

■ Meet-a-Member

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Which places did you work at before? For example, where did you do your PhD, postdoc(s) and so on I completed my PhD at the University of Exeter, UK on the primary production and photosynthesis of the common reed *Phragmites australis* (Fig. 5.1). I measured above and below ground biomass, leaf photosynthesis, light and temperature profiles and modelled canopy photosynthesis. I was then appointed as a Research Officer in the Biology Section of the Central Electricity Research Laboratories, Leatherhead, UK specifically to develop and build outdoor systems for studies of air pollutants (SO₂ and O₃) on crops and forests (with no enclosure or chamber). These later evolved globally for studies of elevated CO₂ effects into the widely-used FACE systems. This work is reported in Special Issues: *Agriculture Ecosystems & Environment* (1991) **33**(3) and *Plant, Cell & Environment* (1995) **18**(3). Outdoor experiments led me to conclude that indirect biotic and abiotic interactions with pollutants were as important, or even more important, than direct physiological effects on plant growth.

Why did you choose to work on plant UV-effects? I remember being intrigued by a conference poster on UV effects by Alan Teramura which also appealed to my use of outdoor experiments (see Fig.). In 1992 I moved to the Institute of Terrestrial Ecology (ITE) at Monks Wood, UK. When I was asked for comments on who might be suitable for studies of UV impacts of ozone depletion on ecosystems I suggested that I would like to be involved. This

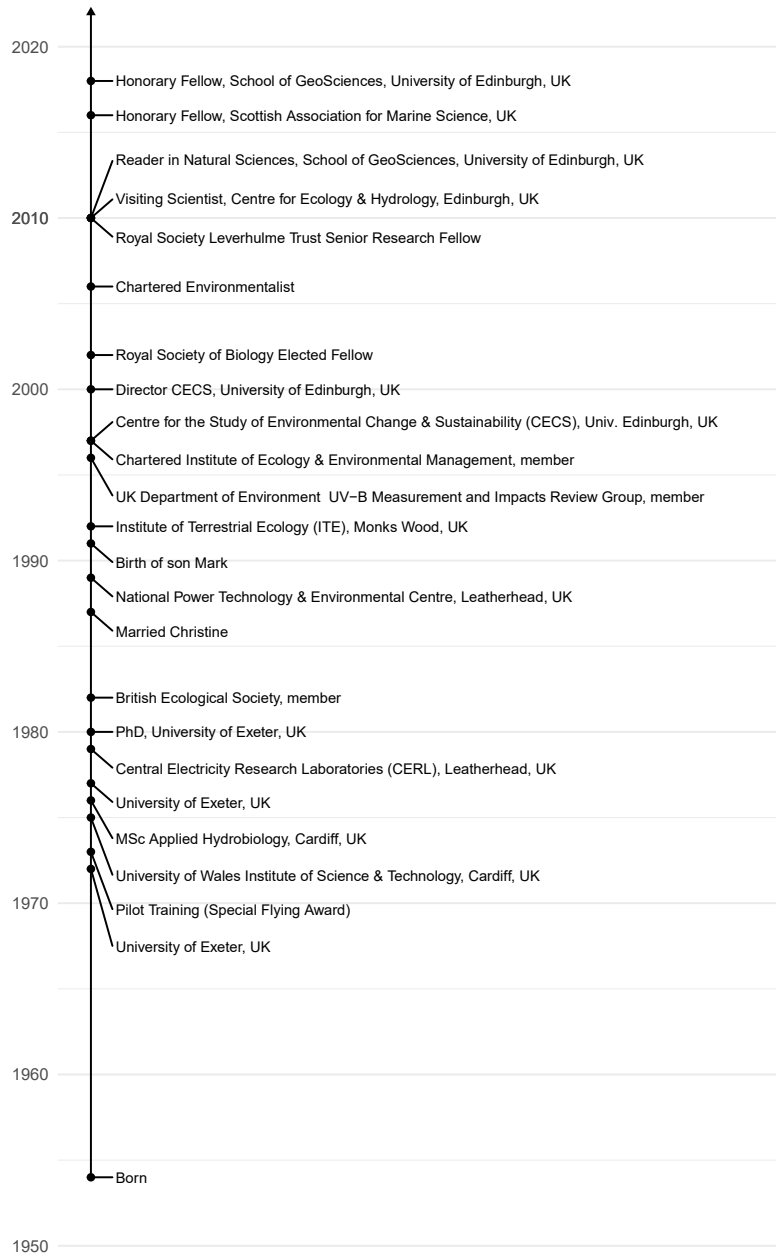


Figure 5.1: Time line showing important events in Andy R. McLeod's career.

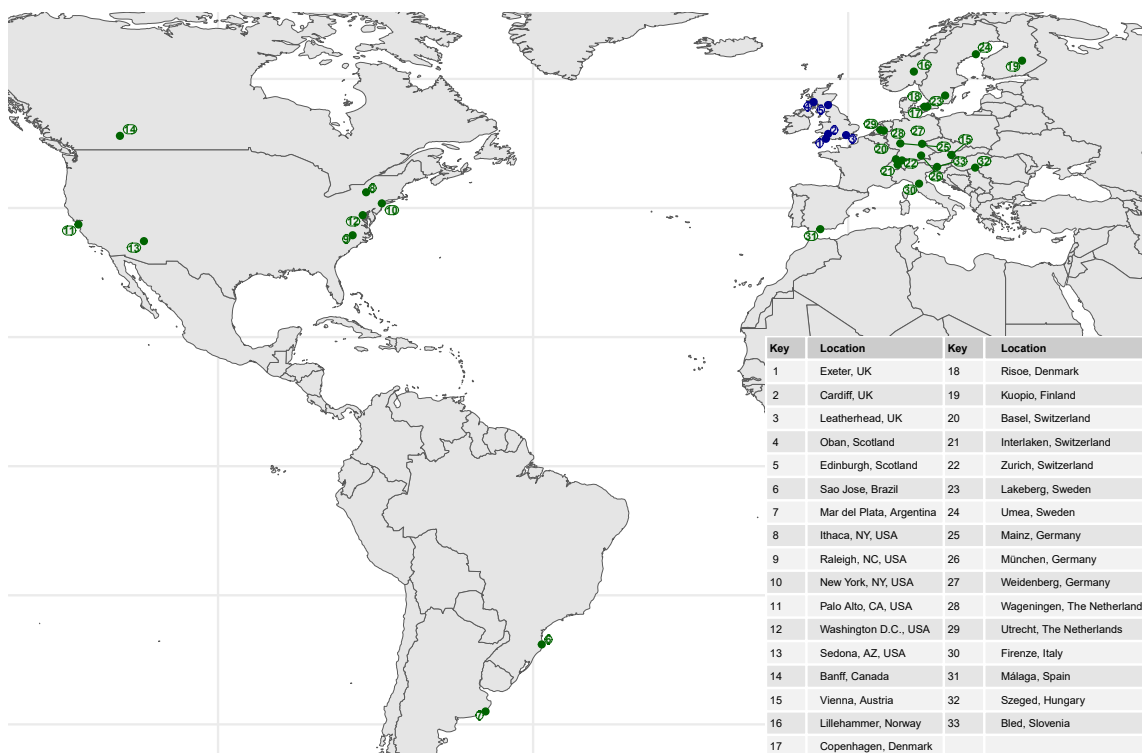


Figure 5.2: Important places in Andy McLeod’s career. In blue sites of study and employment, in green scientific visits and presentations outside U.K.

enabled me to visit the UV facilities used by Alan and Joe Sullivan at the University of Maryland, USA and I also received much advice from Martyn Caldwell and Charles Ashurst. I remain exceedingly grateful for their advice and assistance. This enabled me to construct an outdoor modulated UV lamp system and use this to evaluate effects on plants and led to my ongoing interest.

What is your research-specialisation? I was trained as an ecologist, hydrobiologist and plant ecophysiologicalist and my research has addressed several fields of study. After working on air pollution effects for 13 years, my UV research specialised in using modulated outdoor lamp supplementation systems, and in collaboration with many colleagues, addressing the many aspects of physiology and ecology that influence plant responses, particularly biotic and abiotic interactions.

Most recently I have focussed on mechanisms for photochemical emissions



Figure 5.3: Andy McLeod using a range of filtered gas bags to measure photochemical production of dissolved gases in seawater at the ocean surface during the longest day of 2018.

from freshwater and marine sources using lab exposure systems and sunlight on the ocean surface to measure gas production in seawater (see Fig. 5.3). However, aquatic work was a new area and I have learned much from experienced colleagues in the Association and the wider community. I continue to co-supervise a project on the role of UV in macular degeneration in the human eye in which knowledge from UV studies on plants has proved very valuable to the medical team.

Of which UV-related accomplishment are you most proud, and why? In 2006 I was intrigued by a Letter to Nature which suggested that emissions from plants by an unknown mechanism might contribute up to 30% of atmospheric methane. I thought that UV might be involved and, in collaboration with many colleagues, I investigated whether UV irradiation of pectin in plant cell walls resulted in formation of methane (*New Phytologist* (2008) **180**, 124–132) and the mechanisms involved (*Plant, Cell & Environment* (2009) **32**, 1–9). We then scaled emissions globally using modelled UV levels and leaf area index (*New Phytologist* (2010) **187**, 417–425) and measured emissions from many species (*Plant, Cell & Environment* (2015) **38**, 980–989). The global scaling suggested that UV-driven leaf emissions contributed < 1% of global at-

atmospheric methane emissions, much smaller than the original 30% reported. The paper was selected for inclusion in a [Special Online Issue of *New Phytologist* that commemorates Sir Arthur Tansley](#) who introduced the ecosystem concept into biological studies.

Can you tell a funny story relating to your work on UV-effects? After a PhD viva on UV effects on plant organic matter, the examiners, including me, hatched a plan (whilst drinking wine) to test whether UV could explain methane on Mars by UV-driven emissions from the organic matter in meteorites. Yes really! And we hadn't had that much wine. We had no dedicated finance but each person could contribute in some way (including access to a meteorite sample). I was to provide a 1000 W xenon arc lamp (the one in Fig 2.8 of the *Beyond the Visible* handbook) and get it to Utrecht, in The Netherlands. I took three hours to fill it with polystyrene granules in an enormous rucksack before boarding a ferry from the UK to Amsterdam on foot. Unusually, the customs officer asked to search my rucksack but opened my briefcase first. He examined all my papers on UV effects on plants, smiled and just waved me on. Six months later returning by car I was directed into a shed for a full car search by sniffer dogs. Fortunately, I had my Health & Safety documents and gave the customs officer gauntlets and a face visor (as xenon bulbs can explode). He listened to my story about methane on Mars, grinned and waved me on without a search. So, there are many good reasons to prepare your Health & Safety documents on UV hazards. The experiments were eventually published in *Nature* (2012) **486**, 93–96, so plant ecologists really can contribute to planetary science.

Have you got any hints, tips or other advice to share? Never be surprised by the range of biotic and abiotic interactions with UV exposure outdoors that can influence your results.

And, a few technical points to avoid uncontrolled exposures in an outdoor supplementation system that tracks sunlight.

1. As well switching lamps on/off by software control near sunrise/sunset, also use a separate timer on the lamp power supply to turn off during hours of defined darkness (and adjust times weekly through the season).
2. Add a separate electronic circuit that also turns off the power to lamps if it is not pulsed regularly by the modulation control software (to ensure the software hasn't stalled).
3. Use an uninterruptable power supply to avoid problems during short power failures.

These features enable you to avoid uncontrolled and possibly unmeasured exposures due to control systems stopping caused by software glitches and

electricity voltage fluctuations or failure. It is especially important in long-term experiments over several years.

What made you join UV4Plants? This was a logical decision even after formal retirement in order to maintain contact with friends and colleagues and to develop my knowledge, aid writing up past work and hopefully some future research activity.

How would you like UV4Plants to develop in the future? I think it is important to maintain international knowledge and capabilities in many science fields and the Association has a clear role in relation to UV effects on plants. Thus, the transfer of experience to younger scientists has particular value. I would like to see a continuation and development of Training Workshops in conjunction with conferences and perhaps hold some joint meetings or sessions with other relevant societies. The experience of UV studies on plants also has considerable value in other related disciplines where UV effects in the field are often still not fully appreciated or ignored in ecological field studies.

Who would you like to appear in a future “Meet-a-Member”? Patrick Neale

Editorial-board-reviewed article.
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