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Metabolomics Group  
Biosciences Division  
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### **Research Interests/Current Activities**

Research interests include quantifying plant and microbe responses to perturbations using mass spectrometry-based metabolomics, natural product synthesis, separations chemistry, and instrumentation including GC/MS

### **Professional Experience**

2010-current **Senior Technician, Metabolomics Group**  
Biosciences Division  
Oak Ridge National Laboratory, Oak Ridge, TN

2008-2010 **Senior Technician, Plant Systems Biology**  
Environmental Sciences Division,  
Oak Ridge National Laboratory, Oak Ridge, TN

2007-2008 **Senior Technical Support Staff, Plant Molecular Ecology**  
Environmental Sciences Division,  
Oak Ridge National Laboratory, Oak Ridge, TN

2005-2006 **Technical Support Staff, Ecosystems and Plant Sciences**  
Environmental Sciences Division,  
Oak Ridge National Laboratory, Oak Ridge, TN

1998-2004 **Contract Chemist, Chemical Separations Group**  
Chemical Sciences Division,  
Oak Ridge National Laboratory, Oak Ridge, TN

### **Education and Training**

2010/12 IATA Transportation of Dry Ice by Air Shipper Certification  
1996 B.A. Chemistry, ACS CPT, Rollins College, Winter Park, FL  
1994 A.A. Honors Degree, Valencia Community College, Orlando, FL

### **Publications**

Hui Shen, Charleson R Pooviah, Angela Ziebell, Timothy J Tschaplinski, Sivakumar Pattathil, Erica Gjersing, Nancy L **Engle**, Rui Katahira, Yunqiao Pu, Robert Sykes, Fang Chen, Arthur J Ragauskas, Jonathan R Mielenz, Michael G Hahn, Mark Davis, Neal Stewart Jr and Richard A Dixon. "Enhanced characteristics of genetically modified switchgrass (*Panicum virgatum* L.) for high biofuel production." *Biotechnology for Biofuels*, in press

Douwe van der Veen, Jonathan Lo, Steven D. Brown, Courtney M. Johnson, Timothy J. Tschaplinski, Madhavi Martin, Nancy L. **Engle**, Robert A. van den Berg, Aaron D. Argyros, Nicky C. Caiazza, Adam M. Guss, and Lee R. Lynd. "Characterization of *Clostridium*

*thermocellum* strains with disrupted fermentation end product pathways.” *Journal of Industrial Microbiology & Biotechnology* DOI 10.1007/s10295-013-1275-5

Kridelbaugh, D.M., Nelson, J., **Engle**, N.L., Tschaplinski, T.J., Graham, D.E. “Nitrogen and Sulfur Requirements for *Clostridium thermocellum* and *Caldicellulosiruptor bescii* on Cellulosic Substrates in Minimal Nutrient Media.”, *Bioresource Technology* vol 130, 125-135 (2013), doi: <http://dx.doi.org/10.1016/j.biortech.2012.12.006>

Yee, K. L., Rodriguez, M, Jr., Tschaplinski, T. J., **Engle**, N. L., Martin, M. Z., Fu, C., Wang, Z.-Y., Hamilton-Brehm, S., and J. R. Mielenz. “Evaluation of the bioconversion of genetically modified switchgrass using simultaneous saccharification and fermentation and a consolidated bioprocessing approach.” *Biotechnol. Biofuel*. 5: 81. 2012.

Timothy J Tschaplinski, Robert F Standaert, Nancy L **Engle**, Madhavi Z Martin, Amandeep K Sangha, Jerry M Parks, Jeremy C Smith, Reichel Samuel, Nan Jiang, Yunqiao Pu, Arthur J Ragauskas, Choo Y Hamilton, Chunxiang Fu, Zeng-Yu Wang, Brian H Davison and Richard A Dixon. “Down-regulation of the Caffeic acid O-methyltransferase Gene in Switchgrass Reveals a Novel Monolignol Analog.” *Biotechnology for Biofuels*, 5:71 (21 Sep 2012)

Shihui Yang, Richard J Giannone, Lezlee Dice, Zamin K Yang, Nancy L **Engle**, Timothy J Tschaplinski, Robert L Hettich and Steven D Brown. "Clostridium thermocellum ATCC27405 transcriptomic, metabolomic and proteomic profiles after ethanol stress." *BMC Genomics* 13, 336, (2012).

Van Dyk M.M., Kullán A.R.K., Mizrahi E., Hefer C.A., Van Rensburg L.J., Newman D., Coetzer N., Tschaplinski T.J., Cushman K.C., **Engle** N.L., Tuskan G.A., Jones N., Kanzler A., Bayley A., Myburg A.A. “Identifying genomic regions involved in growth, wood property, transcript and metabolite variation in an F-2 pseudo-backcross pedigree of *Eucalyptus grandis* x *Eucalyptus urophylla*.” *South African Journal of Botany*. 79: 218-218. (2012)

Li, Y., Tschaplinski, T. J., **Engle**, N. L., Hamilton, C. Y., Rodriguez, M., Liao, J. C., Schadt, C.W., Guss, A. M., Yang, Y.-F., and D. E. Graham. "Combined inactivation of the *Clostridium cellulolyticum* lactate and malate dehydrogenase genes substantially increases ethanol yield from cellulose and switchgrass fermentations." *Biotechnology for Biofuels* 5, 2, (2012).

Zhao, N., Guan, J., Ferrer, J.-L., **Engle**, N., Chern, M., Ronald, P., Tschaplinski, T.J., Chen, F. "Biosynthesis and emission of insect-induced methyl salicylate and methyl benzoate from rice." *Plant Physiology and Biochemistry* 48, no. 4, 279—287, (2010).

Sung-Jae Yang, Irina Kataeva, Scott D. Hamilton-Brehm, Nancy L. **Engle**, Timothy J. Tschaplinski, Crissa Doepke, Mark Davis, Janet Westpheling, and Michael W. W. Adams. "Efficient degradation of lignocellulosic plant biomass without pretreatment by the 9 thermophilic anaerobe, *Anaerocellum thermophilum* DSM 6725." *Applied and Environmental Microbiology* 75, no. 14, 4762—4769, (2009).

Yang, S., T. J. Tschaplinski, N.L. **Engle**, S.L. Carroll, S. L. Martin, B. H. Davison, A. V. Palumbo, S. D. Brown. "Transcriptomic and metabolomic profiling of *Zymomonas mobilis* during aerobic and anaerobic fermentations." *BMC Genomics* 10, no. 34, 1471—2164, (2009).

Delmau, L. H.; Bazelaire, E.; Bonnesen, P. V.; **Engle**, N. L.; Gorbunova, M. G.; Haverlock, T. J.; Moyer, B. A.; Ensor, D. D.; Meadors, V. M.; Harmon, B. W.; Bartsch, R. A.; Surowiec, M. A.; Zhou, H. "DRAMATIC IMPROVEMENTS IN CAUSTIC-SIDE SOLVENT EXTRACTION OF CESIUM THROUGH MORE EFFICIENT STRIPPING." In *INTERNATIONAL SOLVENT EXTRACTION CONFERENCE, ISEC 2008*, 689, Montreal, Québec: The Canadian Institute of Mining, Metallurgy and Petroleum, (2008).

Custelcean, R., N.L. **Engle**, P.V. Bonnesen. "Crystalline hydrogen-bonded nanocolumns of cyclic thiourea octamers." *CrystEngComm* 9, 452, (2007).

Moyer, Bruce A; Bazelaire, Eve; Bonnesen, Peter V; Custelcean, Radu ; Delmau, Laetitia Helene; Ditto, Mary E ; **Engle**, Nancy L; Gorbunova, Maryna; Haverlock, Tamara ; Levitskaia, Tatiana G.; Bartsch, Richard A.; Surowiec, Malgorzata A.; Marquez, Manuel; Zhou, Hui. "Next Generation Extractants for Cesium Separation from High-Level Waste." In *Separation Science & Technology in the Nuclear Industry*, 32—44, Thane: Special INASAT Bulletin, (2006).

Delmau, L.H., P.V. Bonnesen, N.L. **Engle**, T.J. Haverlock, F.V. Sloop Jr., B.A. Moyer. "Combined Extraction of Cesium and Strontium from Alkaline Nitrate Solutions." *Solvent Extraction and Ion Exchange* 24, no. 2, 197—225, (2006).

Kang, H-A, N.L. **Engle**, P.V. Bonnesen, L.H. Delmau, T.J. Haverlock, B.A. Moyer. "An Equilibrium Model of Pseudo-Hydroxide Extraction in the Separation of Sodium Hydroxide from Aqueous Solutions Using Lipophilic Fluorinated Alcohols and Phenols." *Sep. Sci. Technol.*, **40** (1-2), 725-738. (2005).

**Engle**, N.L., P.V. Bonnesen, B.A. Tomkins, T.J. Haverlock, B.A. Moyer. "Synthesis and Properties of Calix[4]arene-bis[4-(2-ethylhexyl)benzo-crown-6], A Cesium Extractant With Improved Solubility. " *Solvent Extr. Ion Exch.*, **22** (4), 611-636, (2004).

Gorbunova, M.G., P.V. Bonnesen, N.L. **Engle**, E. Bazelaire, L.H. Delmau, B.A. Moyer. "New amino-functionalized 1,3-altenate calix[4]arene bis- and mono-(benzo-crown-6 ethers) for pH-switched cesium nitrate extraction. " *Tetrahedron Letters*, **44** (2003), 5397-5401.

Sachleben, R.A., J.C. Bryan, G.M. Brown, R. Dabestani, N.L. **Engle**, T.J. Haverlock, B.P. Hay, H.-F. Ji, A. Urvoas, B.A. Moyer. "Rational Design of Cesium-Selective Ionophores and Chemosensors: Dihydroxycalix[4]arene Crown-6 Ethers." *European J. Org. Chem.*, (2003), 4862-4869.

Anderson, Charles; McGinnis, Michael; Vagle, Kurt; Edwards, Anna; **Engle**, Nancy; Sick, Rachel; Kabalka, George W.; Pagni, Richard M. "The s-cis and s-trans  $\pi$  complexes of B-bromocatecholborane and (E)-2-butenal." *Journal of Chemical Research, Synopses* (2003), Issue11, 726-727.

Bonnesen, P.V., F.V. Sloop Jr., F. V., N.L. **Engle**. "Stability of the Caustic-Side Solvent Extraction (CSSX) Process Solvent: Effect of High Nitrate on Solvent Nitration." ORNL Report ORNL/TM-2002/115, Oak Ridge National Laboratory, Oak Ridge, TN, July 2002.

Chambliss, C.K., T.J. Haverlock, P.V. Bonnesen, N.L. **Engle**, B.A. Moyer. "Selective Separation of Hydroxide from Alkaline Media by Liquid-Liquid Extraction with Weak Hydroxy Acids." *Environ. Sci. Technol.* **36**, (8) 1861-1867 (2002).

Bryan, J.C., N.L. **Engle**, R.A. Sachleben. "Synthesis and Structure of Dihydrocalix[4]arenes Bearing O-benzonitrile and O-acetyl Substituents." *J. Chem. Crystallogr.* **32**(1-2), 33-38 (2002).

Duchemin, C.R., N.L. **Engle**, P.V. Bonnesen, T.J. Haverlock, L.H. Delmau, B.A. Moyer. "Solvatochromic Solvent Polarity Measurements of Alcohol Solvent Modifiers and Correlation with Cesium Extraction Strength. " *Solvent Extr. Ion Exch.* **19**(6), 1037-1058 (2001).

Bryan, J.C., N.L. **Engle**, R.A. Sachleben, B.P. Hay. "Tribenzo-18-crown-6 Acetonitrile Solvate." *Acta Crystallogr. C57*, 1359-1360 (2001).

Bonnesen, P.V., T.J. Haverlock, N.L. **Engle**, R.A. Sachleben, B.A. Moyer. "Development of Process Chemistry for the Removal of Cesium from Acidic Nuclear Waste by Calix[4]arene-Crown-6 Ethers." *In Calixarene Molecules for Separations*, G. J. Lumetta, R. D. Rogers, and A. S. Gopalan, Eds., ACS Symposium Series, Vol. 757, American Chemical Society, Washington, D. C., 2000; Chap. 3, pp. 26-44.

Delmau, L.H., J.C. Bryan, B.P. Hay, N.L. **Engle**, R.A. Sachleben, B.A. Moyer. "Benzyl Phenol Derivatives: Extraction Properties of Calixarene Fragments." *In Calixarene Molecules for Separations*, G. J. Lumetta, R. D. Rogers, and A. S. Gopalan, Eds., ACS Symposium Series, Vol. 757, American Chemical Society, Washington, D. C., 2000; Chap. 7, pp. 86-106.

### **Honors, Awards, Affiliations**

American Chemical Society

2010 ORNL Significant Event Award-Team: Next-Generation CSSX: Dramatically

Improved Performance to Accelerate Tank-Waste Cleanup and Reduce Life Cycle Costs

2008 ORNL Technical Support Award

1996 American Chemical Society Undergraduate Award in Analytical Chemistry

1996 American Institute of Chemists Outstanding Senior Award

1995 National Science Foundation Undergraduate Research Fellow