

**Curriculum vitae
Anne M Borland**

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Employment History:

2011 – Joint faculty appointment, ORNL/Newcastle University
2003-present Reader in Molecular Plant Physiology, School of Biology, Newcastle University
2004-present Director, Moorbank Botanic Garden, Newcastle University
1998-2002 Lecturer, Dept. Agricultural and Environmental Sciences, Newcastle University
1995-98 Research Associate, Dept. Agricultural and Environmental Sciences, Newcastle University
1995 Visiting Lecturer, University Sunderland
1990-94 NERC Postdoctoral Fellow, Dept. Agricultural and Environmental Sciences, Newcastle University
1987-90 Research Associate, Dept Biology, Newcastle University
1986-87 Research Associate, Dept Biology, Lancaster University

Education:

Glasgow University, BSc (Hons) Botany 1982
University College North Wales PhD 1986

Research interests:

Crassulacean acid metabolism: ecophysiology, biochemistry and molecular biology
Evolution of photosynthetic diversity: anatomical constraints and molecular mechanisms
Control of plant metabolism by the circadian clock
Plant responses at physiological, biochemical and molecular levels to abiotic stresses that include gaseous air pollutants, heavy metals, drought and salinity
Plant physiological attributes influencing nectar and pollen composition.

External Appointments

Board of Editors Global Change Biology-Bioenergy
Board of Editors Annals Applied Biology (2001-2005)
NERC Peer Review College (2003-2007)
Society Experimental Biology Education and Public Affairs Committee
European Vice Chair 2005 Gordon Research Conference 'CO₂ assimilation in plants'
European Chair 2008 Gordon Research Conference 'CO₂ assimilation in plants'
Chief External Examiner, Hartpury College, University of West of England

Collaborators and other affiliations

1. Current Collaborators:

University Reno, Nevada, USA: Prof J Cushman; Liverpool University, UK: Dr James Hartwell;
Oxford University, UK: Prof Andrew Smith; Cambridge University, UK: Prof Howard Griffiths;
University East Anglia, UK: Dr Nikolai Pedentchocuk; Essex University, UK: Dr Tracey Lawson;
University Leuven, Belgium: Dr Johan Ceusters; Royal Botanic Gardens, KEW, UK: Dr Ilia Leitch; Forschungszentrum Juelich Germany, Dr Achim Walter

2. Graduate Advisors and Postdoctoral Sponsors.

Ph.D. advisor, Prof. John Farrar, University College North Wales.

Postdoctoral advisors, Prof. Terry Mansfield, Lancaster University, Prof Peter Lea, Lancaster University, Prof Howard Griffiths, Newcastle University

3. PhD Advisor (18 PhD students).

Andrew Roberts, Newcastle University (NU); Antony Dodd (NU); Stewart Elliott (NU); Jane Delahunty (NU); Sajjad Haider (NU); Simon Fraser (NU); Richard French (NU); Katherine Shorrocks (NU); Edna Antony (NU); Eleni Goumenaki (NU); Beata Pater (Polish Academy); Nikos Tzortzakis (NU); Andrea Barrera (NU); Phatanawan Prominin (NU); Aayush Sharma (NU); Phil Renforth (NU); Thana Khan (NU); Dalal al-Baijan (NU).

4. Postdoctoral Advisor (7 scholars): Tahar Taybi, (NU), UK; Johan Ceusters, University of Leuven, Belgium and NU; Shaniyar Bayramov, Azerbaijan Academy of Science; Ewa Niewiadomska, Polish Academy of Sciences; Thorsten Grams, Technical University Darmstadt; Simon Peacock, NU; Eileen Power, NU.

University Teaching

Plant Biology 1 (module leader)

Plant Biology 2

Plant Biology 3 (module leader)

Biodiversity and Conservation

Educational Outreach Activities

Lead investigator for Open Air Laboratories –NE, an England-wide initiative to promote public understanding of environmental quality by ‘hands-on’ monitoring of biological indicator species.

Plant Masterclasses

Science art and writing (Leverhulme funded project)

PUBLICATIONS

Haider, MS, Barnes JD, Cushman JC, **Borland AM**. 2012. A CAM- and starch-deficient mutant of the facultative CAM species *Mesembryanthemum crystallinum* reconciles sink demands by repartitioning carbon during acclimation to salinity. *Journal of Experimental Botany* 63, 1985-1996.

Yang X, Li T, Weston D, Karve A, Labbe JL, Gunter LE, Sukumar P, **Borland A**, Chen J-G, Wullschlegel SD, Tschaplinski TJ, Tuskan GA (2011) Innovative biological solutions to challenges in sustainable biofuels production. *In* MADS Bernardes, ed, Biofuel Production-Recent Developments and Prospects. Intech, Rijeka, pp 375-414

Borland AM, Barerra-Zambrano, VA, Ceusters J, Shorrocks K. 2011. The photosynthetic plasticity of crassulacean acid metabolism: an evolutionary innovation for sustainable productivity in a changing world. *New Phytologist* 191, 619-633.

Tzortzakis N, Taybi T, Roberts R, Singleton I, **Borland A**, Barnes JD. 2011. Low-level atmospheric ozone exposure induces 1 protection against *Botrytis2 cinerea* with down regulation of ethylene-, jasmonate- and pathogenesis 3 related genes in tomato fruit. *Postharvest Biology and Technology*, 61, 152-59.

Ceusters J, **Borland AM**, Godts C, Londers E, Croonenborgs S, Van Goethem D, De Proft MP. (2010). Crassulacean acid metabolism under severe light limitation: a matter of plasticity in the shadows? *Journal of Experimental Botany* 62: 283-291.

Goumenaki E, Taybi T, **Borland AM**, Barnes J (2010) Mechanisms underlying the impacts of ozone on photosynthetic performance. *Environmental and Experimental Botany* 69, 259-266.

- Ceusters J, **Borland AM** (2010) Impacts of elevated CO₂ on the growth and physiology of plants with crassulacean acid metabolism. *Progress in Botany* 72, 163-181.
- Ceusters J, **Borland AM**, Ceusters N, Verdoodt V, Godts C, De Proft MP (2010) Seasonal influences on carbohydrate metabolism in the CAM bromeliad *Aechmea* 'Maya': consequences for carbohydrate partitioning and growth. *Annals of Botany* 105, 301-309
- Ceusters J, **Borland AM**, Londers E, Verdoodt V, Godts C, De Proft MP (2009). Differential usage of storage carbohydrates in the CAM bromeliad *Aechmea* 'Maya' during acclimation to drought and recovery from dehydration. *Physiologia Plantarum*, 135, 174-184
- Ceusters J, **Borland AM**, De Proft MP (2009) Drought adaptation in plants with crassulacean acid metabolism involves the flexible use of different storage carbohydrate pools. *Plant Signalling and Behaviour* 4, 212-214
- Borland AM**, Griffiths H, Hartwell J, Smith JAC (2009) Exploiting the potential of plants with crassulacean acid metabolism for bioenergy production on marginal lands. *Journal of Experimental Botany*, 60, 2879-2896
- Antony E, Taybi T, Courbot M, Mugford S, Smith JAC, **Borland AM** (2008) Cloning, localisation and expression analysis of vacuolar sugar transporters in the CAM plant *Ananas comosus* (pineapple). *Journal of Experimental Botany*, 59, 1895-1908.
- Cushman JC, Agarie S, Albion RL, Elliott S, Taybi T, **Borland AM** (2008) Isolation and characterisation of mutants of common ice plant deficient in Crassulacean acid metabolism. *Plant Physiology* 147, 228-238.
- Antony E, **Borland AM** (2008) The role and regulation of sugar transporters in plants with Crassulacean acid metabolism. *Progress in Botany*, 70 127-143
- Ceusters J, **Borland AM**, Londers E, Verdoodt V, Godts C, De Proft MP (2008) Diel shifts in carboxylation pathway and metabolite dynamics in the CAM bromeliad *Aechmea* 'Maya' in response to elevated CO₂. *Annals of Botany*, 102, 389-397
- Niewiadomska E, **Borland AM** (2007) Crassulacean acid metabolism: a cause or consequence of oxidative stress *in planta*? *Progress in Botany*, 69, 247-266.
- Tzortzakis N, **Borland A**, Singleton I, Barnes JD (2007) Impact of atmospheric ozone-enrichment on quality-related attributes of tomato fruit. *Postharvest Biology and Technology*, in press
- Borland AM**, Elliott S, Patterson S, Pater B, Taybi T, Cushman J, Barnes JD (2006) Are the metabolic components of Crassulacean acid metabolism up-regulated in response to an increase in oxidative burden? *Journal of Experimental Botany*, 57, 319-328.
- Hale ML, **Borland AM**, Wolff K (2005) High degree of conservation of nuclear microsatellite loci in the genus *Clusia*. *Genome*, 48, 946-950.
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- Taybi T, Nimmo HG, **Borland AM** (2004) Expression of phosphoenolpyruvate carboxylase (PEPC) and PEPC-kinase genes: implications for genotypic capacity and phenotypic plasticity in expression of Crassulacean acid metabolism. *Plant Physiology*, 135: 587-598
- Borland AM**, Taybi T (2004) Synchronization of metabolic processes in plants with Crassulacean acid metabolism. *Journal of Experimental Botany*, 55: 1255-1265.
- Haslam R, **Borland AM**, Maxwell K, Griffiths H (2003) Physiological responses of the CAM epiphyte *Tillandsia usneoides* L. (Bromeliaceae) to variations in light and water supply. *Journal of Plant Physiology*, 160, 627-634
- Kafi M, Stewart WS, **Borland AM** (2003) Carbohydrate and proline contents in leaves, roots, and apices of salt-tolerant and salt-sensitive wheat cultivars. *Russian Journal of Plant Physiology* 50, 155-162

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- Taybi T, **Borland AM**, Nimmo HG (2002) Differential crassulacean acid metabolism expression in four *Clusia* species: implications for PEP carboxylase kinase genes. *Comparative Biochemistry and Physiology*, **132A**, 122
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- Maxwell K, **Borland AM**, Haslam RP, Helliker BR, Roberts A, Griffiths, H (1999) Modulation of ribulose-1,5-bisphosphate carboxylase activity during the diurnal phases of the crassulacean acid metabolism plant *Kalanchoe daigremontiana*. *Plant Physiology*, **121**, 849-856
- Gillon JS, **Borland AM**, Harwood KG, Roberts A, Broadmeadow MSJ and Griffiths H (1998). Carbon isotope discrimination in terrestrial plants: carboxylations and decarboxylations. In:

Stable Isotopes and the Integration of Biological, Ecological and Geochemical Processes
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- Roberts A, **Borland AM**, Griffiths H (1997). Discrimination processes and shifts in carboxylation during the phases of crassulacean acid metabolism. *Plant Physiology*, **113**, 1283-1292.
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- Borland AM** (1996). A model for the partitioning of photosynthetically fixed carbon during the C₃-CAM transition in *Sedum telephium* L. *New Phytologist* **134**, 433-444.
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- Borland AM** (1994). Regulation of carboxylation patterns in C₃-CAM intermediates in response to drought: evidence from measurements of short-term changes in carbon isotope discrimination and implications for leaf carbon balance. *Journal of Experimental Botany* **45**, 45.
- Borland AM**, Griffiths H, Broadmeadow MSJ, Fordham MC, Maxwell C (1993). Short-term changes in carbon isotope discrimination in the C₃-CAM intermediate *Clusia minor* L. growing in Trinidad. *Oecologia* **95**, 444-453.

- Borland AM**, Griffiths, H (1992). Properties of phosphoenol-pyruvate carboxylase and carbohydrate accumulation in the C₃-CAM intermediate *Sedum telephium* L. grown under different light and watering regimes. *Journal of Experimental Botany* **43**, 353-361.
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- Borland AM**, Lea PJ (1991). The response of enzymes of nitrogen and sulphur metabolism in barley to pollution by low doses of sulphur dioxide. *Agriculture, Ecosystems and Environment* **33**, 281-292.
- Borland AM**, Griffiths H (1990). The regulation of CAM and respiratory recycling by water supply and light regime in the C₃-CAM intermediate *Sedum telephium*. *Functional Ecology* **4**, 33-39.
- Griffiths H, Broadmeadow MSJ, **Borland AM**, Hetherington CS (1990). Short-term changes in carbon-isotope discrimination identify transitions between C₃ and C₄ carboxylation during crassulacean acid metabolism. *Planta* **181**, 604-610.
- Borland AM**, Farrar JF (1989). The partitioning of photosynthetically fixed carbon in the leaf blade and leaf sheath of *Poa pratensis* L. *Journal of Experimental Botany* **220**, 1247-1254.
- Borland AM**, Griffiths H (1989). The regulation of citric acid accumulation and carbon recycling during CAM in *Ananas comosus*. *Journal of Experimental Botany* **210**, 53-60.
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- Borland AM**, Farrar JF (1988). Compartmentation and fluxes of carbon in leaf blades and leaf sheaths of *Poa annua* L and *Poa x jemtlandica* (Almq.) Richt. *Plant, Cell and Environment* **11**, 535-543.
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