Joshua K. Michener

1 Bethel Valley Road
Oak Ridge, TN, 37830

michenerjk@ornl.gov
(865) 576-7957

Education:

California Institute of Technology	Bioengineering	PhD	2012
Massachusetts Institute of Technology	Chemical Engineering	S.B.	2006
Massachusetts Institute of Technology	Biology	S.B.	2006

Research Experience:

2020-Present	Adjunct Professor, Department of Chemical and Biomolecular Engineering, University of Tennessee, Knoxville
2018-Present	Staff Scientist, Biosciences Division, Oak Ridge National Laboratory
2015-2018	Wigner Staff Fellow, Biosciences Division, Oak Ridge National Laboratory
2014-2015	NRSA Fellow, Biological Engineering, MIT
2012-2014	NRSA Fellow, Organismal and Evolutionary Biology, Harvard University

Publications: (*: Corresponding author)

Cahill JF, Kertesz V, Saint-Vincent P, Valentino H, Drufva E, Thiele N, and **Michener JK**. High-Throughput Characterization and Optimization of Polyamide Hydrolase Activity Using Open Port Sampling Interface Mass Spectrometry. *J. Am. Soc. Mass Spectrom.* 2023 June, 34, 7, 1383–1391. Link.

Bilbao A, Munoz N, Kim J, Orton DJ, Gao Y, Poorey K, Pomraning KR, Weitz K, Burnet M, Nicora CD, Wilton R, Deng S, Dai Z, Oksen E, Gee A, Fasani RA, Tsalenko A, Tanjore D, Gardner J, Smith RD, **Michener JK**, Gladden JM, Baker ES, Petzold CJ, Kim Y-M, Apffel A, Magnuson JK, and Burnum-Johnson KE*. PeakDecoder enables machine learning-based metabolite annotation and accurate profiling in multidimensional mass spectrometry measurements. *Nat Comms* 2023 April 28; 14: 2461. Link.

Allemann MN, Presley GN, Elkins JG, and **Michener JK***. *Sphingobium lignivorans* sp. nov., isolated from river sediment downstream of a paper mill. *Int J Syst Evol Microbiol* 2023 Feb. Link.

Kuatsjah E, Zahn M, Chen X, Kato R, Hinchen DJ, Konev MO, Katahira R, Orr C, Wagner A, Zou Y, Haugen SJ, Ramirez KJ, **Michener JK**, Pickford AR, Kamimura N, Masai E*, Houk KN*, McGeehan JE*, and Beckham GT*. Biochemical and structural characterization of a sphingomonad diarylpropane lyase for cofactorless deformylation. *Proc Natl Acad Sci USA* 2023 Jan; 120 (4) e2212246120. Link.

Varner PM, Allemann MN, **Michener JK**, and Gunsch CK*. The effect of bacterial growth strategies on plasmid transfer and naphthalene degradation for bioremediation. *Environ. Technol. Innov.* 2022 November; 28: 102910. Link.

Vasileva DP†, Streich JC†, Burdick LH†, Klingeman DM, Chhetri HB, Brelsford CM, Ellis JC, Close DM, Jacobson DA*, and **Michener JK***. Protoplast fusion in *Bacillus* species produces frequent, unbiased, genome-wide homologous recombination. *Nucleic Acids Research* 2022 June; 50(11): 6211-6223. Link.

Bleem A†, Kuatsjah E†, Presley GN†, Hinchen DJ, Zahn M, Garcia DC, Michener WE, König G, Tornesakis K, Allemann MN, Giannone RJ, McGeehan JE*, Beckham GT*, and **Michener JK***, Discovery, characterization, and metabolic engineering of Rieske non-heme iron monooxygenases for guaiacol O-demethylation. *Chem Catalysis* 2022 May. Link.

Moore JAM, Abraham PE, Michener JK, Muchero W, and Cregger MA*. Ecosystem consequences of introducing plant growth promoting rhizobacteria to managed systems and potential legacy effects. *New Phytologist* 2022 Jan; 234:1914–1918. Link.

Azubuike CC, Allemann MN, and **Michener JK***. Microbial assimilation of lignin-derived aromatic compounds and conversion to value-added products. *Curr Opin Microbiol* 2021 Nov 11;65:64-72. Link

Presley GN†, Werner AZ†, Katahira R, Garcia DC, Haugen SJ, Ramirez KJ, Giannone RJ, Beckham GT*, **Michener JK***. Pathway discovery and engineering for cleavage of a β-1 lignin-derived biaryl compound. *Metab Eng* 2021 May; 65: 1-10. Link.

Cregger MA, Carper DL, Christel S, Doktycz MJ, Labbé J, **Michener JK**, Dove NC, Johnston ER, Moore JAM, Vélez JM, Morrell-Falvey J, Muchero W, Pelletier DA, Retterer S, Tschaplinski TJ, Tuskan GA, Weston DJ, and Schadt CW*. Plant–Microbe Interactions: From Genes to Ecosystems Using *Populus* as a Model System. *Phytobiomes J* 2021 Mar; 5 : 29-38. Link.

Hatmaker E, Presley G, Cannon O, **Michener JK**, Guss A, and Elkins J*. Complete genome sequences of four natural *Pseudomonas* isolates that catabolize a wide range of aromatic compounds relevant to lignin valorization. *Microbiol Resour Announc* 2020 Dec 3;9(49):e00975-20. Link.

Elmore JR, Dexter GN, Salvachúa D, O'Brien M, Klingeman DM, Gorday K, **Michener JK**, Peterson DJ, Beckham GT, and Guss AM*. Engineered Pseudomonas putida simultaneously catabolizes five major components of corn stover lignocellulose: Glucose, xylose, arabinose, p-coumaric acid, and acetic acid. *Metab Eng* 2020 Nov; 62 : 62-71. Link.

Chaves JE, Wilton R, Gao Y, Munoz Munoz N, Burnet MC, Schmitz Z, Rowan J, Burdick LH, Elmore J, Guss A, Close D, Magnuson JK, Burnum-Johnson KE, and **Michener JK***, Evaluation of chromosomal insertion loci in the Pseudomonas putida KT2440 genome for predictable biosystems design. *Met Eng Comm* 2020 Jul 19;11:e00139. Link.

Gilmour CG*, Bullock Soren A, Gionfriddo CM, Podar M, Wall JD, Brown SD, Michener JK, Soledad Goñi Urriza M, Elias DA. *Pseudodesulfovibrio mercurii* sp. nov., a mercury-methylating bacterium isolated from sediment. *Int J Syst Evol Microbiol* 2019 Jun;71(3). Link.

Close D, Cooper CJ, Wang X, Chirania P, Gupta M, Ossyra JR, Giannone RJ, Engle NL, Tschaplinski TJ, Smith JC, Hedstrom L, Parks JM, and **Michener JK***, Horizontal transfer of a pathway for coumarate catabolism unexpectedly inhibits purine nucleotide biosynthesis. *Mol Microbiol* 2019; 112 (6) 1784-1797. Link.

Millet L, Velez J, and **Michener JK***, Genetic selection for small molecule production in competitive microfluidic droplets. *ACS Synth Biol* 2019. 8, 8, 1737-1743 Link

Trofimov AA, Pawlicki AA, Borodinov N, Mandal S, Mathews TJ, Hildebrand M, Ziatdinov MA, Hausladen KA, Urbanowicz PK, Steed CA, Ievlev AV, Belianinov A, **Michener JK**, Vasudevan R, and Ovchinnikova OS*. Deep data analytics for genetic engineering of diatoms linking genotype to phenotype via machine learning. *npj Comput Mater* 2019 5:67. Link.

Chaves JE, Presley GN, and **Michener JK***, Modular engineering of biomass degradation pathways. *Processes* 2019, 7(4), 230. Link.

Tuskan GA*, Groover AT, Schmutz J, DeFazio SP, Myburg A, Grattapaglia D, Smart LB, Yin T, Aury J-M, Kremer A, Leroy T, Le Provost G, Plomion C, Carlson JE, Randall J, Westbrook J, Grimwood J, Muchero W, Jacobson D, **Michener JK**. Hardwood tree genomics: unlocking woody plant biology. *Front Plant Sci* 2018; 9: 1799. Link.

Cecil JH, Garcia DC, Giannone RJ, **Michener JK***. Rapid, parallel identification of catabolism pathways of lignin-derived aromatic compounds in *Novosphingobium aromaticivorans*. *Appl Environ Microbiol* 2018 84:e01185-18. Link.

Standaert RF, Giannone RJ, and **Michener JK***. Identification of parallel and divergent

optimization solutions for homologous metabolic enzymes. *Metab Eng Comm* 2018. 6:56-62. Link.

Clarkson SM, Giannone RJ, Kridelbaugh DM, Elkins JG, Guss AM*, and **Michener JK***, Construction and optimization of a heterologous pathway for protocatechuate catabolism in *Escherichia coli* enables bioconversion of model aromatic compounds. *Appl Env Microbiol* 2017 Aug 31;83(18). Link.

Michener JK*, Vuilleumier S, Bringel F, and Marx CJ. Transfer of a catabolic pathway for chloromethane in *Methylobacterium* strains highlights different limitations for growth with chloromethane or with dichloromethane. *Front Microbiol* 2016. Link

Houser JR, Barnhart C, Boutz DR, Carroll SM, Dasgupta A, **Michener JK**, et al. Controlled measurement and comparative analysis of cellular components in *E. coli* reveals broad regulatory changes in response to glucose starvation. *PLoS Comput Biol* 2015; 11(8): e1004400. Link

Michener JK, Camargo Neves AAC, Vuilleumier S, Bringel F, and Marx CJ. Effective use of a horizontally-transferred pathway for dichloromethane catabolism requires post-transfer refinement. *eLife* 2014;10.7554/eLife.04279 Link.

Michener JK, Vuilleumier S, Bringel F, and Marx CJ. Phylogeny poorly predicts the utility of a challenging horizontally-transferred gene in *Methylobacterium* strains. *J Bacteriol.*, June 2014 196:2101-2107 Link.

Michener JK and Smolke CD. Synthetic RNA switches for yeast metabolic engineering. *Methods in Molecular Biology, Yeast Metabolic Engineering.* 2012; 1152:125-36 Link.

Michener JK, Nielsen J, and Smolke CD. Identification and treatment of heme depletion due to over-expression of a lineage of evolved P450 monooxygenases. *Proc Natl Acad Sci U S A.* 2012 Nov 20;109(47):19504-9. Link.

Michener JK and Smolke CD. High-throughput enzyme evolution in *Saccharomyces cerevisiae* using a synthetic RNA switch. *Metab Eng.* 2012 Jul; 14(4):306-16. Link

Michener JK, Thodey K, Liang JC, and Smolke CD. (2011) Applications of genetically-encoded biosensors for the construction and control of biosynthetic pathways. *Metab Eng.* 2012 May; 14(3):212-22. Link

Invited and contributed presentations:

Michener JK. Discovery and engineering of nylon hydrolases for PA66 recycling. 2023. Enzyme Engineering XXVII, Singapore.

Michener JK. Biocatalyst discovery for sustainable chemical production and recycling. 2023. Society for Biocatalysis Japan Annual Meeting, Kagoshima, Japan.

Michener JK. Biocatalyst discovery for sustainable chemical production and recycling. 2023. Toyota RIKEN Symposium on Cutting Edge Research on the Use of Biocatalysts for SDGs, Nagoya, Japan.

Michener JK. New pathways for microbial assimilation of lignin-derived aromatic dimers. 2023. Nagaoka University of Technology, Nagaoka, Japan.

Drufva E, Cahill J, Saint-Vincent P, Valentino H, Parks J, Williams A, Demerdash O, Kertesz V, Bocharova V, Chen S, and **Michener JK**. 2023. Discovery and engineering of novel nylon hydrolases. Protein Engineering Gordon Research Conference, Smithfield, RI.

Vasileva DP, Streich JC, Chhetri HB, Burdick LH, Klingeman DM, Close DM, Jacobson DA, and **Michener JK**. Quantitative Trait-Locus Mapping: A novel method for linking phenotypes to genotypes in bacteria. 2023. ASM Microbe, Houston, TX.

Saint-Vincent P, Valentino H, Drufva E, Cahill J, Kertesz V, Demerdash O, Parks J, Bocharova V, Chen S, and **Michener JK**. Engineering and characterizing enzymes for nylon degradation and upcycling. 2023. SIMB SBFC, Seattle, WA.

Michener JK. Enzyme discovery and engineering for valorization of natural and artificial waste polymers. American Society of Biochemistry and Molecular Biology. 2023. Seattle, WA.

Michener JK. Mapping bacterial phenotype to genotype for pathway discovery. 2023. University of Idaho, Moscow, ID.

Vasileva DP, Streich JC, Chhetri HB, Burdick LH, Klingeman DM, Close DM, Jacobson DA, and **Michener JK**. 2022. Bacterial genome shuffling creates unique recombination patterns throughout the chromosome. Subtillery.

Allemann MN and **Michener JK**. 2022. Pathway discovery, optimization and engineering in *Novosphingobium* for lignin valorization. Lignin Gordon Research Conference, Easton, MA.

Valentino HR, Parks JM, Chen S, and **Michener JK**. 2022. Engineering of a Redox Neutral Enzyme Cascade for Production of Aliphatic Diamines. Enzyme Engineering XXVI, Dallas, TX.

Vasileva DP, Streich JC, Chhetri HB, Burdick LH, Lagergren J, Klingeman DM, Close DM, Jacobson DA, and **Michener JK**. 2022. Quantitative trait loci (QTL) mapping: a novel method for gene discovery in bacteria. 3rd Annual Griffith's Legacy.

Michener JK. 2021. Discovery and engineering of novel aromatic catabolic enzymes from non-model bacteria. Great Lakes Bioenergy Research Center, Madison, WI.

Michener JK. 2021. Metabolic Engineering of Non-Model Bacteria for Valorization of Hemicellulose and Lignin. Molecular Plant Sciences, Michigan State University, East Lansing, MI.

Michener JK. 2020. Systems Metabolic Engineering of *Novosphingobium aromaticivorans* for Lignin Valorization. Genomic Sciences Program Annual PI Meeting, Washington, DC.

Michener JK. 2019. High-throughput screens and selections for enzyme function in non-model bacteria. American Institute of Chemical Engineering Annual Meeting, Orlando, FL.

Presley GN, Cannon ON, Elkins JG, Giannone RJ, Garcia DC, and **Michener JK**. Expanding the molecular toolkit for lignin valorization by rapid pathway identification and new microbe isolation. SIMB Annual Meeting, Washington, DC.

Burdick LH, Streich JC, Ellis JC, Close D, Jacobson DA, and **Michener JK**. 2019. Measuring Homologous Recombination Rates During Protoplast Fusion. ASM Microbe, San Francisco, CA.

Michener JK. 2019. Optimizing Microbial Pathways for Lignin Valorization. SIMB Symposium on Biotechnology for Fuels and Chemicals, Seattle, WA.

Michener JK. 2019. Optimizing Microbial Pathways for Lignin Valorization. Department of Chemical Engineering, University of Tennessee, Knoxville, TN.

Michener JK. 2018. Enzymatic Conversion of Lignin-derived Aromatic Compounds. Frontiers in Biorefining, St. Simons Island, GA.

Cecil JH and **Michener JK**. 2017. Identification and Reconstruction of Pathways for Catabolism of Lignin-Derived Aromatic Compounds. American Institute of Chemical Engineers Annual Meeting, Minneapolis, MN.

Velez J and **Michener JK**. 2017. Selecting for Small Molecule Production in Competitive Microfluidic Droplets. American Institute of Chemical Engineers Annual Meeting, Minneapolis, MN.

Michener JK. 2015. Evolutionary Optimization of Heterologous Pathways in Microbes. Department of Chemical Engineering, University of Washington, Seattle, WA.

Michener JK. 2015. Evolutionary Optimization of Heterologous Pathways in Microbes. Department of Bacteriology, University of Wisconsin, Madison, WI.

Michener JK. 2015. Evolutionary Optimization of Heterologous Pathways in Microbes. Biosciences Division, Oak Ridge National Laboratory, Oak Ridge, TN.
Michener JK. 2014. Evolutionary Optimization of Heterologous Pathways in Microbes. Center for Environmental Health Sciences, MIT, Cambridge, MA.
Michener JK. 2014. Evolutionary Optimization of Heterologous Pathways in Microbes. Department of Agricultural and Biological Engineering, Purdue University, West Lafayette, IN.
Michener JK. 2014. Evolutionary Optimization of Heterologous Pathways in Microbes. School of Biology, Georgia Tech University, Atlanta, GA.
Michener JK. 2014. Evolutionary Refinement of a Horizontally-Transferred Pathway in Methylobacteria. American Institute of Chemical Engineers Annual Meeting, Atlanta, GA.
Michener JK. 2014. Experimental Evolution Recapitulates Adaptation after Horizontal Gene Transfer. American Society of Microbiology 114th General Meeting, Boston, MA.
Michener JK. 2014. Experimental Evolution of Heterologous Pathways in Microbes. Department of Biochemistry and Molecular Biology, Michigan State University, East Lansing, MI.
Michener JK. 2013. Recapitulating Adaptation after Horizontal Gene Transfer. Microbial Evolution Meetings. Harvard University, Cambridge, MA.
Michener JK. 2013. Optimizing the Host-Pathway Interface. Biochemistry, Molecular Biology and Biophysics Department, University of Minnesota, Minneapolis, MN.

Advisees:

Graduate Students:
Emily Smith (2021 – Present) – Genome Science and Technology, University of Tennessee

Postdoctoral Research Associates:
Célestin Bourgery (2024 – Present); PhD AgroParisTech, France
Liangyu Qian (2023 – Present); PhD, Texas A&M University
Apurv Mhatre (2023 – Present); PhD, Arizona State University
Hannah Valentino (2021 – 2023); PhD, Virginia Tech; Currently at Birch Biosciences
Oumar Sacko (2021 – 2022); PhD, Old Dominion University; Currently at Ginkgo Biosciences
Christopher Azubuike (2021 – Present); PhD, Newcastle University, United Kingdom
Marco Allemann (2020 – 2022); PhD, University of California, San Diego; Currently at Algenesis
Delyana Vasileva (2019 – 2022); PhD, University of Tokyo, Japan; Currently at ORNL
Stephan Christel (2019 – 2022); PhD, Linnaeus University, Sweden; Currently at Cemvita
Julie Chaves (2018 – 2021); PhD, University of California, Berkeley. Currently at Inscripta.
Gerald Presley (2018 – 2019); PhD, University of Minnesota. Currently Assistant Professor, Oregon State University.

Other:
Joanna Chang (2022) – SULI Undergraduate intern, University of Texas, Austin
Brandy Barber (2019-2020) – Post-bachelors research associate, University of Tennessee
Timkhite-Kulu Berhane (2019-2020) – Post-masters research associate, University of Tennessee
Zach Schmitz (2018) – SULI Undergraduate intern, MIT
Jacob Cecil (2017) – SULI Undergraduate, University of Tennessee
Jessica Velez (2017) – GEM PhD student, University of Tennessee
Danika Nimlos (2016) – SULI Undergraduate intern, University of California, Berkeley
Aline Carmago-Neves (2014) – PhD student, University of São Paulo

Professional Affiliations:

American Institute of Chemical Engineers (AIChE)
American Society for Microbiology (ASM)
International Metabolic Engineering Society (IMES)
Society for Industrial Microbiology and Biotechnology (SIMB)

Awards:

DOE Early Career Award (2019-2024)
Oak Ridge Postdoctoral Association Mentor of the Year (2019)
DOE Distinguished Staff Fellowship (2015-2018)
NIH NRSA Postdoctoral Fellowship (2012-2015)
Nordic Research Fellowship (2011)
NSF Graduate Research Fellowship (2018-2011)
Roger de Friez Hunneman Prize (2006)
Phi Beta Kappa (2006)

Professional Service:

USDA NIFA Grant Review Panel (2023)
Editorial Board, *Applied and Environmental Microbiology* (2020-2025)
Session chair, ASBMB Annual Meeting (2023)
Session chair, ASM Annual Meeting (2021)
Session chair, AIChE Annual Meeting (2015, 2018-2022)
Session chair, SIMB Annual Meeting (2019, 2022)
Session chair, ASBMB Annual Meeting (2023)
iGEM Championship Judge (2012-2014, 2018)
Invited panelist, NSF workshop on "Creating a Research Agenda for the Ecological Implications of Synthetic Biology" (January 2014)
Invited panelist, Sloan Foundation workshop on "Governance Approaches for Synthetic Biology" (June 2014)