

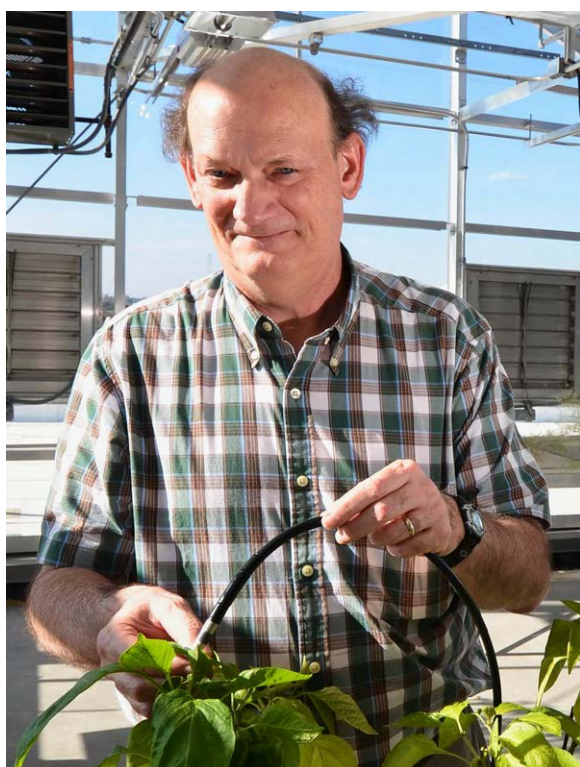
■ Meet-a-Member:

Paul W. Barnes

Marcel A. K. Jansen, ORCID: [0000-0003-2014-5859](https://orcid.org/0000-0003-2014-5859)

School of Biological, Earth and Environmental Sciences, University College Cork, Ireland

DOI: [10.19232/uv4pb.2019.1.21](https://doi.org/10.19232/uv4pb.2019.1.21) © 2019 The Author, licensed under (CC BY-SA 3.0)



Paul W. Barnes, Professor and J.H. Mullahy Endowed Chair in Environmental Biology.

ORCID: [000-0002-5715-3679](https://orcid.org/000-0002-5715-3679)

Department of Biological Sciences and Environment Program, Loyola University New Orleans, New Orleans, Louisiana, USA

<mailto:pwbarnes@loyno.edu>

Why did you choose to work on plant UV-effects? As a budding ecologist, I had little to no knowledge or interest in the effects of UV radiation on plants. In fact, my primary research interest (both as an undergraduate and then a graduate student) was understand-

ing the ecological significance of variation in photosynthetic pathways (i.e., C3 vs. C4) in North American native prairie grasses. My first exposure to plant UV-effects research came as a postdoctoral researcher in Martyn Caldwell's lab at Utah State University. This research was aimed at understanding the effects of enhanced UV-B on plant competition and the work eventually led to modelling light capture in multi-species canopies and exploring photomorphogenic effects of UV-B on plant morphology. All of this was happening in the mid-1980's before the discovery of the UV-B photoreceptor UVR8, and there was little recognition that UV-B could elicit non-damaging effects in plants. This research also had a sense of urgency as the Antarctic 'ozone-hole' had just been discovered and there was heightened concern over the potential ecological consequences of stratospheric ozone depletion. As a result of this experience, I came to enjoy conducting research that addressed intriguing fundamental questions about how plants respond to changes in their UV environment but which also had practical implications.

What is your research-specialisation? I am a plant physiological ecologist by training with interests in environmental UV photobiology, plant and ecosystem responses to global environmental change, mechanisms of plant-plant interactions, plant carbon, water and light relations, and grassland and savanna ecology. Presently, my research is fo-

cussed on addressing the following:

1. Understanding acclimation responses of plants to fluctuating UV conditions with particular interest in the mechanisms and physiological significance of rapid adjustments in UV sunscreen protection (e.g., flavonoids and related phenolics) in plants. This research is mostly conducted on cultivated plants using several species as model systems.
2. Further elucidating the role of UV radiation in driving the decomposition of leaf litter. This is largely field research that has been conducted in warm deserts where photodegradation has emerged as a potentially important driver of decomposition. Recent studies, however, have expanded to study photodegradation in coastal wetlands.
3. Determining the nature and ecological significance of positive (facilitation) and negative (competition) interactions between plants in grasslands and savannas. The overarching goal of this research is to better understand the causes and consequences of woody plant encroachment into dryland ecosystems, which is a world-wide phenomenon.

Of which UV-related accomplishment are you most proud, and why? My research has involved many students and collaborators over the years, so my accomplishments really reflect the collective contributions and support of these associates. Having said this, I think my proudest accomplishment is the discovery that plants can adjust their UV-shielding within a matter of minutes in response to changes in solar radiation. While others had alluded to this possibility, our research clearly demonstrated that this was a widespread phenomenon among higher plants and that it involved rapid changes in phenolic chemistry within leaves. We have yet to fully understand the functional signifi-



Figure 6.1: Paul W. Barnes as a Ph.D. student measuring stomatal conductance of prairie grasses in the Nebraska Sandhills.

cance of these changes, but I believe this research has changed how we view plant acclimation to UV radiation, particularly with respect to the time-scale in which plants can respond to rapid changes in UV radiation in their environment. I am also quite proud of the work I have done as a member of the UNEP Environmental Effects Assessment Panel, which, in support of Montreal Protocol, prepares scientific assessments on the environmental effects of ozone depletion and interactions with climate change.

Can you tell a funny story relating to your work on UV-effects? Soon after I obtained a UV-A PAM, I began conducting field research in Hawaii. In my travels, I would always take this instrument with me on the airplane and as I passed through airport security there were invariably questions about what it was that I had in my possession. In one instance I was traveling with the UV-A PAM to New Zealand. As I moved through Customs in Auckland, one of the agents stopped me and, in a very serious tone, requested that I open the case for inspection. As he was looking inside the case he asked me what this device was. Not knowing what level of scientific expertise he possessed, I said something very general like “It’s a scientific

instrument". For most security agents this was usually sufficient. In this instance, however, the young fellow persisted and wanted more detailed information. "What does it actually measure?" he asked. I told him it measured plant pigments—again a fairly general description. He pressed on and asked "What kind of pigments?" I couldn't tell if he was actually interested in knowing the answer or if he wasn't sure I was being truthful. So, I decided to be very specific in my next answer. I said "It measures UV screening pigments in leaves, non-invasively using chlorophyll fluorescence." He paused, then smiled, and said "Oh how interesting. I used a Walz mini-PAM to measure chlorophyll fluorescence on plants in my fourth-year research project for my diploma." So, with the tension eased, we both had a good chuckle and talked a bit about my research, his research and how he ended up as a Customs Agent and not a scientist as others behind me waited rather impatiently to file through Customs.

Have you got any hints, tips or other advice to share? I think it is prudent to be rather sceptical of findings that report large (and often detrimental) effects of UV radiation on plants. From my experience, I have come to appreciate that many plant responses to solar UV (especially UV-B) under realistic field conditions are subtle and difficult to detect. Thus, to avoid spurious results and conclusions, I think it is essential to pay attention to proper experimental design (e.g., high and independent replication), careful measurement of UV radiation, and accepted protocols and procedures for manipulating UV radiation, whether that involves UV filters or UV-emitting lamps. Having said this, be open to surprises and unanticipated findings in your research. In my own case, we discovered diurnal changes in UV-shielding because we just happened to be measuring plants at different times of day (e.g., dawn vs. midday). We assumed that time of day



Figure 6.2: Paul W. Barnes taking measurements with a UVA-PAM in the greenhouse at Loyola University New Orleans.

wouldn't matter for these measurements. Initially we thought the differences we observed were due to errors in measurement or instrument calibration. It took some time to convince ourselves that these changes were real, but we could have easily dismissed these results as "noise" in our data.

What made you join UV4Plants? I was invited to serve as an external evaluator for the COST Action UV4Growth program in 2014. I attended the final COST meeting in Bled, Slovenia that year, gave a presentation and have been a member ever since. I have to say it has been a most enjoyable and rewarding experience and I am most thankful to the managing members of UV4Growth/UV4Plants for the opportunity to be associated with this organization.

How would you like UV4Plants to develop in the future? I would like UV4Plants to grow in numbers and become more international in representation. I feel like this association has a lot to offer students and re-

searchers around the world and can provide the critical support, collegiality and networking to maintain a strong and vibrant community for those interested in plant-UV science. I would also like to see the UV4Plants community initiate additional multi-investigator projects that cut across sub-disciplines (e.g., molecular to ecological) and/or conduct coordinated research projects at multiple field sites around the globe.

Who would you like to appear in a future “Meet-a-Member”? Pedro Aphalo

Editorial-board-reviewed article.

Published on-line on 2020-01-13.

Edited by: Pedro J. Aphalo.