



eXtra Botany

Virtual Issue Editorial

JXB at SEB Florence 2018

SEB Annual Meetings cover a diverse range of plant, animal and cell biology, and that diversity extends within each section – as scientists we are all specialists, but we all deeply value the wider connections between disciplines that are a vital part of the organization. That range and ethos is echoed in the plant science published in *Journal of Experimental Botany (JXB)* every month, and this year we have put together a virtual issue of the journal both to celebrate our approach and increase awareness of how the content is developing.

The articles selected follow the plant session at the SEB meeting and also include those from the preceding satellite meeting, ‘Advances in Plant Reproduction – from Gametes to Seeds’. A number of papers in the issue cover fascinating aspects of pollination and reproductive investment, including the effects of temperature on pollination in faba bean (*Vicia faba*), which produces a move from selfing to outcrossing in this significant crop (Bishop *et al.*, 2017; Stoddard, 2017), and the mechanism by which wheat flowers open when self-pollination fails, facilitating cross-pollination (Dixon *et al.*, 2017; Okada *et al.*, 2017). These findings are important in understanding fundamental mechanisms and moreover are directly relevant for breeders, and in both cases their wider importance is highlighted and further explored in the accompanying Insight articles by other research scientists. Insights in the eXtra Botany section, a part of our journal since 2016 (Raines, 2016), provide readers with accessible information beyond their specialism and highlight links between disciplines – as with the diverse sessions at the SEB meetings.

Continuing the theme of plant reproduction, Staedler *et al.* (2017) used a new approach with computed tomography-based tools to examine reproductive investment in orchids. The high-resolution 3D imaging of flowers with almost no specimen destruction was used to count the pollen grains and ovules at two different scales in ‘deceptive’ and ‘rewarding’ species. This is interesting not just in the specific situation, understanding the balance between species types and their effects on pollinators, but also in the much wider value of the methodology in counting high-contrast objects within tissues, an aspect covered further by Legland *et al.* (2017). Related reviews in the issue cover the complex biomechanics of seed germination (Steinbrecher and Leubner-Metzger, 2017) and parthenocarpy, i.e. fruit set without fertilization (Joldersma and Liu, 2018; see also the Flowering Newsletter and Blog at floweringhighlights.org).

Moving to broad topics in the SEB meeting, these include the genome/genomics and environmental impacts on epigenetic memory (see Rodriguez-Granados *et al.*, 2016; Shen *et al.*, 2016; Nakamura and Hennig, 2017; Wang and Köhler, 2017; Yolcu *et al.*, 2018); the shaping of root architecture (Amtmann and Shahzad, 2017; Walch-Liu *et al.*, 2017; Du and Scheres, 2018); morphogenesis in non-flowering plants (Peguero-Pina *et al.*, 2017; Veromann-Jürgenson *et al.*, 2017; Thelander *et al.*, 2018); the impact of climate change on forests (Dusenge and Way, 2017; Slot and Way, 2017); general plant temperature responses (Hu *et al.*, 2017); enhancing photosynthesis with CO₂-concentrating mechanisms (Beardall and Raven, 2017; Ji *et al.*, 2017; Rae *et al.*, 2017); and, finally, plant biotechnology for human health and nutrition (Moses and Goossens, 2017; Poon *et al.*, 2018).

The link with societal issues has always been important in *JXB*, and the work by Poon *et al.* on cyclotides is yet another example of this close connection. It was demonstrated that introduction of a specific asparaginyl endopeptidase gene greatly improves the production of cyclic peptides in a range of plants, including *Nicotiana benthamiana*, as well as crops such as bush bean (*Phaseolus vulgaris*), lettuce and canola. As noted by the authors, cyclotides hold great potential, both as key active molecules themselves and, through their exceptional stability, as facilitators.

Interpreting the science

Interweaving with regular issues of the journal, our special issues provide a focus on topical areas, and these are led by authoritative Special Issue Editorials, often written by guest editors who have also been involved in organizing the scientific programmes for related conferences. These provide essential context about the overall area of research and act as a useful point of reference for each collection. But increasingly we have encouraged writers to go further than this, taking a view on the state of the field, wider implications and new directions, much as one would take away from participation in the sessions at meetings. In this issue, again linking with major sessions at the SEB meeting, such editorials cover seed development, maturation and germination (Penfield, 2017), the plant hormones auxin (Weijers *et al.*, 2018) and jasmonate (Zhu and Napier, 2017), and plant senescence (Woo *et al.*, 2018). All plant biology links with global environmental issues, but research in *JXB* often makes this connection directly, including in the editorials by Griffiths *et al.* (2017), which advances new

evolutionary ideas in the area of carbon concentrating mechanisms in aquatic photosynthesis, and [Considine et al. \(2017\)](#), which sets out the need for crop improvement programmes to re-focus on legumes in coming years, addressing the challenge of food security and climate change ([Considine et al., 2017](#)).

Prestigious Darwin reviews in *JXB* have provided readers with in-depth accounts of diverse subjects for many years, and those selected for this issue provide coverage ranging from the origins of multicellularity ([Niklas et al., 2018](#)) to trace metal metabolism ([Andresen et al., 2018](#)), seed germination ([Steinbrecher and Leubner-Metzger, 2017](#)) to control of leaf angle ([Mantilla-Perez and Fernandez, 2017](#)) and leaf hydraulic decline during dehydration ([Scoffoni and Sack, 2017](#)). Sweeping through these is the link between an understanding of basic plant function and effective breeding programmes for a rising population, and the review by [Xu et al. \(2017\)](#) on the enhancement of genetic gain, i.e. the increase in performance that can be achieved each year, provides an outstanding, detailed analysis.

Experimental approaches

[Stutz et al. \(2017\)](#) used a ^{13}C -labelling technique to examine the complexity of xylem-originating CO_2 and its effect on measured leaf respiration in trees. The dilemma, so important in understanding carbon allocation and cycling, is further highlighted and explained by [Gessler \(2017\)](#). Such rigorous experimental analysis – with significant implications for our understanding – is another characteristic of the *JXB* approach. The Viewpoint by [Dietz \(2017\)](#) similarly tackles previous experimental limitations, with the focus here on ensuring that subcellular localization is properly considered in investigating the metabolome. Such thought-provoking, short articles in the eXtra Botany section of the journal are welcome and also provide the opportunity to tackle controversial areas (e.g. [Blum, 2016](#); [Maron et al., 2016](#); [Shabala, 2017](#)).

Community support

We are proud of the link between the SEB and *JXB* (it is fully owned by the society), and the cross-disciplinary approach to science exemplified by the SEB Annual Meeting and the journal is clear from the themes and articles explored here. The journal is also pleased to be able to provide direct sponsorship for the satellite meeting ‘Advances in Plant Reproduction – from Gametes to Seeds’ and the session covering morphogenesis in non-flowering plants.

High-impact science and excellent quality metrics, underpinned by an outstanding editorial board, will always be critical for *JXB*. But as a community-led journal other aspects including free open access publication for corresponding authors of subscribing institutions, any reasonable format for initial submission, free data archiving with Dryad Digital Repository (up to 20 GB) and full integration with the BioRxiv preprint server are also given a very high priority. This year publication on acceptance has been a popular new addition ensuring that papers are available at the earliest possible opportunity. We

also undertake the highest standards of quality assessment, with friendly and supportive staff making the publication process as efficient as possible.

As always, comments are very welcome – just email the editorial office at j.exp.bot@lancaster.ac.uk with any feedback and/or questions.

Keywords: Climate change, CO_2 -concentrating mechanisms, epigenetics, morphogenesis, plant biotechnology, plant reproduction, plant temperature responses, root architecture.

Christine Raines¹ and Jonathan Ingram²

¹ Editor in Chief, *Journal of Experimental Botany*
Department of Biological Sciences, University of Essex,
Colchester, CO4 3SQ, UK

² Senior Commissioning Editor/ Science Writer, *Journal of Experimental Botany*

Bailrigg House, Lancaster University, Lancaster, LA1 4YE, UK
Correspondence: rainc@essex.ac.uk or j.ingram@lancaster.ac.uk

References

- Amtmann A, Shahzad Z.** 2017. To respond or not to respond? Natural variation of root architectural responses to nutrient signal. *Journal of Experimental Botany* **68**, 2636–2640.
- Andresen E, Peiter E, Küpper H.** 2018. Trace metal metabolism in plants. *Journal of Experimental Botany* **69**, 909–954.
- Beardall J, Raven JA.** 2017. Cyanobacteria vs green algae: which group has the edge? *Journal of Experimental Botany* **68**, 3697–3699.
- Bishop J, Jones HE, O’Sullivan DM, Potts SG.** 2017. Elevated temperature drives a shift from selfing to outcrossing in the insect-pollinated legume, faba bean (*Vicia faba*). *Journal of Experimental Botany* **68**, 2055–2063.
- Blum A.** 2016. Stress, strain, signaling, and adaptation—not just a matter of definition. *Journal of Experimental Botany* **67**, 562–565.
- Considine MJ, Siddique KHM, Foyer CH.** 2017. Nature’s pulse power: legumes, food security and climate change. *Journal of Experimental Botany* **68**, 1815–1818.
- Dietz K-J.** 2017. Subcellular metabolomics: the choice of method depends on the aim of the study. *Journal of Experimental Botany* **68**, 21–22.
- Dixon LE, Bencivenga S, Boden SA.** 2018. A new opening for wheat seed production. *Journal of Experimental Botany* **69**, 341–343.
- Du Y, Scheres B.** 2018. Lateral root formation and the multiple roles of auxin. *Journal of Experimental Botany* **69**, 155–167.
- Dusenge ME, Way DA.** 2017. Warming puts the squeeze on photosynthesis – lessons from tropical trees. *Journal of Experimental Botany* **68**, 2073–2077.
- Gessler A.** 2017. Where does it come from, where does it go? The role of the xylem for plant CO_2 efflux. *Journal of Experimental Botany* **68**, 2633–2636.
- Griffiths H, Meyer MT, Rickaby REM.** 2017. Overcoming adversity through diversity: aquatic carbon concentrating mechanisms. *Journal of Experimental Botany* **68**, 3689–3695.
- Hu Y, Jiang Y, Han X, Wang H, Pan J, Yu D.** 2017. Jasmonate regulates leaf senescence and tolerance to cold stress: crosstalk with other phytohormones. *Journal of Experimental Botany* **68**, 1361–1369.
- Ji X, Verspagen JMH, Stomp M, Huisman J.** 2017. Competition between cyanobacteria and green algae at low versus elevated CO_2 : who will win, and why? *Journal of Experimental Botany* **68**, 3815–3828.
- Joldersma D, Liu Z.** 2018. The making of virgin fruit: the molecular and genetic basis of parthenocarpy. *Journal of Experimental Botany* **69**, 955–962.

- Legland D, Devaux MF, Guillon F.** 2018. Quantitative imaging of plants: multi-scale data for better plant anatomy. *Journal of Experimental Botany* **69**, 343–347.
- Mantilla-Perez MB, Salas Fernandez MG.** 2017. Differential manipulation of leaf angle throughout the canopy: current status and prospects. *Journal of Experimental Botany* **68**, 5699–5717.
- Maron LG, Piñeros MA, Kochian LV, McCouch SR.** 2016. Redefining ‘stress resistance genes’, and why it matters. *Journal of Experimental Botany* **67**, 5588–5591.
- Moses T, Goossens A.** 2017. Plants for human health: greening biotechnology and synthetic biology. *Journal of Experimental Botany* **68**, 4009–4011.
- Nakamura M, Hennig L.** 2017. Inheritance of vernalization memory at FLOWERING LOCUS C during plant regeneration. *Journal of Experimental Botany* **68**, 2813–2819.
- Niklas KJ, Dunker AK, Yruela I.** 2018. The evolutionary origins of cell type diversification and the role of intrinsically disordered proteins. *Journal of Experimental Botany* **69**, 1437–1446.
- Okada T, Jayasinghe JEARM, Nansamba M, Baes M, Warner P, Kouidri A, Correia D, Nguyen V, Whitford R, Baumann U.** 2018. Unfertilized ovary pushes wheat flower open for cross-pollination. *Journal of Experimental Botany* **69**, 399–412.
- Peguero-Pina JJ, Sancho-Knapik D, Gil-Pelegrín E.** 2017. Ancient cell structural traits and photosynthesis in today’s environment. *Journal of Experimental Botany* **68**, 1389–1392.
- Penfield S.** 2017. Seed biology - from lab to field. *Journal of Experimental Botany* **68**, 761–763.
- Poon S, Harris KS, Jackson MA, McCorkelle OC, Gilding EK, Durek T, van der Weerden NL, Craik DJ, Anderson MA.** 2018. Co-expression of a cyclizing asparaginyl endopeptidase enables efficient production of cyclic peptides *in planta*. *Journal of Experimental Botany* **69**, 633–641.
- Rae BD, Long BM, Förster B, Nguyen ND, Velanis CN, Atkinson N, Hee WY, Mukherjee B, Price GD, McCormick AJ.** 2017. Progress and challenges of engineering a biophysical CO₂-concentrating mechanism into higher plants. *Journal of Experimental Botany* **68**, 3717–3737.
- Rodriguez-Granados NY, Ramirez-Prado JS, Veluchamy A, Latrasse D, Raynaud C, Crespi M, Ariel F, Benhamed M.** 2016. Put your 3D glasses on: plant chromatin is on show. *Journal of Experimental Botany* **67**, 3205–3221.
- Scoffoni C, Sack L, Ort D.** 2017. The causes and consequences of leaf hydraulic decline with dehydration. *Journal of Experimental Botany* **68**, 4479–4496.
- Shabala S.** 2017. Signalling by potassium: another second messenger to add to the list? *Journal of Experimental Botany* **68**, 4003–4007.
- Shen Y, Issakidis-Bourguet E, Zhou DX.** 2016. Perspectives on the interactions between metabolism, redox, and epigenetics in plants. *Journal of Experimental Botany* **67**, 5291–5300.
- Slot M, Winter K.** 2017. Photosynthetic acclimation to warming in tropical forest tree seedlings. *Journal of Experimental Botany* **68**, 2275–2284.
- Staedler YM, Kreisberger T, Manafzadeh S, Chartier M, Handschuh S, Pamperl S, Sontag S, Paun O, Schönenberger J.** 2018. Novel computed tomography-based tools reliably quantify plant reproductive investment. *Journal of Experimental Botany* **69**, 525–535.
- Steinbrecher T, Leubner-Metzger G.** 2017. The biomechanics of seed germination. *Journal of Experimental Botany* **68**, 765–783.
- Stoddard FL.** 2017. Climate change can affect crop pollination in unexpected ways. *Journal of Experimental Botany* **68**, 1819–1821.
- Stutz SS, Anderson J, Zulick R, Hanson DT.** 2017. Inside out: efflux of carbon dioxide from leaves represents more than leaf metabolism. *Journal of Experimental Botany* **68**, 2849–2857.
- Thelander M, Landberg K, Sundberg E.** 2018. Auxin-mediated developmental control in the moss *Physcomitrella patens*. *Journal of Experimental Botany* **69**, 277–290.
- Veromann-Jürgenson LL, Tosens T, Laanisto L, Niinemets Ü.** 2017. Extremely thick cell walls and low mesophyll conductance: welcome to the world of ancient living! *Journal of Experimental Botany* **68**, 1639–1653.
- Walch-Liu P, Meyer RC, Altmann T, Forde BG.** 2017. QTL analysis of the developmental response to L-glutamate in Arabidopsis roots and its genotype-by-environment interactions. *Journal of Experimental Botany* **68**, 2919–2931.
- Wang G, Köhler C.** 2017. Epigenetic processes in flowering plant reproduction. *Journal of Experimental Botany* **68**, 797–807.
- Weijers D, Nemhauser J, Yang Z.** 2018. Auxin: small molecule, big impact. *Journal of Experimental Botany* **69**, 133–136.
- Woo HR, Masclaux-Daubresse C, Lim PO.** 2018. Plant senescence: how plants know when and how to die. *Journal of Experimental Botany* **69**, 715–718.
- Xu Y, Li P, Zou C, Lu Y, Xie C, Zhang X, Prasanna BM, Olsen MS.** 2017. Enhancing genetic gain in the era of molecular breeding. *Journal of Experimental Botany* **68**, 2641–2666.
- Yolcu S, Li X, Li S, Kim YJ.** 2018. Beyond the genetic code in leaf senescence. *Journal of Experimental Botany* **69**, 801–810.
- Zhu Z, Napier R.** 2017. Jasmonate - a blooming decade. *Journal of Experimental Botany* **68**, 1299–1302.