UNIVERSITY OF BIRMINGHAM | BIFOR

Birmingham Institute of Forest Research

(BIFoR)

Annual Report

2017

Contents

Photo credits: Page 13 BIFoR launch, John James Photography, University of Birmingham
Cover image: Field Assistant Anna Gardner, 40 m up in the air, maintaining the equipment which measures the exchange of gases and energy between Mill Haft forest and the atmosphere.

Directors' Introduction, Professors Rob MacKenzie and Michael Tausz

2017 ends with forests very much in the national news. The New Northern Forest has received a £5.7m 'vote of confidence' from government and woodlands are recognised as a key component of using and managing land sustainably in the government's 25-year environment plan. Internationally, the Food and Agriculture Organisation (FAO) of the United Nations document State of Food and Agriculture places forests at the heart of productive-but-sustainable farming.

Reaching across the University, BIFoR is well-placed to bring together expertise in natural sciences, social sciences, and the humanities to address the 'wicked' complexity underpinning both the FAO call for agricultural transformation and the UK government's concept of 'Net Environmental Gain'. We are delighted to announce the first substantive funding for BIFoR in this multi- and interdisciplinary arena: the Leverhulme Trust Doctoral Scholarship Programme, *Forest Edge*. Although, we are already active in many forested landscapes, and successfully applying diverse disciplinary perspectives, *Forest Edge* is our first opportunity to build a 20-PhD cohort – we think the UK's biggest-ever such cohort – charged with advancing the Institute's vision by providing linked fundamental science, social science, and cultural research of direct relevance to forested landscapes. BIFoR has that vision for research, but also has a duty — as an education provider in a publicly funded university — to engage publics of all sorts with our research. We are proud and enthusiastic partners in ENCOMPASS, a short programme to build skills in public engagement with research ahead of sustained work with citizens and civil society organisations.

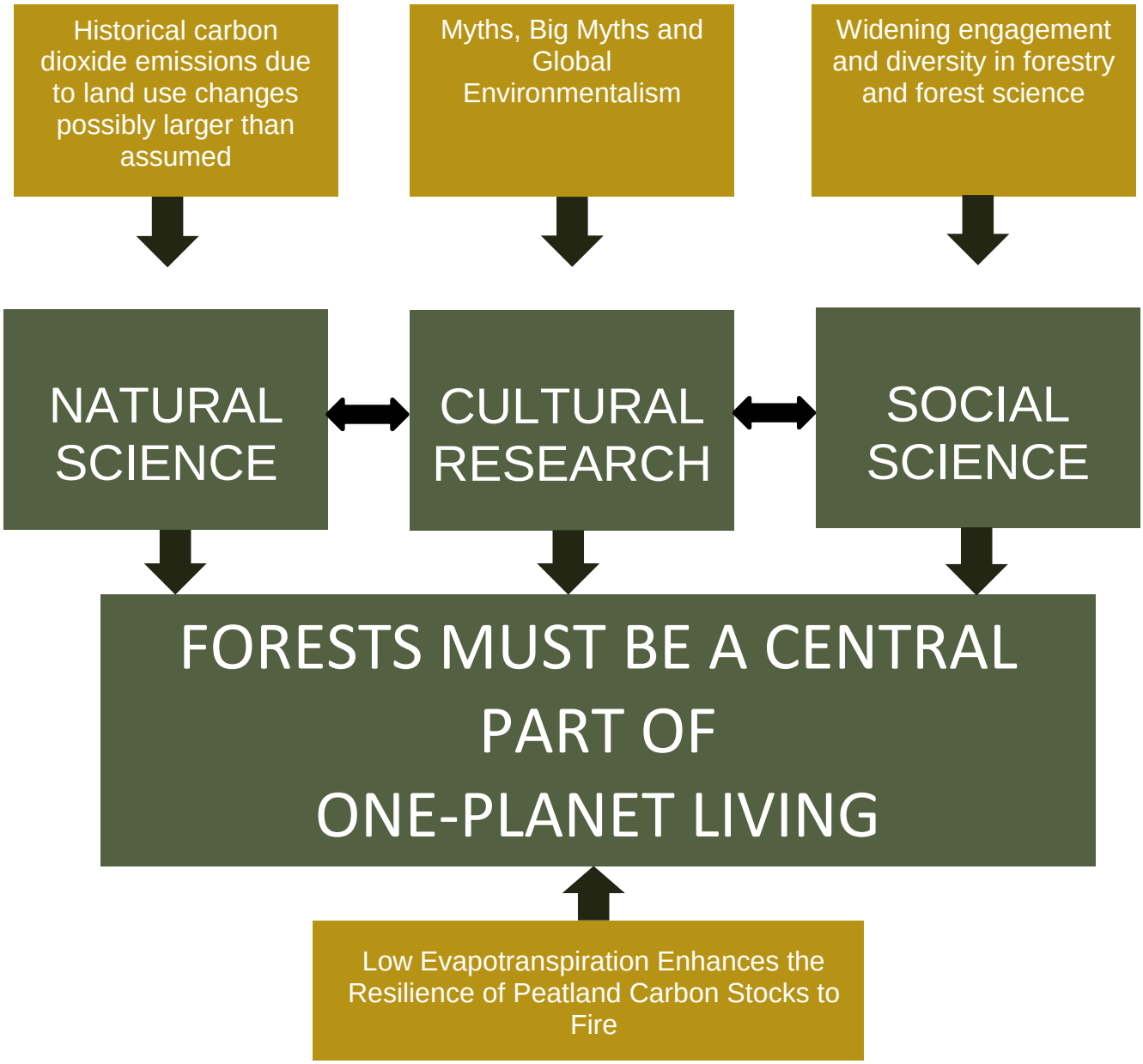
We recognise and value the two-way street that keeps the very best research at the forefront of knowledge and in the service of mankind.

BIFoR colleagues continue to excel. In 2017, Dr Tom Pugh and Dr Emma Ferranti have been awarded prestigious research fellowships on forest mortality and infrastructure resilience, respectively; BIFoR Director of Education, Jeremy Pritchard, was given a Chair in recognition of his many innovative contributions to Life Sciences education.

Our flagship facility, BIFoR FACE, has completed its first growing season under elevated carbon dioxide. It shows every sign of delivering the ground-breaking science for which it was conceived, challenging us to report quickly the early scientific results and use these as proofs-of-concept in our search for funding to explore ever deeper into the forest's form and function.

World leading and interdisciplinary research

The diagram below highlights our key research areas and gives examples of how current research feeds into them. A full list of current BIFoR related publications is given in Appendix 4.



Director's Report, BIFoR FACE by Professor Michael Tausz

2017 saw the BIFoR **F**ree **A**ir **C**O_2 **E**nrichment (BIFoR-FACE) experiment in Mill Haft, Staffordshire, take centre stage. For me personally, 2017 was an equally exciting year as I moved from Australia to Birmingham to my new role as Chair in Forest Ecosystem Science and director of the BIFoR-FACE research programme. I took up the post in March, only days before experimental CO_2 enrichment went live in the forest.

BIFoR-FACE is a so-called '2nd generation' forest FACE site. After a 'first generation' of forest FACE experiments had built our knowledge base on how young forest plantations are affected by increasing atmospheric CO_2, the scientific community has long argued the urgent need for upscaled experiments in mature, complex forest ecosystems. BIFoR-FACE is only the second such facility worldwide, and the only one in the Northern Hemisphere. Recently recognised with awards (Figure 1) for its sensitive construction and low-impact integration into the existing woodland, the facility will enable the much needed real world experiment to improve our climate projections and evaluate risks to forest ecosystems and the services they provide.

On 3rd April 2017, coinciding with the spring flush of the oak trees, the facility was switched on, crowning three years of careful planning, construction and testing. For the entire growing season, three 30-metre-wide plots of mature oak forest have been immersed in an atmosphere with elevated CO_2 concentration, topped up from current values of just above 400 ppm (parts per million) to 550 ppm, a roughly 38% increase, which the entire globe is likely to see by 2050. The futuristic 'sci-fi forest' (as named by BBC's Environment Analyst, Roger Harrabin) consistently achieved its performance targets throughout the year.

Over the entire season, downtime was minimal (only 2.5% of the time), and more than 90% of the time target concentration was within narrow tolerances. These performance measures compare favourably to the only other 2nd generation forest FACE in Australia, and also to previous smaller scale facilities (Table 1).

*BIFoR-FACE 2017 statistics**

Uptime:	97.5 %
Target:	547 ppm ± 15.5 ppm
5-min means on target:	91.5%

Comparison with 'EucFACE' (Western Sydney University, Australia):

Uptime:	95%**
% on target (± 37.5 ppm):	88%**

*April-August data evaluated.

** Ellsworth et al. 2017, Nature Climate Change 7

*** Drake et al 2016, Glob Change Biol 22, 280-290

Table 1 Performance statistics for BIFoR FACE

Further improvements to the research site were completed during 2017. A new laboratory at the base of the large flux tower (Figure 2) allows for safe housing of sensitive instruments, there is now also space for a mobile or visiting laboratory and improved access, in addition walkways into all plots minimise footfall on the

valuable ‘research real estate’ (Figure 4). Four meteorological towers (met masts) are now in place (Figure 5).

The Long Barn, a magnificently renovated 19th century building, has been converted into a research and education facility furnished with seminar space, computer workstations and desk space, and a laboratory ready to process and conserve samples from the forest plots (Figure 3). The Long Barn was the centre piece at the formal launch ceremony hosted by the Vice-Chancellor and Norbury Estate on 21 June 2017 (Figure 10).

Now that the technological challenge has been met and performance proven, additional PhD researchers and their supervisors associated with the BIFoR-FACE programme help to ramp up the scientific measurement programme to track the additional carbon through the ecosystem networks (see pages 8 & 9). With the many opportunities of such a large-scale ecosystem experiment of global significance, particular emphasis is on national and international research collaborations as a key to realise the full scientific potential of the BIFoR-FACE programme (see page 10).

Figure 1 BIFoR awarded West Midlands Royal Institute of Chartered Surveyors (RICS) awards in category of Innovation and awarded Project of the Year. BIFoR was also named winner in the sustainability category at the Insider Property Awards.

Figure 2 land-atmosphere laboratory under the large flux tower and improved pathway for access.

Figure 3 The magnificently renovated 19th century Long Barn houses seminar facility and laboratory on the ground floor and 'hot desk' and discussion spaces in the mezzanine level.

Figure 4 The new walkways to access the experimental plots at BIFoR-FACE without interfering with valuable 'research real estate'

Figure 5 The South west met mast, one of four erected in 2017 to measure air flow into, out of and over, the forest

Scientific Activity at BIFoR FACE

Posters describing BIFoR science are available at - https://www.birmingham.ac.uk/research/activity/bifor/face/ongoing- research.aspx.
The list of posters available to download includes:

- Earthwatch Institute research at BIFoR FACE
- Dispersion inside woodland using CO_2 data
- Distributed intelligent Heat Pulse Sensor (DiHPS)
- Early responses of leaf assimilation to elevated CO_2
- Eddy Covariance Fluxes and Footprints at BIFoR FACE
- Getting to the root of the problem
- Nitrogen Transformation Processes in Forest Soils
- High-frequency monitoring of catchment nutrient exports
- Soil respiration and nutrient dynamics at BIFoR FACE
- Ionophore-based sensors in BIFoR: results and opportunities
- Insect sampling at BIFoR FACE: biodiversity and phenology
- Insects as drivers of change in woodland systems
- Is Winter Coming? Insect phenology models
- Using solar induced fluorescence (SIF)
- Modelling the Spatiotemporal Dynamics of Stream Temperature
- Tree stem CO_2 losses in oak woodland carbon balances
- Temperature and Turbidity Effects on the Fluorescence
- Tree growth responses to environmental fluctuations
- Hyporheic Nutrient Cycling
- VOCs, their role in mapping ecosystem changes under high CO_2
- Tree water transport

Figure 6 cutting edge photosynthesis sensing spectrometer mounted on a 15kg drone and flown over the tree canopy

Figure 7 image captured from the Phenocam on top of the Flux tower, live data can be viewed at http://ow.ly/XQ3Wy

Science Highlight

Rarely seen solitary wasp found in BIFoR FACE, by PhD student Liam Crowley

On the 28th November 2017, a single female of the rarely seen Embolemine wasp, *Embolemus ruddii* Westwood, 1883, (*Hymenoptera Embolemidae*), was found in one of the 18 pitfall traps deployed across the site as part of the monthly invertebrate sampling programme.

Figure 8 Photo of Embolemine wasp.
The total body length of the specimen found was 5 mm

Very few individuals of this species have ever been seen, with only 20 previous British records, going back to 1912 with the most recent one from 1997 (according to Bees, Wasps and Ants Recording Society(BWARS) database). This record, therefore, represents the first confirmed UK sighting for 20 years, as well as the first in Staffordshire. The few pre-existing records of females range from May to September, meaning this record is also 2 months outside the known activity period.

Females are apterous (wingless) and have previously been collected in or near the nests of ants and moles, suggesting some degree of a subterranean lifestyle. Interestingly, there is significant mole activity nearby at the BIFoR site. Whilst the specific host is unknown, the species has been found to parasitise tree-root feeding Cixiidae ('planthoppers') in Europe also hinting at a subterranean nature.

They are believed to overwinter as adults (Burn, 1997), which suggests that it may have been looking for a suitable overwintering site, which given the subterranean associations, is likely to be in the soil or under bark.
Such a find at the BIFoR site highlights the value of the facility in providing a platform for in-depth ecological studies. 198 pitfall samples were taken throughout 2017. With a less detailed sampling regime, the presence of *E. ruddii* would have been missed.

References

Burn, J. T. (1997). http://www.bwars.com/index.php?q=wasp/embolemidae/embolemus-ruddii [accessed December 2017]

Research Collaborators

Throughout 2017 we have continued to work closely with national and international research collaborators, strengthing collaborations with the Met Office, Exeter University, Swansea University and Amazon FACE. Here are details of some further 2017 collaborations.

Silixia, British Geographical Survey

In May, Silixa Ltd, in collaboration with UoB and the British Geological Survey installed a fully automated fibre optics active distributed temperature sensing (A-DTS) system to monitor soil moisture and soil temperature at high resolution. The system measured without supervision along 1,500m of fibre optics cable for 12 weeks.

See more on the NERC funded project https://www.bgs.ac.uk/DiHPS

Forest Research (FR)

A joint PhD studentship commenced in October 2017 (Ed Eaton, see page 12). FR, scientist Eric Casella is continuing his laser scanning of BIFoR FACE to quantify the canopy structure to twig level.

FR, Urban Forestry lead, Kieron Doick is collaborating with BIFoR on the extent of, and ecosystem services provided by, the UK urban forest.

University of Illinois at Urbana-Champaign (UIUC)

University of Birmingham – University of Illinois BRIDGE Programme. In August 2017, Michael Tausz and Tom Pugh attended a workshop held at UIUC bringing together experimentalists and modellers to work on improving the representation of CO_2 fertilisation in crop models using information from FACE experiments. In October 2017 Evan DeLucia, Professor of Biology and Baum Family Director at UIUC, visited BIFoR.

University of Southampton/ University of California Davis

Prof Gail Taylor (now Head of Plant Sciences, University of California Davis) joined the team at BIFoR FACE in March 2017 to take samples back to the lab for 'genetic bar-coding' analysis of biodiversity. A second sampling campaign will take place in Spring 2018.

University of Bristol, University of Helsinki and the Open University

Working with BIFoR scientists, Kadmiel Maseyk, Jon Atherton and Tom Richardson used drones to carry sophisticated sensors above the canopies, complementing fixed installations on the steel towers of the plots, and many physical samples were taken to laboratories for chemical and molecular analysis. sensing of leaf physiology. http://ow.ly/Bv9y30ifPiU

Western Sydney University (WSU) – Hawkesbury Institute for the Environment (HIE) - EucFACE

We hosted Ian Anderson, Director of HIE in June 2017. A Memorandum of Understanding is now in place and Dual award PhD programs have been advertised. Academic staff from UoB and WSU will work together to develop projects and identify potential supervisors from each institution. Students can split their research between BIFoR FACE and EucFACE.

Director's Report, Education by Professor Jeremy Pritchard

2017 has seen the introduction of a new module - Critical Issues for 21st Century Ecosystems. This new module is joint between Biosciences and Geography Earth and Environmental Sciences (GEES). There are 66 students registered (28 biosciences, 36 GEES and 2 natural sciences).

When the live data feed from BIFoR FACE comes online, this module will pave the way to deliver innovative teaching practice. Already in 2017 we saw 9 masters/undergraduate students complete their research at the BIFoR FACE Facility.

During 2017 we hosted visits from UoB students on the Air Pollution Management and Control MSc, the River Environments and their Management MSc, and second year Environmental Sciences. Nine PhD students are working on research directly linked to the BIFoR FACE Facility (see page 12) and several others in the broader BIFoR remit.

2017 saw the launch of the 'BIFoR Network', allowing students to sign up and keep up to date with BIFoR developments and receive information on BIFoR events taking place on campus. 94 students signed up to receive updates on BIFoR volunteering opportunities and after a well-attended BIFoR Volunteering launch event, we matched dozens of students with academics and PhD students to allow them to assist with BIFoR research.

Opportunities include research on soil samples, leaf litter, insect responses to climate change, soil resins, leaf area index, canopy greenness analysis and capturing and comparing root images. A social media workshop was held to gather students' ideas on how we can further expand our reach using existing and additional social media channels. BIFoR was added as an activity on the University's employer-recognised Personal Skills Award (PSA), allowing BIFoR Volunteers to collect PSA points for volunteering undertaken with us.

In March 2017, we hosted a Continuing Professional Development (CPD) event for A level Geography teachers linked to the new curriculum subject, 'Water and Carbon Cycles'. A podcast is available.

We were delighted to host a field trip for A Level geography students from the University School in June 2017. Subsequently BIFoR gave an assembly talk about BIFoR FACE at the University School. In June 2017, Prof Michael Tausz, also spoke to the Eco-Schools Network for Staffordshire. There was lots of interest in BIFoR FACE and two schools have approached the Facility about work experience for students in 2018.

In December, we spoke at an Alumni event talking about BIFoR FACE ('why *do Christmas trees have rings*?). A key note speech was delivered at the annual Geography Teacher Educator's Conference on '*Climate change and BIFoR* FACE' in January 2018. In 2018 the UoB Postgraduate Diploma in Education cohort will visit BIFoR FACE.

94 student volunteers in the 'BIFoR Network'

66 students on the new undergraduate module

9 BIFoR FACE doctoral students

8 educational visits to BIFoR FACE

Doctoral level study – new commencements

In 2017 we welcomed four new PhD students:

Aileen Baird, supervised by Dr Francis Pope and Prof Robin May

"I'll be investigating the effects that enriched CO_2 has on fungi and fungal-like pathogens. I feel that environmental microbiology is a very new, exciting area of research to be in at the moment, with lots of opportunities to discover new things."

Daniel Haynes, supervised by Dr Francis Pope

"I will focus on the production of volatile organic compounds (VOCs) and spores, pollen, bacteria etc. I'm excited to have the chance to study a part of what forests may experience in the future, with important implications for future human health, climate and species distribution."

Ed Eaton, a joint PhD between BIFoR and Forest Research, supervised by Prof Rob MacKenzie and Prof Michael Tausz

"My PhD will focus on the emission of CO_2 from tree trunks: how much is being emitted – and how this varies within and between trees. My PhD research will give me the opportunity to really examine one of the (often poorly-understood) components of forest carbon balances."

Anna Gardner, supervised by Prof Rob MacKenzie and Prof Michael Tausz

"I will be investigating the effect of elevated CO_2 on leaf-level photosynthesis by measurements of gas exchange, stomatal conductance and chlorophyll content."

Our five other PhD students who started in 2016 are:

Liam Crowley – Insects as key drivers of change in woodland systems under climate change, supervised by Dr Scott Hayward, Prof Jeremy Pritchard, Prof Jon Sadler

Anthony Hyacinth – Plant volatile compounds under elevated CO_2 – supervised by Dr Francis Pope and Prof Rob MacKenzie

Angeliki Kourmouli – Soil respiration and biogeochemistry at BIFoR FACE – supervised by Dr Rebecca Bartlett, Dr Iain Hartley (Exeter University) and Dr Zongbo Shi

Sue Quick – Tree-soil-water relations under elevated CO_2 – supervised by Prof Stefan Krause and Prof Rob MacKenzie

Clare Ziegler - Quantitative modelling of root growth and carbon allocation bridging theory and experiment, supervised by Dr Iain Johnstone and Dr Rosemary Dyson

We expect 6-7 new PhD students to join BIFoR in each of the next 3 years through the *Forest Edge* Doctoral Scholarship Programme (see page 18).

Strategic Stakeholder Engagement

Communications and Public Engagement with Research

The BIFoR website (www.birmingham.ac.uk/bifor) and Twitter account: @BIFoRUoB maintain our lively social media presence, which continues to grow thanks to our PhD students and volunteers. In 2018, we will work with a group of undergraduates to enhance the social media platforms we use, and to set up an Instagram account. Two informative new videos are available through our BIFoR playlist on YouTube http://ow.ly/4s8130i3V5P.

Our newsletters — 'Bud Burst' and 'Last Leaf Fall' — are circulated to over 600 people and also available online.

Our main media coverage this year came from the switch-on of the carbon dioxide at the BIFoR FACE Facility on 3 April 2017. We gained significant media coverage including BBC Radio 4's Today Programme, the BBC website, and the Times newspaper. In June 2017, we launched the BIFoR FACE Facility, 70 guests joined the BIFoR Team and UoB senior staff at the launch celebration at the BIFoR FACE Facility, including Prof Alice Roberts and our Vice Chancellor Sir David Eastwood, alongside representatives of Research Councils, government and non-governmental organisations, and local businesses. There was media coverage of the day through Reuters Press Agency with press hits internationally, including America, Italy and Japan.

The University of Birmingham Arts and Science Festival 2017 had a 'Water and Land' theme. BIFoR put on three related events, each one well attended. The collaboration between artist and composer Dr Robin Price and environmental scientist Dr Francis Pope,

Figure 9 Launch, Prof Alice Roberts, Prof Michael Tausz & Vice Chancellor Sir David Eastwood

examined the creative possibilities of mapping nature into music, to ask what music might a future forest make? They used data collected from weather, plant and soil sensors located at the BIFoR FACE Facility.

In June we had a stand at the University's large Community Festival on campus. Children got involved by looking at tree pests under the microscope, identifying trees, and counting tree rings.

Through 2017 we have hosted many tours of the BIFoR FACE Facility, some for those who are just interested and others who we hope will become our research collaborators (see Appendix 3). With thanks to the Alumni Impact Fund 2018 we are working on a virtual reality tour of the Facility, which should be ready early 2018.

In 2018 we will be a core part of UoB's ENCOMPASS team, who have received funding to look at engaging publics and society in environmental sciences research (page 14).

Engaging Communities, Publics and Society with Environmental Science

encompass
engaging communities publics and society

The environment and environmental research

The environment is where we live, the air, water and the ground; it is where all our food, energy and materials come from. It also receives any waste we produce. Academic research seeks to understand how the environment works; it monitors and measures its ability to support life and offers ways to improve the way we live, including reducing our impact up on the environment.

Public Engagement

Currently environmental scientists engage with the public by presenting the results of research through lectures aimed at schools or other community groups. Wider audiences can be reached via the media, often in response to a news story. The ENCOMPASS project aims to shift public engagement to the co-developing of research projects with community organisations, and involving them from the beginning and through all stages of the project.

What environmental research does the University do?

Staff at the University of Birmingham undertake world leading research:

- Investigating how different pollutants form and interact in the atmosphere;
- understanding the impact of climate change on rivers and wetlands;
- assessing the impact of extremely small particles released by society on the health of humans and ecosystems;
- how past climates can help understand current and future climate;
- how ancient animals adapted to changing environments;
- predicting where new mineral resources may be found;

NERC SCIENCE OF THE ENVIRONMENT

What is NERC? The Natural Environmental Science Research Council is funded by Government to commission research that:

Benefits from natural resources,
Builds resilience to environmental hazards,
Manages environmental change

↓

Generates large, long-term economic and societal benefits

↓

Drives UK productivity & competitiveness

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External Stakeholder Engagement

There has been significant engagement with key stakeholders throughout 2017. We have worked very hard at ensuring we link up to other Higher Education Institutes. A list of stakeholder engagement can be found in Appendix 3. Also in Appendix 2 there are details of talks we have given / conferences we have attended.

Earthwatch Institute

Our relationship with Earthwatch continues to deepen. Their Board of Trustees visited the BIFoR FACE Facility in 2017 and there have been several other visits during the year. In 2017 further experiments were set up at BIFoR FACE, including a leaf-litter decomposition experiment (see photo above).

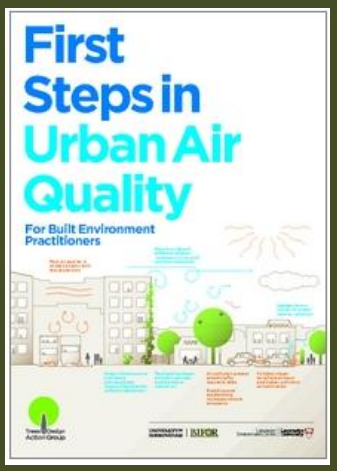
Forestry Skills Forum

Through 2017 we have hosted and provided secretarial support for this group. The remit of the group covers learning and development related to the forestry industry from primary school to degree level. The group commissioned the Forestry Skills Study. The report can be downloaded from http://www.rfs.org.uk/news/2017/12/key-forestry-skills- shortfalls/

West Midlands Forest and Woodlands Advisory Committee (WM FWAC) and Urban Forest and Woodlands Advisory Committee Urban (FWAC)

Rob MacKenzie continues to sit on both these Advisory Committees. Rob led the response of the Urban FWAC to the 'Air Pollution – outdoor air quality and health' call by National Institute for Health and Care Excellence (NICE). A 2012 paper which Rob and colleagues wrote was considered as part of the evidence base*.

Trees Design and Action Group (TDAG)



Through TDAG, Emma Ferranti, who chairs the West Midlands contingent, led forward with the publication of a First Steps in Urban Air Quality Guidance Document. This is available at http://epapers.bham.ac.uk/3069/

* Pugh, T. A. M., A. R. MacKenzie, J. D. Whyatt, and C. N. Hewitt (2012). The effectiveness of green infrastructure for improvement of air quality in urban street canyons. Environmental Science & Technology, 46 (14), 7692-7699. DOI: 10.1021/es300826w.

Internal Stakeholder Engagement

Throughout 2017 we have continued to build BIFoR's network within the University of Birmingham.

Field visits to BIFoR FACE

During 2017 we hosted several visits to BIFoR FACE for University staff, including Academic Registrar, Lee Sanders and a large group of College of Life and Environmental Sciences Professional Service Staff. 2018 is already looking busy for site visits from teams of staff looking for an interesting venue for their away-days.

Birmingham Award for Tremendous Achievement (BUAFTAs)

The BIFoR Technical Team were shortlisted for Team of the Year at the 2017 BUAFTAs. The award recognises a team that is acknowledged as consistently high performing and that works exceptionally well as a team, using the skills of all members productively to execute business as usual activity to a high standard. They missed out in 2017 but have been shortlisted again in 2018.

University of Birmingham Green Heart Project

BIFoR continues to have an influential role in the UoB Green Heart Project discussions/ working group. Measuring over 12 acres, the Green Heart project will open up the centre of campus for students, staff and the local community to enjoy. It will provide a unique space for performances, socialising, meeting and studying, while opening up views across the whole campus, as envisaged in the 1920s. The space will also enhance the setting of those buildings which border the Green Heart, including the new library which opened in September 2016. It will open up new pedestrian and cycle routes, allowing students, staff and visitors to the campus to travel safely and with ease. Throughout the design process, the project team have also sought to create a sustainable, natural and environmentally friendly landscape; both for people and wildlife.

Outputs

The first papers using data from Mill Haft have been published – see Blaen et al., below. A full list of papers can be found in Appendix 4.

Blaen et al (2017), High-frequency monitoring of catchment nutrient exports reveals highly variable storm event responses and dynamic source zone activation, *Journal of Geophysical Research*, doi: 10.1002/2017JG003904

We know that storm events can cause rapid increases in river flow, but we do not know their impact on water quality. We used high-frequency sensors to monitor nitrate and dissolved organic carbon during 29 storm events in the Wood Brook stream at Mill Haft, Staffordshire. Storm events were important periods of nutrient export, particularly when intense rain fell on wet ground. Our results are important to understand the implications of climate change for river water quality.

Sgouridis, F. & Ullah, S. 25 Sep 2017 Soil greenhouse gas fluxes, environmental controls and the partitioning of N_2O sources in UK natural and semi-natural land use types In : Journal of Geophysical Research: *Biogeosciences 122*, 2617-2633 doi:10.1002/2017JG003783

Unmanaged peatlands and forests and extensive and intensive grasslands have been under-represented in estimates of UK greenhouse gas (GHG) emissions. We have measured GHG fluxes monthly in two replicated UK settings and evaluated their environmental controlling factors. Emissions of one GHG, N_2O, were 40 and 13 times higher from the intensive grasslands than from the peatlands and forest soils, respectively. Rough assumptions about the fraction of nitrogen deposited from the atmosphere and re-released as GHG may under- or over-estimate the true fraction, depending on the type of landscape. The use of land use-specific GHG emission factors and further information on N_2O source partitioning is needed to constrain this uncertainty.

Funding

In addition to our £15 million visionary founding gift, from the JABBS Foundation we have secured £0.5 million directly into BIFoR FACE and £3.85 million into BIFoR research more broadly.

Leverhulme Trust Doctoral Scholarship Scheme (DSP), *Forest Edge.* A cohort of 20 doctoral researchers brought together around a single Organising Principle: *to what extent Forest existence, form, and function emerge from detailed interactions within and across scales, from molecules & organisms, to communities & societies*.

The Forest Edge DSP will look at:

- Values and meanings – How do the ways we value forests influence their form and function?
- Change drivers and resilience – Which 'tipping points' and 'great leaps forward' emerge from the adaptation of forests to changing environments?
- Communication cascades – How does communication at molecular, ecological, and social scales determine the functioning of forests?
- Scales of space and time – How far must forests extend, and how long must they persist, to perform specific cultural, socio-economic, or ecological functions?
- Complexity: how patterns emerge - Where and when do critical sites and situations appear in forests?

We will bring together biologists, ecohydrologists, resource economists, environmental philosophers, literary theorists, etc, not to task Doctoral Researchers with learning a bit of everything, but rather to extend science and scholarship into entirely new areas.

£1.05m (2018-2023) All BIFoR-engaged academic staff

European Research Council, TreeMort Project - Redefining the carbon sink capacity of global forests: The driving role of tree mortality.

Everything that lives must die. Yet when it comes to the world's forests, we know much more about the processes governing their life than those governing their death. Global forests hold enormous amounts of carbon in their biomass, which has absorbed about 20% of anthropogenic carbon dioxide emissions over recent decades. Whether the size of this sink will persist, intensify, decrease or even become a source is highly uncertain, yet knowing this is crucial to the calculation of carbon emission budgets consistent with limiting global temperature rise.

Mortality rates and mechanisms are closely tied to forest structure and composition, and thus the storage of carbon in biomass, but there is a striking lack of consensus in existing assessments. TreeMort will combine newly available sources of data with appropriate modelling, to provide quantifications of the rates and causes of tree death, and their relation to environmental drivers.

This will enable globally-comprehensive investigation of the extent to which whole forest structure and function are governed by and interact with mortality, and their likely evolution under environmental change. TreeMort will thus bring us significantly closer to understanding fully how forests interact with the global carbon cycle, assisting efforts to mitigate climate change.

€1.5 million (2018-2023) Dr Tom Pugh

Going Forward

The capability and reputation of BIFoR is growing quickly, internally and externally, nationally and internationally. We have a dedicated and passionate team working directly for BIFoR, and are supported by many BIFoR Champions across the University.

Our key foci for 2018 will be;

- to report early scientific deliverables and use these as proofs-of-concept for grant applications
- to deliver a method for routine canopy access at the BIFoR FACE Facility.
- to prioritise our relationships with external stakeholders focussing on joint funding and help in-kind to BIFoR FACE and *Forest Edge*
- to connect more deeply into the International Forest Research Community, including through the International Union of Forest Research Organisations (IUFRO).
- to engage UoB students in BIFoR FACE through live data transmissions.

Appendix 1: Who's Who in BIFoR

BIFoR Advisory Group Members

Chaired by

Myra Nimmo — Head of College of Life and Environmental Sciences (LES); Pro-Vice-Chancellor; Chair of the BIFoR Advisory Group

Professor Bradwell, Honorary Professor of Immunology University of Birmingham
Professor Richard Bardgett, Manchester University, Professor of Ecology
Iguatemi Costa, Head of Natura Amazon Innovation Centre (NINA), Natura Plc
Professor Peter Freer-Smith former chief scientific adviser for the Forestry Commission
Professor John Grace, University of Edinburgh, Professor and Senior Research Fellow
Professor David Johnson, University of Manchester, Chair in Microbial Ecology
Professor Rob MacKenzie, University of Birmingham, BIFoR Director
Professor Sir Ghillean Prance, formerly Director of Royal Botanical Gardens KEW
Professor Michael Tausz, University of Birmingham, BIFoR Director
Mike Townsend, Principal Advisor for woodland conservation, Woodland Trust, UK
Professor Xin Zhou, China Agricultural University, Department of Entomology

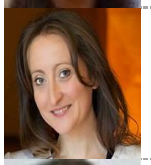
A-Z list of Who's Who in BIFoR

The following is a list of our internal colleagues most closely related to BIFoR in 2017. If you wish to contact someone from this list please contact bifor@contacts.bham.ac.uk and we can help put you in touch.

	First Name	Surname	Position & key words
	Aileen	Baird	PhD student; fungal diversity
	Rebecca	Bartlett	Lecturer Biogeochemistry PhD supervisor of Angeliki Kourmouli Soils; leaf litter; biogeochemistry; nutrient cycles
	Lesley	Batty	Senior Lecturer Environmental Science PhD supervisor of Angeliki Kourmouli Soils; leaf litter; biogeochemistry;
	James	Bendle	Reader (Associate Professor) in Organic Geochemistry; leaf waxes

	First Name	Surname	Position & key words
	Phil	Blaen	Fellow in 2017, now associate from 2018 hydrology; stream monitoring; soil moisture
	William	Bloss	Head of School of Geography Earth and Environmental Sciences; BIFoR Board member
	Deanne	Brettle	BIFoR Project Administrator and Volunteer Coordinator
	Ben	Brown	Centre for Computational Biology; Environmental Bioinformatics

	First Name	Surname	Position & key words
	Chris	Bunce	Head of School of Biosciences; BIFoR Board member
	Hazel	Burton	Student Engagement Projects Officer (LES) Student engagement officer working with BIFoR
	Xiaoming	Cai	Senior Lecturer Modelling the CO_2 dispersion at BIFoR FACE
	Luke	Chance	Head of Finance College of Life and Environmental Sciences; BIFoR Board member,
	Vicky	Chapman	Civil Engineering Leaf fall; modelling;
	Faye	Claridge	Artist in residence
	Liam	Crowley	PhD Student (Bio); Invertebrates; ecology; pollinators
	Simon	Dixon	Postdoctoral Research Fellow (GEES) Flooding; wood in rivers
	Rosemary	Dyson	Senior Lecturer in Applied Mathematics; PhD supervisor for Clare Ziegler; modelling; root systems
	Ed	Eaton	PhD Student; tree stem respiration
	Emma	Ferranti	NERC Knowledge Exchange Fellow; Interdisciplinary Lead (Weather and climate); urban trees

	First name	Surname	Position & key words
	Lesley Ann	Ford	Operations Manager for GEES; BIFoR Board member;
	Anna	Gardner	PhD student; leaf-level photo-synthesis; gas exchange; stomatal conduc-tance; chlorophyll
	Louise	Hardwick	AHRC Early Career Leadership Fellow; Interdisciplinary Lead -Ecocriticism
	David	Hannah	Director of Research for College of Life and Environmental Sciences; BIFoR Board member
	Nick	Harper	Senior Technician at BIFoR FACE
	Kris	Hart	Operations Manager at BIFoR FACE
	Scott	Hayward	Lecturer; supervisor for Liam Crowley; Molecular Eco-physiology; Invert-ebrates; phenology, bio-diversity, climate change, stress adaptation, ecology
	Daniel	Haynes	PhD student; Volatile Organic Compounds (VOCs) spores; pollen; bacteria
	Jason	Hilton	Reader in Palaeobiology; Paleobotany
	Dan	Holmes	Estates lead for BIFoR FACE
	Tony	Hyacinth	PhD Student; VOCs

	First Name	Surname	Position & key
	Iain	Johnston	Birmingham Fellow (Bio); PhD supervisor for Clare Ziegler; modelling; root systems
	Nicholas	Kettridge	Senior Lecturer; ecohydrology; peatlands;
	Jennifer	Kirby	PhD student; leaf fall; modelling; trains;
	Angeliki	Kourmouli	PhD student; CO_2 fluxes, bioavailable nutrients, biogeochemistry.
	Stefan	Krause	Professor of Ecohydrology and Biogeochemistry; PhD supervisor for Sue Quick; DTS;
	Bronwen	Lord	Director of Operations for College of Life and Environmental Sciences; BIFoR Board member
	Rob	MacKenzie	Director of BIFoR FACE; PhD supervisor for Ed Eaton, Anna Gardner, Tony Hyacinth, Susan Quick
	David	Maddison	Prof of Economics; BIFoR Board member
	Eloise	Marais	Birmingham Fellow; Earth observations & atmospheric chemistry modelling
	Peter	Miles	Technician at BIFoR FACE Facility
	Francis	Pope	Lecturer, Interdisciplinary Lead; supervisor for Tony Hyacinth and Aileen Baird
	Jeremy	Pritchard	Director of Education; BIFoR Board member; supervisor for Liam Crowley

	First name	Surname	Position & key
	Tom	Pugh	Lecturer Environmental Science; forest biogeochemistry modelling; tree mortality and climate change effects on ecosystems
	Sue	Quick	PhD student; Sap flow; forest ecohydrology
	Andrew	Quinn	Senior Lecturer in Atmospheric Science and Engineering; BIFoR Board member
	Jon	Sadler	Professor of Biogeography (GEES) PhD supervisor for Liam Crowley; urban forests; birds;
	Zongbo	Shi	Senior Lecturer in Atmospheric Biogeochemistry; Interdisciplinary Lead; PhD
	Michael	Tausz	Director; Chair in Forest Ecosystem Science; PhD supervisor Ed Eaton & Anna Gardner; tree physiology, ecophysiology & ecosystem processes
	Sabine	Tausz-Posch	Lecturer; leaf physiology; seed quality
	Rick	Thomas	Senior Research Fellow; atmospheric measurements; fluxes; flux tower
	Frank	Uekötter	Reader in Environmental Humanities; Interdisciplinary Lead; environmental history;
	Sami	Ullah	Senior Lecturer biogeochemistry of terrestrial ecosystems, nitrogen, carbon & phosphorus cycling GHG emissions from soils
	Clare	Ziegler	PhD Student; modelling; root systems

Appendix 2: BIFoR Presence at Sectoral Conferences and Workshops

The role of tree mortality and vegetation dynamics in global terrestrial carbon uptake.	Tom Pugh, University of Stirling, invited seminar. Jan 2017.
Green Infrastructure & Air Pollution	Rob Mackenzie, invited talk and panel discussion, CIBSE workshop “Overcoming obstacles to high density resilient cities”, 6th January, London’s Living Room, City Hall, London. Feedback “Your presentation was excellent– and was probably the most popular topic.”
Attendee	Susan Quick, British Woodland Survey workshop in Oxford, 1 Feb 2017
Green Infrastructure & Air Pollution	Rob MacKenzie, invited talk, Forests and Woodlands Advisory Committee West Midlands, Cannock Chase, 22nd February
Entomological research at BIFoR FACE.	Liam Crowley, invited talk, to Wyre Forest advisory group meeting, Wyre Forest Centre, 14 March
Global Environmental Change	Phil Blaen, Rob MacKenzie and Jeremy Pritchard, Royal Geographical Society CPD event, University of Birmingham, 16 March 2017
A Journey Through Deep Time: Plants Rocks and Carbon Dioxide	Rob MacKenzie, Arts and Science Festival event, University of Birmingham, 16 March 2017
The Secrets of Trees	Jeremy Pritchard, Arts and Science Festival event, University of Birmingham, 16 March 2017
Ecohydrology in a changing world	Nicholas Kettridge, invited speaker, Sun Yat-sen University, Guangzhou, Guangdong, China, March 2017
Peatland Ecohydrology	Nicholas Kettridge, invited speaker, Huazhong University of Science and Technology, Wuhan, China, March 2017
Ecohydrology	Nicholas Kettridge, invited speaker, South University of Science and Technology of China, Shenzhen, China, March 2017
Bugs, Bees, Carbon and Trees.	Liam Crowley, invited speaker, British Entomological and Natural History Society AGM, Oxford, March 2017
Air Quality, Trees, and Design	Rob MacKenzie, invited presentation with Jo Gibbons (Landscape Architect), Trees, People & Built Environment III Conference, Birmingham, 5-6 April 2017
Attendee	Sue Quick, CCFG/BES conference Biodiversity effects of ‘irregular’silviculture in native woodland Larmer Tree/ Tollard Royal estate, Dorset, 5-6 April 2017
High-resolution water quality sensors	Phil Blaen, European Geosciences Union General Assembly (EGU) 2017, Vienna, 25 April 2017
Shallow peatland ecohydrology - the control of peat depth on moss productivity	Nicholas Kettridge, EGU, 24th-28nd April 2017, Vienna.
Ecohydrology of the wetland-forestland interface: hydrophobicity in leaf litter and its potential effect on surface evaporation	Nicholas Kettridge, EGU, 24th-28nd April 2017, Vienna.
Spatio-temporal dynamics of evapotranspiration from forested, ephemeral wetlands and its implication	Nicholas Kettridge, EGU, 24th-28nd April 2017, Vienna.

for hydrologic connectivity in the Western Boreal Plain in Alberta, Canada	
Hotsotpots and hot moments; the control of structural heterogeneity on the thermal regime of the peatland soil-atmosphere interface	Nicholas Kettridge, EGU, 24th-28nd April 2017, Vienna.
The committed long-term sink of carbon due to vegetation changes may rival carbon losses due to permafrost thawing	Tom Pugh, poster, EGU, April 2017
Insights into the effects of patchy ice layers on water balance heterogeneity in peatlands	Simon Dixon and Nick Kettridge EGU, 24th-28nd April 2017, Vienna.
The role of forest disturbance in global forest mortality and terrestrial carbon fluxes	Tom Pugh, oral presentation, EGU, April 2017
Hydrological resiliency in the Western Boreal Plains: classification of hydrological responses using wavelet analysis to assess landscape resilience.	Nicholas Kettridge, poster at EGU, 23-28 April, Vienna, Austria. [Poster]
A concept of ephemeral wetlands as water-transmitting landscape units in Canada's Western Boreal Plain	Nick Kettridge, European Geosciences Union General Assembly, 24th-28nd April 2017, Vienna.
Tranquil City and Trees Design and Action Group (TDAG)	Rob MacKenzie, invited seminar with Julie Godfrey and Neil Davidson at Transport for London, 26 April 2017
Attendee and organiser	Sami Ullah, British Society of Soil Science, Midland Association meeting (0.5 day) at Norbury Junction, 24 May 2017
Moss and peat hydraulic properties are optimized to maximise peat water use efficiency, Forests under global change	Nicholas Kettridge, invited speaker, annual workshop of the midlands soil discussion group of the British Society of Soil Sciences. 24 May 2017
Low evapotranspiration enhances peatland resilience to fire	Nicholas Kettridge HydroEco, 18th-23rd May 2017, University of Birmingham.
Attendee	Michael Tausz, AmazonFACE: Impacts of climate change in the Amazon forest workshop 7-8 June 2017
Woodland Waterworlds– Resilience to Climate Change' BIFoR	Sue Quick, poster, HydroEco Conference, 19-22 June 2017
'Drivers of microbial activity,…	Sophie Comer-Warner, oral presentation, HydroEco Conference, 19-22 June 2017
Identifying hydroclimatological controls on storm-event variability…'	Phil Blaen, oral presentation, HydroEco Conference, 19-22 June 2017
BIFoR-FACE	Michael Tausz, Eco-Schools Network, Staffordshire, 29 June 2017
Air Quality	Rob MacKenzie & Zongbo Shi, invited seminar to UoB postgraduates at Westmere House, 7 July 2017
Green Infrastructure for Air Quality improvement (GI4AQ)	Rob MacKenzie, invited presentation at Trees Design Action Group West Midlands, Birmingham, 12 July 2017
Attendee to workshop	UIUC workshop, Illinois, Tom Pugh and Michael Tausz, 16 August 2017

Is winter coming? Insect phenology models	Poster presentation to Midlands Integrated Biosciences Training Programme (MIIBTP) Annual Research Poster session, Jess Gaudy, September 2017
Quantifying the global carbon sink in recovering forest	Tom Pugh, oral presentation, iLEAPS conference, Oxford, Sept. 2017
Insects as drivers of change in woodland systems	Liam Crowley, poster presentation, Royal Entomological Society forest insect special interest group meeting, September 2017
Attendee	Sue Quick Observatree 1 final conference Edinburgh, 14 September 2017
http://ow.ly/lDPL30gGNk7	BIFoR FACE Scientific Community meeting, please see web page link (left) for posters, 14 September 2017
Understanding the future climate using forests	Rob MacKenzie, invited presentation to Birmingham Science City Innovative Low Carbon Working Group, Birmingham, 21 Sept. 2017
BIFoR FACE	Michael Tausz, University School assembly talk, Birmingham, 1 October 2017
Forests, threats to forests and biodiversity	Liam Crowley, Harborne Academy High School, Birmingham, 16 October 2017
A new forest-scale Free-Air carbon Enrichment (FACE) facility at the Birmingham Institute of Forest Research (BIFoR)	Rob MacKenzie, Invited presentation as part of Royal Society Workshop on soil carbon, Chicheley Hall, 12-13 October 2017
Quantifying the global carbon sink in recovering forest	Tom Pugh, oral presentation, LUC4C final meeting and workshop, Brussels, October 2017
Doing More for Less: Low-Cost Sensors in Meteorology	Rick Thomas , University of Birmingham, 19 October 2017
Moss and peat hydraulic properties are optimized to maximise peat water use efficiency	Nicholas Kettridge, invited speaker, University of Leeds, Leeds.November 2017
Is winter coming? – Insect responses to climate change.	Scott Hayward, Invited seminar: Department Biology, University of Rennes 1, 10th November 2017
Attendee	Sue Quick, BES Citizen Science event, 19 November 2017
Working with uncertainties in air quality modelling	Rob MacKenzie, Invited presentation and panel, CIBSE Build2Perform Conference, London Olympia, 22 November 2017.
The BIFoR FACE Facility	Michael Tausz, special seminar on campus open to BIFoR Network, 29 November 2017
Urban Form and Air Quality	Invited presentation, RTPI West Midlands Planning Summit, Birmingham, 30 November 2017
Learning from opportunistic wetland: the role of substrate and landscape position on reconstructed landforms in a sub-humid climate	Nicholas Kettridge, presentation, American Geophysical Union Fall Meeting, New Orleans, December 2017
Threshold Responses in Runoff from Sub-humid Heterogeneous Low Relief Regions	Nicholas Kettridge, American Geophysical Union Fall Meeting, New Orleans, December 2017

Appendix 3: BIFoR stakeholders

The following programme of engagement gives a flavour of our stakeholder engagement in 2017. Without stakeholders, our research will lie unused. We capture our interactions with key stakeholders on a University of Birmingham database, which allows us to keep track in detail of this important part of our mission.

*Edu = Education, Third = Third Sector, Pr = Private, Pu = Public, PER = Public Engagement with Research

Date	Title	Sector*	Location
10 January	Myerscough College, seminar for Bio/GEES "Using plant traits to inform species selection for urban environments"	Edu	Edgbaston Campus
11 January	BIFoR participation in Greenhouse Gas Town Planning meeting	All	Leeds
11 January	Start of a 6 week internship for 2 UoB students	Edu	BIFoR FACE
17 January	Queensbridge High School, Birmingham, BIFoR FACE presentation	Edu	Queensbridge High School
17 January	Brook Cottage Care Home	PER	BIFoR FACE
19 January	Local Tree Consultants (Solopian and Doug Williams)	PER	BIFoR FACE
20 January	Wyre Forest, Senior Reserve Manager	Third	BIFoR FACE
21 January	Earthwatch Institute	Third	BIFoR FACE
24 January	Woodland Heritage visit	Third	BIFoR FACE
27 January	UoB masters students 'Carbon Management' course visit	Edu	BIFoR FACE
21 February	Royal Institute of Chartered Surveyors (RICS), members of the award panel (see Figure 2)	Pr	BIFoR FACE
28 February	UoB students visit (Prof Bill Bloss' research group)	Edu	BIFoR FACE
28 February	Woodland Trust members	Third	BIFoR FACE
28 February	Local farm – Soulton Farm	PER	BIFoR FACE
7 March	UoB Environmental Sciences students visit	Edu	BIFoR FACE
8 March	Understanding the European Greenhouse Gas Budget: Towards supporting COP21 meeting	Pr, Pu, Third	London
9 March	Energy Institute visit	Pr	BIFoR FACE
14 March	National Nature Reserve Advisory Group for the Wyre Forest presentation	Pu	Wyre Forest centre
14-17 March 2017	Arts and Science Festival x 3 events	PER	Edgbaston Campus
16 March	Royal Geographical Society CPD event	Edu	Edgbaston Campus
17 March	New Staff within UoB's School of Geography Earth and Environmental Sciences (GEES)	Edu	BIFoR FACE
20 March	Imperial College London – Colin Prentice and Cesar Terrer	Edu	BIFoR FACE
22 March	Earthwatch	Third	BIFoR FACE
23 March	University of Exeter visit (Nadine Unger)	Edu	BIFoR FACE
23 March	University of Cambridge (Conor Bolas and Valerio Ferracci)	Edu	BIFoR FACE

25 March	Professor Alice Roberts visit	PER	BIFoR FACE
26 March	Harper Adams, students and staff	Edu	BIFoR FACE
29 March	Harper Adams students visit	Edu	BIFoR FACE
30 March	UoB – Joe Wood from Engineering and Physical Sciences	Edu	BIFoR FACE
31 March	Cambridge University visit (Alex Archibald)	Edu	BIFoR FACE
31 March	BBC's Roger Harrabin and film crew	PER	BIFoR FACE
3 April	BIFoR press event	All	BIFoR FACE
3-4 April	Earthwatch	Third	BIFoR FACE
7 April	Imperial College London – undergraduate students	PER	BIFoR FACE
8 April	LmP Technical Services Ltd	Pr	BIFoR FACE
4 May	Earthwatch Institute	Third	BIFoR FACE
11 May	Reuters Press Agency – Matthew Stock	Pr	BIFoR FACE
12 May	Birmingham Professional Information and Networking Seminars (BPINS) Group visit	Edu	BIFoR FACE
22 May	HydroEco conference field trip	Pri Pu	BIFoR FACE
23-24 May	Earthwatch Institute	Third	BIFoR FACE
24 May	Staffordshire Business and Environment Network (SBEN)	Pr Pu	BIFoR FACE
24 May	British Society of Soil Science, Midlands Soil Discussion Group	Pr Pu	BIFoR FACE
25 May	Met Office	Pu	BIFoR FACE
26 May	Picarro seminar to GEES / BIO	Edu	BIFoR FACE
11 June	UoB Community Festival	PER	Edgbaston Campus
15 June	Imperial College London	Edu	BIFoR FACE and Edgbaston Campus
21 June	Launch of the BIFoR FACE Facility	All	BIFoR FACE
21 June	Shrewsbury and Newport Canals Trust members	Third	BIFoR FACE
23 June	Hydroeco conference delegates (up to 10)	Edu	BIFoR FACE
23 -24 June	University of Birmingham undergraduate open day	PER	Edgbaston campus
27 June	Institute of Chartered Foresters visit	Pr Pu Third	BIFoR FACE
27 June	Ian Anderson, Director of Hawkesbury Institute for the Environment	Edu	BIFoR FACE
30 June	University School A level students and Head teacher	Edu	BIFoR FACE
8 July	Diamond Wood celebration event	PER	Norbury
20 July	Invited presentation on London Eye as part of UoB Bringing Birmingham to You, London, Birmingham Alumni event	Pri	London
11 July	Urban Forestry and Woodland Advisory Committee	All	BIFoR FACE
14 July	Natura, Iguatemi Costa	Pr	BIFoR FACE
17 July	Internship University of Brighton Student – 6 week placement	Edu	BIFoR FACE
20-21 July	Earthwatch Institute	Third	BIFoR FACE

20 July	Whitgreave Discussion Group	PER	BIFoR FACE
25 July	West Midlands Forestry and Woodland Advisory Committee	All	BIFoR FACE
28 July	Earthwatch Institute – Trustees	Third	BIFoR FACE
3 August	Keele University – Aleksander Radu	Edu	BIFoR FACE
9 August	Joint Research Council members	Pu	BIFoR FACE
16 August	BBC One Show filming	Pu	BIFoR FACE
17 August	UoB's Academic Registrar, Lee Sanders	Edu	BIFoR FACE
18 August	University of the Third Age	Pu	BIFoR FACE
30 August	Earthwatch Institute	Third	BIFoR FACE
6 September	Forestry Skills Forum meeting	All	BIFoR FACE
9 Sept 7	University of Birmingham undergraduate open day	PER	Edgbaston campus
14 September	BIFoR FACE Science Community National Meeting	All	Edgbaston Campus
16-18 Sept	Welcome Week for UoB students	Edu	Edgbaston Campus
20 September	Epping Forest, City of London	Pu	Epping Forest
20 September	Thermo Fisher	Pr	BIFoR FACE
26 September	Countryside Landowners Association	Pri Pu	BIFoR FACE
3 October	Sir Dominic Cadbury	Pr	BIFoR FACE
6 October	Rivers and Environmental Management MSc students	Edu	BIFoR FACE
10-11 October	Earthwatch	Third	BIFoR FACE
10-12 October	University of Illinois at Urbana-Champaign seminar & visit to BIFoR FACE	Edu	Edgbaston BIFoR FACE
14 October	University of Birmingham undergraduate open day	PER	UoB campus
18 October	Woodland Trust	Third	Edgbaston Campus
24 October	Waseda University (Japan), Prof Jun Matsumoto,	Ed	BIFoR FACE
25 October	Earthwatch staff	Third	BIFoR FACE
1 November	Staffordshire Business and Environment Network	Pr Pu	BIFoR FACE
9 November	Stobart Forestry	Pr	BIFoR FACE
22 November	Rothamsted University	Edu	BIFoR FACE
25 November	Botanical Society of University of Birmingham	Edu	BIFoR FACE
27 November	Forestry Commission, Tim Nisbet seminar		Edgbaston Campus
28 November	ENCOMPASS 'kick-off' meeting	All	Edgbaston Campus
28 November	UoB's Engineering and Physical Sciences, Andy Packham	Edu	BIFoR FACE
29 November	Launch of the Technical Academy	All	BIFoR FACE
19 December	DEFRA Animal and Plant Health Group away day, including prof Nicola Spence, Defra Chief Plant Health Officer.	Pu	BIFoR FACE

Appendix 4: BIFoR Papers

Those directly discussing the BIFoR FACE Facility are marked with an asterisk. Papers from 2014-2016 can be found in our 2016 annual report, available online at **https://www.birmingham.ac.uk/Documents/college-les/gees/bifor/BIFoR-annual-report-2016-Public.pdf**

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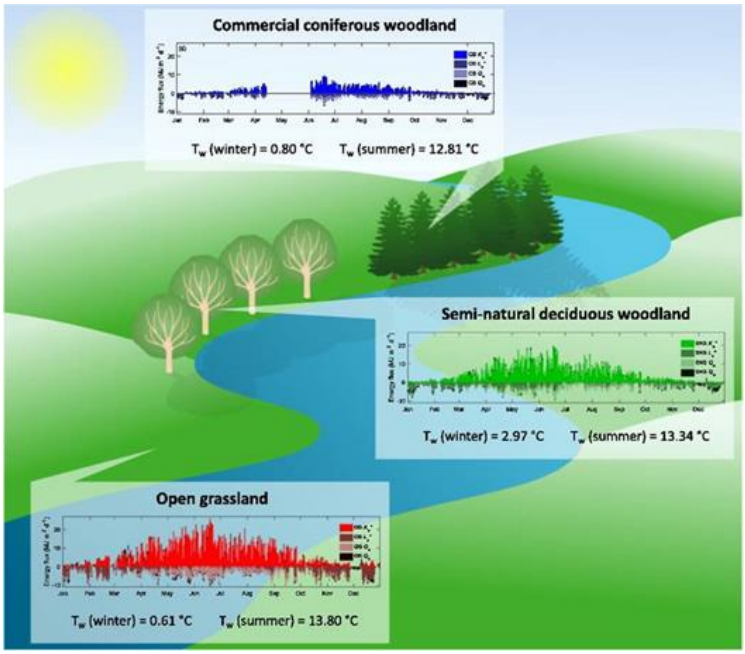

Figure 10 Graphic taken from Dugdale et al (2017)

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- Article Woodland Trust. “Time Travelling Woodland: an Experimental Vision of 2050” by Kate Lewthwaite, 03rd April 2017 (https://www.woodlandtrust.org.uk/blog/2017/04/bifor-face-experiment/)
- Rapid Researcher feature in Old Joe, the University Alumni Magazine with BIFoR, PhD student Clare Ziegler. Clare also won the Westmere Research Poster Conference in June 2017.
- BBC 2 – Fighting for Air http://www.bbc.co.uk/programmes/b09m2djj
- Article in Antenna, a journal of the Royal Entomological Society, Bugs, bees, carbon and trees, page 127
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- Article in The Conversation, July 2017 Using forests to manage carbon: a heated debate http://theconversation.com/using-forests-to-manage-carbon-a-heated-debate-81363

- The following are articles written by Dr Frank Uekötter, op-ed columnist with www.focus.de
    - (The Year in Review: Trump Cancelled the Paris Agreement on 1 June, 2017) available online at https://www.focus.de/politik/experten/focus-online-serie-8-tage-die-die-welt-veraendert-haben-1-juni-2017-der-tag-an-dem-sich-trump-entschied-aus-dem-klimaabkommen-auszutreten_id_8033245.html (online since December 29, 2017).
    - (The Climate Summit in Bonn decides on the future path of global climate policy) available at http://www.focus.de/politik/experten/erstes-treffen-nach-trumps-paukenschlag-bei-bonner-klimagipfel-entscheidet-sich-ob-klimapolitik-unser-vertrauen-noch-verdient_id_7802341.html (online since November 5, 2017).
    - (Fascists loved eucalyptus - the hidden factor behind the forest fires in Portugal) available at http://www.focus.de/politik/experten/gastbeitrag-von-frank-uekoetter-hinter-der-feuerkatastrophe-von-portugal-steckt-auch-die-waldwirtschaft-der-vergangenheit_id_7283109.html (online since June 26, 2017).
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BIFoR related bloggers and pod casts include:

- Dr Louise Hardwick (ecocriticism) https://josephzobel.wordpress.com/ecocriticism-ecocritique/
- Dr Simon Dixon (river management) https://therivermanagementblog.wordpress.com/
- Liam Crowley, www.entocast.com Episode May 2017 Bugs, Bees, Carbon and Trees

Appendix 6: Funding 2017

Title	Principle Investigator	Funder	Call	Awarded
	Stefan Krause	Joint Research Council	Cooperation bid	Jan 2017
Virtual Reality - Augmented reality tour of the BIFoR FACE Facility	Rick Thomas	Internal	Alumni Impact Fund	Feb 2017
Equipment replacement Grant - replace equipment destroyed during storm event	Kris Hart	Internal	Life Environment Sciences College Fund	May 2017
Bringing the Mediterranean to Birmingham: impact and adaptation for 8-12 degrees of warming	Emma Ferranti	Engineering and Physical Sciences Research Council	Environmental Change Challenge Fellowships	June 2017
H2020_ERC_TREEMORT	Tom Pugh	European Research Council	Starter Grant	August 2017
ENCOMPASS: Engaging Communities, Publics and Society	Carl Stevenson	Natural Environment Research Council	Engaging Environments	October 2017
Additional Power Leads for soil flux system	Peter Miles	British Society of Soil Science		November 2017
Workshop held at University of Illinois bringing together experimentalists and modellers to work on improving the representation of CO_2 fertilisation in crop models using information from FACE experiments	Tom Pugh	Internal	UoB-University of Illinois at Urbana-Champaign (UIUC) BRIDGE programme	2017
Doctoral Scholarship scheme - Forest Edge	Rob MacKenzie	Leverhulme Trust	Doctoral Scholarship scheme	December 2017

Figure 11 each mast is 25m high and each array is 30 m in diameter

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Tel: 01785 284 624

*not all sat nav devices have been updated to include this postcode. An alternative is head for Norbury Junction, ST20 0PN: BIFoR FACE is about 200 metres south of the canal junction.