

Bud Burst

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NEWSLETTER OF THE BIRMINGHAM INSTITUTE OF FOREST RESEARCH



Approximately 1,000 metres of pipework carries carbon dioxide (CO₂) throughout the woodland
Photo credit, Andrew Priest Photography www.prophotographers.co.uk

Spring is always an exciting time in deciduous woodlands such as Mill Haft in Staffordshire. With warming temperatures, understory plants strive to make good use of their share of sunlight before the dominant oak trees unfold new leaves. Taking some time to remobilise winter reserves from roots and stems, the more than 150-year-old oaks flush eventually and the canopy closes to become the efficient assimilation machinery that fixes carbon dioxide (CO₂) and channels sun energy into the forest ecosystem for another growing season, driving complex nutrient cycles and food webs, from the large trees to the soil microbes and everything in between including insects, birds, and mammals.

Spring 2017 was even more exciting at Mill Haft, as the BIFoR Free-Air CO₂ Enrichment (FACE) facility was 'switched on' on the 2nd of April, coinciding with bud break of the oak trees. After three years of careful planning, construction and testing - with special thanks to the University of Birmingham's Estates Team and in particular Daniel Holmes - Professor Rob Mackenzie and Operations Manager Dr Kris Hart opened the main CO₂ valve and one of the largest ecosystem experiments worldwide was finally under way. Would it all work? The team's tensions were quickly released, as the facility started operating just as planned. Three

30 metre plots of mature oak forest are now immersed in an atmosphere with elevated CO₂ concentration, topped up from current values of about 400 ppm (parts per million) to 550 ppm, a roughly 38% increase, which the entire globe is likely to see by 2050.

This decade long experiment will provide much needed real world data about the fate of increasing atmospheric CO₂ in forests and effects on all aspects of the ecosystem. Annual crops and young tree plantations can use additional CO₂ to increase growth and yields, but this is not at all clear for mature forest ecosystems, which are characterised by complex nutrient cycles and large carbon buffers in soils and tree biomass, long life cycles and slow responses. Current estimates have forests, especially mature ones, absorb about 30% of the CO₂ added by human activities to the atmosphere. This is an important (and free) contribution of forests to slow climate change, but the capacity of mature forest ecosystems to continue absorbing ever increasing amounts of CO₂ is entirely unknown. Even adverse effects on ecosystem health and resilience are possible with profound consequences for forests as well as the rate of global climate change. Experiments such as BIFoR FACE and its currently two analogues worldwide (in a dry evergreen forest in Australia, and in a tropical rainforest in Brazil) are urgently needed to address such significant knowledge gaps.

Welcome

We are delighted to share that in March 2017 Professor Michael Tausz joined the School of Biosciences as Chair in Forest Ecosystem Sciences, BIFoR Director and academic lead for BIFoR's Free-Air Carbon Dioxide Enrichment (FACE) facility. Professor Tausz arrived ready for the initial "switch on" which you can read more about below. Videos explaining further the importance of this research are available on the BIFoR website.

Funding success

We were delighted to receive a grant of over £5,000 from the University of Birmingham Alumni Impact Fund. The project "Bringing the Forest into the Classroom - A Virtual Reality Tour of the BIFoR FACE experiment" seeks to utilise rapidly developing, low-cost technologies to make an interactive, virtual reality 360° tour of key parts of the BIFoR woodland. 'Hotspots' within each Virtual Reality Tour scene will display photos, videos, information sheets or even live data - to help the user find out about instruments and elements of the FACE infrastructure. The Virtual Reality Tour is intended to allow students and online users to remotely experience, learn and interact with the experimental woodland and will be viewable on phones, tablets, PCs and virtual reality headsets. We'll keep you updated on progress but in the meantime you can see a 360° image of one of the FACE arrays on the home page of our website. A trial run of experiencing the a 360° scene taken from the top of our 40m Flux tower reveals it is not for the faint hearted! We will post on twitter when more scenes are available.

Science at BIFoR FACE

One of the new initiatives taken this spring has been initiated by one of the postgraduates and taken forward enthusiastically by the operational and research team. There is a need to record the emergence of spring phenology, and indeed the progress of autumnal tints and leaf shedding. The significance of phenological changes in respect of climate change have been appreciated for a considerable period of time and records date back at least a hundred years in some areas. In the 1990s the relaunching of a centralised, standardised recording mechanism promoted by the BBC's Springwatch and Autumnwatch and managed by the [Woodland Trust](#) in the form of [Nature's Calendar](#) has been a successful initiative; it is reliant on citizen science recorders throughout the country. BIFoR has decided to use the same criteria (e.g. bud burst for trees, and first sightings of



insects/ birds/ flora) for its own recording this year, even though more detailed phenological records may be developed for future research projects. We feel the use of national data for comparison give our records a decent pedigree and we understand both limitations and advantages of this legacy. Our camera traps help to monitor wildlife at night.



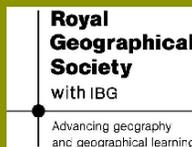
Outreach

On 16 March 2017 at the [Lapworth Museum](#) as part of the Arts and Science Festival, Richard Butler, Rob MacKenzie and Carl Stevenson spoke to a very engaged audience regarding the site of the [BIFoR FACE Facility](#). The Facility is built on Bromsgrove red sandstone. Richard explained what the atmospheric environment was like and what type of flora and fauna existed 240 million years ago, Carl explained the geology of the site in relation to the rest of the UK and how CO₂ levels have changed over time. Finally, Rob talked about the BIFoR FACE experiment and why it is important to find out now how our UK forests will respond to the steep rise in concentrations of CO₂ in the atmosphere.



Education

In March, a Continuing Professional Development event was offered to A level Geography teachers. We worked with the Royal Geographical Society (with the Institute of British Geographers) to deliver this event. The focus of the evening was on water and carbon cycles, landscape systems and global systems and gave teachers ideas for the new element of 'Independent Investigation' in the A Level Geography qualification. We introduced the inter-relationships between CO₂, plants, soil, carbon and water cycles and explained how the BIFoR FACE facility can help us understand these issues. Teachers left with a data stick including resources for each practical topic. These resources will be shared on the RGS-IBG website later in 2017. If you are interested to visit the BIFoR FACE Facility with your students please do get in touch.



Research highlight: BIFoR stream featured

Dr Phil Blaen, a research fellow with BIFoR, was lead author of a paper published in Science of the Total Environment. Data from a high-frequency stream monitoring station installed at the BIFoR FACE experimental research facility helped contribute to this paper which looked at monitoring strategies for our UK rivers. Excessive nutrient concentrations in our UK rivers threaten aquatic ecosystem structure and functioning and can pose substantial risks to human health! The paper summarises that there is call for the development of monitoring systems that can adapt in real-time to rapid changes in environmental conditions. DOI:10.1016/j.scitotenv.2016.06.116



Leadership Fellows

The Trees and Design Action Group (TDAG)

by Dr Emma Ferranti

TDAG brings together individuals and organisations from the public and private sectors to increase awareness of the role of trees and green infrastructure in the built environment. TDAG regularly meets in the Midlands region and recently organised a knowledge exchange event called 'Making Healthy Spaces' with BIFoR and the regional Royal Town Planning Institute at the University of Birmingham. Over 50 practitioners, staff, and students, came along to discuss the importance of including green infrastructure, Natural Capital, and health in the planning process. To find out more visit www.tdag.org.uk

Life of an intern

by Laurence Opie (3rd year Environmental Science BSc at UoB)
I was taken on as an intern at BIFoR for a professional placement module on my course, and worked there one day a week, for ten weeks. Whilst there, I designed and built two hibernacula, artificial habitats for amphibians displaced by the new infrastructure, and generally worked towards preparing the site for the start of the FACE experiment. In shadowing the team, I learnt a lot about what it takes to conduct a large scale scientific project and would highly recommend the experience to any future prospective students.

Coming soon

14 September 2017 10:00-16:00
Second National Community Meeting. A chance for collaborators (current and future) to reflect on the first season of research at BIFoR FACE with elevated CO₂ conditions and to look to the future. Booking essential.

Stay in touch

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