Delegates had plenty to see in the conference breaks, with a wide range of companies exhibiting their products and services. Credit: Rob Hawkins.

Tomorrow's forestry today

On 2–3 May, over 330 professionals descended on the Edinburgh International Conference Centre for the Institute of Chartered Foresters' flagship national conference.

BILLED as 'Innovation for Change: New drivers for tomorrow's forestry', the line-up for the two-day conference promised 18 speakers, both UK and international, delivering a wide range of subjects setting out what the future may hold and how the forestry sector can prepare for it.

The conference offered an opportunity for delegates to learn about innovation in forestry through a real mix of sessions looking at everything from the power of using real time-data to biotechnology, the circular economy, radar, thermal imagery, machine learning, drones and much more.

The conference highlighted that technology is an enabler for success not a disrupter. The industry should embrace technology as a key driver for transformation and adaptability. Futurologist Mark Stevenson stated "Technology is not the answer. Technology is always the question." This powerful platform showcased the technology available to our sector including artificial intelligence, robots, augmented reality and virtual reality.

Following a welcome by David Edwards FicFor, President of the ICF, Fergus Ewing MSP opened the flagship conference providing a resounding endorsement of Scottish forestry. He praised the Institute for raising professional standards and stated that, "conditions for growth and success in the forestry and timber sector have never been better." He also highlighted that it is time for forestry in Scotland to move to centre stage.

Testing out a virtual world. Credit: Rob Hawkins.

SESSION 1: FOOTPRINT FOR THE FUTURE

Following the Cabinet Secretary, Fiona Lickorish, formerly of Cranfield University, suggested tools for our industry based on strategic foresight. Foresight can be defined as 'the systematic examination of potential threats, opportunities, and likely future developments which are at the margins of current thinking and planning'.

The methodology to do this included horizon scanning, risk prioritisation, scenario building, stress testing and visioning.

Fiona explained the potential benefits of foresight research to an organisation. These include helping to reduce uncertainty by identifying new and relevant information, developing new and future business fields/markets, building a knowledge base, identifying and managing emerging risks and opportunities and spotting those risks or opportunities which may challenge/contribute to your objectives. Foresight research will also inform long-term planning and facilitate strategic discussions and plan for resilience.

Next up, Nick Pyatt, Director at Trioss, spoke on 'Adaptation pathways: Adapting in an uncertain climate changing world'.

The approach was initially pioneered in planning London's flood protection and is now being adopted worldwide. The global climate is changing in ways that will change forest management decisions at some point; changing wind, rain and temperature.

At the current rate of change, the climate today will be different from the climate at the end of a rotation. Whilst the climate is changing, it is not possible to know precisely when different management decisions might be needed. It is possible, though, to work out under what climate conditions current decisions would no longer be good enough within a range of climate outcomes that are possible in the UK. Nick talked through the approach and considered its value for the UK forest sector. Under what conditions will the current Wind Throw Hazard Class calculation no longer be a good guide for forestry planning? What will be the most effective response for different decisionmakers? How will we know when to act? How do we ensure those actions happen? What are the answers for other key forest management decisions?

The final speaker in session 1 was Christos Matskas, Senior Azure Developer at Microsoft, who spoke about the impact of an IoT (Internet of things) landscape and cloud-centric approach, and what comes next. Christos advised us that there are options to improve connectivity enabling foresters to do more to utilise the cloud.

The statistics presented by Christos on the IoT were quite astounding – 80 billion connected 'things' by 2025, 180 zettabytes (not a term most of us hear every day!) of digital data by 2025 and a global IoT market of £457 billion by 2020.

SESSION 2: BENEFITING FROM BIOSCIENTIFIC ADVANCEMENTS

Professor Tariq Butt of Swansea University kicked off this session talking about biopesticides and products and strategies for control of chestnut weevil and chestnut tortrix, pine processionary moth (PPM) and pine weevil (PW).

The global market for biopesticides – naturally occurring plant-protection products such as microbial biological control agents (fungi, viruses, bacteria), semiochemicals and botanicals (plant extracts, essential oils) – is growing rapidly and is predicted to reach US$7.6 billion by 2022. This growth is driven by various factors including the withdrawal of many pesticides, supermarkets and consumers demanding zero residues, insecticide resistance in pest populations and environmental protection.

Entomopathogenic fungi (EPF), plant oils and kairomones have been identified for the control of PPM, PW and other tree pests, and offer an environmentally friendly alternative to conventional chemical pesticides.

Botanicals show much promise for the control of PPM larvae – without exposing operators to the urticating hairs.

Semiochemicals will play an increasingly important role in pest-control programmes. Attractants could be used to lure pests to control agents – reducing the area to be treated and helping reduce cost.

Next up was a presentation by Professor John MacKay, from the Department of Plant Sciences, University of Oxford, on biotechnology and tree breeding which looked at recent developments in forest genomics and matching technology with needs. He looked at the new challenges facing us in the 21st century and the impact of climate change, governance and globalisation. There will undoubtedly be an increased focus on adaptability and resilience with new opportunities arising from genomic technologies, and UK organisations must work together to coordinate and adopt new methods.

Dr Graham Ormondroyd, Head of Materials Research at the BioComposites Centre, Bangor University, then considered the potential modification of home-grown timber. There are three current

A full house in the auditorium.

Fergus Ewing with ICF Executive Director Shireen Chambers.

commercial forms of timber modification – acetylation, resin impregnation and thermal modification.

Graham talked about various projects currently ongoing in the UK, which confirms that there is a fledgling timber-modification industry in the UK working across all three major modification types.

There is the demand. The UK is looking to invest in clean technologies including timber and timber in construction. The wood science R&D base exists in the UK and this needs to be exploited, and we need to match the technologies with the available timber and vice versa.

SESSION 3: AUTOMATION IN MACHINE TECHNOLOGY

John Pineau, Provincial Leader – Ontario at FPInnovations (Canada), highlighted the main challenges of developing autonomous equipment in forestry. John pointed out that we need to develop a pool of skilled people to operate one or many robots, manage robot operations, build forest robots and service these new types of machines.

Jock McKie, UK managing director, John Deere Forestry Ltd, considered how to deliver more with less, looking at the importance of innovation in ensuring profitable and sustainable future operations.

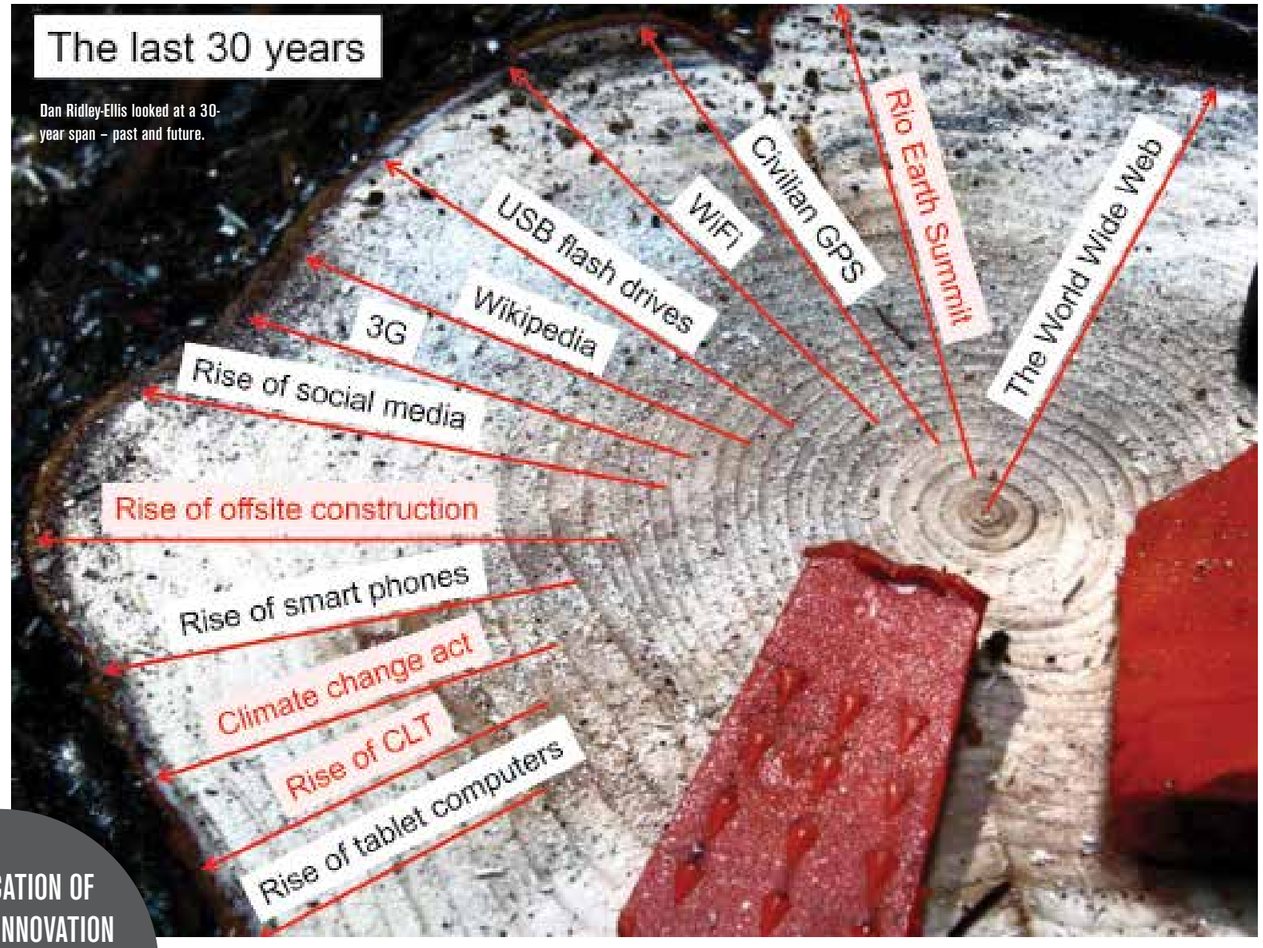
There is, he said, a continuous pressure to increase productivity, though with lesser skilled operators, in more challenging conditions and with a need for sustainable logging operations. Legislation, he said, does not always make these demands easy to achieve.

On the subject of autonomous machines there is no doubt that machines, or certain functions of machines, may become autonomous in the future, but the dynamic nature of the forest environment may also be a limiting factor in the speed of development.

IDENTIFICATION OF EMERGING INNOVATION IS FUNDAMENTAL TO STAYING AHEAD OF THE GAME.

Jeremie Leonard, Senior Engineer at BioCarbon Engineering, then showcased the power of using drones to plant trees anywhere with precision. Why use drones? They can plant anywhere, using precision GNSS and data-driven path planning, night flying is possible and there are ever-expanding analytics tools. Jeremie explained that, "drones are up to 40 times faster than using people to plant trees."

Each session of the day concluded with a Q&A session with the panel of speakers which elicited some interesting questions relating to the amount of data we currently store - is it too much? There was discussion of the scope and prognosis of accessing scientific funding and what innovations we should be looking at now for forestry of the future.



SESSION 4: EMERGING TOOLS FOR TREE PROFESSIONALS PART 1

On Day Two Professor Iain Woodhouse, Professor of Applied Earth Observation at the University of Edinburgh, explained the benefits of using satellite radar remote sensing. Iain demonstrated that this technology can see through clouds and identify clearfelling within a forest. Enda Keane, Director at TreeMetrics, demonstrated the value of real-time data to make better decisions for harvesting and marketing, saying that every important decision can and should be supported by the application of data and analytics.

Professor Dr Christian Rosset, MOTI Project Manager and Professor of Silviculture and Forest Planning at Bern University of Applied Sciences, convinced the audience of the power of MOTI's mobile app, referred to as the 'Swiss Army knife' for forest inventories, for capturing dendrometric variables through a live demo of basal area sweeps. Many delegates downloaded the app while he was talking.

SESSION 4: EMERGING TOOLS FOR TREE PROFESSIONALS PART 2

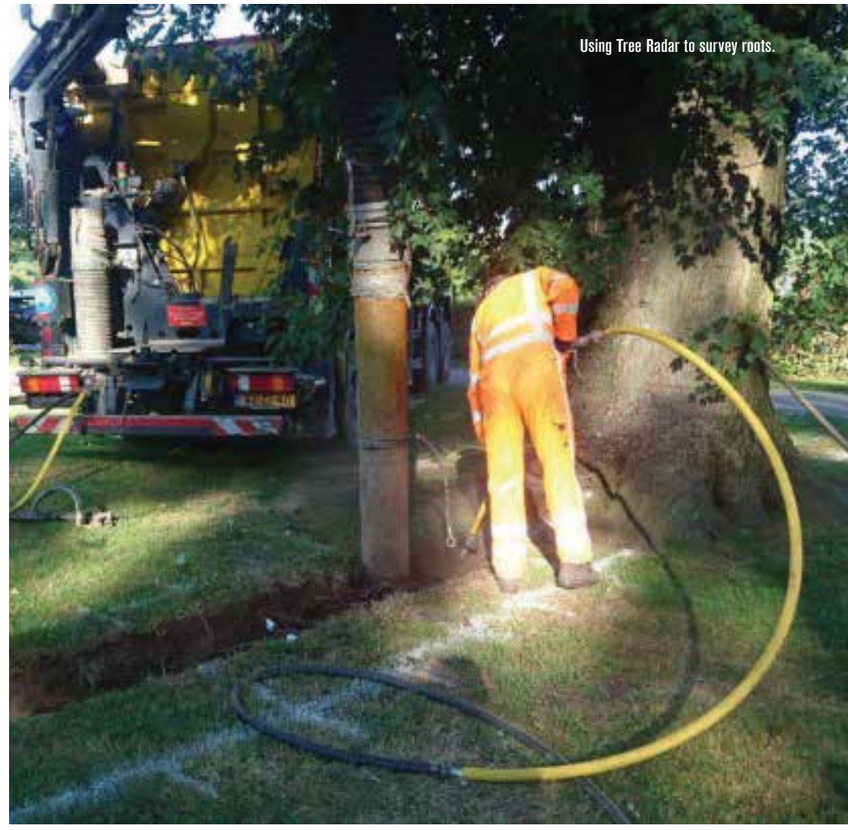
Juan Suárez-Minguez, Forest Research, kicked off part 2 with a session on early detection of tree stress by thermal imagery.

Looking at new diseases challenging Britain such as *Phytophthora ramorum* in larch plantations, Dothistroma needle blight of lodgepole pine, Corsican pine (*Pinus nigra*) or Scots pine (*Pinus silvestris*) and Chalara affecting ash, he talked about why monitoring systems were needed. Looking at the development of an energy balance model to estimate stomatal conductance as an indicator of plant stress, Juan came up with one of the longest equations most of the audience had ever seen (too long to reproduce here!).

Stomata conductance may provide a pre-visual method to monitor processes of decline associated with pathogen activity and climate change, but more work is needed to reduce uncertainty in some of the most sensitive variables such as the air and canopy temperature.

Sharon Hosegood, Director of Sharon Hosegood Associates Ltd. explained the use of Tree Radar to survey roots in urban environments. The Tree Radar unit allows for non-invasive inspection of both trunks and roots. The trunk can be inspected at any elevation and roots over any surface.

Results show root location and depth along scan lines, presented in a series of 'top-down' views (to scale) and a 'virtual trench'. The results can then be imported in to CAD if required. Understanding where the roots are enables sustainable design of foundations, utilities and hard surfacing.


Using Tree Radar to survey roots.

Root density is also an indication of tree health and stability.

Dr Dan Ridley-Ellis, Head of the Centre for Wood Science and Technology at Edinburgh Napier University, in the last presentation of this session exhorted us to equip ourselves for the future. Considering developments over the past 30 years, he then looked at the challenges of the next 30 years for the forest industry – an ageing population in the UK (and similar countries), increased world population and affluence, increased living standards and expectations, urbanisation, climate change, legislation on environment, carbon reduction etc. and changing public ideas on what forests are actually for.

SESSION 5: NEW HORIZONS

The final session of the conference saw Professor Stefano Pascucci, Professor in Sustainability and Circular Economy at the Exeter Business School, explain the circular economy and illustrate models in forest management and timber production.

Chris Woods, Head of Digital with Drax, spoke on social media in the wider environment, giving examples of the advantages and disadvantages to social media use. Chris spoke of the various methods that Drax employs to tell its story to the public, staff, other interested parties.

The final presentation in this session – the future and what to do about it – fell to futurologist Mark Stephenson, who gave a very insightful presentation which both amused and captivated the entire audience.

Conference Chair Chris Hamill said: "Our working environment is becoming increasingly competitive, meaning identification of emerging innovation is fundamental to staying ahead of the game. It's an all-round foundation that we're laying – not just in technology and science, but also in how we sensitively approach challenges, such as the human impact of a changing sector."

Delegates to the conference cannot fail to have been truly inspired by what the future may hold and how the industry can prepare for innovation.

The Institute's National Conference was sponsored by A. W. Jenkinson Forest Products, Scottish Woodlands and Tilhill Forestry with additional support from: 2Excel geospatial, Forest Research, Sorbus International, Trackplot, and media partner Forestry Journal.