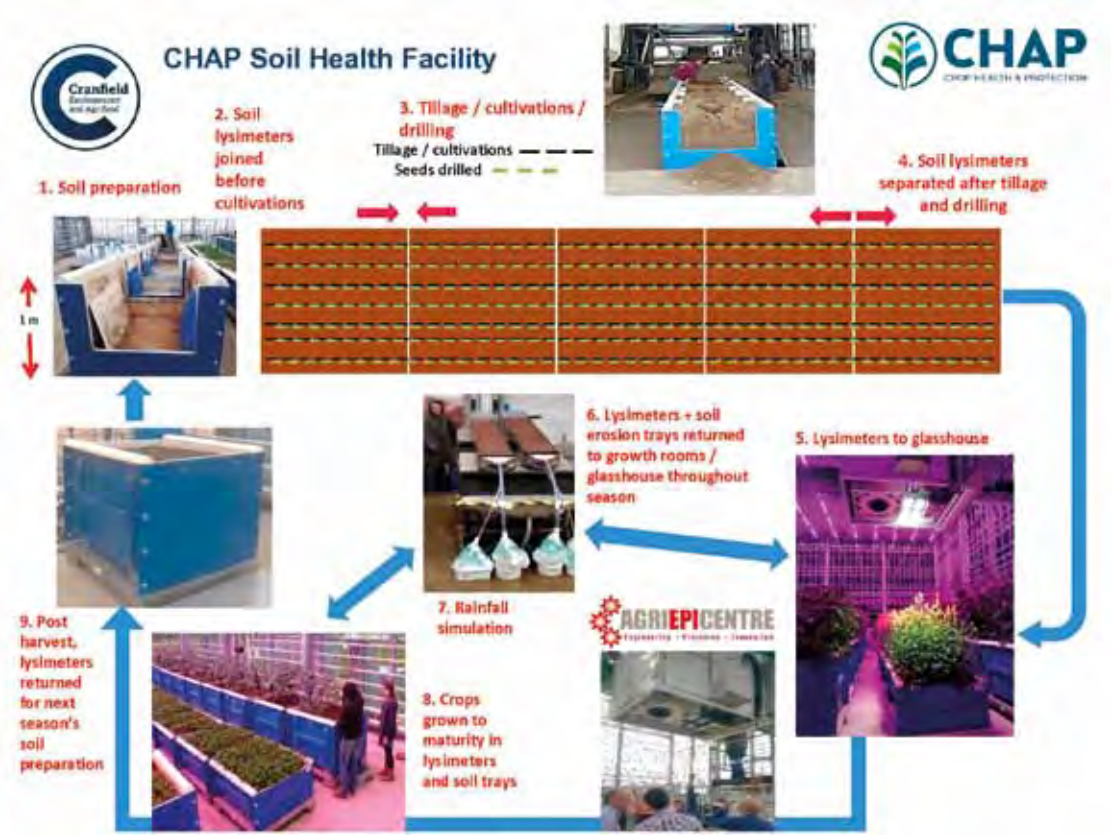
The Royal Agricultural University at Cirencester was the ideal venue for the Western Branches first meeting of the Autumn 2017/18 programme. Our President elect Professor Jane Rickson gave us an informative presentation on the UK Agritech Centres for Innovation. Some headline figures grabbed our attention on the impact of UK Agriculture to the overall economy, for instance:

- **The agri-food supply chain is** worth £96 Billion (7% of UK's gross value added (GVA) output), and employs 3.8 million people.
- **Agriculture** employs 450,000 people and contributes £9billion to the UK economy.
- **Exports were** £18 billion of food, feed and drink exports in 2012 and the UK is one of the top 12 food and drink exporters world-wide.

With these eye watering statistics you might think that financial backing for research and development in all things related to agriculture would be easy. Indeed, the UK Government committed £90 million of tax payer's money to set up a number of 'Centres of Agricultural Innovation' to ensure UK agriculture would become a world leader in agricultural technology, innovation and sustainability. However, as with all aspects of life there is no "free lunch". The Government invited robust proposals to a) justify initial investment by BEIS (the Department of Business, Energy and Industrial Strategy) and b) ensure the Centres were commercially viable in the long term by attracting funding from agribusinesses. The result was four successful concepts.

- **AGRIMETRICS:** First of the centres, opened in October 2015.
- Uses data science and modelling to build a more productive, sustainable and efficient food system.
- **CIEL - Centre for Innovation Excellence in Livestock**: A direct link between science and practice to increase the speed of innovation and discovery in livestock research and development.
- **AgriEpiCentre:** Operates in the precision agriculture arena with the aim of improving productivity and sustainability in UK agriculture.
- **CHAP - Crop Health & Protection:** Tackling crop threats of pests and diseases, using real time data and state of the art facilities to support product development and tillage practices.

Jane's focus, as a Professor of Soil Erosion and Conservation is with the CHAP centre. Their ethos is to "revolutionise how global farming deals with biotic crop threats". Not for the faint hearted, when the challenges of agrochemical resistance and extreme weather patterns are now common place in both traditional arable and horticultural systems.
One aspect of CHAP is its soil health facilities based at Cranfield University. These facilities demonstrate how basic good soil management practices underpin continual cropping regimes. CHAP's soil health facilities include the use of soil "lysimeters"; effectively individual soil boxes which can be joined together to cultivate and sow seeds using commercial available soil engaging implements, mounted on a gantry.
Once cultivated, the boxes can be separated and moved to the controlled conditions of the CHAP glasshouse for individual analysis of crop emergence and development, soil conditions (e.g. moisture status by weight measurement), and the effect of induced stress conditions.
Each soil "box" can be cropped to represent field conditions, with detailed investigations undertaken such as where soil organic matter needs to be in the soil profile. Tackling stubborn weeds such as blackgrass remains high on the agenda. The role of the cover crops has also resurged, particularly with cross compliance regulations moving towards soil sustainability.
If we refer back to the "commercial" need for the Agritech Centres, the simple fact of providing reliable information to the global agricultural industries at a quicker rate is the required result.
The range of stakeholders in food production now extends beyond the seed houses, equipment manufacturers and agrochemical companies, to include bio-digestate operators and developers of sensor technology. The CHAP centre is striving to offer a wide range of research projects to entice a share of industries match funding cash inputs.
Jane's delivery ensured the audience of Institution members - lecturers, students and visitors - had a greater understanding of the AgriCentres role in shaping technological developments in agriculture. An open invitation is there for a follow up presentation to ensure we all keep up to speed with the work undertaken by Professor Rickson and her colleagues.



MEMBERSHIP CHANGES

ADMISSIONS
MEMBER
Belcher E
Foster WM
Chima PS
Njeru P N

ASSOCIATE MEMBER
Ahioba UV (western)

AFFLIATE
Leech D (E Mid)
Reeves C (Wrekin)
Hennessy T (Ireland)
Sigley CP (Wrekin)

TECHNICIAN
Stirrat A (Scottish)

STUDENT
Cranfield University
Beale J

Greenmount Campus
Anderson W
Bell S
Brady K
Corr S
Donnelly JP
Dowdall L G S
Dunn CL
Griffiths R
Hunter M
Kennedy LRD
Luddy R
McAllister R
McLaughin C
Miller BW
Mortimer D
Neeson P
Nixon JR
Rees RM
Smith S
Stewart R
Tracey C
Trainor N
Walker LT
Winter JD

Warwick
Bray R

South West College Omagh
Bates D
Bell J
Cassidy P
Daly C
Devine B
Dooher O
Ebbitt WJ
Gallagher M
Gilmour H
Gray AJ
Keys N
Macpherson A
McBride RS
McCloskey C
McKenna S
McSorley T
Mullen S
Mullin C
Parke AD
Patterson A
Robinson J
Rooney T
Ross S
Ryan D
Service AM
Slevin RS

READMISSION
Worsley CR (East Midlands)
Sheehy J (Ireland)

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

Shewring J IEng CEnv FIAgrE, East Anglia, a member since 1951

Lane KH IEng MIAgrE, East Midlands, a member since 1950

Welstead DJ MIAgrE, Southern, a member since 1973

TRANSFERS
Fellow
Price D (Wrekin)
Newbold AC (Yorkshire)

Member
Corker N (Southern)

Associate Member
Sutton TG (Wrekin)

Affiliate
Green C (Wrekin)

ENGINEERING COUNCIL REGISTRATIONS

CEng
Antille DL (Australia)

EngTech
McArthur BS (Southern)
Moley C (Ireland)

SOCIETY FOR THE ENVIRONMENT
CEnv

Priddle S (S Western)

LONG SERVICE CERTIFICATES (1 APRIL – 30 JUNE 2018)

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

Name		*Date of Anniversary*
50 Years		
Thomas Cochran	AIAgrE	09-Apr-18
John Anthony Earley	MIAgrE	09-Apr-18
Peter Lawrence Redman	HonFIAgrE	09-Apr-18
James Rollo Robinson	MIAgrE	09-Apr-18
35 Years		
James Stanley Price	AMIAgrE	30-Apr-18
Leigh David French	AMIAgrE	15-May-18
William Arthur Helen	MIAgrE	27-Jun-18

Name		*Date of Anniversary*
25 Years		
Ian Mark Harris	AMIAgrE	22-Apr-18
John Andrew Mawhinney	AMIAgrE	01-Jun-18
Charles David Nicklin	MIAgrE	02-Jun-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

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

Bomford Turner Ltd
Salford Priors, Evesham
Worcestershire WR11 5SW

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

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

Thursday 18 October 2018
IAgrE COUNCIL MEETING
Venue tbc

Tuesday 6 November 2018
IAgrE LANDWARDS CONFERENCE
Royal Academy of Engineering
London

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

OTHER EVENTS

Sunday 10 June 2018
OPEN FARM SUNDAY
Organised by LEAF

13-14 June 2018
CEREALS 2018
Chrisnall Grange Duxford
Cambridgeshire

13-14 June 2018
N8 AGRIFOOD CONFERENCE
People, Health and Food System: Challenges and Solutions for 2030
Hilton Liverpool City Centre

20 June 2018
THE ARABLE EVENT
Weston Park
Shropshire

23 June 2018
LACKHAM COLLEGE REUNION
Lackham House
Chippenham

23 June 2018
INTERNATIONAL WOMEN IN AGRICULTURE (INWED) 2018
The Theme this year is 'Raising the Bar'

8 – 12 July 2018
AG-ENG 2018 EurAgEng Conference
Wageningen, Netherlands

23-26 July 2018
ROYAL WELSH SHOW
Llanelwedd

6 September 2018 9.30-4pm
FEG SYMPOSIUM 2018
Engineering Forest Access for All
Newton Rigg Campus

26 September 2018
TILLAGE-LIVE 2018
Eweford Farm,
Dunbar, East Lothian

31 October – 1 November 2018
SALTEX
National Exhibition Centre
Birmingham

2 November 2018
AG CAREERS LIVE
Telford International Centre
Telford

7 – 8 November 2018
FARM BUSINESS INNOVATION 2018
National Exhibition Centre
Birmingham

21 November 2018
AGRI-SCOT 2018
Royal Highland Centre
Ingliston
Edinburgh

22-23 November 2018
Midlands Machinery Show
Newark

28-29 November 2018
THE CROPTEC SHOW
East of England Showground
Peterborough

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

Further information and updates on www.iagre.org

21-24 June 2018
ROYAL HIGHLAND SHOW
Edinburgh

Institution of Agricultural Engineers

2018 **LANDWARDS CONFERENCE**

Royal Academy of Engineering
Carlton House Crescent
London

TUESDAY 6 NOVEMBER
10.00am to 4.00pm

CONFERENCE THEME:
Engineering Collaboration for Success

Further information and booking details
Sarah McLeod 01234 750876
E: secretary@iagre.org
W: 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

NARROW BOAT ALBERT

Biosystems Managing Editor Dr Steve Parkin CEng CEnv Hon FIAgrE and his wife Maggie are keen narrow boaters and the proud owner of NB Albert, their second boat, the first being a 41ft traditional narrow boat. Their home mooring is the Kingfisher Marina at Yardley Gobion on the Grand Union Canal.

Albert is a 41ft narrow boat; built by Kennet & Avon Boatbuilders in 1994 and fitted out by her first owner in cottage-style. The hull has 15/6/4mm plating and when cruising her draught is around 31".
In 2008 Albert's cabin sides were repainted in Mason's Mid Coach Green with black panels surrounded by scumble. The coachline around the cabin was in gold. The roof was finished in Corfe Grey and Craftmaster Raddle Red (stern section). Unusually, the scumble paint was Dulux Brushwood and it was unvarnished as recommended by the manufacturer. The bows, engine room roof and cratch were decorated with traditional harlequin patterns. The decoration was originally carried out by Colin Dundas and the painting by Baxters Boatfitting Services.
In 2018 Albert had a repaint by Colin Dundas, largely following the theme and decoration adopted in 2008. Colin used a combination of his own devising that also doesn't require a varnish coat. The roof is now in Multiforte - Medium Grey and Red Oxide (Stern).

The walls of the interior of the boat are in diagonal tongue and groove iroko with other surfaces in mahogany plywood. There are a number of items of antique furniture on board including a small oak desk. The main seating is a Parker Knoll settee and chair.

Heating is via a Brunel coal-burning stove positioned towards the front of the saloon and Alde gas central heating. Hot water comes either from the calorifier, linked to the engine, land-line immersion heater (1kW), or the Alde. Cooking is by gas with a separate hob and cooker and there is a Shoreline 12 v DC fridge.

The main bedroom contains a double-bed with a canopy and storage underneath. Usually this is called a four poster but here it has only one complete post and a dummy half-post. "Technically a one-and-a-half poster!" says Steve

Lighting is via conventional 12 v dc although most have been converted to LED to save power. There are also two fully functioning oil-lamps on board; one in the saloon and one in the traditional back cabin.

Astern of the engine room is a traditional-styled back cabin with a Premier solid fuel range, oil lamp, brass knobs, ticket drawer, ribbon plates and lace. The traditional single side bed has been modified so it becomes a small double bed running across the boat.

RUSTON & HORNBY ENGINE

Albert's engine is a Ruston & Hornsby 2YWM MkV a two-cylinder vertical water-cooled engine which was manufactured in India, probably in the late 1980s. It was sold by KE Jones (Steam Cruising) to the first owner of Albert, Mike Hurd, in 1994. Supplied with the engine was a 1985 parts list and a 1982 operator's manual, both of which I find invaluable. The engine was supplied complete with a PRM 160 gearbox with a 2:1 reduction. It has Mico (i.e. Bosch in India) direct fuel injection and is fitted with two alternators; a Bosch 90A to supply the domestic batteries which is driven by an oversized pulley, and a 35A driven by the original pulley system to charge to engine start battery.

The 2YWM is simple to operate. Although it has high compression (40:1) its large starter motor usually turns over the engine quite rapidly and once primed, it fires up readily.

As supplied, normal engine tick-over is about 500 rpm but a spring loaded system fitted to the engine stop mechanism, has been added which allows tick-over to be reduced to around 400 rpm. Canal cruising is usually at about 600 rpm and river cruising is at around 750 rpm. The power available has been more than adequate to cope with the Thames Tideway and crossing the tidal Great Ouse to Denver Sluice.

Steve says "The sound of the engine underway is quite memorable – basically it thumps. I often get complements from the towpath. Once at Great Heywood I got 'that's a lovely sound – I could listen to it all day', to which I replied "I do!"

Read more about NB Albert on https://nbalbert.blogspot.co.uk

Institution of Agricultural Engineers

Landwards Conference 2018

ENGINEERING COLLABORATION FOR SUCCESS:

BEST PRACTICE FOR KNOWLEDGE EXCHANGE IN AGRICULTURAL ENGINEERING

Tuesday 6 November 2018

Royal Academy of Engineering,
Prince Philip House,
3 Carlton House Terrace,
London SW1Y 5DG

In the United Kingdom, there are superb examples of industry and university collaborations which lead to ground breaking technologies and revolutionary new practices.

As agricultural engineering, recognised as a key discipline enabling agriculture to deliver food security, grows and evolves the need for better knowledge exchange has never been more important.

How can collaboration in engineering work? What does success look like?

This conference will explore successful collaborations in engineering between commercial, industrial, research and academic partners.

Key benefits of attending

- Gain an oversight of technological developments emerging in modern agricultural engineering and AgriTech
- Focus on the challenges of knowledge exchange and industry/university partnerships
- Learn about cutting edge insights into knowledge exchange best practices
- Find out what you need to consider if you are to engage in successful collaboration
- Participate in elevator pitches where you might contribute expertise or gain support
- Meet like-minded people and forge future collaborative relationships
- Develop ideas and initiate new approaches alongside industry leaders

When, where, how much, where to book?

When: Tuesday 6 November 2018

Where: Royal Academy of Engineering, London

Cost: Member Delegate Rate £100 + vat, Member Retired Rate £75 + vat,
Student Member Rate £40 + vat,
Non-Member Delegate Rate £150 + vat,
Non Member Retired Rate £100 + vat

Booking: www.iagre.org/IAgrEConference2018

Conference speakers


PROF JANE RICKSON


DR SUSANNAH BOLTON


KEITH NORMAN


PROF KEITH RIDGEWAY


CHRIS DANKS