
RACHEL SPICER

Assistant Professor of Botany
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Education

Ph.D. 2006 Harvard University, Cambridge, MA. Organismic & Evolutionary Biology
M.S. 1997 Oregon State University, Corvallis, OR. Wood Science & Engineering and Forest Science (dual degree)
B.S. 1993 University of Massachusetts, Amherst, MA. Forest Science (*summa cum laude*)

Professional Appointments

2010 – present Assistant Professor of Botany, Connecticut College, New London, CT
2006 – 2010 Rowland Junior Fellow, Rowland Institute at Harvard, Cambridge, MA
1997 – 1999 Faculty Research Assistant, Oregon State University, Corvallis, OR

Fellowships and Awards

2003 – 2004 Merit Fellowship, Harvard University
2000 – 2003 U.S. EPA Graduate Fellowship, Harvard University
2000 – 2005 Derek Bok Excellence in Teaching Award, Harvard University
2002 LiCor Prize for Best Student Paper, Botanical Society of America
1995 – 1997 U.S. EPA Graduate Fellowship, Oregon State University
1994 – 1996 Walt A. Gruetter, Arnold and Vera Meier, and Alfred W. Moltke Fellowships
1993 Commonwealth Scholar, Hershel G. Abbot Award

Publications

Spicer, R. 2014. Symplasmic networks in secondary vascular tissues: parenchyma distribution and activity supporting long distance transport. *Journal of Experimental Botany* 65:1829-1848.

Spicer, R., T. Tisdale-Orr, C. Talavera. 2013. Auxin-responsive DR5 promoter coupled with transport assays suggest separate but linked routes of auxin transport during woody stem development in *Populus*. *PLoS ONE* 8:e72499

Hearn D., T. Poulsen & **R. Spicer**. 2013. The evolution of growth forms with expanded root and shoot parenchymatous storage is correlated across the eudicots. *International Journal of Plant Sciences* 174:1049-1061.

Carraro, N. C., T. Tisdale-Orr, R. Clouse, A. Knöller & **R. Spicer**. 2012. Diversification and expression of the PIN, AUX/LAX and ABCB families of putative auxin transporters in *Populus*. *Frontiers in Plant Science* 3:1-17.

Domec, J.-C., B. Lachenbruch, M. Pruyn & **R. Spicer**. 2012. Effects of age-related increases in sapwood area, leaf area, and xylem conductivity on height-related hydraulic costs in two contrasting coniferous species. *Annals of Forest Science* 69:17-27.

- M. Pruyn & **R. Spicer**. 2012. Parenchyma. Encyclopedia of Life Sciences. John Wiley & Sons, Ltd., Chichester. DOI: 10.1002/9780470015902.a0002083.pub2.
- Lens, F., L. Cooper, M.A. Gandolfo, A. Groover, P. Jaiswal, B. Lachenbruch, **R. Spicer**, M.E. Staton, D.W. Stevenson, R.L. Walls & J. Wegrzyn. 2012. An extension of the Plant Ontology for wood anatomy and development. *IAWA Journal* 33:113-117.
- Spicer, R.** & A. Groover. 2010. Evolution of development of vascular cambia and secondary growth. *New Phytologist* 186:577-592.
- Spicer, R.** & N.M. Holbrook. 2007. Parenchyma cell respiration and survival in secondary xylem: does metabolic activity decline with cell age? *Plant, Cell and Environment* 30:934-943.
- Spicer, R.** & N.M. Holbrook. 2007. Effects of carbon dioxide and oxygen on sapwood respiration in five temperate tree species. *Journal of Experimental Botany* 58:1313-1320.
- Spicer, R.** 2005. Senescence in secondary xylem: heartwood formation as an active developmental program. In: Vascular Transport in Plants, eds. N.M. Holbrook and M. Zwieniecki, pp. 457-475. Elsevier/Academic Press, Oxford.
- Spicer, R.** & N.M. Holbrook. 2005. Within-stem oxygen concentration and sap flow in four temperate tree species: does long-lived xylem parenchyma experience hypoxia? *Plant, Cell & Environment* 28:192-201.
- Olszyk, D., M. Apple, B.L. Gartner, **R. Spicer**, C. Wise, E. Buckner, A. Benson-Scott, & D. Tingey. 2005. Xeromorphy increases in shoots of *Pseudotsuga menziesii* (Mirb.) Franco seedlings with exposure to elevated temperature but not elevated CO₂. *Trees: Structure and Function* 19:552-563.
- Spicer, R.** & B.L. Gartner. 2002. Compression wood has a minimal impact on the water relations of Douglas-fir (*Pseudotsuga menziesii*) seedlings despite a large effect on shoot hydraulic properties. *New Phytologist* 154:633-640.
- Spicer, R.** & B.L. Gartner. 2001. The effects of cambial age and position within the stem on specific conductivity in Douglas-fir (*Pseudotsuga menziesii*) sapwood. *Trees: Structure and Function* 15:222-229.
- Spicer, R.**, B.L. Gartner & R.L. Darbyshire. 2000. Sinuous stem growth in a Douglas-fir (*Pseudotsuga menziesii*) plantation: growth patterns and wood quality effects. *Canadian Journal of Forest Research* 30:761-768.
- Gartner, B.L., D.C. Baker & **R. Spicer**. 2000. Distribution and vitality of xylem rays in relation to tree leaf area in Douglas-fir. *IAWA Journal* 21:398-401.
- Gartner, B.L., J.J. Morrell, C.M. Freitag, & **R. Spicer**. 1999. Heartwood decay resistance by vertical and radial position in Douglas-fir trees from a young stand. *Canadian Journal of Forest Research* 29:1993-1996.
- Spicer, R.** & B.L. Gartner. 1998. Hydraulic properties of Douglas-fir (*Pseudotsuga menziesii*) branches and branch halves with reference to compression wood. *Tree Physiology* 18:777-784.
- Spicer, R.** & B.L. Gartner. 1998. How does a gymnosperm branch assume the hydraulic status of a main stem when it takes over as leader? *Plant, Cell & Environment* 21:1063-1070.

Conference Abstracts

- Spicer, R., S. Norcross and N. Carraro. 2014. Reduced expression of PIN1 in *Populus* via RNAi causes a significant reduction in auxin transport capacity but produces no obvious structural phenotype. Botanical Society of America Annual Meeting, Boise, ID, USA.
- Evanich, D., H. Noble and R. Spicer. 2014. Partial defoliation suggests that mature leaves contribute to the basipetal auxin stream in woody *Populus* stems. Botanical Society of America Annual Meeting, Boise, ID, USA.
- Spicer, R. and D. Evanich. 2013. Auxin dynamics during woody shoot development: filling in the gaps between stem and leaf. Plant Vascular Biology 2013, Helsinki, Finland.
- Spicer, R., Talavera, C. and T. Tisdale-Orr. 2013. Polar auxin transport in developing *Populus* shoots during the transition from primary to secondary growth. American Society of Plant Biologists, Plant Biology 2013, Providence, RI, USA.
- Evanich, D., H. Noble and R. Spicer. 2013. Effects of defoliation on the auxin content of developing xylem in hybrid poplar. 11th Annual Plant Biology Symposium, University of Massachusetts, Amherst, MA, USA.
- Spicer, R. 2012. DR5 in *Populus*: Valuable tool or dangerous misinformant? Gordon Research Conference: Plant Molecular Biology / Genomic Approaches to Plant Signaling Systems, Holderness, NH, USA.
- Spicer, R. and T. Tisdale-Orr. 2011. Auxin response and transport during the initiation of secondary in *Populus*. Botanical Society of America Annual Meeting, St. Louis, MO, USA.
- Spicer, R., T. Tisdale-Orr and N. Carraro. 2010. Auxin transport during the transition from primary to secondary growth in *Populus*. Plant Vascular Biology 2010, Columbus, OH, USA.
- Spicer, R., N. Carraro and T. Tisdale-Orr. 2010. The role of auxin transport in *Populus* vascular development. IAWA, IAWS & IUFRO Conference Proceedings, University of Wisconsin, Madison, WI, USA.
- Carraro, N., T. Tisdale-Orr and R. Spicer. 2009. Expression analysis of auxin-transport proteins in *Populus*. IUFRO Tree Biotechnology Conference Proceedings, Whistler, British Columbia, Canada.
- Spicer, R. and N. M. Holbrook, 2007. Senescence of vascular tissue in woody stems: Do trees actively 'decommission' xylem? Vascular Plant Biology 2007, Taipei, Taiwan.
- Spicer, R. and N. M. Holbrook, 2006. Heartwood formation in *Pinus strobus*: Is parenchyma cell death a form of programmed cell death? American Society of Plant Biologists, Plant Biology 2006, Boston, MA, USA.
- Spicer, R. and N. M. Holbrook. 2005. Small scale patterns with large scale implications: the role of programmed cell death in determining the sapwood volume of forest trees. Supplement to the *Bulletin of the Ecological Society of America*.
- Spicer, R. and N.M. Holbrook. 2004. Evaluating possible causes of parenchyma cell death during the transition from sapwood to heartwood. Supplement to the *Bulletin of the Ecological Society of America*.
- Spicer, R. and N.M. Holbrook. 2003. Effects of within-stem gas concentrations on sapwood physiology: Implications for sapwood aging and senescence. Supplement to the *Bulletin of the Ecological Society of America*.
- Spicer, R. and N.M. Holbrook. 2002. Senescence of secondary xylem in angiosperms versus conifers: the aging and death of parenchyma cells during the transition from sapwood to heartwood. *American Journal of Botany*, Supplement.

Conference Abstracts, cont.

- Gartner, B.L., J.C. Domec, M. Pruyn and R. Spicer. 2000. Age-related changes in sapwood area, leaf area, and xylem permeability in two coniferous species with contrasting sapwood areas. *Proceedings of Age-Related Change in Structure and Function of Forests in the Pacific Northwest: A synthesis of research*. Corvallis, Oregon, USA.
- Spicer, R. and B.L. Gartner. 1999. Reduced specific conductivity in the sapwood of old (110+ yrs) Douglas-fir (*Pseudotsuga menziesii*) trees. Supplement to the *Bulletin of the Ecological Society of America*.
- Spicer, R. and B.L. Gartner. 1998. Hydraulic constraints of reaction wood and their effects on plant performance. *Proceedings of the Second Annual Functional-Structural Tree Models Workshop*, 11-15 Oct. 1998, Clermont-Ferrand, France.
- Gartner, B.L., R. Spicer, M.L. Pruyn, and J.C. Domec. 1998. Spatial and temporal patterns of hydraulic properties of Douglas-fir xylem. *Proceedings of the Second Annual Functional-Structural Tree Models Workshop*, 11-15 Oct. 1998, Clermont-Ferrand, France.
- Spicer, R. and B.L. Gartner. 1997. How does a gymnosperm branch assume the hydraulic status of a main stem when it takes over as leader? Supplement to the *Bulletin of the Ecological Society of America* 78:316.
- Spicer, R. and B.L. Gartner. 1996. Hydraulic conductivity of compression wood in branches of Douglas-fir (*Pseudotsuga menziesii*). *American Journal of Botany*, Supplement 83:53.

Invited talks & panels/workshops

- University of Vermont, Plant Biology Seminar Series*, Burlington, VT. Invited lecture: "Making connections: The role of auxin in woody plant vascular development" March 21, 2013.
- Plant Morphology 2013: Linking Phenotype to Development*, Arnold Arboretum, Boston, MA. Short course lecture: "Auxin dynamics during secondary vascular development" June 14, 2013.
- Wood Ontology Meeting*, Plant Ontology Group, New York Botanic Garden, New York, NY. Feb 4-7, 2012.
- Harvard University Herbarium Seminar Series*, Arnold Arboretum, Boston, MA. Invited lecture: "Making connections: Auxin transport and leaf-stem continuity in *Populus*" Apr 4, 2012.
- NESCent Catalysis Meeting: Evolutionary Origins and Development of Woody Plants*. National Evolutionary Synthesis Center, Duke University, Durham, N.C., Oct 14-16, 2011
- University of Missouri, Division of Biological Sciences Seminar Series*, Columbus, MO. Invited lecture: "Linking growth and physiology in the model woody plant *Populus*" Discussant with graduate students: "Liberal arts colleges as a career path for scientists" Sept 21, 2011.
- Plymouth State University, Department of Biology Seminar Series*, Plymouth, NH. Invited lecture: "How trees make wood: the role of auxin in patterning and differentiation in the vascular cambium." Feb 2009.
- Institute of Forest Genetics*, Pacific Southwest Research Station, U.S. Forest Service, Placerville, CA. Visiting lecture: "The biology of heartwood formation in conifers". Apr 2007.
- Smithsonian Environmental Research Center*, College Park, MD. Invited lecture: "Aging in large woody stems". Feb 2003.

Grants and Research Awards

National Science Foundation Award (BIO/IOS/RUI) "Auxin dynamics during vascular development in the model woody plant *Populus*". September 2013 – August 2016. \$395,064.

Rowland Institute Junior Fellowship. "Role of auxin in *Populus* stem development". Sept 2007 – Aug 2010. Internal award totaling \$232,000 over four years.

National Science Foundation DDIG in Integrative Biology. "The Role of Programmed Cell Death in Heartwood Formation". June 2003 – May 2006. \$12,000.

Deland Award, Arnold Arboretum. "Effects of within-stem gas composition on parenchyma metabolism". May 2002 - May 2005. \$5000.

Professional Memberships

American Society of Plant Biologists

Botanical Society of America

International Association of Wood Anatomists