TIMOTHY J. TSCHAPLINSKI
Distinguished Research & Development Staff
Metabolomics and Bioconversion Group Leader
Biosciences Division
Oak Ridge National Laboratory, Oak Ridge, TN 37831-6341
(865) 574-4597; FAX (865) 241-1555
Email: tschaplinstj@ornl.gov
Webpage: https://www.ornl.gov/staff-profile/timothy-j-tschaplinski
ORCID iD: 0000-0002-9540-6622
Google Scholar: http://scholar.google.com/citations?user=qLSYcUEAAAAJ&hl=en
Google Scholar H-Index: 51

RESEARCH INTERESTS

Plant molecular physiologist experienced in biochemistry, specifically the application of mass spectrometry to research problems in genomics, bioenergy crop production, environmental stress physiology, and plant-microbe signaling. Current research includes metabolomics for phenotypic characterization of genetically-modified *Populus, Arabidopsis*, *Eucalyptus*, *Castanea*, switchgrass, and numerous bioenergy-relevant microbial species. Research targets include the application of genomic tools for the accelerated domestication of *Populus* to increase drought tolerance and biomass productivity on marginal sites, and to manipulate bioproduct formation. Most recent activities include characterizing the molecular basis of plant-microbe (bacterial and fungal) symbiotic relationships in contrast with pathogenic relationships.

POSITIONS

2007-present	**Distinguished Research Staff**, Biosciences Division Oak Ridge National Laboratory, Oak Ridge, TN
2017-present	**Faculty Member** of the Bredesen Center for Interdisciplinary Research and Graduate Education, University of Tennessee, Knoxville, TN
2004-present	**Adjunct Faculty**, UT-ORNL Genome Science & Technology Graduate School University of Tennessee, Knoxville, TN
2003-present	**Adjunct Professor**, Department of Plant Sciences University of Tennessee, Knoxville, TN
2002-2006	**Senior Scientist**, Environmental Sciences Division, Oak Ridge National Laboratory, Oak Ridge, TN
1995-1997	**Adjunct Professor**, Institute of Agriculture University of Tennessee, Knoxville, TN
1990-2002	**Research Staff**, Environmental Sciences Division, ORNL, Oak Ridge, TN
1989-1990	**ASG Postdoctoral Research Associate**, Environmental Sciences Division Oak Ridge National Laboratory, Oak Ridge, TN
1987-1989	**ORAU Postdoctoral Research Associate**, Environmental Sciences Division Oak Ridge National Laboratory, Oak Ridge, TN
1986	**Lecturer**, Tree Physiology, University of Toronto, Toronto, Canada

EDUCATION

1982-87	**Ph.D. Forestry** - University of Toronto, Toronto, Ontario, Canada
1980-82	**M.Sc. Forestry** - University of Toronto, Toronto, Ontario, Canada
1976-80	**B.Sc. Biology** - Carleton University, Ottawa, Ontario, Canada

PUBLICATIONS - 169 total

Close, D.M., S.J. Cooper, X. Wang, P. Chirania, M. Gupta, J.R. Ossyra, R.J. Giannone, N. Engle, T.J. Tschaplinski, J.C. Smith, L. Hedstrom, J.M. Parks, and J.K. Michener. 2019. Horizontal transfer of a pathway for coumarate catabolism unexpectedly inhibits purine nucleotide biosynthesis. Molecular Microbiol. (tentatively accepted)

Uehling, J.K., M. Entler, H. Meredith, L. Millet, C. Timm, J. Aufrecht, G. Bonito, N. Engle, J.L. Labbé, M.J. Doktycz, S. Retterer, J. Spatafora, J.E. Stajich, T.J. Tschaplinski, and R. Vilgalys. 2019. Microfluidics and metabolomics reveal symbiotic bacterial-fungal interactions between *Mortierella elongata* and *Burkholderia* include metabolite exchange. Front. Microbiol. (in press)

Zhang, J., M. Xie, M. Li, J. Ding, Y. Pu, A. Bryan, W. Rottmann, K. Winkeler, C. Collins, Cassandra, V. Singan, E. Lindquist, S. Jawdy, L. Gunter, N. Engle, X. Yang, K. Barry, T.J. Tschaplinski, J. Schmutz, G. Tuskan, W. Muchero, and J.-G. Chen. 2019. Overexpression of a Prefoldin β subunit gene reduces biomass recalcitrance in the bioenergy crop *Populus*. Plant Biotechnol. J. (in press)

Yang, X., D. Liu, T.J. Tschaplinski, and G.A. Tuskan. 2019. Comparative genomics can provide new insights into evolutionary mechanisms and gene function in CAM plants. J. Exp. Bot. (in press)

Weighill, D.A, T.J. Tschaplinski, G.A. Tuskan, and D.A. Jacobson. 2019. Multi-omic data integration in poplar. Front. Genet. (in press)

Ha, C.M, D. Fine, A. Bahtia, X. Rao, M.Z. Martin, N.L. Engle, D.J. Wherrit, T.J. Tschaplinski, L.W. Sumner, and R.A. Dixon. 2019. Ectopic defense gene expression is associated with growth defects in *Medicago truncatula* lignin pathway mutants. Plant Phys. (preprint published) http://www.plantphysiol.org/content/early/2019/07/09/pp.19.00533

Labbé, J., W. Muchero, O. Czarnecki, J. Wang, X. Wang, A.C. Bryan, K. Zheng, Y. Yang, S.S. Jawdy, L.E. Gunter, W. Schackwitz, J. Martin, F. Le Tacon, T. Li, Z. Zhang, P. Ranjan, X. Yang, D.A. Jacobson, T.J. Tschaplinski, J. Schmutz, J-G. Chen, and G.A. Tuskan. 2019. Mediation of plant-mycorrhizal interaction by a lectin receptor-like kinase. Nature Plants Brief Communication 5:676-680. https://doi.org/10.1038/s41477-019-0469-x

Taoa, J., K. Rajana, B. Ownley, K. Gwinn, D. D'Souza, N. Moustaid-Moussa, T.J. Tschaplinski, and N. Labbé. 2019. Natural variability and antioxidant properties of commercially cultivated switchgrass extractives. Industrial Crops and Products 138: 5 October 2019 https://doi.org/10.1016/j.indcrop.2019.111474

Veach, A.M., R. Morris, D.Z. Yip, Z.K. Yang, N.L. Engle, M.A. Cregger, T.J. Tschaplinski, and C.W. Schadt. 2019. Rhizosphere microbiomes diverge among *Populus trichocarpa* plant-host chemotypes, but it depends on soil origin. Microbiome 7:76 https://doi.org/10.1186/s40168-019-0668-8

Xie, H., N.L. Engle, S. Venketachalam, C.G. Yoo, J. Barros, M. Lecoultre, N. Howard, G. Li, L. Sun, A.C. Srivastava, S. Pattathil, Y. Pu, M.G. Hahn, A.J. Ragauskas, R.S. Nelson, R.A. Dixon, T.J. Tschaplinski, E.B. Blancaflor, and Y. Tang. 2019. Combining loss of function of folypolyglutamate synthetase1 and caffeoyl-coA 3-O-methyltransferase1 for lignin reduction and improved saccharification efficiency in *Arabidopsis thaliana*. Biotech. for Biofuels 12:108

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Tschaplinski, T.J. and S.D. Simpson. 2019. Development of a sustainable green chemistry platform for production of acetone and downstream drop-in fuel and commodity products directly from biomass syngas via a novel energy conserving route in engineered acetogenic bacteria. ORNL CRADA FINAL REPORT NFE-16-06364

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Barros-Rios, J. L. Escamilla-Trevino, L. Song, X. Rao, J.C. Serrani-Yarce, M.D. Palacios, N.L. Engle, T.J. Tschaplinski, F. Choudhury, B. Venables, R. Mittler, and R.A. Dixon. 2019. 4-Coumarate 3-hydroxylase in the lignin biosynthesis pathway is a cytosolic ascorbate peroxidase. Nature Communications 10, Article number: 1994 (2019) https://www.nature.com/articles/s41467-019-10082-7#Sec25

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Chhetri, H.B., D. Macaya-Sanz, D. Kainer, A.K. Biswal, J.-G. Chen, C. Collins, L.M. Evans, K. Hunt, S.S. Mohanty, T. Rosenstiel, D. Ryno, K. Winkeler, X. Yang, D. Jacobson, D. Mohnen, W. Muchero, S.H. Strauss, T.J. Tschaplinski, G.A. Tuskan, S.P. DiFazio. 2019. Multi-trait genome-wide association analysis of *Populus trichocarpa* identifies key polymorphisms controlling morphological and physiological traits. New Phytologist First published: 07 March 2019; https://doi.org/10.1111/nph.15777

Tuskan, G.A., W. Muchero, T.J. Tschaplinski, and A.J. Ragauskas. 2019. Population-level approaches reveal novel aspects of lignin biosynthesis, content, composition and structure. Current Opinions in Plant Biotechnol. 56:250–257. https://doi.org/10.1016/j.copbio.2019.02.017

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Cecchini, N.M, S. Roychoudhry, D.J. Speed, K. Steffes, A.Tambe, K. Zodrow, K. Konstantinoff, H.W. Jung, N.L. Engle, T.J. Tschaplinski, and J.T. Greenberg. 2018. Underground azelaic acid-conferred resistance to *Pseudomonas syringae* in Arabidopsis. Molecular Plant-Microbe Interactions 32:86-94 https://dx.doi.org/10.1094/MPMI-07-18-0185-R

Yin, H., H.-B. Guo, D. Weston, A.M. Borland, P. Ranjan, P.E. Abraham, J. M. Wachira, G.A. Tuskan, T.J. Tschaplinski, S.D. Wullschleger, H. Guo, R. Hettich, A. Visel, S. Gross, Z. Wang, X. Yang. 2018. Diel rewiring and positive selection of ancient plant proteins enabled evolution of CAM photosynthesis. BMC Genomics 19:588 https://doi.org/10.1186/s12864-018-4964-7

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E. Lindquist, R.S. Payyavula, J. Barros-Rios, R. Dixon, N. Engle, R.W. Sykes, M. Davis, S. S. Jawdy, L.E. Gunter, O. Thompson, S.P. DiFazio, L.M. Evans, K. Winkler, C. Collins, J. Schmutz, H. Guo, U. Kalluri, M. Rodriguez, K. Feng, J.-G. Chen, and G.A. Tuskan. 2018. A 5-enolpyruvylshikimate 3-phosphate synthase functions as a transcriptional repressor in *Populus*. The Plant Cell 30:1645-1660. https://doi.org/10.1105/tpc.18.00168

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Weighill, D., P. Jones, M. Shah, P. Ranjan, W. Muchero, J. Schmutz, A. Sreedasyam, D. Macaya-Sanz, R. Sykes, N. Zhao, M.Z. Martin, S. DiFazio, T.J. Tschaplinski, G. Tuskan, and D. Jacobson. 2018. Pleiotropic and epistatic network-based discovery: Integrated networks for target gene discovery. Front. Energy Res., 11 May 2018 https://doi.org/10.3389/fenrg.2018.00030

Sander, K., D. Chung, D. Hyatt, J. Westpheling, D.M. Klingeman, M. Rodriguez Jr., N.L. Engle, T.J. Tschaplinski, B.H. Davison, and S.D. Brown. 2018. Rex in *Caldicellulosiruptor bescii*: novel regulon members and its effect on the production of ethanol and overflow metabolites. MicrobiologyOpen 2018:e639. https://doi.org/10.1002/mbo3.639

Song, Y., D.A. Johnson, R. Peng, D.K. Hensley, P.V. Bonnesen, L. Liang, J, Huang, F. Yang, F, Zhang, R. Qiao, T. J. Tschaplinski, N.L. Engle, Z. Wu, D.A. Cullen, H.M. Meyer III, B.G. Sumpter, and A.J. Rondinone. 2018. A physical catalyst for the electrolysis of nitrogen to ammonia. Sci. Adv. 4:e1700336 https://doi.org/10.1126/sciadv.17003336

Whitham, J.M., Moon, J.-W., Rodriguez Jr., M., Engle, N.L., Klingeman, D.M, Rydzak, T, Abel, M.M., Tschaplinski, T.J., Guss, A.M., and S.D. Brown. 2018. *Clostridium thermocellum* LL1210 pH homeostasis mechanisms informed by transcriptomics and metabolomics. Biotech. for Biofuels 11:98 https://doi.org/10.1186/s13068-018-1095-y

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Abraham, P.E., B. Garcia, L.E. Gunter, S.S. Jawdy, D.A. Jacobson, N.L. Engle, X. Yang, R.L. Hettich, G.A. Tuskan, and T.J. Tschaplinski. 2018. Quantitative proteome profile of water-deficit stress responses in *Populus deltoides* leaves. Plos One 13(2): e0190019. https://doi.org/10.1371/journal.pone.0190019

Faraji, M., L.L. Fonseca, L. Escamilla-Trevino, J. Barros-Rios, N.L. Engle, Z.K. Yang; T.J. Tschaplinski, R. A. Dixon, and E.O. Voit. 2018. Mathematical models of lignin biosynthesis. Biotech. for Biofuels. 11:34. https://doi.org/10.1186/s13068-018-1028-9

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THESES

Ph.D.	Physiological correlatives of vigorous growth in hybrid poplar.
M.Sc.F.	The effects of root restriction on growth, water relations and senescence of European alder (*Alnus glutinosa* Gaertn.) seedlings.
B.Sc.	The age composition of a collection of rabid and non-rabid Big Brown Bats (*Eptesicus fuscus*) as determined by dental annuli.

PROFESSIONAL SOCIETIES/ACTIVITIES

Scientific Reports (a Nature journal) Editorial Board (2019)
DOE-ARPA-E Phytosequestration Workshop (2015)
DOE-ARPA-E- Transportation Energy Resources from Renewable Agriculture (TERRA)- Workshop participant and Review Panel Member (2014)
Current Metabolomics - Editorial Board (2012 - present)
ORNL Invention Disclosure Review Committee – (2008-2011)
DOE Genomic Science and Technology for Energy and the Environment Review – Microbial

and Plant Processes for Bioenergy Reviewer (2010)
DOE-EREE High-Yield Scenario Workshop – Woody Energy Crops Participant (2009)
DOE 30x30 Workshop on Biomass Energy – Woody Crop Development panel member (2006)
Southeast Regional Biomass Consortium – Lead of Woody Crop Development (2006)
International Poplar Genome Consortium – Coordinator of the Metabolic Characterization and Metabolomics section of the Science Plan for post-genome sequencing research (2002)
Environmental and Experimental Botany – Editorial Board (2002 – present)
Tree Physiology – Editorial Review Board (1994 – present)
Bioactive Natural Products Consortium – University of Tennessee – member (2002 – 2004)
National Science Foundation – Major Research Instruments Panel (1998)
US DOE rep. to the International Energy Agency Ecophysiology Working Group (1989-1993)
International Society for Molecular Plant-Microbe Interactions – member/participant
American Society of Plant Biologists – member/participant
Canadian Society of Plant Physiologists – member/participant

SCHOLARSHIPS

1985	Canadian Forestry Service Scholar Scholarship
1984	Natural Sciences & Engineering Research Council Postgraduate Scholarship – Forestry Special
1983	Natural Sciences and Engineering Research Council Postgraduate Scholarship
1982	Natural Sciences and Engineering Research Council Postgraduate Scholarship
1982	Edward Elsworth Johnson Postgraduate Forestry Fellowship
1981	University of Toronto Open Master's Fellowship
1980	Canadian National Sportsmen's Fellowship
1980	Natural Sciences and Engineering Research Council - Summer Research Award