

Bud burst

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NEWSLETTER OF THE BIRMINGHAM INSTITUTE OF FOREST RESEARCH

A wonderful end to the beginning Professor Rob MacKenzie, BIFoR Director



Phase 1 of the BIFoR Free-Air Carbon Dioxide Enrichment (FACE) facility is complete, and it works. The University of Birmingham has joined the global elite of climate experimentation Big Science. [Facility construction](http://ow.ly/Z2gSd) (see <http://ow.ly/Z2gSd>) has been accomplished on schedule and with outstanding care not to damage the precious **Mill Haft** woodland ecosystem. Given that scientific measurements have continued throughout the construction phase (see overleaf), the analogy is not so much to ‘keyhole surgery’ as to keyhole surgery on Wayne Rooney’s cruciate ligament while he continues to play for England.

The data collected so far demonstrate that we can significantly strengthen the scientific power of the facility with another season of pre-fumigation characterisation and a year’s less fumigation. Since we are driven by what our scientific discoveries reveal, that is how we will proceed. Simultaneously, we will use CO₂ fumigation for highly innovative studies of how air moves through and away from woods at night.

Why is this Phase 1? The facility works but infrastructural and scientific challenges remain. Routine canopy access is a challenge begging for an innovative robotic solution; footfall within the experimental patches is already subject to a carefully considered protocol, but needs some clever ‘pavement’ infrastructure.

‘Kitting out’ the facility with scientific instruments never ends; we have provided a minimum set of measurements, but now we want to unleash colleagues’ ingenuity. Now is the time to bring evermore sophisticated equipment to bear on tracking the carbon, water, and other key chemicals through the plant, animal, and microbial dimensions of the ecosystem. Now we can go to the next level to meet the most pressing and demanding requirements of our stakeholders and funding agencies. Much of this research co-creation will intersect with the broader BIFoR research described overleaf and in [previous newsletters](#).

Now is the time to get involved, to invent, to invest.

Every breath (your soil takes)

In BIFoR FACE three circular, 30m diameter areas of woodland will be exposed to elevated levels of carbon dioxide. Where will the extra carbon go? To answer this question requires careful measurement of each part of the carbon budget of the woodland: from the air into the leaf, from the leaf to the stem, down the stem to the roots, and then from the roots to the surrounding soil. Carbon can be stored in the soil (as living roots but also as dead plant fragments) or can be lost back to the air through the respiration of the plants themselves, invertebrates, and especially microbes. Measuring this “soil respiration” is easy in principle, but notoriously hard in practice.

Thanks to another considerable donation from the **John Horseman Trust**, we have been able to purchase state of the art kit to complete these complex measurements.



Using a helicopter for parts of the build protected the woodland soil (see “Every breath”, above).

BIFoR FACE science update

Current measurements at BIFoR-FACE include: climate; exchange of CO₂, momentum, energy and water vapour between the woodland canopy and the air; soil, ground, and [stream water quantity and quality](#); leaf-level gas exchange and photosynthetic efficiency; volatile metabolites that are released into the air; leaf-litter production; woody debris production and loss; partitioned soil respiration (i.e., the production of CO₂ by roots, fungi and decomposer invertebrates); real-time stem width ‘dendrometry’; leaf area index and [canopy greenness index](#); and fine root growth; 80 soil samples, analysed for nutrients, soil texture and pH, show Mill Haft is a low nutrient forest, similar to other mature temperate forests in the UK and elsewhere. Habitat classification shows that Mill Haft is representative of similar W10 oak woodlands. Mill Haft developed in a way typical of UK oak woodland: carbon isotopes in tree rings correlate closely with summer [Central England Temperature](#) and oxygen isotopes correlate with [England and Wales Precipitation](#). **Dr Francis Pope** is leading preparation of the first science paper reporting these results.



Stakeholders have their say about BIFoR FACE

Alistair Yeomans of [Sylva Foundation](#): *'BIFoR's FACE facility is vital to advance forest science, as it focuses on the physical parameters that constitute good woodland condition. This will contribute to our understanding of how to achieve thriving, resilient woodlands. This is a forester's ultimate goal, so I really look forward to the research outputs'*



Dougal Driver of ['Grown in Britain'](#) tweeted *"Brilliant to see @GrowninBritain partner @BIFoRUoB #climate #research build take shape in Staffordshire wood. http://ow.ly/Z2gSd"*

Research highlight: BIFoR Paper 13



By Quartl (Own work) [CC BY-SA 3.0], via Wikimedia Commons

Dr **Scott Hayward** and colleagues published in *Global Change Biology* a paper studying how macro- and microclimatic interactions can drive variation in species' habitat associations.

The study looks at how habitat associations of the speckled wood butterfly, *Pararge aegeria*, in the UK have changed over time in line with variation in specific aspects of climate (temperature and moisture availability). These changing patterns in habitat association reflect the butterfly's response to local climate ('microclimatic') differences in its favoured (woodland) habitat versus more open habitats.

Pateman, R. M., Thomas, C. D., [Hayward, S. A. L.](#) and Hill, J. K. (2015) doi:10.1111/gcb.13056

Association of Science Education (ASE) Conference 2016

In January both Jenny Shepherd (Public Health) and Dr Jerry Pritchard (Biosciences) delivered presentations at the [ASE](#). Each introduced the audience to BIFoR and in particular BIFoR FACE. Jenny spoke about future research that could look further into the link between forests and well-being. Jerry captivated the audience by explaining the impact that raised CO₂ levels might have on plants. One audience member said, "plants are officially awesome!" after listening to the lecture.



Leadership Fellows

Weather and Climate

Dr Emma Ferranti has joined our team of Interdisciplinary Research Fellows. Emma is a NERC Knowledge Exchange Fellow working on a range of infrastructure/climate projects with Birmingham City Council and other project partners. Emma has already been a tremendous asset to BIFoR helping to encourage undergraduate students to become involved.

Water

Dr Stefan Krause has successfully secured funding for *HydEOMEx*: a project demonstrating the potential of real-time hydrological situation monitoring and early warning.

History and Ecocriticism

Congratulations to our Leadership Fellows **Dr Louise Hardwick** and **Dr Frank Uekötter** who will both present talks at the [University of Birmingham Arts and Science Festival](#) 14th –20th March 2016.

'In the trees' update!

In our last newsletter we shared research comparing data from human tree climbers and great apes to gain insight into how the bipedal locomotion and cognition of our ancestors evolved. Dr Susannah Thorpe has since been honoured with the award of [Royal Society Leverhulme Trust](#) Senior Research Fellowship to pursue her research. She will study human indigenous climbers in Malaysia, that routinely climb in the forest canopy to access honey. She will study UK professional tree climbers too including our team at BIFoR



The Leverhulme Trust



Coming soon

30th April to 2 May 2016

[Norbury Canal Festival](#)

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