

## CURRICULUM VITA

### BRIAN H. DAVISON

Oak Ridge National Laboratory  
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### RESEARCH INTERESTS

Bioconversion of renewable resources into fuels and chemicals (ethanol, organic acids, solvents), Hybrid processes (catalytic upgrading), Systems analysis of microbes (cultivation and proteomics), Non-aqueous biocatalysis, Biofiltration of VOCs, Bioremediation of chlorinated organics, Bioreactor modeling (mass transfer and kinetics), Immobilization of microbes and enzymes, Biosorption of metals, Extractive fermentations.

### PROFESSIONAL EXPERIENCE

**Oak Ridge National Laboratory, Corporate Fellow, 2020-present**

**Oak Ridge National Laboratory, Chief Scientist for Systems Biology and Biotechnology, 2006–Present**

Lead Lab-wide initiatives in Systems Biology and in Bioenergy. Serve as Chief Science Officer for the Center for Bioenergy Innovation ([cbi.ornl.gov](http://cbi.ornl.gov)). Served as Science Coordinator for integration for the BioEnergy Science Center, [www.bioenergyscience.org](http://www.bioenergyscience.org). Coordinated successful proposals for the Bioenergy Science Center and other projects. PI for the ongoing DOE-BER project on “Visualization of Solvent Disruption of Biomass and Biomembrane Structures in the Production of Advanced Biofuels and Bioproducts” (<https://sfa-biofuels.ornl.gov/>). Manage internal investment portfolio and develop new programs, staff and teams in these focus areas. Research in biomass conversion, microbial cultivation and nonaqueous enzymes. Co-developed technology in catalytic upgrading of ethanol into hydrocarbons, which is licensed to Vertimass. Chief Scientist for Genomic Sciences for the U.S. DOE Biological and Environmental Research Office (2009–2011). Serve as Chair of the Institutional Biosafety Committee since 2001.

**Oak Ridge National Laboratory, Director, Life Sciences Division, 2004–2005**

Management of active research division consisting of 100 staff members in addition to students and subcontractors. Continued research while assisting multiple initiatives for genomics, biosecurity, and sensors.

**Oak Ridge National Laboratory, Senior Biochemical Engineer and Group Leader, 1995–2001, Distinguished Researcher and BioChemical Engineering Research Group Leader, 2002–2003**

Research and Development (R&D) activities expanded in areas listed with programmatic responsibilities, supervision, and support of 5 to 15 research staff members including postdocs, technicians, and students. Managed more than ten research projects. Project Team Leader of the Alternative Feedstocks Program which involved coordination for interdisciplinary multilab teams with industrial partners for demonstration of an economic process to convert renewables into commodity chemicals (i.e., succinic acid). Other projects include: nonaqueous biocatalysis, biofiltration and ethanol fermentation with experimental planning and modeling. Served as Co-Chair of the 15th to 26th *Symposia on Biotechnology for Fuels and Chemicals*. Assisted in several lab-wide initiatives (e.g., Bioenergy/Bioproducts, chemical warfare decontamination, biological CO<sub>2</sub> sequestration). Operated a 500-L fermentor as Manager for ORNL’s Bioprocessing User Facility 1992–2003.

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**Oak Ridge National Laboratory, Biochemical Engineer II, 1990–1995**

R&D on bioprocessing with increased supervisory duties. Projects included immobilized-cell bioreactors, extractive fermentation of butanol, biomethanogenesis, conversion of wastepaper, and collaborations with outside researchers and private industry. Assisted in the development of a predictive model for the fluidized-bed bioreactor. Responsible for interface of research and maintenance staff in preparation for major external Environmental Safety and Health inspection while serving as Local Facility Supervisor for two years.

**Oak Ridge National Laboratory, Biochemical Engineer I, 1985–1990**

Research emphasized experiments and modeling of immobilized-cell fluidized-bed bioreactors. Designed and tested bioreactors for ethanol production and for simultaneous fermentation and separation of organic acids. This included scale-up (to a 10-ft column) and the use of industrial feedstocks.

**University of Tennessee-Knoxville, Faculty – Bredesen Center, University of Tennessee/ORNL,**

2010 – Present [unpaid], degree program in energy, two graduate students and many committees.

**Adjunct Professor of Chemical and Biological Engineering, 1988–Present [unpaid]; supervision of three Ph.D. students and four Masters students; occasional instructor of BioChE graduate courses**

**EDUCATION**

- Ph.D.** Chemical Engineering, California Institute of Technology, Pasadena, California, 1985.  
Thesis topic: “*Dynamics and Coexistence of Mixed Microbial Cultures.*” Stable coexistence of competing microorganisms (*E. coli* and *S. cerevisiae*) in chemostats.  
Thesis Advisor: Dr. Gregory N. Stephanopoulos
- B.S.E.** Chemical Engineering, with honors, University of Rochester, Rochester, New York, 1979.

**AWARDS and HONORS**

- USDOE Secretary of Energy’s Honor Achievement Award for “DOE National Laboratories’ COVID-19 Clinical Testing Teams,” 2020.
- UT-Battelle Individual Achievement in Technology Transfer, ORNL, 2018.
- Fellow, Society for Industrial Microbiology and Biotechnology (SIMB), 2017.
- Fellow, American Institute of Chemical Engineers (AIChE), 2016.
- USDOE Secretary of Energy’s Honor Achievement Award for “The WIPP Technical Assessment Team (TAT) and Accident Investigation Board (AIB),” 2015.
- UT-Battelle Science Communicator of the Year, ORNL, 2010.
- Charles D Scott Award for distinguished contributions to the field of biotechnology for fuels and chemicals, Society for Industrial Microbiology, Symposium on Biotechnology for Fuels and Chemicals, 2006.
- College of Fellows, American Institute for Medical and Biological Engineering (AIMBE), 2006.
- R&D100 Award for “Production of Chemicals from Biologically Derived Succinic Acid,” *Research & Development Magazine*, 1997. This technology was licensed for commercialization by BioAmber.
- Management Achievement Award, Life Sciences Division, ORNL, 2002.
- Significant Event Award for “Expression of Lignin Peroxidase in Yeast,” ORNL, 2000.
- Significant Event Award for “Dry Enzyme Catalysis,” ORNL, 2000.
- Technology Maturation Award for Succinic Acid Process, ORNL, 1999.
- Technical Achievement Award for “Innovative Research Leading to the Development of the Biparticle Fluidized-Bed Bioreactor,” Martin Marietta Energy Systems, Inc., 1992.

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Distinguished Writing Award for Scholarly Articles (First place) by the Society for Technical Communication - East Tennessee, 1991.

Significant Event Award for “High Productivity, Ethanol Fermentation,” Martin Marietta Energy Systems, 1987.

Outstanding Graduating Engineer, University of Rochester, 1979.

Wilson Scholar, University of Rochester, 1975–1979.

AIChE Outstanding Junior Chemical Engineer, University of Rochester, 1978.

National Merit Scholarship, 1975.

### PROFESSIONAL AFFILIATIONS

American Institute of Chemical Engineers: Board of Directors (2020-2022), Fellow, chair for sessions  
Society for Biological Engineering: Board of Directors - AIChE (2012–on).

American Chemical Society (chaired symposia and sessions and served on several BIOT committees).  
Society for Industrial Microbiology and Biotechnology.

Chair, Symposium on Biotechnology for Fuels and Chemicals and editor of the Proceedings in *Appl. Biochem. Biotechnol.* (1994–2005). Organizing Committee (2006–2012). The Symposium grew from 150 to 400 attendees during my twelve years as chair.

Editorial Boards: *Biotechnol for Biofuels* (2018-present); *J Industrial Biotechnology* (2011–Present).

Advisory boards: NSERC Bioconversion Network for Guelph and Univ. British Columbia (2009–2015).

BBSRC Sustainable Bioenergy Centre (BSBEC), United Kingdom (2010–2015).

C3 Bio EFRC, Purdue University (2012–on).

Southeast Agriculture and Forestry Energy Resources Alliance (2007–2010).

Co-Organizer for the USDOE “Biomass to Biofuels” Workshop, December 2005. “Breaking the Biological Barriers to Cellulosic Ethanol,” DOE/SC-0095.

Participant in “Microbial Production of Energy” Colloquium, March 10–12, 2006, San Francisco, California.  
Report by American Academy of Microbiology.

### JOURNAL PUBLICATIONS (Includes Journal Published, Peer Reviewed, Conference Proceedings are separate). WebScience H-index is 36.

Erica L. Gjersing, Bryon S. Donohoe, Brian H. Davison, Gerald A. Tuskan, Wellington Mucharo, Robert W. Sykes, Stephen R. Decker and Mark F. Davis, “Plant Cell Wall Chemical Composition Governs Cell Wall Rigidity and Biomass Recalcitrance” (in prep)

Martin, Stanton; Harman-Ware, Anne; Kinoshita, Robert; Wilson, Bruce; Brandt, Craig; Emerson, Rachel; Davison, Brian; Jacobson, Oslo; Sievers, David; Collett, James. Field to Fuel: Information tracking throughout the lifecycle of a feedstock. *ACS Sust Chem Eng* (submitted)

Luoxi Tan, Micholas Dean Smith, Haden L. Scott, Ahmad Yahy, James G. Elkins, John Katsaras, Hugh M. O’Neill, Sai Venkatesh Pingali, Jeremy C. Smith, Brian H. Davison, Jonathan D. Nickels. Partitioning and structural changes in biomembranes in the presence of perturbing co-solvents. *Green Chem* (submitted).

Punita Manga, Steve Allman, Kyle Sander, Miguel Rodriguez Jr., Dawn M. Klingeman, Madhavi Z. Martin, Nancy L. Engle, Richard J. Giannone, Suresh Poudel, Timothy J. Tschaplinski, Robert L. Hettich,

Brian H. Davison, and Steven D. Brown. "Improved *Caldicellulosiruptor bescii* growth and substrate utilization at lower pH." (submitted)

Jonathan D. Nickels, Kyle S. Bonifer, Rachel Tindall, Ahmad Yahya, Luoxi Tan, Changwoo Do, Brian H. Davison, and James G. Elkins. "CRISPRi inhibition of beta-ketoacyl-ACP synthase (fabF) improves chemical and isotopic labeling of biomembranes in *Bacillus subtilis*." *Frontiers Microb* (2022, submitted) Wang, Yun-Yan; Smith, Micholas; Luna, Liang Meng, Xianzhi; Pu, Yunqiao; Mitra, Mazarei; Agarwal, Rupesh; Rukmani, Shalini; Davison, Brian; Ragauskas, Arthur. "Cyrene Pretreatment on Switchgrass: Effect of Pretreatment Conditions on Lignin Structure." *Green Chem* (2022) (submitted).

Junyan Zhang, Shiba Adhikari, Ce Yang, Evan C. Wegener, Jeffrey T. Miller, Theodore R. Krause, Kinga A. Unocic, Lawrence F. Allard, Dongxia Liu, Brian H. Davison, Zili Wu, Zhenglong Li. "Zeolite-supported atomically dispersed catalyst for selective ethanol conversion to C3-C6 olefins." (submitted)

Chang Geun Yoo, James B. Brown, Brian H. Davison, Richard A. Dixon, Claus Felby, Michael E. Himmel, Daniel A. Jacobson, Martin Keller, Debra Mohnen, Wellington Muchero, Lisbeth Olsson, Yunqiao Pu, Pawel Piatek, C. Neal Stewart, Jr., Blake A. Simmons, Timothy J. Tschaplinski, Gerald A. Tuskan, Charles E. Wyman, Yongil Yang, and Arthur J. Ragauskas, "Understanding Lignocellulosic Biomass Recalcitrance: Recent Approaches in Feedstock and Conversion Strategies," (submitted)

Liang, Luna; Wang, Yun-Yan; Bhagia, Samartha; Sethuraman, Vaidyanathan; Yang, Zhi; Meng, Xianzhi; Pingali, Sai Venkatesh; Bryant, Nathan; Petridis, Loukas; Smith, Jeremy; Gallego, Nidia; Pu, Yunqiao; Evans, Barbara; O'Neill, Hugh; Davison, Brian; Ragauskas, Arthur. "Chemical and Morphological Structure of Transgenic Switchgrass Organosolv Lignin Extracted by Ethanol, Tetrahydrofuran, and  $\gamma$ -Valerolactone Pretreatments". *ACS Sust Chem Eng* (2022) (in press) doi: 10.1021/acssuschemeng.2c00948

James G. Elkins, Miguel Rodriguez, Jr., Olivia N. Cannon, Raynella M. Connatser, Gbikeloluwa B. Oguntimein, Michael D. Kass, Brian West, and Brian H. Davison. n-Butanol or isobutanol as a value-added fuel additive to inhibit microbial degradation of stored gasoline." *Fuel Communications* **12**:100072 (2022). <https://doi.org/10.1016/j.jfueco.2022.100072>

Yan Song; Xianzhi Meng; Wei Jiang; Barbara R. Evans; Haoxi Ben; Yuanming Zhang; Yunqiao Pu; Sai Venkatesh Pingali; Brian H. Davison; Zhang, Sai; Guangting Han; A. Ragauskas. "Deuterium incorporation into cellulose: A mini-review of biological and chemical methods." *Cellulose* **29**:4269-4286 (2022). DOI 10.1007/s10570-022-04551-4.

Lee R. Lynd, Gregg T. Beckham, Adam M. Guss, Lahiru Jayakody, Eric M. Karp, Costas Maranas, Robert L. McCormick, Daniel Amador-Noguez, Yannick Bomble, Brian H. Davison, Charles Foster, Michael Himmel, Evert Holwerda, Mark S. Laser, Chiam Yu Ng, Daniel G. Olson, Yuriy Román-Leshkov, Cong Trinh, Gerald A. Tuskan, Vikas Upadhayay, Derek R. Vardon, Lin Wang, Charles E. Wyman, "Toward Low-cost Biological and Combined Hybrid Biological/Catalytic Conversion of Cellulosic Biomass to Fuels." *Energy Environ. Sci.* **15**:938-990 (2022) DOI: 10.1039/D1EE02540F

Junyan Zhang, Eunji Yoo, Brian H. Davison, Dongxia Liu, Joshua A. Schaidle, Ling Tao, Zhenglong Li, "Towards cost-competitive middle distillate fuels from ethanol within a market-flexible C2 platform-based biorefinery concept." *Green Chem* **23**:9534-9548 (2021) DOI: 10.1039/D1GC02854E

Yang, Z., Foston, M.B., O'Neill, H., Urban, V.S., Ragauskas, A., Evans, B.R., Davison, B.H., and Pingali, S. V. "Structural Reorganization of Non-Cellulosic Polymers Observed *in situ* during Dilute Acid Pretreatment by Small Angle Neutron Scattering," *ACS Sust Chem Eng* 10:314-322 (2021). doi: 10.1021/acssuschemeng.1c06276

Tan, Luoxi; Elkins, James G.; Davison, Brian H.; Kelley EG; Nickels J. "Implementation of a self-consistent slab model of bilayer structure in the SasView suite," *J Appl Crystall* 54: 363-370 Part: 1 (2021). DOI: 10.1107/S1600576720015526

Smith, Micholas D; Pingali, SV; Elkins, JG; Bolmatov, D; Standaert, RF; Nickels, JD; Urban, VS; Katsaras, J; Davison, BH; Smith, JC; Petridis, L. "Solvent-induced membrane stress in biofuel production: molecular insights from small-angle scattering and all-atom molecular dynamics simulations," *Green Chem* 22(23) (2020). DOI: 10.1039/d0gc01865a

Renee M. Happs, Andrew W. Bartling, Crissa Doeppke, Anne E. Harman-Ware, Robin Clark, Erin G. Webb, Mary Biddy, Jin-Gui Chen, Gerald A. Tuskan, Mark F. Davis, Wellington Muchero, and Brian H. Davison, "Economic Impact of Yield and Composition Variation in Bioenergy Crops: *Populus trichocarpa*," *Biofuels, Bioproducts and Biorefining* 15(1):176-188 (2021). dx.doi.org/10.1002/bbb.2148

Shah, Riddhi; Bhagia, Samarthya; Keum, Jong; Pingali, Sai Venkatesh; Ragauskas, Arthur; Davison, Brian; O'Neill, Hugh. "Structural Insights into Low and High Recalcitrance Natural Poplar Variants using Neutron and X-ray scattering," *ACS Sust Chem Eng* 8:13838-13849 (2020). doi:10.1021/acssuschemeng.0c05251

Matthew Langholtz, Brian H. Davison, Henriette I. Jager, Laurence Eaton, Latha M. Baskaran, Maggie Davis, and Craig C. Brandt, "Increased nitrogen use efficiency in crop production can provide economic and environmental benefits," *Science of The Total Environment*, 758:143602 (2021). <https://doi.org/10.1016/j.scitotenv.2020.143602>.

Danielle Berardi, Edward Brzostek, Elena Blanc-Bates, Evan H DeLucia, Melannie Hartman, Jeffrey Kent, Debasish Saha, Brian H. Davison, and Tara W Hudiburg, "21st century biogeochemical modeling: Successes and challenges for Century-based models and where do we go from here?" (2020), *GCB Bioenergy*. 12: 774-788. <https://doi.org/10.1111/gcbb.12730>

Sai Venkatesh Pingali, Micholas Smith, Shih-Hsien Liu, Takat Rawal, Yunqiao Pu, Riddhi Shah, Barbara R Evans, Volker Urban, Brian H. Davison, Charles M Cai, Arthur Ragauskas, Hugh M. O'Neill, Jeremy C Smith, Loukas Petridis. "Deconstruction of biomass enabled by local de-mixing of cosolvents at cellulose and lignin surfaces." *PNAS* 117: 16776-16781 (2020) <https://doi.org/10.1073/pnas.1922883117>

Mitra Mazarei, Holly L. Baxter, Avinash Srivastava, Guifen Li, Hongli Xie, Alexandru Dumitrache, Miguel Rodriguez Jr., Jace M. Natzke, Ji-Yi Zhang, Geoffrey B. Turner, Robert W. Sykes, Mark F. Davis, Michael K. Udvardi, Zeng-Yu Wang, Brian H. Davison, Elison B. Blancaflor, Yuhong Tang and Charles Neal Stewart Jr., (2020) "Silencing Folylpolyglutamate Synthetase1 (FPGS1) in Switchgrass (*Panicum virgatum* L.) Improves Lignocellulosic Biofuel Production," *Front. Plant Sci.*, 11: 843 <https://doi.org/10.3389/fpls.2020.00843>

Kyle Sander, Daehwan Chung, Dawn M. Klingeman, Miguel Rodriguez Jr., Jason Whitham, Brian H. Davison, Janet Westpheling, Steven D. Brown. "Gene Targets for Engineering Osmotolerance in *Caldicellulosiruptor bescii*." *Biotechnol. for Biofuels* 13:50 (2020) DOI: 10.1186/s13068-020-01690-3

Farahi, Rubye; Lereu, Aude; Charrier, Anne; Kalluri, Udaya; Davison, Brian; Passian, Ali. "Nanomechanics and Raman spectroscopy of in situ native carbohydrate storage granules for enhancing starch quality and lignocellulosic biomass production." *ACS Omega* 5(6): 25942602 (2020). doi: 10.1021/acsomega.9b02849

John R. Hannon, Lee R. Lynd, Onofre Andradec, Pahola Thathiana Benavides, Gregg T. Beckham, Mary J. Bidy, Nathan Brown, Mateus F. Chagas, Brian H. Davison, Thomas Foust, Tassia L. Junqueira, Mark S. Laser, Zhenglong Li, Tom Richard, Ling Tao, Gerald Tuskan, Michael Wang, Jeremy Woods, Charles E. Wyman. "Technoeconomic and life cycle analysis of catalytically converting wet ethanol into fungible fuel blendstocks." *PNAS* 117(23): 12576-12583 (2020) doi/10.1073/pnas.1821684116

Riddhi Shah, Shixin Huang, Sai Venkatesh Pingali, Daisuke Sawada, Yunqiao Pu, Miguel Rodriguez, Jr., Arthur J. Ragauskas, Seong H. Kim, Barbara R. Evans, Brian H. Davison, and Hugh O'Neill. "Hemicellulose–Cellulose Composites Reveal Differences in Cellulose Organization after Dilute Acid Pretreatment," *Biomacromol* 20:893-903 (2019). <https://doi.org/10.1021/acs.biomac.8b01511>

Barbara R. Evans, Marcus Foston, Hugh M. O'Neill, David Reeves, Caroline Rempe, Kathi McGrath, Arthur J. Ragauskas, Brian H. Davison. "Production of deuterated biomass by cultivation of *Lemna minor* (duckweed) in D<sub>2</sub>O." *Planta* 249(5):1465–1475. (2019) DOI: 10.1007/s00425-019-03097-3

Evert K. Holwerda, Robert S. Worthen, Ninad Kothari, Ronald C. Lasky, Brian H. Davison, Chunxiang Fu, Zeng-Yu Wang, Richard A. Dixon, Ajaya K. Biswal, Debra Mohnen, Richard S. Nelson, Holly L. Baxter, Mitra Mazarei, Wellington Muchero, Gerald A. Tuskan, Charles M. Cai, Erica E. Gjersing, Mark F. Davis, Michael E. Himmel, Charles E. Wyman, Paul Gilna and Lee R. Lynd. "Multiple levers for overcoming the recalcitrance of lignocellulosic biomass," *Biotechnol. for Biofuels* 12:15 (2019). doi.org/10.1186/s13068-019-1353-7.

Hu, Michael, Bischoff, Brian; Morales-Rodriguez, Marissa; Gray, Kevin; Davison, Brian; "Superhydrophobic or hydrophilic porous metallic/ceramic tubular membranes for continuous separations of biodiesel/water W/O and O/W emulsions," *Ind. Eng. Chem. Res.* 58:1114-1122 (2019). doi:10.1021/acs.iecr.8b04888

Samarthya Bhagia, Xianzhi Meng, Barbara R. Evans, John R. Dunlap, Garima Bali, Jihua Chen, Kimberly Shawn Reeves, Hoi Chun Ho, Brian H. Davison, and Arthur J. Ragauskas. "Ultrastructure and Enzymatic Hydrolysis of Deuterated Switchgrass," *SciRep* 8:13226 (2018). doi: 10.1038/s41598-018-31269-w

Samarthya Bhagia, Yunqiao Pu, Barbara R. Evans, Brian H. Davison, Arthur J. Ragauskas. "Hemicellulose characterization of deuterated switchgrass." *Bioresour Technol.* 269:567-570 (2018). doi.org/10.1016/j.biortech.2018.08.034.

Kyle Sander, Daehwan Chung, Doug Hyatt, Janet Westpheling, Dawn M. Klingeman, Miguel Rodriguez Jr., Nancy L. Engle, Timothy J. Tschaplinski, Brian H. Davison, Steven D. Brown. "Rex in *Caldicellulosiruptor bescii*: Novel Regulon Members and its Effect on the Production of Ethanol and

Overflow Metabolites.” *Microbiol. Open* 8:e00639 (2019) DOI: 10.1002/mbo3.639

Charrier, Anne M., Lereu, AL, Farahi, RH, Davison, BH, Passian, Ali. “Nanometrology of Biomass for Bioenergy: The Role of Atomic Force Microscopy and Spectroscopy in Plant Cell Characterization,” *Frontiers Energy Res* 6: e11. (2018) DOI:10.3389/fenrg.2018.00011

Arkin, AP, Cottingham, RW, ..., Davison BH, et al. (81 co-authors), “The DOE System Biology Knowledgebase Project (KBase)” *Nature Biotechnol.* 36:566. doi: 10.1038/nbt.4163 (2018).

Daisuke Sawada, Udaya Kalluri, Hugh O’Neill, Volker Urban, Paul Langan, Brian Davison, Sai Venkatesh Pingali. “Tension wood structure and morphology conducive for better enzymatic digestion.” *Biotechnol for Biofuels*, 11:44 (2018) doi: 10.1186/s13068-018-1043-x

Gbekeloluwa B. Oguntimein, Miguel Rodriguez, Jr., Alexandru Dumitrache, Todd Shollenberger, Stephen R. Decker, Brian H. Davison, and Steven D. Brown. “Anaerobic Microplate Assay for Direct Microbial Conversion of Switchgrass and Avicel using *Clostridium thermocellum*.” *Biotech. Lett.* 40(2): 303-308. DOI: 10.1007/s10529-017-2467-2 (2018)

Derya Vural, Catalin Gainaru, Hugh O’Neill, Yunquiao Pu, Micholas Dean Smith, Sai Venkatesh Pingali, Eugene Mamontov, Brian H. Davison, Alexei P. Sokolov, Arthur J. Ragauskas, i Jeremy C. Smith, Loukas Petridis. “Impact of hydration and temperature history on the structure and dynamics of lignin,” *Green Chem.* 20(7): 1602-1611 (2018) DOI: 10.1039/c7gc03796a

Yoo, CG; Dumitrache, A; Muchero, W; Natzke, J; Akinosho, H; Li, M; Sikes, RW; Brown, SD; Davison, B; Tuskan, GA; Pu, YQ; Ragauskas, AJ. “Significance of Lignin S/G Ratio in Biomass Recalcitrance of *Populus trichocarpa* Variants for Bioethanol Production.” *ACS Sust. Chem. Engr.* 6(2): 2162-2168 DOI: 10.1021/acssuschemeng.7b03586 (2018)

Ajaya K. Biswal, MA Atmodjo, M Li, HL Baxter, CG Yoo, Y Pu, Y-C Lee, M Mazarei, IM Black, J-Y Zhang, H Ramanna, AL Bray, ZR King, PR LaFayette, S Pattathil, BS Donohoe, SS Mohanty, D Ryno, K Yee, OA Thompson, M Rodriguez Jr, A Dumitrache, J Natzke, K Winkeler, C Collins, X Yang, L Tan, RW Sykes, EL Gjersing, A Ziebell, GB Turner, SR Decker, MG Hahn, BH Davison, MK Udvardi, J Mielenz, MF Davis, RS Nelson, WA Parrott, AJ Ragauskas, CN Stewart, Jr. and D Mohnen. “Sugar release and growth of biofuel crops are improved by downregulation of pectin biosynthesis,” *Nature Biotechnol.* (2018) doi:10.1038/nbt.4067.

Baxter, Holly, Mitra Mazarei, Alexandru Dumitrache, Jace Natzke, Miguel Rodriguez, Jiqing Gou, Chunxiang Fu, Robert Sykes, Geoffrey Turner, Mark Davis, Steven Brown, Brian Davison, Zeng-Yu Wang, C. Neal Stewart, “Transgenic miR156 switchgrass in the field: growth, recalcitrance, and rust susceptibility,” *Plant Biotechnol. J.* 16:39-49 (2018). DOI: 10.1111/pbi.12747

Paul Gilna, Lee R. Lynd, Debra Mohnen, Mark F. Davis, and Brian H. Davison. “Progress in understanding and overcoming biomass recalcitrance: a Bioenergy Science Center (BESC) perspective.” *Biotechnol for Biofuels*, 10:285 (2017), DOI 10.1186/s13068-017-0971-1; <http://rdcu.be/zWXs>

Kyle Sander, Kei-ji G. Asano, Deepak Bhandari, Gary J. Van Berkel, Steven D. Brown, Brian Davison, Timothy J. Tschaplinski. “Targeted Redox and Energy Cofactor Metabolomics in *Clostridium*

thermocellum and Thermoanaerobacterium saccharolyticum.” *Biotechnol Biofuels* 10:270 (2017) DOI 10.1186/s13068-017-0960-4; <http://rdcu.be/zWXC>

RS Nelson, CN Stewart Jr., J Gou, S Holladay, L Gallego-Giraldo, A Flanagan, DGJ Mann, H Hisano, WA Wuddineh, CR Poovaiah, A Srivastava, AK Biswal, H Shen, LL Escamilla-Treviño, J Yang, CF Hardin, R Nandakumar, C Fu, J Zhang, X Xiao, R Percifield, F Chen, JL Bennetzen, M Udvardi, M Mazarei, RA Dixon, Z-Y Wang, Y Tang, D Mohnen and BH Davison, “Development and use of a switchgrass (*Panicum virgatum* L.) transformation pipeline by the BioEnergy Science Center to evaluate plants for reduced cell wall recalcitrance.” *Biotechnol for Biofuels*, 10:309 (2017), [doi.org/10.1186/s13068-017-0991-x](https://doi.org/10.1186/s13068-017-0991-x)

Anne E. Harman-Ware, Renee M. Happs, Brian H. Davison, and Mark F. Davis, The effect of coumaryl alcohol incorporation on the structure and composition of lignin dehydrogenation polymers.” *Biotechnol Biofuels* (2017) 10:281; DOI 10.1186/s13068-017-0962-2; <http://rdcu.be/zWXz>

Yoo, Chang Geun; Pu, Yunqiao; Meng, Xianzhi; Evans, Barbara; Muchero, W; Yee KL; Rodriguez, M, Bali, G; Engle NL, etc. and reorder names; Davison, Brian; Ragauskas, Arthur. “Insights of biomass recalcitrance in *Populus trichocarpa* natural variants for biomass conversion.” *Green Chem* 19:5467-5478 (2017) DOI: 10.1039/c7gc02219k.

Meng, Xianzhi; Evans, Barbara; Yoo, Chang Geun; Pu, Yunqiao; Davison, Brian; Ragauskas, Arthur. "The effect of in-vivo deuteration on structure of switchgrass lignin." *ACS Sus Chem Eng* 5: 8004-8010 (2017) DOI: 10.1021/acssuschemeng.7b01527

O'Neill, H; SV Pingali, L Petridis, JH He, E Mamontov, L Hong, V Urban, B Evans, P Langan, JC Smith, BH Davison. “Dynamics of water bound to crystalline cellulose,” *Sci Reports* 7:11840 (2017) DOI: 10.1038/s41598-017-12035-w

Jeffrey V. Zurawski, Piyum A. Khatibi, Hannah O. Akinosho, Christopher T. Straub, Scott H. Compton, Jonathan M. Conway, Laura L. Lee, Arthur J. Ragauskas, Brian H. Davison, Michael W.W. Adams, and Robert M. Kelly. “Bioavailability of carbohydrate content in natural and transgenic switchgrasses for the extreme thermophile *Caldicellulosiruptor bescii*,” *Appl. Env. Microbiol.* 83:unsp e00969 (2017) DOI: 10.1128/AEM.00969-17.

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### BOOK CHAPTERS

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### CONFERENCE PROCEEDINGS

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Barton, J. W., C. D. Vodraska, S. A. Jones, and B. H. Davison, "Enhanced Solubility of Priority Contaminants in High-Biomass Systems and Associated Impacts on Biofilter Operation," *Proceedings of the 2002 USC-TRG Conference on Biofiltration*, Newport Beach, California, October 30–November 1, 2002.

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Klasson, K. T., J. W. Barton, B. H. Davison, S. C. Thorp, and J. M. Aaron, "Performance of Propane-Degrading Bacterium," *Proceedings of Air and Waste Management Association's 92nd Annual Meeting and Exhibition* (1999).

Barton, J. W., X. S. Zhang, K. T. Klasson, and B. H. Davison, "Predictive Mathematical Modeling of Trickling Bed Biofilters for Elucidating Mass Transfer and Kinetic Effects," *Proceedings of the 91st Annual Meeting of the Air and Waste Management Association*, San Diego, California, June 1998, Paper 98-WAA.13P.

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Davison, B. H. and E. N. Kaufman, "Enhanced Fermentation Systems with Continuous Removal of Inhibitory Products," *Proceedings of Corn Utilization Conference V*, St. Louis, Missouri, June 8–10, 1994.

Davison, B. H., C. D. Scott, and E. N. Kaufman, "Three Immobilized-Cell Bioreactors for Enhanced Production of Chemicals," *Proceedings of the First Biomass Conference of the Americas: Energy Environment Agriculture and Industry*, Burlington, Vermont, August 30–September 2, 1993, **Vol. II**, 1249–1258.

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## ORNL REPORTS

U.S. Department of Energy, *2016 Billion-Ton Report: Advancing Domestic Resources for a Thriving Bioeconomy, Volume 1: Economic Availability of Feedstocks*, M. H. Langholtz, B. J. Stokes, and L. M. Eaton (Leads), 448p.; ORNL/TM-2016/160, Oak Ridge National Laboratory, Oak Ridge, Tennessee (Contributor) (2016).

Nghiem, N. P. and B. H. Davison, "Continuous Ethanol Production Using Immobilized-Cell/Enzyme Biocatalysts in Fluidized-Bed Reactor (FBR)," Oak Ridge National Laboratory, ORNL/TM-2002/164 (November 2003).

Klasson, K. T. and B. H. Davison, "A General Methodology for Evaluation of Carbon Sequestration Activities and Carbon Credits," Oak Ridge National Laboratory, ORNL/TM-2002/235 (November 2002).

Davison, B. H., N. P. Nghiem, M. Donnelly, S. P. Tsai, J. Frye, R. Landucci, and M. Griffin, "Production of Chemical Derivatives from Renewables," CRADA Final Report, C/ORNL/96-0407 (2002).

Busche, R. M., C. D. Scott, B. H. Davison, and L. R. Lynd, "The Ultimate Ethanol: Technoeconomic Evaluation of Ethanol Manufacture, Comparing Yeast vs *Zymomonas* Bacterium Fermentations," ORNL/TM-11852, Oak Ridge National Laboratory, Oak Ridge, Tennessee (August 1991).

## INVITED PANELS (SELECTED) AND RESULTING ROADMAPS IF AVAILABLE

### Co-Organizer

USDOE "Biomass to Biofuels" Workshop, December 2005, "Breaking the Biological Barriers to Cellulosic Ethanol," DOE/SC-0095.

"New Biocatalysts: Essential Tools for a Sustainable 21st Century Chemical Industry," Council for Chemical Research and USDOE OIT, Palo Alto, California, November 16–18, 1999.

Nitrogen Economy DOE Lab Workshop, Oak Ridge, TN September 2016.

### Organizing Committee/Session/Breakout Chair

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“Vision 2020: 2000 Separations Roadmap,” AIChE Center for Waste Reduction Technologies and USDOE (2000).

“Alternative Feedstocks Program Technical and Economic Assessment: Thermal/chemical and Bioprocessing Components,” USDOE OIT, July 1993.

“The Technology Roadmap for Plant/crop-based Renewable Resources 2020,” National Corn Growers Association and USDOE-OIT, 2/1999, DOE/GO-10999-706.

“DOE Genomics:GTL Roadmap – Systems Biology and the Environment,” DOE/SC-0090, August 2005.

“Systems Biology Knowledgebase for a New Era in Biology – A Genomics:GTL Report from the May 2008 Workshop,” DOE/SC-0113.

“New Frontiers in Characterizing Biological Systems – Report from the May 2009 Workshop,” DOE/SC-0121.

“DOE Systems Biology Knowledgebase Implementation Plan – From the Knowledgebase System Development Workshop, June 13, 2010, in Crystal City, Virginia,” September 2010.

### **Participant**

“U.S. Government Accountability Office – Expert Meeting on Advanced Biofuels Research and Development,” NAS, Washington DC, May 2016; resulting in “RENEWABLE FUEL STANDARD: Low Expected Production Volumes Make It Unlikely That Advanced Biofuels Can Meet Increasing Targets,” GAO-17-108, November 2016

“DOE Bioproducts to Enable Biofuels Workshop,” Westminster, Colorado, July 2015, DOE/EE-1294 December 2015.

“DOE-OBP: Workshop on Conversion Technologies for Advanced Biofuels,” Arlington, Virginia, December 6–8, 2011.

“Microbial Energy Conversion,” American Academy of Microbiology, workshop March 2006.

“National Algal Biofuels Technology Roadmap – National Algal Biofuels Workshop, December 2008,” May 2010, DOE/EE-0332.

Review panels for USDA, SBIR, NSF Biocatalysis (December 2012), and DOE (BETO, BER, EPSCOR).

Biosafety Assessment and review for NREL, August 2017.

### **STUDENTS**

5 Years: Ph.D.: Kyle Sanders, Andrew LePore, Riddhi Shah, Punita Manga  
Past: MS: C. L. Cheng, Greg DeLozier, Paula A. Cameron, Miguel Rodriguez, Jr.  
Ph.D.: Mai Y. Sun

### **Post-Degrees Studies**

5 Years: Alexandre Dumitrache, Kelsey Yee, Erik Casbeer, and Zhenglong Li,  
Past: John W. Barton, Ping Wang, Laurel O’Connor, Manesh S. Krishnan

### **CONFERENCES (recent)**

**Commercializing Industrial Biotechnology** Chair 9/2015, San Diego, CA. Organizing committee 2017, 2019, and 2020.

**RECENT SELECTED INVITED PRESENTATIONS (2010–PRESENT)**

“Economic Impact of Yield and Composition Variation in Bioenergy Crops: *Populus trichocarpa*” International Congress on Sustainability Science & Engineering (ICOSSE '20), virtual, August 2020.

“Biomass pretreatment and degradation – deeper understanding by the use of neutron scattering and molecular dynamics,” Chalmers University, Sweden, February 14, 2019

“The use of bacterial cellulose to create model composites and provide insights into hemicellulose-cellulose interactions from thermochemical pretreatment” Society for Industrial Microbiology and Biotechnology, Chicago, IL, August 2018.

“Modes of Research Collaboration among the Bioenergy Research Centers,” Bioenergy Research Center Coordination and Readiness Assessment meeting, Washington, DC, October 2017

“The legacy of the BioEnergy Science Center (BESC) and the future with the Center for Bioenergy Innovation (CBI),” Joint BioEnergy Institute Annual Retreat. Monterrey CA, September 2017.

“Structure and function of Biomass in bioprocessing,” University of Tennessee Institute of Agriculture Center for Renewable Carbon seminar, Knoxville, TN July 2017

“Microbial hydrolysis of *Populus* biomass is limited by cellulose and lignin colocalization at the plant cell wall surface,” Symposium on Biotechnology for Fuels and Chemicals, San Francisco CA May 2017

“Novel Vertimass catalyst for ethanol conversion into renewable jet, diesel, and gasoline blend stocks and high value co-products,” Symposium on Biotechnology for Fuels and Chemicals, San Francisco CA May 2017

“The Nitrogen Economy: the role of new biological and environmental sciences,” seminar to DoE BER staff, Germantown, MD April 2017

“Overcoming Recalcitrance in the Improvement of Biofeedstocks via Genomic Research,” Advance Bioeconomy Leadership Conferences, Washington DC, February 2017

“the Nitrogen Economy,” DOE Big Ideas Preliminary Proposal Review, Berkeley CA January 2017

“Bioenergy and Bioproducts Research at ORNL,” briefing to P&G staff, ORNL, January 2017

“Neutron Scattering and Simulation Provide Insights into Fundamental Mechanisms of Biomass Pretreatment,” DOE-BER Genomic Sciences Meeting, March 2016.

“Commercializing Industrial Biotechnology – Closing Summary of the State of the Field,” Co-Chair: Commercializing Industrial Biotechnology Workshop – Society of Biological Engineering, San Diego, California, September 28–29, 2015.

“Dynamics and Coexistence in Applied Biochemical Engineering,” session in honor of 65th birthday of Gregory Stephanopoulos, AIChE Annual Meeting, Salt Lake City, November 2015.

“Biorefineries and Bioconversions: Current and Future Challenges,” plenary talk for the International

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Bioenergy Conference, Manchester, United Kingdom, March 11–13, 2014.

“Strategies for Increased Bio-Based Fuels – Biotechnology and Recalcitrance,” plenary talk for Section 15c, AIChE Annual Meeting, Atlanta, Georgia, November 2014.

“Bioconversion Challenges and Opportunities,” NSERC Bioconversion Network Enzyme Hydrolysis Workshop and 5th AGM, Montreal, Canada, June 2–4, 2014.

“DOE Bioenergy Research Center Achievement and Technology Transfer,” 11th World Congress on Industrial Biotechnology, Philadelphia, Pennsylvania, May 12–15, 2014.

“Strategies for Increased Bio-Based Fuels - with a Focus on Biotechnology Solutions to Recalcitrance,” BSRI 2014 Annual Retreat, “The Future of Bioenergy,” Athens, Georgia, May 2, 2014.

“Metabolic and Process Engineering in Industrial Scale-up of Biobased Products,” 11th World Congress on Industrial Biotechnology, Philadelphia, Pennsylvania, May 12–15, 2014.

“Existing Challenges and the Future of Bioenergy and Bioproducts Development in Canada,” FIBRE Conference Cornwall, Ontario, Canada, June 2013.

“The Promise and Progress of University Bioenergy Research” 2012 Georgia Energy Solutions for the Southeast Meeting, Tifton, Georgia, November 29, 2012.

“Bioconversion” NSERC AGM and Pretreatment Workshop, Vancouver, B.C., Canada, June 4–6, 2012.

“Progress of Research in Bioenergy Centers: an update on the major DOE and other Bioenergy Research Centers,” Bioenergy BIO International Convention, June 27–30, 2011, Washington, D.C.

“Overcoming Biomass Recalcitrance,” Oklahoma ESPCoR Annual State Conference, University of Oklahoma, Norman, Oklahoma, April 29, 2010.

“Advances in Conversion and Sustainability at BESC – A DOE Bioenergy Research Center,” 6th World Congress on Industrial Biotechnology and Bioprocessing, Montreal, Canada, July 19–22, 2009.

#### **PAST SELECTED INVITED PRESENTATIONS (1999–2009)**

“BioEnergy Science Center” in “Developing a Cellulosic Biofuels Industry: The Tennessee Biofuels Initiative,” BIO Pacific Rim Summit, November 11–16, 2007, Honolulu, Hawaii.

“BioEnergy Science Center: Initial Results in Overcoming Biomass Recalcitrance,” BIOMASS 2009: Fueling Our Future, National Harbor, Maryland, March 17–18, 2009.

“Structural Understanding of Key Physical Properties in the Pretreatment and Enzyme Hydrolysis of Biomass,” AIChE Annual Meeting, San Francisco, California, November 2013.

“Strategies to Generate Biofuels from Cellulosic Biomass by Overcoming Recalcitrance at the BioEnergy Science Center,” AIChE Annual Meeting, San Francisco, California, November 2013.

By invitation of the Ministry of Science and Technology – P.R. China, “Integrated Bioproducts and Separations,” International High Level Forum on Bioeconomy, Beijing, China, September 14–16, 2005.

Davison, B. H., “Nontraditional Biocatalysis,” BIO 2001, Annual Meeting of the Biotechnology Industry Organization, San Diego, California, June 24–27, 2001.

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Davison, B. H., A. Mulchandani, A. Borole, C. Cheng, and M. Rodriguez, Jr., "Perioxidase-Catalyzed Epoxidation of Alkenes," 221st ACS National Meeting, American Chemical Society, San Diego, California, April 1–5, 2000.

Nghiem, N. P., M. I. Donnelly, and B. H. Davison, "Production of Succinic Acid from Lignocellulosic Materials," 221st ACS National Meeting, American Chemical Society, San Diego, California, April 1–5, 2001.

Davison, B. H., J. W. Barton, T. K. Klasson, and L. E. O'Connor, "Removal and Destruction of CWA Simulants Using 'Dry' Enzyme-Impregnated Fabrics and Coatings," Booz-Allen & Hamilton, Inc., International Symposium on Applications of Enzymes in Chemical and Biological Defense, Orlando, Florida, May 13, 2001.

Davison, B. H., J. W. Barton, A. B. Francisco, and K. T. Klasson, "The Effect of Biomass on the Measured Solubility of Sparingly Soluble Organics in Aqueous Bioremediation Systems," 2000 USC-TRG Conference on Biofiltration, Los Angeles, California, October 18–20, 2000.

Nghiem, N. P., B. H. Davison, and T. M. Cofer, "Comparison of Ethanol Production from Lignocellulosic Sugars by Two Chromosomally Integrated Microbial Strains in a Fluidized-Bed Reactor," 23rd Symposium on Biotechnology for Fuels and Chemicals, Breckenridge, Colorado, May 6–9, 2001.

Davison, B. H., T. Kuritz, and C. K. McKeown, "Green Biopolymer for Decon of Contaminated Surfaces," Presentation at *Decontamination, Demolition and Restoration (DD&R) Topical Meeting on Site Restoration of Government and Commercial Facilities*, Knoxville, Tennessee, September 12–16, 1999.

Davison, B. H., T. Kuritz, J. W. Barton, and C. K. McKeown, "Green Biopolymers for Decontamination of Metals from Surfaces," oral and poster presentation at AEMSP Review Meeting, Atlanta, Georgia, April 2000.

Davison, B. H., T. Kuritz, C. K. McKeown, and J. W. Barton, "Green Biopolymer Coatings for Improved Decontamination of Metals from Surfaces," Platform presentation at 13th Annual Technical Information Exchange (TIE) Workshop, Albuquerque, New Mexico, November 13–15, 2001.