

**Charles Kevin Boyce**

**Department of the Geophysical Sciences  
University of Chicago**

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**Education**

Harvard University	Ph.D.	2001	Paleontology
California Institute of Technology	B.S. (with honors)	1995	Biology
California Institute of Technology	B.S. (with honors)	1995	Literature

**Professional Experience**

Associate Professor	University of Chicago	
Geophysical Sciences, Committee on Evolutionary Biology, & the College		2010-
Assistant Professor	University of Chicago	2003-2010
Associate	National Research Council	2001-2003

**Professional Activities**

Recipient, Charles Schuchert Award for excellence and promise in paleontology	2011
Fellow, Paleontological Society	2011-
Associate editor, Paleobiology	2011-
Member, Beamline Advisory Team, proposed X-ray microscope, NSLS II	2008-
Chair, Paleobotanical Section, Botanical Society of America	2006-2007
Member, Moseley Award committee, Botanical Society of America	2004-2006
Research Associate, Geology, Field Museum of Natural History	2004-
Member, Cookson Award committee, Botanical Society of America	2003
National Research Council Associateship, NASA Astrobiology Institute	2001-2003
Carnegie Geophysical Laboratory Postdoctoral Fellowship (declined)	2001
Carnegie Institution Predoctoral Fellow	1999-2001
NSF Predoctoral Fellowship	1996-1999

Reviewer for:

American Journal of Botany; American Mineralogist; American Naturalist; Annals of Botany; Earth & Planetary Science Letters; Ecological Monographs; Geochimica et Cosmochimica Acta; Geology; International Journal of Plant Science; Journal of Biogeography; Journal of Geology; Journal of Magnetic Resonance; Journal of Theoretical Biology; Naturwissenschaften; New Phytologist; Palaeogeography, Palaeoclimatology, Palaeoecology; Palaeontology; Palaios; Paleobiology; Paleontological Research; Plant, Cell & Environment; Proceedings of the National Academy of Sciences; Review of Palaeobotany & Palynology; Science.

American Chemical Society; NASA Exobiology; NSF Earth Sciences; NSF Geobiology and Low-Temperature Geochemistry; Paleontological Society; United States - Israel Binational Agricultural Research & Development Fund.

**Teaching Experience**

GEOS 13200 Historical Geology

GEOS 32500 Evolutionary history of terrestrial ecosystems

GEOS 34600 Chemical information in the sedimentary and fossil records

**Student Supervision**

Andrew Leslie (Ph.D. 2010) Evolution of pollination biology in fossil and living seed plants

Hilary Christensen (6<sup>th</sup> year) Body size and diet in Cretaceous and early Cenozoic mammals

Kathryn Larson (5<sup>th</sup> year) Biogeography and biomechanics of fruit evolution in the Fagales

Three pre-candidacy Ph.D. students

Two undergraduate senior theses

Five high school honors theses

Thesis committee member for 11 additional graduate students

**Postdoctoral Supervision**

Jung-Eun Lee (2009-2010) Feedbacks between plant evolution and climate

Fulton Rockwell (2011-) Modeling of leaf hydraulic physiology

**Current Research Funding**

NSF EAR-1024041, 2010-2013, C. K. Boyce (P.I.), Collaborative Research: Seeing the forest with the leaves--inferring plant habit and ecophysiology from leaf fossils.

## Research Publications

- Boyce, C. K.**, M. A. Zwieniecki. In review. Testing the limits on CO<sub>2</sub> as a driver of plant evolution and terrestrial productivity. *Proceedings of the National Academy of Sciences*.
- Lee, J.-E., C. Frankenberg, C. van der Tol, L. Guanter, **C. K. Boyce**, J. B. Fisher, E. Morrow, J. A. Berry, J. Worden, S. Asefi, G. Badgley, S. Saatchi. In review. Satellite observations of fluorescence capture the response of Amazonian productivity to seasonality and drought. *Nature*.
- Boyce, C. K.**, A. B. Leslie. In review. The paleontological context of angiosperm vegetative evolution. *International Journal of Plant Sciences*.
- Leslie, A. B., **C. K. Boyce**. In review. Function, constraint, and the evolution of angiosperm reproductive innovations. *International Journal of Plant Sciences*.
- Lee, J.-E., B. R. Lintner, **C. K. Boyce**, P. J. Lawrence. 2011. Land use change exacerbates tropical South American drought by sea surface temperature variability. *Geophysical Research Letters* 38: L19706.
- Boyce, C. K.**, J.-E. Lee. 2011. Could land plant evolution have fed the marine revolution? *Paleontological Research* 15: 100-105.
- Nicotra, A. B., A. Leigh, **C. K. Boyce**, C. S. Jones, K. J. Niklas, D. Royer, and H. Tsukaya. 2011. The evolution and functional significance of leaf shape in the angiosperms. *Functional Plant Biology* 38: 535-552.
- Leigh, A., M. A. Zwieniecki, F. E. Rockwell, **C. K. Boyce**, A. B. Nicotra, N. M. Holbrook. 2011. Structural and hydraulic correlates of heterophylly in *Ginkgo biloba* L. *New Phytologist* 189: 459-470.
- Boyce, C. K.**, J.-E. Lee, T. S. Feild, T. J. Brodribb, M. A. Zwieniecki. 2010. Angiosperms helped put the rain in the rainforests: The impact of plant physiological evolution on tropical biodiversity. *Annals of the Missouri Botanical Gardens* 97: 527-540.
- Boyce, C. K.**, M. Abrecht, D. Zhou, P.U.P.A. Gilbert. 2010. X-ray photoelectron emission spectromicroscopic analysis of arborescent lycopsid cell wall composition and Carboniferous coal ball preservation. *International Journal of Coal Geology* 83: 146-153.
- Lee, J.-E., **C. K. Boyce**. 2010. Impact of the hydraulic capacity of plants on water and carbon fluxes in tropical South America. *Journal of Geophysical Research* 115: D23123.
- Boyce, C. K.**, C. L. Hotton. 2010. *Prototaxites* was not a taphonomic artifact. *American Journal of Botany* 79: 1073.
- Boyce, C. K.**, J.-E. Lee. 2010. An exceptional role for flowering plant physiology in the expansion of tropical rainforests and biodiversity. *Proceedings of the Royal Society of London B* 277: 3437-3443.
- Boyce, C. K.** 2010. The evolution of plant development in paleontological context. *Current Opinion in Plant Biology* 13: 102-107.
- Hobbie, E. A., **C. K. Boyce**. 2010. Carbon sources for the Paleozoic giant fungus *Prototaxites* inferred from modern analogues. *Proceedings of the Royal Society of London B* 277: 2149-2156.
- Boyce, C. K.**, T. J. Brodribb, T. S. Feild, M. A. Zwieniecki. 2009. Angiosperm leaf vein evolution was physiologically and environmentally transformative. *Proceedings of the Royal Society of London B* 276: 1771-1776.
- Boyce, C. K.** 2009. Seeing the forest with the leaves—clues to canopy placement from leaf fossil size and venation characteristics. *Geobiology* 7: 192-199.

- Boyce, C. K.** 2008. The fossil record of plant physiology and development—What leaves can tell us. *Paleontological Society Papers* 14: 133-146.
- Boyce, C. K.** 2008. How green was *Cooksonia*? -- the importance of size in understanding the early evolution of physiology in the vascular plant lineage. *Paleobiology* 34: 179-194.
- Boyce, C. K.,** C. L. Hotton, M. L. Fogel, G. D. Cody, R. M. Hazen, A. H. Knoll, F. M. Hueber. 2007. Devonian landscape heterogeneity recorded by a giant fungus. *Geology* 35: 399-402.
- Boyce, C. K.** 2007. Mechanisms of laminar growth in morphologically convergent leaves and flower petals. *International Journal of Plant Science* 168: 1151-1156.
- Zwieniecki, M. A., H. Stone, A. Leigh, **C. K. Boyce,** N. M. Holbrook. 2006. Hydraulic design of pine needles: one-dimensional optimization for single-vein leaves. *Plant, Cell & Environment* 29: 803-809.
- Boyce, C. K.** 2005. The evolutionary history of roots and leaves. Pp. 479-499 *in* N. M. Holbrook & M. A. Zwieniecki, eds. *Vascular transport in plants*. Elsevier Sciences/Academic Press.
- Boyce, C. K.** 2005. Patterns of segregation and convergence in the evolution of fern and seed plant leaf morphologies. *Paleobiology* 31: 117-140.
- Zwieniecki, M. A., **C. K. Boyce,** N. M. Holbrook. 2004. Functional design space of single veined leaves: role of tissue hydraulic properties in constraining leaf size and shape. *Annals of Botany* 94: 507-513.
- Boyce, C. K.,** M. A. Zwieniecki, G. D. Cody, C. Jacobsen, S. Wirick, A. H. Knoll, N. M. Holbrook. 2004. Evolution of xylem lignification and hydrogel transport regulation. *Proceedings of the National Academy of Sciences USA* 101: 17555-17558.
- Zwieniecki, M. A., **C. K. Boyce,** N. M. Holbrook. 2004. Hydraulic limitations imposed by crown placement determine final size and shape of *Quercus rubra* L. leaves. *Plant, Cell & Environment* 27: 357-365.
- Boyce, C. K.,** G. D. Cody, M. L. Fogel, R.M. Hazen, C. M. O'D. Alexander, A. H. Knoll. 2003. Chemical evidence for cell wall lignification and the evolution of tracheids in Early Devonian plants. *International Journal of Plant Sciences* 164: 691-702.
- Zwieniecki, M. A., P. J. Melcher, **C. K. Boyce,** L. Sack, N. M. Holbrook. 2002. Hydraulic architecture of leaf venation in *Laurus nobilis* L. *Plant, Cell & Environment* 25: 1445-1450.
- Boyce, C. K.,** G. D. Cody, M. Feser, C. Jacobsen, A. H. Knoll, S. Wirick. 2002. Preservation of cell wall chemistry and microstructure in plant fossils as old as 400 million years: detection by carbon X-ray absorption spectromicroscopy. *Geology* 30: 1039-1042.
- Boyce, C. K.,** A. H. Knoll. 2002. Evolution of developmental potential and the multiple independent origins of leaves in Paleozoic vascular plants. *Paleobiology* 28: 70-100.
- Boyce, C. K.,** A. H. Knoll, R. M. Hazen. 2001. Nondestructive, in situ, cellular-scale mapping of elemental abundances including organic carbon in permineralized fossils. *Proceedings of the National Academy of Sciences USA* 98: 5970-5974.
- Kirschvink, J. L., S. Padmanabha, **C. K. Boyce,** J. Oglesby. 1997. Measurement of the threshold sensitivity of honeybees to weak, extremely low-frequency magnetic fields. *Journal of Experimental Biology* 200: 1363-1368.