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About

Daniel joined the University of Birmingham in 2013 as a Birmingham Fellow. His research centres on investigating how plants sense and respond to their environment, with a particular focus on the role that targeted protein degradation plays during plant growth, development and stress response.

Qualifications

- 2004 - BSc Biological Sciences (Genetics), University of Birmingham
- 2005 – MSc Applied Genetics, University of Birmingham
- 2009 – PhD Plant molecular biology, University of Birmingham

Biography

After completing his undergraduate and master's studies at the University of Birmingham, Daniel stayed on to complete a PhD with Dr. Juliet Coates, where he investigated the proteolytic control of key regulators of root branching in *Arabidopsis*. In 2009 he moved to the lab of Prof. Michael Holdsworth at the University of Nottingham, where he studied the role of the N-end rule pathway of protein degradation during plant development. This work led to the discovery of the importance of this pathway for the perception of oxygen in plants. In 2012 he was awarded and independent Nottingham Advanced Research Fellowship to develop his research independence, and in October 2013 he returned to the University of Birmingham to establish his own research group.

Research

Research in Dr Gibbs' lab utilises molecular, genetic and biochemical approaches to investigate how plants use targeted protein degradation as a mechanism for sensing and responding to diverse developmental and environmental signals. The general aim of our work is to increase our understanding of how plants develop and respond to the environment, and to identify promising targets that can be manipulated in agriculturally important crops to improve growth, productivity and stress tolerance.

Proteins are major functional components of cells, and the regulation of their turnover is essential for controlling cellular responses and developmental outputs. In plants, targeted proteolysis has important roles in sensing and coordinating responses to internal developmental cues (e.g. phytohormones, such as auxin) and environmental signals (e.g. oxygen availability). The "N-end rule pathway" is an ancient and highly evolutionarily conserved proteolytic system that targets proteins for destruction based on the nature of their N-terminus (the beginning of the protein). We recently identified the first targets of this pathway in the plant kingdom, and showed that they mediate plant perception and response to low oxygen stress (hypoxia), a situation that frequently occurs during floods (Gibbs *et al*. 2011 *Nature*). This is the first example of a direct molecular mechanism for oxygen sensing in plants, and represents a major breakthrough for the future development of flood-tolerant crops, a key focus for food security. More recently, this same pathway has been shown to mediate perception and transduction of nitric oxide (NO), an important developmental signaling molecule in plants (Gibbs *et al*., 2014 *Molecular Cell*). This highlights the importance of N-end rule-mediated protein degradation in plants, and our ongoing studies suggest that the N-end rule plays a key role in a wide range of other developmental and physiological processes.

Current research is focused on characterizing novel 'branches' and protein substrates of the N-end rule pathway in *Arabidopsis*, with a particular focus on linking the control of protein stability to agriculturally important developmental processes and abiotic stress responses. Furthermore, our studies aim to provide insight into the evolution of signal transduction mechanisms in multicellular organisms.

Other activities

- Member of the International Society of Plant Anaerobiosis (ISPA)
- Recipient of the 2013 ISPA "Outstanding Scientist" award, presented at the 11th international ISPA conference, held at the International Rice Research Institute (IRRI), Philippines.

Publications

Please see Dr. Gibbs' **lab website (https://sites.google.com/site/danielgibbslab/)** and **Google Scholar profile (http://scholar.google.co.uk/citations?user=4rqp6V8AAAAJ&hl=en)**

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Gibbs DJ and Coates JC (2014) **AtMYB93 is an endodermis-specific transcriptional regulator of lateral root development in *Arabidopsis* (https://www.landesbioscience.com/journals/psb/article/29808/)** . ***Plant Signalling and Behaviour***. DOI:10.4161/psb.29808

Gibbs DJ*, Bacardit J, Bachmair A, Holdsworth MJ* (2014) **The eukaryotic N-end rule pathway: conserved mechanisms and diverse functions (http://www.cell.com/trends/cell-biology/abstract/S0962-8924(14)00075-0)** . ***Trends in Cell Biology***. http://dx.doi.org/10.1016/j.tcb.2014.05.001. ***co-corresponding author**

Gibbs DJ, Isa NM, Movahedi M, Lozano-Juste J, Mendiondo GM, Berckhan S, Marín-de la Rosa N, Vicente Conde J, Sousa Correia C, Pearce, SP, Bassel GW, Hamali B, Talloji P, Tomé DFA, Coego A, Beynon J, Alabadí D, Bachmair A, León J, Gray JE, Theodoulou FL, Holdsworth MJ (2014) **Nitric oxide sensing in plants is mediated by proteolytic control of Group VII ERF transcription factors (http://www.cell.com/molecular-cell/abstract/S1097-2765(13)00930-1)** . ***Molecular Cell***, 10.1016/j.molcel.2013.12.020

- See: **press release (http://www.nottingham.ac.uk/news/pressreleases/2014/january/sniffed-out-the-gas-detectors-of-the-plant-world.aspx)** ;**Science Signalling editor's choice (http://stke.sciencemag.org/cgi/content/abstract/sigtrans;7/312/ec44)** ; **F1000 recommendation (http://f1000.com/prime/718251941)**

Gibbs DJ, Voss U, Harding SA, Fannon J, Moody LA, Yamada E, Swarup K, Nibau C, Bassel GW, Choudhary A, Lavenus J, Bradshaw SJ, Stekel DJ, Bennett MJ, Coates JC (2014) **AtMYB93 is a novel negative regulator of lateral root development in Arabidopsis (http://onlinelibrary.wiley.com/doi/10.1111/nph.12879/abstract)** . ***New Phytologist***. DOI: 10.1111/nph.12879.

- See: **BBSRC press release (http://www.bbsrc.ac.uk/news/food-security/2014/140606-pr-root-growth-boost-crop-performance.aspx)**

Bassel GW, Stamm P, Mosca G, Barbier de Reuille P, **Gibbs DJ**, Winter RM, Janka A, Holdsworth MJ, Smith RS (2014)**Mechanical constraints imposed by 3D cellular geometry and arrangement modulate growth patterns in the Arabidopsis embryo (http://www.pnas.org/content/early/2014/05/23/1404616111.abstract?sid=b50b5117-6970-4a2c-bd6a-d35464d50f31)** . ***Proc Natl Acad Sci USA***. doi: 10.1073/pnas.1404616111

Bailey-Serres J, Fukao T, **Gibbs DJ**, Holdsworth MJ, Lee SC, Licausi F, Perata P, Voesenek LA, van Dongen JT (2012) **Making sense of low oxygen sensing. (http://www.ncbi.nlm.nih.gov/pubmed/22280796)** ***Trends Plant Sci.***17(3):129-38

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- See: **press release (http://www.bbsrc.ac.uk/news/food-security/2011/111024-pr-flood-tolerant-crops.aspx)** ; **Nature reviews Molecular cell biology highlight (http://www.nature.com/nrm/journal/v12/n12/full/nrm3235.html)** ; **Science signalling highlight (http://stke.sciencemag.org/cgi/content/abstract/sigtrans;4/200/ec323)** ; **F1000 rating (http://f1000.com/prime/13470970)**

Bassel GW, Lan H, Glaab E, **Gibbs DJ**, Gerjets T, Krasnogor N, Bonner AJ, Holdsworth MJ, Provart NJ (2011) **Genome-wide network model capturing seed germination reveals coordinated regulation of plant cellular phase transitions. (http://www.ncbi.nlm.nih.gov/pubmed/21593420)** ***Proc Natl Acad Sci U S A***. 108(23):9709-14

- See: **press release (http://www.sciencedaily.com/releases/2011/05/110518121032.htm)**

Nibau C, **Gibbs DJ**, Bunting KA, Moody LA, Smiles EJ, Tubby JA, Bradshaw SJ, Coates JC (2011) **ARABIDILLO proteins have a novel and conserved domain structure important for the regulation of their stability. (http://www.ncbi.nlm.nih.gov/pubmed/21052782)** ***Plant Mol Biol.*** 75(1-2):77-92.

Nibau C*, **Gibbs DJ***, Coates JC (2008) **Branching out in new directions: the control of root architecture by lateral root formation. (http://www.ncbi.nlm.nih.gov/pubmed/18452506)** ***New Phytol.*** 179(3):595-614. *Joint first author.