



Last leaf fall

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NEWSLETTER OF THE BIRMINGHAM INSTITUTE OF FOREST RESEARCH



Image: John Caulfield, Michael Crampton, Gareth Thomas and Marine Cambon performing "log surgery." Image credit Jozsef Vuts

A downward spiral: insects, microbes & Acute Oak Decline by James McDonald and Marine Cambon

Acute Oak Decline (AOD), is a complex disease affecting native oak trees that involves many biotic and abiotic factors. AOD incidence and severity has increased over the last 10 years, however the cause of this increase in disease is still very poorly understood. Trees with AOD can develop bleeding wounds (a tell-tale sign of AOD infection) that are caused by the growth of three primary bacterial pathogens, and the larvae of the bark-boring beetle, *Agrius biguttatus*. While identifying the disease causing agents was an important first step, we are left with many questions, for example; What factors make a tree susceptible to these pathogens? And do the bacteria and beetle work together to exacerbate disease once it sets hold in a tree? A previous study from our group showed that one of the bacterial

pathogens, *Brenneria goodwinii*, becomes more virulent when trees are infected with the beetle larvae. To take the further we observed and categorised the chemical signals that the beetle produces when grown in oak wood and tested their impact on the bacteria. This work showed that several chemical compounds produced by the *Agrius* larvae do positively impact the pathogens growth and pathogenicity. This work is important because it is the first evidence that bacteria can receive chemical signals from insects, and it supports the conclusion that the beetle and bacteria are working together to cause disease. It leads to several new exciting areas of research looking at the evolution of cross kingdom interactions and tree disease.

Future research

Adriane Esquivel Muelbert will be co-investigator for a new NERC-NSF funded project to improve the understanding on the drivers and causes of death of large tropical trees linking between landscape and regional scales. "This research is vital as we are facing an emergency situation" says Adriane in the Nature News Article 'When will the Amazon hit a tipping point?'



The Ecological Continuity Trust (ECT) continues its generous support to BIFoR with new grants given this year to researchers to prepare samples to send to the Sanger Institute's BIOSCAN project looking at flying insect biodiversity.



Welcome

Dr Liling Chang, Assistant Professor, responses of terrestrial ecosystems to climate change, elevated atmospheric CO₂ and disturbance events.

Dr Alice Gauthey, Royal Society Research Fellow, long-term acclimation to eCO₂.

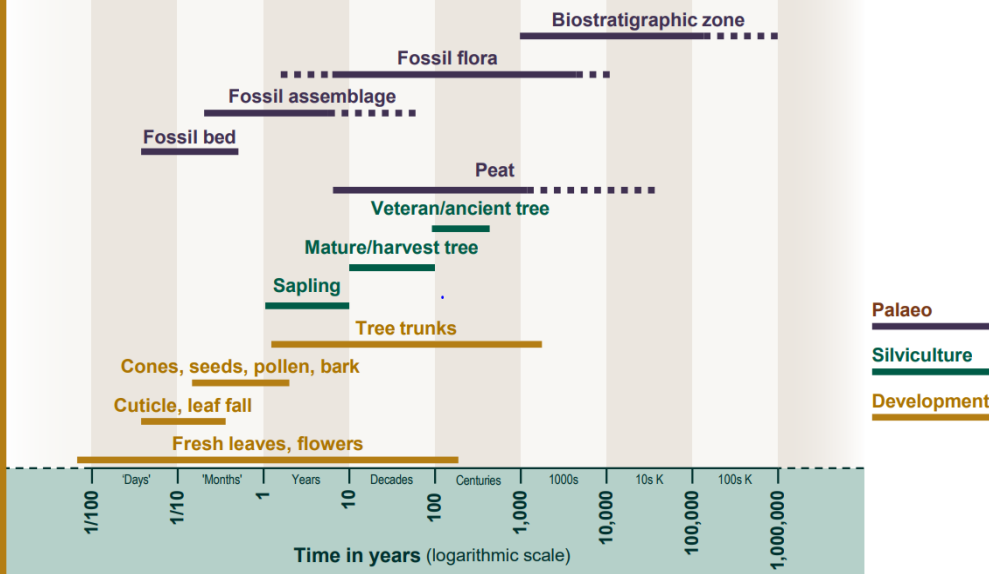
Dr Anna Gardner, Early-career Researcher at BIFoR FACE.

Dr Joe He, postdoctoral research with MEMBRA project.

Dr Anne Kairu, Newton International Fellow.

We say goodbye to; Dr Giulio Curioni (BIFoR Data Manager & Analyst); Dr Johanna Pihlblad (postdoc).

The time domain



Tree Time Domain graphic produced for the annual meeting

The theme of our conference in July was ‘Trees in Time.’ The posters and recordings of many of the talks are still available on our [website](#). Our next annual meeting will be 3 and 4 July 2024 and our theme is ‘Communities.’

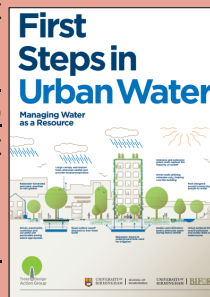
The 10–12 April 2024 brings to campus also the inaugural [International Conference of Three Societies on Literature and Science](#). BIFoR will of course be involved, with Prof **John Holmes** at the helm. Delegates are offered a visit to the BIFoR FACE facility or the [Ruskin Land](#) forest site on the 13 April.

BIFoR Education

We have just launched, ‘[Future Forests](#)’, a set of resources to help secondary schools mark COP28 and amplify student voice around climate change. A series of curriculum linked lessons encourage pupils to work together to create a ‘solution tree’ that can be added to our digital woodland before being developed into a ‘solution pitch’ to form a message for COP28 and beyond.

New ‘First Steps’ Guide

Dr **Emma Ferranti** has supported the publication of another practical and important resource along with the [Trees Design and Action Group \(TDAG\)](#). The latest in the ‘First steps’ series focusses on [First Steps in Urban Water](#).



Congratulations

Dr **Kris Hart** (BIFoR FACE Operations Manager) won the **Papin Prize** award for **Contribution to Infrastructure** at the Higher Education Technician Summit. University of Birmingham Professional Awards went to **Thomas Downes** (Apprentice of the Year) and **Deanne Brettle** and **Sam Dobbie** for the ‘[BIFoR in a Box](#)’ STEM resources.

Doctoral research

Joining us this year are; **Rachel Calder** (fungal communities), **Zachary Chu** (biodiversity dynamics), **Naya Desai** (quantifying ecosystem services from urban trees), **Shomari Healey** (ecosystem demography modeling), **Teddy Hunter** (), **Rachel Mailes** (forest diversity & carbon); **Sophie Powell** (eCO₂ microbial diversity), **Andrea Vellido Dieguez** (bacterial cherry canker). The BIFoR talent pipeline in the forestry / forest sciences continues; we congratulate Drs **Sijeh Asuk**, **Dion Dobrzynski**, **Kerryn Little**, **Sophie Mills** & **Bridget Warren**.

Creative BIFoR

A new temporary exhibition by artist **Ben Wigley** has launched at the University’s Lapworth Museum. **Hart of the Wood (Ways of the Plant)** is a bold new multidisciplinary art and film project. Entry is free.

Research Highlight: Elevated CO₂ alters photo-synthesis, growth & susceptibility to powdery mildew

By **Rosa Sanchez Lucas, Carolina Mayoral, Estrella Luna Diez & Mark Raw**

We report the effects of elevated atmospheric CO₂ on plant growth, photosynthesis and defence in oak seedlings. We provide evidence that elevated CO₂ (eCO₂) enhances growth and photosynthesis which could be seen as a good thing for the survival of oak seedlings. However, we also observed that eCO₂ enhances susceptibility to the biotrophic fungi causing powdery mildew (PM) disease. Thankfully, we have identified a defence elicitor that enhances resistance to this disease and this is not affected to eCO₂. Nevertheless, considering that oak trees are keystone trees of our European forests and that their regeneration is threatened by the high susceptibility of oak seedlings to this disease, our results warrant further investigations on the risks of climate change associated with enhanced levels of atmospheric CO₂.

<https://doi.org/10.1042/BCJ20230002>



Brilliant BIFoR volunteers logged over 1,000 hours in 2022/23!

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