

**Elizabeth N. Bess, PhD**  
*Assistant Professor of Chemistry and Molecular Biology & Biochemistry*

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### Professional Positions Held

<b>Assistant Professor of Molecular Biology &amp; Biochemistry</b>	2019–Present
<b>Assistant Professor of Chemistry (<i>primary</i>)</b> University of California, Irvine—Irvine, CA	2018–Present
<b>Howard Hughes Medical Institute Postdoctoral Fellow of the Life Sciences Research Foundation</b> Dept. of Microbiology & Immunology, University of California, San Francisco—San Francisco, CA Research Advisor: Professor Peter J. Turnbaugh, PhD	2015–2018
<b>Clinical Research Coordinator</b> Emergency Department, School of Medicine, University of Utah—Salt Lake City, UT Advisor: Professor Troy Madsen, MD	2009–2010

### Education & Training

<b>Ph.D. in Chemistry</b> Department of Chemistry, University of Utah—Salt Lake City, UT Research Advisor: Professor Matthew S. Sigman	2010–2015
<b>Novartis Doctoral Traineeship</b> Bioreactions Group, Novartis Institutes of BioMedical Research—Basel, Switzerland Research Advisor: Dr. Stephan Lütz	Summer 2014
<b>B.S. in Biological Chemistry, <i>magna cum laude</i></b> Department of Chemistry, University of Utah—Salt Lake City, UT	2004–2009

### Honors & Awards

♦ <a href="#">Scialog Fellow: Microbiome, Neurobiology, and Disease, Research Corp.</a>	2021–2023
♦ <a href="#">Young Investigator Grant for Probiotics Research, Global Probiotics Council</a>	2021
♦ <a href="#">UC Irvine Hellman Fellow</a>	2020
♦ <a href="#">Howard Hughes Medical Institute Postdoctoral Fellow, Life Sciences Research Fndtn</a>	2016–2018
♦ <a href="#">Career Development Grant for Postdoctoral Women</a> , Amer. Society for Microbiology ( <a href="#">profile</a> )	2016
♦ Cheves Walling Award for Excellence in Graduate Research, Dept. of Chem., Univ. of Utah	2015
♦ University of Utah Graduate Research Fellowship	2014–2015
♦ <a href="#">Anna Louise Hoffman Award, Graduate Research</a> , Iota Sigma Pi Nat'l Honor Society ( <a href="#">profile</a> )	2014
♦ IUPAC Poster Prize Certificate, OMCOS -17 Conference	2013
♦ NSF Graduate Research Fellowship Program, Honorable Mention	2012
♦ Dow Chemical 1 <sup>st</sup> -Year Graduate Student Scholastic Achievement Award, Univ. of Utah	2011
♦ Chemistry Departmental Scholarship for Scholastic Excellence, Univ. of Utah	2008
♦ Joseph Turner Crockett, M.D., Memorial Scholarship, College of Science, Univ. of Utah	2008
♦ Marjorie N. Parry Scholarship, Women's Club, Univ. of Utah	2008
♦ Armantrout Memorial Scholarship, Dept. of Chemistry, Univ. of Utah	2007
♦ Mack Thomas Rozelle Scholarship, Dept. of Chemistry, Univ. of Utah	2006
♦ Honors at Entrance Scholarship, Univ. of Utah	2004–2008

**Peer-Reviewed Publications****Independent Research:**

20. Ortiz de Ora, L.; Uyeda, K. S.; **Bess, E. N.\*** Discovery of a Gut Bacterial Metabolic Pathway that Drives  $\alpha$ -Synuclein Aggregation and Neurodegeneration. *ACS Chemical Biology*, **in revision**. (Preprint: *BioRxiv*. **2022**, doi: <https://doi.org/10.1101/2022.06.08.495350>).
19. Rich, B.E.; Jackson, J. C.; Ortiz de Ora, L.; Long, Z. G.; Uyeda, K. S.; **Bess, E. N.\*** Alternative Pathway for Dopamine Production by Acetogenic Gut Bacteria that O-Demethylate 3-Methoxytyramine, a Metabolite of Catechol O-Methyltransferase. *J. Appl. Microbiol.* **2022**, doi: [10.1111/jam.15682](https://doi.org/10.1111/jam.15682).
18. Ortiz de Ora, L.; **Bess, E. N.\*** The Emergence of *Caenorhabditis elegans* as a Model Organism for Dissecting the Gut–Brain Axis. *mSystems*, **2021**, *6*, e00755-21.
17. Maini Rekdal, V; Bernardino, P. N.; Luescher, M. U.; Kiamehr, S.; Le, C.; Bisanz, J. E.; Turnbaugh, P. J.; **Bess, E. N.**; Balskus, E.P. A Widely Distributed Metalloenzyme Class Enables Gut Microbial Metabolism of Host- and Diet-Derived Catechols. *eLife*, **2020**, *9*, e50845.

**Postdoctoral, Graduate, and Post-Baccalaureate Research:**

16. Bisanz, J. E.; Soto-Perez, P.; Noecker, C.; Aksenov, A.; Lam, K. N.; Kenney, G. E.; **Bess, E. N.**; Haiser, H. J.; Kyaw, T. S.; Yu, F. B.; Rekdal, V. M.; Ha, C. W. Y.; Devkota, S.; Balskus, E. P.; Dorrestein, P. C.; Allen-Vercoe, E.; Turnbaugh, P. J. A Genomic Toolkit for the Mechanistic Dissection of Intractable Human Gut Bacteria. *Cell Host Microbe* **2020**, *27*, 1001-1013.e9.
15. **Bess, E. N.**; Bisanz, J.; Yarza, F.; Bustion, A.; Rich, B. E.; Li, X.; Kitamura, S.; Waligurski, E.; Ang, Q. Y.; Alba, D. L.; Spanogiannopoulos, P.; Nayfach, S.; Koliwad, S. K.; Wolan, D. W.; Franke, A. A.; Turnbaugh, P. J. Genetic Basis for the Cooperative Bioactivation of Plant Lignans by *Eggerthella lenta* and Other Human Gut Bacteria. *Nature Micro.* **2020**, *5*, 56–66.
14. Carmody, R.; Bisanz, B.; Bowen, B.; Maurice, C.; Lyalina, S.; Louie, K.; Treen, D.; Chadaideh, K.; Rekdal, V.; **Bess, E. N.**; Spanogiannopoulos, P.; Ang, Q. Y.; Bauer, K.; Balon, T.; Pollard K.; Northen, T.; Turnbaugh, T. Cooking Shapes the Structure and Function of the Gut Microbiome. *Nature Micro.* **2019**, *4*, 2052–2063.
13. Maini Rekdal, V.; **Bess, E. N.**; Bisanz, J. E.; Turnbaugh, P. J.; Balskus, E. P. Discovery and Inhibition of an Interspecies Gut Bacterial Pathway for Levodopa Metabolism. *Science* **2019**, *364*, eaau6323.
12. Sigman, M. S.; Harper, K. C.; **Bess, E. N.**; Milo, A. The Development of Multidimensional Analysis Tools for Asymmetric Catalysis and Beyond. *Acc. Chem. Res.* **2016**, *49*, 1292–1301.
11. Spanogiannopoulos, P.; **Bess, E. N.**; Carmody, R. N.; Turnbaugh, P. J. The Microbial Pharmacists Within: A Metagenomic View of Xenobiotic Metabolism. *Nature Rev. Microbiol.* **2016**, *14*, 273–287.
10. Mougel, V.; Santiago, C. B.; Zhizhko, P. A.; **Bess, E. N.**; Varga, J.; Frater, G.; Sigman, M. S.; Coperet, C. Quantitatively Analyzing Metathesis Catalyst Activity and Structural Features in Silica-Supported Tungsten Imido-Alkylidene Complexes. *J. Am. Chem. Sci.* **2015**, *137*, 6699–6704.
9. **Bess, E. N.**; Guptill, D.; Davies, H. M. L.; Sigman, M. S. Using IR Vibrations to Quantitatively Describe and Predict Site-Selectivity in Multivariate Rh-Catalyzed C–H Functionalization. *Chem. Sci.* **2015**, *6*, 3057–3062.
8. **Bess, E. N.**; Bischoff, A. J.; Sigman, M. S. Designer Substrate Library for Quantitative, Predictive Modeling of Reaction Performance. *Proc. Natl. Acad. Sci. U.S.A* **2014**, *111*, 14698–14703.

7. Bess, E. N.; DeLuca, R. J.; Tindall, D. J.; Oderinde, M. S.; Roizen, J. L.; Du Bois, J.; Sigman, M. S. Analyzing Site Selectivity in Rh<sub>2</sub>(esp)<sub>2</sub>-Catalyzed Intermolecular C–H Amination Reactions. *J. Am. Chem. Soc.* **2014**, *136*, 5783–5789.
6. Milo, A.; Bess, E. N.; Sigman, M. S. Interrogating Selectivity in Catalysis using Molecular Vibrations. *Nature* **2014**, *507*, 210–214.
5. Bess, E. N.; Sigman, M. S. Distinctive *Meta*-Directing Group Effect for Iridium-Catalyzed 1,1-Diaryllkene Enantioselective Hydrogenation. *Org. Lett.* **2013**, *15*, 646–649. Highlighted in *Angew. Chem. Int. Ed.* **2013**, *52*, 8795–8797.
4. Harper, K. C.; Bess, E. N.; Sigman, M. S. Multidimensional Steric Parameters in the Analysis of Asymmetric Catalytic Reactions. *Nature Chem.* **2012**, *4*, 366–374.
3. Sherwood, K.; Sugeran, S.; Bossart, P.; Bledsoe, J.; Barton, E.; Bernhisel, K.; Bess, E.; Madsen, T. EDOU Staffing by PAs: What are the Effects on Patient Outcomes? *JAAPA* **2011**, *24*, 31–37.
2. Lingenfelter, E. M.; Davis, V.; Larrabee, K.; Bess, E.; Canning, P.; Madsen, T. 192: Cholesterol Screening and Intervention Compliance In Chest Pain Patients In the Emergency Department Observation Unit Setting. *Ann. Emerg. Med.* **2010**, *56*, S64.
1. Bledsoe, J.; Hamilton, D.; Bess, E.; Holly, J.; Sturges, Z.; Madsen, T. Treatment of Low-risk Pulmonary Embolism Patients in a Chest Pain Unit. *Crit. Pathw. Cardiol.* **2010**, *9*, 212–215.

### Book Chapters

Bess, E. N.; Sigman, M. S. Linear Free Energy Relationships (LFERs) in Asymmetric Catalysis. In *Asymmetric Synthesis II: More Methods and Applications*, Christmann, M.; Bräse, S., Eds. Wiley-VCH Verlag GmbH & Co. KGaA: Weinheim, 2012; pp 363–370.

### Invited Lectures

- ◆ Keynote Address; Gordon Research Seminar on Drug Metabolism; Holderness, NH; July 2022.
- ◆ NSF Center for C–H Functionalization Sunset Symposium; Atlanta, Georgia; July 2022.
- ◆ American Society of Microbiology, Microbe Meeting; Washington DC; June 2022.
- ◆ American Chemical Society, “Gut Reaction” Session, San Diego, CA/Virtual; March 2022.
- ◆ NSF Center for C–H Functionalization Virtual Symposium: Alumni Edition; May 2021.
- ◆ STEM Scholars Program; Willamette University, Salem, Oregon; April 2021.
- ◆ Neuro-Rehabilitation Seminar Series; University of Southern California; April 2021.
- ◆ Center for Epigenetics and Metabolism; University of California, Irvine; December 2019.
- ◆ National Taiwan University–University of California, Irvine Symposium; Irvine, CA; December 2019.
- ◆ California State University, Los Angeles; Minority Opportunities in Research; November 2019.
- ◆ Chapman University; Chemistry & Biochemistry Program; Orange, CA; October 2019.
- ◆ Southern California Microbiome Symposium; Irvine, CA; September 2019.
- ◆ California State University, Los Angeles; Department of Chemistry & Biochemistry; September 2019.
- ◆ Breast Oncology Disease-Oriented Team; UC Irvine Medical Center; April 2019.
- ◆ Allergan Pharmaceutical; Irvine, CA; March 2019.
- ◆ Minority Sciences Program; University of California, Irvine; February 2019.
- ◆ American Chemical Society Meeting, Orange County Section; Santa Ana, CA; January 2019.
- ◆ University of California, Irvine; Department of Molecular Biology & Biochemistry; October 2018.
- ◆ UCI Microbiome Initiative Meeting; University of California, Irvine; October 2018.
- ◆ Breast Oncology Program Scientific Retreat; University of California, San Francisco; February 2018.
- ◆ University of California, Santa Barbara; Department Chemistry & Biochemistry; February 2018.
- ◆ University of Utah; Department of Biochemistry; Salt Lake City, UT; February 2018.
- ◆ University of Utah; Department of Pharmacology & Toxicology; Salt Lake City, UT; February 2018.

- ◆ University of Wisconsin-Madison; Department of Chemistry; Madison, WI; January 2018.
- ◆ Arizona State University; School of Molecular Sciences; Tempe, AZ; December 2017.
- ◆ Boston College; Chemistry Department; Chestnut Hill, MA; December 2017.
- ◆ University of California, Irvine; Department of Chemistry; Irvine, CA; November 2017.
- ◆ Rising Stars Symposium; University of Utah; Salt Lake City, UT; September 2017.
- ◆ American Chemical Society Annual Meeting; San Francisco, CA; April 2017.
- ◆ Microbial Pathogenesis Seminar Series; University of California, San Francisco; March 2017.
- ◆ American Chemical Society Annual Meeting; Philadelphia, PA; August 2016.
- ◆ NSF Center for C–H Functionalization Symposium; Atlanta, GA; August 2013.

### Teaching & Outreach

- ◆ [Podcast Guest on “ChemTalk”](#). Interviewed July 2022; air date October 3, 2022.
- ◆ **California State Summer School for Mathematics and Science (COSMOS) Instructor:** Partnered with Prof. Allon Hochbaum to design the new COSMOS cluster “Stressed Out Bugs: How Bacteria Respond to Changing Environments” for high school students (July–August 2022)
- ◆ **Mentorship Panel:** Gordon Research Seminar on Drug Metabolism (July 2022)
- ◆ **PacificSTEM Speaker and Panelist:** Spoke with students in middle and high schools from South LA and Orange Counties, as well as their families, about having a career in STEM (March 2022)
- ◆ **Instructor: Chem 219, Chemical & Structural Biology,** UC Irvine (Fall 2018, Fall 2019, Winter 2021, Winter 2022). Taught graduate-level course on chemical biology based on the primary literature. Implemented new modules on writing research proposals and constructing and delivering scientific presentations.
- ◆ **Instructor: Chem 51B, Organic Chemistry,** UC Irvine (Winter 2019, Winter 2020, Winter 2021, Winter 2022). Taught undergraduate-level course on reactions mechanisms in organic chemistry for chemistry majors and non-majors.
- ◆ **Faculty Mentor: UC Irvine Association for Women in Science (AWIS),** The Inner Circle Program (2019)
- ◆ **Lecturer: Osher Lifelong Learning Institute,** UC Irvine (October 2019)
- ◆ **Lecturer: Southern California Undergraduate Research Symposium,** UC Irvine (August 2019)
- ◆ **Keynote Speaker: ACS Orange County Undergraduate Awards Ceremony,** Cypress College (April 2019)
- ◆ **Guest Lecturer: Bridges to the Baccalaureate Program,** City College of San Francisco (October 2016)
- ◆ **Museum Exhibitor: Human Gut Microbiome Interactive Museum Exhibit,** California Academy of Sciences, Nightlife Event (August 2016)
- ◆ **Career-Day Speaker:** Benjamin Franklin Intermediate School, Daly City, CA (January 2016)
- ◆ **Investor Liaison:** Wayne Brown Institute, non-profit venture accelerator, Salt Lake City, Utah (Fall 2014)
- ◆ **Science Fair Judge:** Greater Salt Lake City Area (Jan. 2014, Jan. 2013)
- ◆ **Education, Outreach & Diversity Representative:** NSF Center for C–H Functionalization Student Advisory Board (2013-2014)
- ◆ **Tutor: Upward Bound,** program for low-income or first-generation college students, University of Utah (2011- 2012)
- ◆ **Teaching Assistant: Organic Chemistry,** University of Utah (Spring 2011, Spring 2008, Summer 2007)
- ◆ **Instructor: ACT Mathematics Preparation Course,** program for low-income or first-generation college students, West Jordan, Utah (September 2011)
- ◆ **Teaching Assistant: Inorganic Chemistry,** University of Utah (Fall 2010)
- ◆ **Service Committee Chair: Student Alumni Board,** University of Utah (2007–2009)
- ◆ **President: Phi Eta Sigma Honor Society,** University of Utah (2007–2008)
- ◆ **Counselor: Rocky Mountain Candlelighters for Childhood Cancer,** Salt Lake City, Utah 2007

### Professional Activities & Memberships

- ◆ Faculty Advisory Board: UC Irvine Infectious Disease Science Initiative (2019–Present)
- ◆ Member: Chao Family Comprehensive Cancer Center and Breast Oncology Disease-Oriented Team (2019–Present)
- ◆ American Chemical Society (member from 2016–Present)
- ◆ American Society for Microbiology (member from 2019–Present)
- ◆ International Society for Microbial Ecology (member from 2019–Present)

### Other Leadership Roles & Training

- ◆ Scientific Leadership & Management Skills Course, UC San Francisco, 16-hr training (November 2017)
- ◆ Asst. Research Coordinator, Pain Research Center, University of Utah School of Medicine (2008–2010)
- ◆ Violin Instructor, Black Violin Studio, Bountiful, Utah (2005–2009)

### Research Funding

#### Current Support:

TheoryLab Collaborative (TLC) Grant PI: Bess 1/1/2023–12/31/2023  
American Cancer Society

*“Defining In Vivo Tamoxifen Metabolism by Host–Microbe Interactions”*

The goal of this project is to provide the first systematic map of tamoxifen metabolism and distribution that accounts for both the host and its gut microbiota. Tamoxifen is an anti-breast cancer drug that has variable effectiveness across patients. Inter-individual variations in microbiota composition and tamoxifen catabolism may be a critical determinant of patient responsiveness. Conducted in collaboration with Cholsoon Jang (UCI), our quantitative analysis of tamoxifen metabolism is expected to pave the way for predicting drug bioavailability across patients.

Center for Space and Earth Science—Student Fellow Program 10/1/2022–9/30/2025

Los Alamos National Laboratory (Student support; no direct costs to PI/lab)

*“Discovering Gut Bacteria Responsible for Degrading Dietary Lignocellulose”*

The goal of this project is to use flow cytometry and single-cell genomics to isolate and identify gut bacteria that deconstruct lignin. This program provides support for a student in my laboratory to visit LANL for 4 months per year for 3 years. Funds are provided to the PI to visit LANL for 1 week each year.

Scialog Grant #28626 PI: Bess 7/15/2022–7/14/2023

Sponsored by Research Corporation for Science Advancement, the Frederick Gardner Cottrell Foundation, and the Paul G. Allen Frontiers Group

*“Electrifying Mechanisms of Intestinal  $\alpha$ -Synuclein Aggregation in Parkinson’s Disease Onset”*

The goal of this project is to use electrochemical and impedance sensing tools developed by collaborator Aida Ebrahimi (Penn State) to characterize, in real-time, a novel mechanism discovered in the Bess Lab by which gut bacteria induce pathogen aggregation of  $\alpha$ -synuclein, a protein key to Parkinson’s disease pathogenesis.

Scialog Grant #28648 PI: Bess 7/15/2022–7/14/2023

Sponsored by Research Corporation for Science Advancement, the Frederick Gardner Cottrell Foundation, and the Paul G. Allen Frontiers Group

*“Tracking  $\alpha$ -Synuclein from Enteroendocrine Cells to the Enteric Nervous System”*

The goal of this project is to determine whether  $\alpha$ -synuclein aggregates that form in intestinal enteroendocrine cells can propagate to the enteric nervous system.

Global Probiotics Council’s PI: Bess 4/27/2021–12/31/2023

Young Investigator Grant for Probiotics Research

*“Using Dietary Fiber to Harvest Novel Probiotics from the Human Gut Microbiota”*

The goal of this project is to identify the bacteria and enzymes responsible for degrading dietary lignocellulose, what metabolites result, and how this shapes bacterial community composition and function.

Departmental Start-Up Funds, University of California, Irvine 7/1/2018–6/30/2021

**Prior Support:**

University of California PI: Bess 10/1/2020–9/30/2021

Cancer Research Coordinating Committee

*“Leveraging the Human Gut Microbiome to Predict Efficacy of Tamoxifen in Breast Cancer”*

The goal of this project was to determine how communities of gut bacteria are shaped by exposure to the anti-cancer drug tamoxifen as well as whether gut bacteria metabolize tamoxifen.

Hellman Fellowship Program, UC Irvine PI: Bess 7/1/2020–6/30/2021

*“Using Dietary Fiber to Harvest Novel Probiotics from the Human Gut Microbiome”*

The goal of this project was to generate preliminary data to show that gut bacteria degrade lignin, a dietary fiber.

American Cancer Society Institutional Research Grant PI: Bess 11/1/2019–10/31/2020

*“Uncovering the Human Gut Microbiome’s Role in Estrogen Metabolism”*

The goal of this project was to determine how gut bacteria counterbalance the role of liver catechol-O-methyltransferase (COMT) in regulating host levels of catecholic hormones (e.g., estrogens and dopamine).

Howard Hughes Medical Institute Fellow of Life Sciences Research Foundation PI: Bess 8/1/2016–6/30/2018

*“Discovery of a Bacterial Gene in the Gut Microbiome Encoding Metabolism of Dietary Lignans”*

The goal of this project was to discover the genetic and biochemical basis for gut bacteria converting molecules rich in a plant-based diet into bioactive metabolites linked to anti-breast cancer effects.

University of Utah Graduate Research Fellowship 8/16/2014–5/15/2015

The goal of this project was to develop a mathematics-based approach to predict and optimize the behavior of molecules in chemical reactions.