

# JONATHAN M. CONWAY, Ph.D.

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## EDUCATION

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Ph.D., Chemical Engineering, North Carolina State University, Raleigh, NC	May 2017
M.S., Chemical Engineering, North Carolina State University, Raleigh, NC	December 2013
B.S., Chemical Engineering, University of Notre Dame, Notre Dame, IN	May 2011

## EXPERIENCE

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<b>Assistant Professor</b> Department of Chemical and Biological Engineering, Princeton University, Princeton, NJ	<b>August 2021 – present</b>
<b>Postdoctoral Research Associate</b> Department of Biology, University of North Carolina, Chapel Hill, NC PI: Dr. Jeffery L. Dangl <b>Research Focus:</b> Engineering the plant root microbiome to investigate and modify root colonization, hormone homeostasis, and plant immune system activation for the improvement of plant growth, health, and productivity	<b>October 2017 – July 2021</b>
<b>Postdoctoral Research Scholar</b> <b>Graduate Research Assistant</b> Department of Chemical and Biomolecular Engineering, North Carolina State University, Raleigh, NC PI: Dr. Robert M. Kelly <b>Thesis:</b> <i>In vitro</i> and <i>in vivo</i> analysis of the role of multi-domain glycoside hydrolases from extremely thermophilic <i>Caldicellulosiruptor</i> species in the degradation of plant biomass	<b>May 2017 – September 2017</b> <b>August 2011 – May 2017</b>
<b>Industrial Intern</b> MedImmune, Upstream Manufacturing Science & Technology, Frederick, MD	<b>Summer 2010 and Summer 2011</b>
<b>Undergraduate Research Assistant</b> Department of Chemical and Biomolecular Engineering, University of Notre Dame, Notre Dame, IN PI: Dr. William F. Schneider <b>Summary:</b> Molecular simulations of small molecule adsorption on platinum surfaces	<b>September 2010 – May 2011</b>

## HONORS AND AWARDS

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James K. Ferrell Outstanding Ph.D. Graduate Award, NC State Chemical Engineering Department	2017
Award for Excellence in Mentorship, NC State Graduate Student Association	2016
Recognition for Excellence in Laboratory Teaching, NC State Graduate Student Association	2016
Graduate Assistance in Areas of National Need (GAANN) Fellowship, NC State Biotechnology Program	2012-2014

## PEER REVIEWED PUBLICATIONS

**GOOGLE SCHOLAR LINK:** [HTTPS://SCHOLAR.GOOGLE.COM/CITATIONS?USER=AVSHMMCAAAJ&HL=EN](https://scholar.google.com/citations?user=AVSHMMCAAAJ&hl=en)

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- Teixeira, P.J.P.L.<sup>†</sup>, N.R. Colaianni<sup>†</sup>, T.F. Law<sup>†</sup>, **J.M. Conway**<sup>†</sup>, S. Gilbert, H. Li, I. Salas-González, D. Panda, N.M. Del Risco, O.M. Finkel, G. Castrillo, P. Mieczkowski, C.D. Jones, and J.L. Dangl. (2021) Specific Modulation of the Root Immune System by a Community of Commensal Bacteria. *Proc Natl Acad Sci USA*. 118(16):e2100678118. Doi: 10.1073/pnas.2100678118 († These authors contributed equally to this work).
- Colaianni, N.R., K. Parys, H.-S. Lee, **J.M. Conway**, N.H. Kim, N. Edelbacher, T.S. Mucyn, M. Madalinski, T.F. Law, C.D. Jones, Y. Belkhadir, J.L. Dangl. (2021) A Complex Immune Response to Flagellin Epitope Variation in Commensal Communities. *Cell Host Microbe*. 29(4):635-649. Doi: 10.1016/j.chom.2021.02.006
- Finkel, O.M.<sup>†</sup>, I. Salas-González<sup>†</sup>, G. Castrillo<sup>†</sup>, **J.M. Conway**<sup>†</sup>, T.F. Law, P.J.P.L. Teixeira, E.D. Wilson, C.R. Fitzpatrick, C.D. Jones, J.L. Dangl. (2020) A single bacterial genus maintains root development in a complex microbiome. *Nature*. 587:103-108. Doi: 10.1038/s41586-020-2778-7 († These authors contributed equally to this work)

- Fitzpatrick, C.R.<sup>†</sup>, I. Salas-González<sup>†</sup>, **J.M. Conway**, O.M. Finkel, S. Gibert, D. Russ, P.J.P.L. Teixeira, and J.L. Dangl. (2020) The Plant Microbiome: From Ecology to Reductionism and Beyond. *Annu. Rev. Microbiol.* 74:81-100. Doi: 10.1146/annurev-micro-022620-014327 (<sup>†</sup> These authors contributed equally to this work)
- Wang, B., Z. Z. Zhao, L. Jabusch, D. Chiniquy, K. Ono, **J.M. Conway**, Z. Zhang, G. Wang, D. Robinson, J.-F. Cheng, J.L. Dangl, T. Northen, and Y. Yoshikuni. (2020) CRAGE-Duet Facilitates Modular Assembly of Biological Systems for Studying Plant-Microbe Interactions. *ACS Synth. Biol.* In Press. Doi: 10.1021/acssynbio.0c00280
- Straub, C.T., P.A. Khatibi, J.P. Wang, **J.M. Conway**, A.M. Williams-Rhaesa, I.M. Peszlen, V.L. Chiang, M.W.W. Adams, and R.M. Kelly. (2019) Quantitative Fermentation of Unpretreated Transgenic Poplar by *Caldicellulosiruptor bescii*. *Nat. Commun.* 10(1):1-6. Doi: 10.1038/s41467-019-11376-6
- Conway, J.M.**, J.R. Crosby, A.P. Hren, R.T. Southerland, L.L. Lee, V.V. Lunin, P. Alahuhta, M.E. Himmel, Y.J. Bomble, M.W.W. Adams, and R.M. Kelly. (2018) Novel Multidomain, Multifunctional Glycoside Hydrolases from Highly Lignocellulolytic *Caldicellulosiruptor* Species. *AIChE J.* 64(12):4218-4228. Doi: 10.1002/aic.16354
- Levy, A., **J.M. Conway**, J.L. Dangl, and T. Woyke. (2018) Elucidating Bacterial Gene Functions in the Plant Microbiome. *Cell Host Microbe.* 24(4):475-485. Doi: 10.1016/j.chom.2018.09.005
- Conway, J.M.**, J.R. Crosby, B.S. McKinley, N.L. Seals, M.W.W. Adams, and R.M. Kelly. (2018) Parsing *in vitro* and *in vivo* Contributions to Microcrystalline Cellulose Hydrolysis by Multidomain Glycoside Hydrolases in the *Caldicellulosiruptor bescii* Secretome. *Biotechnol. Bioeng.* 115(10):2426-2440. Doi: 10.1002/bit.26773
- Williams-Rhaesa, A.M., N.K. Awuku, G.L. Lipscomb, F.L. Poole, G.M. Rubinstein, **J.M. Conway**, R.M. Kelly, and M.W.W. Adams. (2018) Native Xylose-Inducible Promoter Expands the Genetic Tools for the Biomass-Degrading, Extremely Thermophilic Bacterium *Caldicellulosiruptor bescii*. *Extremophiles.* 22(4):629-638. Doi: 10.1007/s00792-018-1023-x
- Straub, C.T., J.A. Counts, D.M.N. Nguyen, C.-H. Wu, B.M. Zeldes, J.R. Crosby, **J.M. Conway**, J.K. Otten, G.A. Lipscomb, G.J. Schut, M.W.W. Adams, and R.M. Kelly. (2018) Biotechnology of Extremely Thermophilic Archaea. *FEMS Microbiol. Rev.* 42(5):543-578. Doi: 10.1093/femsre/fuy012
- Lee, L.L., S.E. Blumer-Schuetz, J.A. Izquierdo, J.V. Zurawski, A.J. Loder, **J.M. Conway**, J.G. Elkins, M. Podar, A. Clum, P.C. Jones, M.J. Piatek, D.A. Weighill, D.A. Jacobson, M.W.W. Adams, and R.M. Kelly. (2018) Genus-wide Assessment of Lignocellulose Utilization in the Extremely Thermophilic Genus *Caldicellulosiruptor* by Genomic, Pangenomic and Metagenomic Analyses. *Appl. Environ. Microbiol.* 84(9):e02694-17. Doi: 10.1128/AEM.02694-17
- Conway, J.M.**, B.S. McKinley, N.L. Seals, D. Hernandez, P.A. Khatibi, S. Poudel, R.J. Giannone, R.L. Hettich, A.M. Williams-Rhaesa, G.L. Lipscomb, M.W.W. Adams, and R.M. Kelly. (2017) Functional Analysis of the Glucan Degradation Locus (GDL) in *Caldicellulosiruptor bescii* Reveals Essential Roles of Component Glycoside Hydrolases in Plant Biomass Deconstruction. *Appl. Environ. Microbiol.* 83(24):e01828-17. Doi: 10.1128/AEM.01828-17. Spotlight article selected by AEM editors.
- Zurawski, J.V., P.A. Khatibi, H.O. Akinosho, C.S. Straub, S.H. Compton, **J.M. Conway**, L.L. Lee, A.J. Ragauskas, B.H. Davidson, M.W.W. Adams, and R.M. Kelly. (2017) Bioavailability of Carbohydrate Content in Natural and Transgenic Switchgrasses for the Extreme Thermophile *Caldicellulosiruptor bescii*. *Appl. Environ. Microbiol.* 83(17):e00969-17. Doi: 10.1128/AEM.00969-17
- Williams-Rhaesa, A.M., F.L. Poole, J. Dinsmore, G.L. Lipscomb, G.M. Rubinstein, I.M. Scott, **J.M. Conway**, L.L. Lee, P.A. Khatibi, R.M. Kelly, and M.W.W. Adams. (2017) Genome Stability in Engineered Strains of the Thermophilic, Lignocellulose-Degrading Bacterium *Caldicellulosiruptor bescii*. *Appl. Environ. Microbiol.* 83(14):e00444-17. Doi: 10.1128/AEM.00444-17. Spotlight article selected by AEM editors.
- Blumer-Schuetz, S.E., J.V. Zurawski, **J.M. Conway**, Piyum A. Khatibi, D.L. Lewis, Q. Li, V.L. Chiang, and R.M. Kelly. (2017) *Caldicellulosiruptor saccharolyticus* transcriptomes reveal consequences of chemical pre-treatment and genetic modification of lignocellulose. *Microb. Biotechnol.* Doi: 10.1111/1751-7915.12494
- Lipscomb, G.L., **J.M. Conway**, S.E. Blumer-Schuetz, R.M. Kelly, and M.W.W. Adams. (2016) Highly Thermostable Kanamycin Resistance Marker Expands the Toolkit for Genetic Manipulation of *Caldicellulosiruptor bescii*. *Appl. Environ. Microbiol.* AEM-00570. Doi: 10.1128/AEM.00570-16
- Conway, J.M.**, W.S. Pierce, J.H. Le, J.H. Wright, G.W. Harper, A.L. Tucker, J.V. Zurawski, L.L. Lee, S. E. Blumer-Schuetz, R.M. Kelly. (2016) Multi-Domain, Surface Layer Associated Glycoside Hydrolases Contribute to Plant Polysaccharide Degradation by *Caldicellulosiruptor* Species. *J. Biol. Chem.* 291, 6732-6747. Doi: 10.1074/jbc.M115.707810

- Zurawski, J.V., **J.M. Conway**, L.L. Lee, H. Simpson, J.A. Izquierdo, S.E. Blumer-Schuette, I. Nookaew, M.W.W. Adams, R.M. Kelly. (2015) Comparative analysis of extremely thermophilic *Caldicellulosiruptor* species reveals common and differentiating cellular strategies for plant biomass utilization. *Appl. Environ. Microbiol.* 81(20):7159-7170. Doi: 10.1128/AEM.01622-15
- Lee, L.L., J.A. Izquierdo, S.E. Blumer-Schuette, J.V. Zurawski, **J.M. Conway**, R.W. Cottingham, M. Huntemann, A. Copeland, I.-M.A. Chen, N. Kyrpides, V. Markowitz, K. Palaniappan, N. Ivanova, N. Mikhailova, G. Ovchinnikova, E. Andersen, A. Pati, D. Stamatis, T.B.K. Reddy, N. Shapiro, H.P. Nordberg, M.N. Cantor, S.X. Hua, T. Woyke, R.M. Kelly. (2015) Complete Genome Sequences of *Caldicellulosiruptor* sp. Strain Rt8.B8, *Caldicellulosiruptor* sp. Strain Wai35.B1, and "*Thermoanaerobacter cellulolyticus*". *Genome Announc.* 3(3). Doi:10.1128/genomeA.00440-15
- Blumer-Schuette, S.E., M. Alahuhta, **J.M. Conway**, L.L. Lee, J.V. Zurawski, R.J. Giannone, R.L. Hettich, V.V. Lunin, M.E. Himmel, R.M. Kelly. (2015) Discrete and structurally unique proteins (täpirins) mediate attachment of extremely thermophilic *Caldicellulosiruptor* species to cellulose. *J. Biol. Chem.* 290(17): 10645-10656. Doi: 10.1074/jbc.M115.641480
- Blumer-Schuette, S.E., S.D. Brown, K.B. Sanders, E.A. Bayer, I. Kataeva, J.V. Zurawski, **J.M. Conway**, M.W.W. Adams, R.M. Kelly. (2014) Thermophilic lignocellulose deconstruction. *FEMS Microbiol. Rev.* 38(3):393-448. Doi: 10.1111/1574-6976.12044
- Deshlahra, P., **J. Conway**, E.E. Wolf, and W.F. Schneider. (2012) Influence of Dipole-Dipole Interactions on Coverage-Dependent Adsorption: CO and NO on Pt(111). *Langmuir* 28(22):8408-8417.

## BOOK CHAPTERS

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- Loder, A.J., B.M. Zeldes, **J.M. Conway**, J.A. Counts, C.T. Straub, P.A. Khatibi, L.L. Lee, N.P. Vitko, M.W. Keller, A.M. Rhaesa, G.M. Rubenstein, I.M. Scott, G.L. Lipscomb, M.W.W. Adams, and R.M. Kelly. (2017) Extreme Thermophiles as Metabolic Engineering Platforms: Strategies and Current Perspective. In: *Industrial Biotechnology: Microorganisms* (C. Whittmann and J. Liao, editors). Wiley-VCH Verlag GmbH & Co. pp 507-580. Doi: 10.1002/9783527807796.ch14
- Conway, J.M.**, J.V. Zurawski, L.L. Lee, S.E. Blumer-Schuette, R.M. Kelly. (2015) Lignocellulosic Biomass Degradation by the Extremely Thermophilic Genus *Caldicellulosiruptor*. In: *Thermophilic Microorganisms*. (Fuli Li, editor). Caister Academic Press. pp 91-120. ISBN: 978-1-910190-13-5
- Zurawski, J.V., S.E. Blumer-Schuette, **J.M. Conway**, R.M. Kelly. (2014) The Extremely Thermophilic Genus *Caldicellulosiruptor*: Physiological and Genomic Characteristics for Complex Carbohydrate Conversion to Molecular Hydrogen. In: *Microbial BioEnergy: Hydrogen Production, Advances in Photosynthesis and Respiration Vol 38*. (D. Zannoni and R. De Philippis, editors). Springer Science. pp 177-195. Doi: 10.1007/978-94-017-8554-9\_8

## ORAL PRESENTATIONS

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- Conway, J.M.**, I. Salas-González, O.M. Finkel, W.G. Walton, M.R. Redinbo, J.L. Dangl. Auxin Degradation by *Variovorax* Maintains Stereotypic Plant Root Development in a Complex Microbiome. Microbiome Movement - AgBioTech Summit. February 2021.
- Conway, J.M.** The Biology and Biotechnology of Plant-Microbe Interfaces. AIChE Virtual Annual Meeting. November 2020.
- Conway, J.M.**, I. Salas-González, O.M. Finkel, W.G. Walton, M.R. Redinbo, J.L. Dangl. Auxin Degradation by *Variovorax* Maintains Stereotypic Plant Root Development within the Complex Plant Microbiome. AIChE Virtual Annual Meeting. November 2020.
- Conway, J.M.**, J.R. Crosby, C.T. Straub, M.W.W. Adams, R.M. Kelly. Exploring *in Vitro* and *in Vivo* Contributions to Lignocellulose Degradation by Multi-Domain Enzymes from Extremely Thermophilic *Caldicellulosiruptor* Species. AIChE Virtual Annual Meeting. November 2020.
- Conway, J.M.** and R.M. Kelly. Building a Better Biofuels Bug: Engineering Plant Biomass Deconstruction and Conversion in *Caldicellulosiruptor bescii*. NC State Chemical Engineering Department Schoenborn Graduate Research Symposium. Raleigh, NC. January 2017. 2<sup>nd</sup> Place Oral Presentation Award.
- Conway, J.M.**, W.S. Pierce, J.H. Le, J.V. Zurawski, L.L. Lee, S.E. Blumer-Schuette, and R.M. Kelly. S-layer associated, multi-domain enzymes mediate deconstruction of lignocellulosic biomass by extremely thermophilic *Caldicellulosiruptor* species. BioEnergy Science Center (BESC) annual science retreat. Chattanooga, TN. June 2016.

- Conway, J.M.**, J.V. Zurawski, L.L. Lee, P.A. Khatibi, S.E. Blumer-Schuetz, and R.M. Kelly. Improving Plant Biomass Degradation in *Caldicellulosiruptor bescii*: Genetic Manipulation and Protein Expression in a Non-Model Organism. NC State Chemical Engineering Department Graduate Student Association - Student Seminar Series. Raleigh, NC. October 2015.
- Conway, J.M.**, W.S. Pierce, J.H. Le, J.V. Zurawski, L.L. Lee, S.E. Blumer-Schuetz, and R.M. Kelly. Lignocellulose degradation at high temperatures: the use of multi-domain, surface layer associated enzymes by the extremely thermophilic genus *Caldicellulosiruptor*. Society of Industrial Microbiology and Biotechnology annual meeting. Philadelphia, PA. August 2015.
- Conway, J.M.**, W.S. Pierce, A.L. Tucker, J.V. Zurawski, L.L. Lee, S.E. Blumer-Schuetz, and R.M. Kelly. Role of novel, multi-domain, cell surface associated, glycoside hydrolases during lignocellulose degradation by extremely thermophilic *Caldicellulosiruptor* species. American Chemical Society national meeting. Denver, CO. March 2015.
- Conway, J.M.**, J.V. Zurawski, L.L. Lee, S.E. Blumer-Schuetz, and R.M. Kelly. Multi-domain glycoside hydrolases from *Caldicellulosiruptor* species: Biochemical and physiological insights. BioEnergy Science Center (BESC) Focus Area 2 meeting. National Renewable Energy Laboratory (NREL), Golden, CO. March 2015.
- Conway, J.M.**, W.S. Pierce, A.L. Tucker, J.V. Zurawski, L.L. Lee, S.E. Blumer-Schuetz, and R.M. Kelly. The role of cell surface-associated enzymes in lignocellulose degradation by extremely thermophilic *Caldicellulosiruptor* species. NC State Molecular Biotechnology Training Program Annual Symposium. Raleigh, NC. November 2014.
- Conway, J.M.**, I. Ozdemir, S.E. Blumer-Schuetz, J.V. Zurawski, L.L. Lee, J.A. Izquierdo, A.L. Tucker, R.M. Kelly. Lignocellulose deconstruction at the cell surface: *Caldicellulosiruptor* SLH proteins. BioEnergy Science Center (BESC) Focus Area 2 meeting. Oak Ridge National Laboratory. Oak Ridge, TN. March 2014.

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## SELECTED POSTER PRESENTATIONS

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- Conway, J.M.** Engineering Bacteria and Plants to Dissect and Manipulate Plant-Microbe Interactions. Meet the Faculty & Post-Doc Candidates Poster Session. AIChE Virtual Annual Meeting. November 2020.
- Conway, J.M.**, E.D. Wilson, E.J. Getzen, P.J. Martinez, D. Panda, I.N. Castillo, N.M. Del Risco, C.A. Lindberg, J.L. Dangi. Genetic Engineering of Plant-associated Bacteria to Interrogate Plant-Microbe Interactions in the Arabidopsis thaliana Microbiome. NCSU-UNC-Duke Post-Doc Research Symposium. Raleigh, NC. May 2019.
- Conway, J.M.**, W.S. Pierce, J.H. Le, J.V. Zurawski, L.L. Lee, P.A. Khatibi, S.E. Blumer-Schuetz, and R.M. Kelly. Characterizing the role of extracellular multi-domain glycoside hydrolases from *Caldicellulosiruptor* species in biomass degradation. BioEnergy Science Center (BESC) annual science retreat. Chattanooga, TN. June 2015.
- Conway, J.M.**, S.E. Blumer-Schuetz, J.V. Zurawski, J.D. Tang, and R.M. Kelly. Role of multi-domain, surface layer homology proteins in biomass degradation by the genus *Caldicellulosiruptor*. NC State Chemical Engineering Department Schoenborn Graduate Research Symposium. January 2014.
- Conway, J.M.**, S.E. Blumer-Schuetz, J.V. Zurawski, and R.M. Kelly. The role of cell surface proteins in plant biomass degradation by the genus *Caldicellulosiruptor*. NC State Molecular Biotechnology Training Program Annual Symposium. November 2012. *Outstanding Poster Award Winner*.

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## TEACHING

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- BMME 691H/692H Honors Thesis Biomedical Engineering, Research Mentor – 2 Theses: 2018-19, 1 Thesis: 2019-20
- BMME 495 Undergraduate Research Biomedical Engineering, Research Mentor – Spring 2018, Spring 2019, Fall 2019
- BIO 395/495 Undergraduate Research in Biology, Research Mentor – Fall 2018, Fall 2019, Spring 2020
- BIT 464/564 Biotechnology: Protein Purification, Head Teaching Assistant – Spring 2015
- BIT 464/564 Biotechnology: Protein Purification, Teaching Assistant – Spring 2014, Spring 2017
- BIT 495/595 Biotechnology: Metagenomics, Course Material Development & Teaching Assistant – Fall 2013, Fall 2014
- CHE 316 Thermodynamics of Chemical and Phase Equilibria, Teaching Assistant – Fall 2012
- CHE 315 Chemical Process Thermodynamics, Teaching Assistant – Spring 2012

## OUTREACH AND SERVICE ACTIVITIES

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UNC Assisting in Development and Mentoring an Innovative Research Experience in Science (ADMIREs), <i>mentor</i>	2019-2020
UNC Microbiology and Immunology Department Prelim Consulting Corps	2019-2020
UNC Science and Math Achievement and Resourcefulness Track (SMART) Program, <i>research mentor</i>	Summer 2018
Notre Dame Club of Eastern North Carolina, <i>Board Member, Communications Co-Chair, Vice President</i>	2018-2021
North Carolina State Science & Engineering Fair Scientific Review Committee, <i>Reviewer</i>	2018-2019
NC State BioLunch Graduate Seminar Series, <i>Graduate Student Coordinator</i>	2016
Fort Bragg Biotechnology Career Seminar, <i>Discussion Panelist</i>	December 2015
NC State Chemical Engineering Department, <i>Graduate Recruiting Student Coordinator</i>	2013
NC State Chemical Engineering Department Graduate Student Association, <i>Secretary</i>	2012-2013
Raleigh Community Concert Band, <i>Clarinetist</i>	2012-2021