**Bradley W. Biggs**

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**Education**

**Northwestern University**, Evanston, Illinois

*Doctor of Philosophy in Chemical Engineering*, June 2021

Advisor: Keith E.J. Tyo

**Northwestern University**, Evanston, Illinois

*Master of Science in Biotechnology*, June 2014

**University of Southern California (USC)**, Los Angeles, California

*Bachelor of Science in Chemical Engineering*, May 2012

**Professional Experience**

**University of Michigan,** Ann Arbor, MI

Assistant Professor (January 2025- )

**Lawrence Berkeley National Laboratory**, Berkeley, CA

Postdoctoral Researcher (October 2021-Present)

Advisor: Adam P. Arkin

**Manus Bio**, Cambridge, MA

Co-op/Research Associate/R&D Intern (2014-2015, 2019)

**Publications**

17. T. Dinh, R. Devanathan, D. Dainko, L. K. Caesar, M. Narayanamoorthy, **B. Biggs**, N. Kelleher, L. Broadbelt, K. Tyo. A survey of α-keto acid condensation potential by ThDP-dependent enzymes. *Submitted*.

16. T. Dinh, **B. Biggs**, D. Dainko, L. Caesar, K. Wu, N. Kelleher, L. Broadbelt, K. Tyo. Using highly multiplexed reactions to rapidly characterize carboligase substrate promiscuity. *Submitted*.

15. **B. W. Biggs** and K. E. J. Tyo. Aromatic natural products synthesis from aromatic lignin monomers using *Acinetobacter baylyi* ADP1. *bioRxiv*: <https://doi.org/10.1101/2023.08.24.55469>.

14. **B. W. Biggs**, M. N. Price, D. Lai, J. Escobedo, Y. Fortanel, Y. Y. Huang, K. Kim, V. V. Trotter, J. V. Kuehl, L. M. Lui, R. Chakraborty, A. M. Deutschbauer, A. P. Arkin. High-throughput protein characterization by complementation using DNA barcoded fragment libraries. *Molecular Systems Biology*. 2024.

13. **B. W. Biggs\***, A. M. de Paz\*, N. J. Bhan, T. R. Cybulski, G. M. Church, K. E.J. Tyo. Engineering Ca2+-dependent DNA polymerase activity. *ACS Synthetic Biology*. 2023.

12. **B. W. Biggs**, H. S. Alper, B. F. Pfleger, K. E.J. Tyo, C. N.S. Santos, P. K. Ajikumar, Gregory Stephanopoulos. Enabling commercial success of industrial biotechnology. *Science*. 2022.

11. E. Arvay, **B. W. Biggs**, L. Guerrero, V. Jiang, K. Tyo. Engineering *Acinetobacter baylyi* ADP1 for mevalonate production from lignin monomers. *Metabolic Engineering Communications*. 2021.

10. C. J. Glasscock, **B. W. Biggs**, J. T. Lazar, J. H. Arnold, L. A. Burdette, A. Valdes, M. K. Kang, D. Tullman-Ercek, K. E.J. Tyo, and J. B. Lucks. Dynamic control of pathway expression with riboregulated switchable feedback promoters. *ACS Synthetic Biology*. 2021.

9. **B. W. Biggs,** S. Bedore, E. Arvay, S. Huang, H. Subramanian, E. A. McIntyre, C. V. Duscent-Maitland, E. L. Neidle, and K. E.J. Tyo. Development of a genetic toolset for the highly engineerable and metabolically versatile *Acinetobacter baylyi* ADP1. *Nucleic Acids Research*. 2020.

8. A. M. Love\*, **Bradley W. Biggs**\*, K. E.J. Tyo, P. K. Ajikumar. Chemically Inducible Chromosomal Evolution (CIChE) for multi-copy metabolic pathway engineering in Escherichia coli. *Methods in Molecular Biology:* *Microbial Metabolic Engineering*. 2019.

7. T. Vogl, T. Kickenweiz, J. Pitzer, L. Sturmberger, A. Weninger, **B. W. Biggs**, E. Köhler, A. Baumschlager, J. E. Fischer, P. Hyden, M. Wagner, M. Baumann, N. Borth, M. Geier, P. K. Ajikumar, A. Glieder. Engineered bidirectional promoters enable rapid multi-gene co-expression optimization. *Nature Communications.* 2018.

6. D. A. Pertusi, M. E. Moura, J. G. Jeffreys, S. Prabhu, **B. W. Biggs**, K. EJ Tyo. Predicting novel substrates for enzymes with minimal experimental effort with active learning. *Metabolic Engineering*. 2017.

5. J. E. Rouck, **B. W. Biggs**, A. Kambalyal, W. R. Arnold, M. De Mey, P. K. Ajikumar, A. Das. Heterologous Expression and Characterization of Plant Taxadiene-5α-Hydroxylase (CYP725A4) in *Escherichia coli*. *Protein Expression and Purification*. 2017.

4. **B. W. Biggs**, J. E. Rouck, A. Kambalyal, C. G. Lim, M. De Mey, C. Starks, M. O’Neil, A. Das, P. K. Ajikumar. Orthogonal Assays Clarify the Oxidative Biochemistry of Taxol P450 CYP725A4. *ACS Chemical Biology*. 2016.

3. **B. W. Biggs**, C. G. Lim, K. Sagliani, S. Shankar, G. Stephanopoulos, M. De Mey, P. K. Ajikumar. Overcoming Heterologous Protein Interdependency to Optimize P450-Mediated Taxol Precursor Synthesis in *Escherichia coli*. *Proceedings of the National Academy of Sciences*. 2016.

2. **B. W. Biggs**, B. De Paepe, C. N. S. Santos, M. De Mey, and P. K. Ajikumar. Multivariate modular metabolic engineering for pathway and strain optimization. *Current Opinion in Biotechnology*. 2014.

1. **B. W. Biggs**, H. K. Hunt, A. M. Armani. Selective Patterning of Si-based Biosensor Surfaces Using Isotropic Silicon Etchants. *Journal of Colloid and Interface Science* 369. 2012.

**Patents**

2. (Application) Production of vanillin-glucoside from lignin-derived carbon by

*Acinetobacter baylyi* ADP1. **Bradley W. Biggs**, Keith Tyo. Application No: 17/681,434.

1. (Application) Riboregulated Switchable Feedback Promoter Systems and Methods. Julius B. Lucks, Danielle Tullman-Ercek, Keith Tyo, **Bradley W. Biggs**. Application Serial No: PCT/US2019/051133.

**Selected Presentations**

3. **[INVITED]** B. W. Biggs. *High-throughput protein characterization by complementation using DNA barcoded fragment libraries*. Ecology Department – Lawrence Berkeley National Laboratory. June, 2024.

2. **[INVITED]** B. W. Biggs. *Development of a synthetic biology toolbox for Acinetobacter baylyi (ADP1), a host for lignin-based metabolic engineering*. American Chemical Society – Biochemical Technology (BIOT) Division, Midwest Student Chapter Webinar. November, 2018.

1. B. W. Biggs, C. G. Lim, M. de Mey, A. Das, P. K. Ajikumar. *Exploring P450 expression in Escherichia coli for the synthesis of complex molecules*. International Conference on Biomolecular Engineering. Lost Pines, Texas. January 2015.

**Grants and Fellowships**

*Funded* ($1.1M), **Co-author** (Northwestern) | Department of Energy, DE-SC0019339 - Biosynthesis of bioprivileged, linear molecules via novel carboligase reactions

*Funded* ($500K), **Co-author** (Northwestern) |National Science Foundation, NSF-1803747 **-** GOALI: Advanced biomanufacturing with inducible feedback promoters

*Funded***, Fellow** (Northwestern, 2016-2018) | National Institutes of Health, Biotechnology T32 Training Program

**Professional Service**

**Professional Society Membership**

American Institute of Chemical Engineering

American Chemical Society

**Journal Reviewer**

Microbial Biotechnology

Metabolic Engineering Communications

Microbial Cell Factories

Biotechnology and Bioengineering

Trends in Biotechnology

**University of Michigan**

\*Chemical Engineering Department, Graduate Admissions Committee (starting 2025)

**Community Service**

* Graduate student Oral Presentation Judge (Area 15C), AIChE Annual Convention (2024)
* Graduate Student Poster Competition Judge (Area 15C), AIChE Annual Convention (2024)
* Graduate Student Poster Competition Judge (Area 15C), AIChE Annual Convention (2023)
* TechWOMEN’s Day Speaker, Berkeley (Oct. 2023)
* Oakland Unified School District, STEM Fair (BASIS) (May 2023)
  + Lesson: Marshmallow and toothpick construction
* Cal Day Bay Area Scientist Inspiring Students, STEM Fair (BASIS) (April 2023)
  + Lesson: Squishy circuits, at science booth
* Bay Area Scientist Inspiring Student (BASIS), Berkeley Arts Magnet (Jan. 2023)
  + Lesson: Squishy circuits – 4th grade class
* Longfellow Middle School (Berkeley) (April 2022)
  + Repaired science classroom microscopes
* Biotech Nexus Career Panel Panelist, Northwestern University (March 2020)
* Chemical and Biological Engineering Teaching Committee, Northwestern
  + Mentor (2019)
  + Committee Member (2019-2020)
* Distinguished Graduate Research Award Committee, Northwestern (2016, 2017)
  + Chemical and Biological Engineering Department Service
* Mentor, Y.O.U. (Jr. Science Club) (Feb. 2016 – June 2019)
  + Volunteer weekly at Evanston elementary schools (Dawes, Washington, Walker, Oakton) as part of an afterschool program working with underprivileged 2nd-5th grade students helping teach the scientific method through activities such as sports, cooking, and forensics.
* Mentoring Matching Engine (Illinois) (Spring 2016-Jan. 2017)
  + Provided remote support for high-school science projects in the fields of chemistry and biology.
* iGEM Mentor (Northwestern) (Summers 2016, 2017)
  + Trained in basic experimental biology techniques and design. Helped with formation of project goal. Helped teach scientific literature searching and cataloging.
* Graduate Student Forum, Northwestern (2016-2017)
  + Chemical and Biological Engineering Department service committee

**Teaching Experience**

**Teaching Apprentice**, Northwestern University Chem\_Eng 210 (Analysis of Chemical Processes)

March 2020-June 2020, Evanston, Illinois

* Co-taught this intro to Chemical Engineering “Energy and Mass Balances”

**Teaching Assistant,** Northwestern University Chem\_Eng 478 (Advances in Biotechnology)

March 2019 – June 2019, Evanston, Illinois

**Teaching Assistant,** Northwestern University Chem\_Eng 478 (Advances in Biotechnology)

March 2018 – June 2018, Evanston, Illinois

**Teaching Assistant**, Northwestern University MBP 476-1 (Kinetics, Energetics, & Bioreactor Design)

March 2017 – June 2017, Evanston, Illinois

**Teaching Assistant**, Northwestern University MBP 402 (Bioprocess Engineering Lab)

March 2016 – June 2016, Evanston, Illinois

## Mentoring

Yuridia Fortanel, bioESP mentee (UC Berkeley) June 2023-Dec. 2023

Project: Enzyme Identification by complementation

Isra Raza, Undergraduate, UC Berkeley September 2022-May 2023

Project: Testing microbial interaction through pairwise synthetic communities

Jasmine Escobedo, bioESP mentee (UC Berkeley) June 2022-Dec. 2023

Project: Enzyme Identification by complementation

Min Kim, Undergraduate, UC Berkeley May 2022-December 2022

Project: Enzyme Identification by complementation

Dexter Lai, Undergraduate, UC Berkeley January 2022-May 2023

Project: Enzyme Identification by complementation

Zahra Nathani, Niles West High School (M.O.R.E. Mentor Program) 2020-2021

Project: Iron fortification of black-eyed peas

IJAS Regional Science Fair Gold Best in Category Award for Health Science

Kevin Wu, Undergraduate, Northwestern University January 2020 – June 2021

Project: High-throughput screening of C-C bond forming enzymes

Lydia Rivers, Undergraduate, Northwestern University June 2019 – December 2019

Project: High-throughput screening of C-C bond forming enzymes

Sara Wixon, M.S. student, Northwestern University January 2019 – June 2019

Project: High-throughput screening of C-C bond forming enzymes

Jenna Cosby, High-school student, Manus Biosynthesis Summer 2018

Project: Improved terpene biosynthesis

Rachel Hua, Undergraduate student, Manus Biosynthesis Summer 2018

Project: Improved terpene biosynthesis

Siddhant Prabhu, M.S. Student, Northwestern University January 2017 – June 2018

Project: Development of characterization pipeline for MenD and other C-C bond forming enzymes

Harshith Subramanian, M.S. Student, Northwestern University September 2017 – June 2018

Project: Evaluation of ADP1 aromatic substrate tolerance and uptake

Tyler Lazar, Undergraduate student, Northwestern University Fall 2016 – June 2018

Project: Engineering taxadiene oxygenase expression for improved Taxol precursor metabolic engineering

Shu Huang, Undergraduate student, Northwestern University Fall 2016- June 2018

Project: Engineering ADP1 for vanillin project from lignin

Taral Talati, Niles West High-school (M.O.R.E Mentor Program) Fall 2016-Spring 2017

Feedback for yearlong high-school science research project. Student received silver at the regional science fair.

Dasmany Denis, VASMP Viterbi Student Alumni Mentoring Program August 2014 – May 2015

Provided academic and professional mentoring through monthly communication.

Ben Miller, NSF REU Summer Fellowship (Northwestern) June 2013-August 2013

Training in antibody surface patterning techniques for protein characterization and basic laboratory procedures.

Emma Meinke, Undergraduate student (USC) August 2011-May 2012

Training in surface functionalization, microscopy techniques, and basic laboratory procedures.