

## Erin L. Bredeweg, Ph. D.

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### Education

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<b>Doctor of Philosophy in Molecular and Cellular Biology</b>	<b>2014</b>
Oregon State University, Corvallis, OR	
Dissertation: "Two fatty acid regulators in <i>Neurospora crassa</i> "	
<b>Bachelor of Science in Zoology</b>	<b>2004</b>
University of Washington, Seattle, WA	
Emphasis: Microbiology, Mycology	

### Qualifications

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I have over 16 years of research experience with bacteria, yeasts and filamentous fungi, including growth and crossing, genetics, synthetic biology and transformation, and bioinformatic and wet-lab analyses of DNA, RNA and protein using molecular and biochemical techniques. I have expertise in protein-specific tagging (fluorescent proteins, epitopes), sequencing library preparation and analysis, and Chromatin Immunoprecipitation (ChIP) assessing protein-specific DNA association. These techniques target a regulatory and genetic approach to bioengineering in order to open a window on biological movement and cellular processes and regulation. In-depth work with capabilities at Pacific Northwest National Lab and through collaboration with other PIs have shown my interdisciplinary collaboration and communication skills. These collaborations have also fostered publications with written contributions in both research and review chapters. My research goals apply basic cell biology for informed and useful design in industrial bioprocesses, and continual learning and adaption in the areas of biodesign, bioproduction, and symbiont and consortial mutualism.

### Professional Experience

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<b>Scientist III, Pacific Northwest National Lab, Richland, WA</b>	<b>January 2018-present</b>
<i>Fungal genetics and phenotyping, synthetic biology, chassis engineering</i>	
<b>Postdoctoral Research Associate, Pacific Northwest National Lab, Richland, WA</b>	<b>2014-2017</b>
Science Manager: Dr. Scott Baker, Environmental Molecular Science Laboratory	
<i>Research: Regulation of lipid accumulation and carbon metabolism, metabolic flux, synthetic biology, bioimaging, forward and reverse genetics</i>	
<b>Graduate Research Assistant (Ph.D.), Oregon State University, Corvallis, OR</b>	<b>2007- 2014</b>
Advisor: Michael Freitag, Molecular and Cellular Biology Program	
<i>Research: Transcription factors in Neurospora crassa regulating response to fatty acids; transcription factor networks; epigenetics; polarized growth and secretion proteins; circadian regulatory pathways</i>	
<b>Surgical Recovery Transport Technician, Registered Nursing Assistant, Spokane, WA</b>	<b>2005- 2007</b>
Supervisor: Judy Demand, Deaconess Surgery Center	
<b>Research Assistant, Washington State University, Pullman, WA</b>	<b>2005</b>
Advisors: Jesko Partecke, Hubert Schwabl, Department of Biological Sciences	
<i>Research: Effects of testosterone on house sparrow development and androgen receptors; cryotome and immunohistochemistry of brain tissue, lab assistance</i>	

**Research Assistant, University of Washington, Seattle, WA** 2004

Advisors: George Bentley, John Wingfield, Department of Zoology

*Research: Hypothalamic expression of GnRH in whitecrown sparrows in different phases of migratory behavior; tissue fixation, immunolabeling, quantitative analysis*

**Research Assistant, University of Washington, Seattle, WA** 2003-2004

Advisor: Joseph Ammirati, Department of Biology

*Research: Fungal mating type identification in basidiomycete species*

### **Projects, Grants, Honors, Awards**

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RACIPAC: DOE-BER EERE proposal: control of algal pests (fungal focus)	2024-present
Soil SFA: Fungal isolation from tall wheat grass rhizosphere	2022-present
Scenario Demo (NSD): reports on molecular biology and genome engineering	2023
Hamberger user project: Fungal Activity with terpene activity-based probes	2023
KBJ EC analysis: C-dependent fungal growth volatiles analysis	2022-2023
Nakayasu: <i>S. cerevisiae</i> expression of <i>H. capsulatum</i> desaturases	2022
APEX genomics: RNA-sequencing analysis of <i>Nitzschia inconspicua</i>	2023
CSC core: NanoLive development, host-microbe imaging (QUT-PNNL), workflows, ARTP cold atmospheric plasma device installation/testing	2023
ETI-Task 3 lead (collaboration with Dr. Brian Clowers, WSU)	2021-2024
EMSL-S&T project contributions (22142):	2020-Present
Bredeweg & Hu, Brandvold, Cort, Aufrecht, Melchior, Williams, Bredeweg & Krishnamoorthy, Krishnamoorthy	
BER-DOE Bioimaging FOA, with Dr. Andreas Vasdekis, U of Idaho	2018-2021
FELIX-Biology SME and supporting Program manager	2018-2022
FY20 Seed LDRD—Lipid map of fungi (207726, funded), PI	2020
FY19 Seed LDRD—Biomaterials of fish scales (funded), PI	2019
Metabolic modeling LDRD: 206541, co-PI	2019-2020
BER-DOE Oil production in oleaginous yeast (DE- SC0008744) (funded)	2013-2017
LBNL-ALS Research Proposal (funded)	2016
PNNL-EMSL User Proposal (funded)	2016
Department of Biochemistry Teaching Assistantship	2013-2014
Department of Biology Teaching Assistantship	2008, 2012
Department of Biochemistry Research Assistantship	2008-2012
CGBI-awarded GRA for genomics	2007-2008
Deans Academic Honor Roll	2000-2004
UW Undergraduate Scholar Award	2000-2002
Elks Club Lodge #1640 Scholarship	2000

### **Professional Memberships**

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Genetics Society of America (GSA)	2009-present
Society for Industrial Microbiology and Biotechnology (SIMB)	2017-2022
American Chemical Society	2018-2019
American Association for the Advancement of Science (AAAS)	2008-2015

### **Synergistic Activities**

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Fungal Genetics Conference (32nd) concurrent session co-chair	2024
Polyextremotolerant Fungal Science group	2023-2024
EMSL Integration 2022 co-chair for Systems and Synthetic biology/AI	2022
FSB seminar presentation	6 December 2022
Soils seminar presentation	9 September 2022
Temporary Team Lead-Cell Signaling and Communication	March-May 2021
Directorate Objective Workshops participation	2021
Peer representative for Publishing Summit	2021
EMSL-DSOC committee member	2020-present
SPOC and support of EMSL projects	2019-present

Cognizant Space Manager of lab space: EMSL 326-28-28A 2018-present  
 Reviewer for 2018-present

- Biotechnology for Biofuels, *Frontiers in Fungal Biology*, *Frontiers in Genetics*

### Teaching and Service

Post-bachelors intern training (Madelyn Berger, Mischelle Schutz)	2022-2023
SULI intern Research Mentoring (Eva Ottum, Irlanda Medranos) <i>Pacific Northwest National Laboratory (Richland, WA)</i>	2020-2023
Research Mentoring (Margaret Jones) <i>Pacific Northwest National Laboratory (Richland, WA)</i>	2016-2018
Guest Lecture Biological Systems Engineering 597: Metabolic Engineering <i>Washington State University, Tricities (Richland, WA)</i>	2016, 2018
Teaching Assistant-Cellular and Molecular Biology <i>Oregon State University (Corvallis, OR)</i>	2011-2013
Teaching Assistant-Lab Techniques in Molecular and Cellular Biology <i>Oregon State University (Corvallis, OR)</i>	2008
Tenure Evaluation Committee, graduate representative <i>Oregon State University (Corvallis, OR)</i>	2008
Day Surgery Center Volunteer <i>Deaconess Hospital (Spokane, WA)</i>	2005

### Publications

1. McCluskey, K., D. Brown, **E. Bredeweg**, and S.E. Baker (2023) "Predicting the Identities of su(met-2) and met-3 in *Neurospora crassa* by Genome Resequencing," *Fungal Genetics Reports*: Vol. 67, Article 3. <https://doi.org/10.4148/1941-4765.2183>
2. **Erin L. Bredeweg**, Kevin McCluskey, Scott E. Baker. "Phenotype to genotype in *Neurospora crassa*: Association of the scumbo phenotype with mutations in the gene encoding ceramide C9-methyltransferase", *Current Research in Microbial Sciences*, vol. 3, 2022, <https://doi.org/10.1016/j.crmicr.2022.100117>
3. Smercina D.N., N.M. Zambare, K.S. Hofmockel, N.C. Sadler, **E.L. Bredeweg**, C.D. Nicora, and L. Markillie, et al. 2022. "Synthetic Soil Aggregates: Bioprinted Habitats for High Throughput Microbial Metaphenomics." *Microorganisms* 10, no. 5:Art. No. 944. PNNL-SA-171905. doi:10.3390/microorganisms10050944
4. Daniel Zamith-Miranda, Heino M. Heyman, Meagan C. Burnet, Sneha P. Couvillion, Xueyun Zheng, Nathalie Munoz, William C. Nelson, Jennifer E. Kyle, Erika M. Zink, Karl K. Weitz, Kent J. Bloodsworth, Jeremy Clair, Jeremy D. Zucker, Jeremy R. Teuton, Samuel H. Payne, Young-Mo Kim, Morayma Reyes Gil, Erin S. Baker, **Erin L. Bredeweg**, Joshua D. Nosanchuk, Ernesto S. Nakayasu. "A Histoplasma capsulatum Lipid Metabolic Map Identifies Antifungal Targets". *mBio* 2021 Vol. 12, Issue 6, e02972-21. doi:10.1128/mBio.02972-21
  - a. preprint: A lipid metabolic map of the pathogenic fungus *Histoplasma capsulatum*
5. Andrew D. McNaughton, **Erin L. Bredeweg**, James Manzer, Jeremy Zucker, Nathalie Munoz Munoz, Meagan C. Burnet, Ernesto S. Nakayasu, Kyle R. Pomraning, Eric D. Merkley, Ziyu Dai, William B. Chrisler, Scott E. Baker, Peter C. St. John, and Neeraj Kumar. "Bayesian Inference for Integrating *Yarrowia lipolytica* Multiomics Datasets with Metabolic Modeling" *ACS Synth. Biol.* (2021). doi: 10.1021/acssynbio.1c00267
6. **Bredeweg E.L.**, Baker S.E. (2021) Strain Construction for Intracellular Metabolic Pathway Localization in *Y. lipolytica*. In: Wheeldon I., Blenner M. (eds) *Yarrowia lipolytica*. *Methods in Molecular Biology*, vol 2307. Humana, New York, NY. [https://doi.org/10.1007/978-1-0716-1414-3\\_10](https://doi.org/10.1007/978-1-0716-1414-3_10)
7. Zamith-Miranda Daniel, Peres da Silva Roberta, Couvillion Sneha P., **Bredeweg Erin L.**, Burnet Meagan C., Coelho Carolina, Camacho Emma, Nimrichter Leonardo, Puccia Rosana, Almeida Igor C., Casadevall Arturo, Rodrigues Marcio L., Alves Lysangela R., Nosanchuk Joshua D., Nakayasu Ernesto S. "Omics Approaches for Understanding Biogenesis, Composition and Functions of Fungal Extracellular Vesicles." *Frontiers in Genetics* 12, pp 641 (2021). doi: 10.3389/fgene.2021.648524
8. Ottum E., S.E. Baker, and **E.L. Bredeweg**. "Production of Biofuels from Biomass by Fungi." In *Encyclopedia of Mycology*. edited by O. Zaragoza and A. Casadevall. 555-576. Amsterdam:Elsevier. 2021. doi:10.1016/B978-0-12-819990-9.00062-7
9. NR Subedi, PS Jung, **EL Bredeweg**, S Nemat, SE Baker, DN Christodoulides, AE Vasdekis. Integrative quantitative-phase and airy light-sheet imaging, *Scientific Reports* 10, 20150 (2020). Pubmed PMID: 33214600; PMCID: PMC7678854.

10. Zamith-Miranda D, Heyman HM, Cleare LG, Couvillion SP, Clair GC, **Bredeweg EL**, Gacser A, Nimrichter L, Nakayasu ES, Nosanchuk JD. Multi-omics Signature of *Candida auris*, an Emerging and Multidrug-Resistant Pathogen. *mSystems*. 2019 June 11; 4:e00257-19.
  - a. preprint: *Candida auris*: multi-omics signature of an emerging and multidrug-resistant pathogen
11. **Bredeweg E.L.**, and S.E. Baker. 2020. "Horizontal gene transfer in Fungi." In *Grand Challenges in Fungal Biotechnology*, edited by Helena Nevalainen. 317-332. doi:10.1007/978-3-030-29541-7
12. Burnet M.C., D. Zamith-Miranda, H.M. Heyman, K.K. Weitz, **E.L. Bredeweg**, J.D. Nosanchuk, and E.S. Nakayasu. 2020. "Remodeling of the *Histoplasma capsulatum* membrane induced by monoclonal antibodies." *Vaccines* 8, no. 2:269. PNNL-SA-152362. doi:10.3390/vaccines8020269
13. **Bredeweg E.L.**, and S.E. Baker. 2018. "Analysis of Intracellular Metabolic Pathway Localization in *Y. lipolytica*." In *Methods in Molecular Biology*. PNNL-SA-138024.
14. Pomraning KR, **Bredeweg EL**, Kerkhoven EJ, Barry K, Haridas S, Hundley H, LaButti K, Lipzen A, Yan M, Magnuson JK, Simmons BA, Grigoriev IV, Nielsen J, Baker SE. 2018. Regulation of yeast-to-hyphae transition in *Yarrowia lipolytica*. *mSphere* 3:e00541-18. <https://doi.org/10.1128/mSphere.00541-18>.
15. Geng, Tao, Smallwood, Chuck R., **Bredeweg, Erin L.**, Pomraning, Kyle R., Plymale, Andrew E., Baker, Scott E., Evans, James E., and Kelly, Ryan T. "Multimodal Microfluidic Platform for Chemostatic and Compartmentalized Cell Culture and Analysis". *Biomicrofluidics*. 2017:11(054104) DOI: 10.1063/1.4986533
16. Pomraning, Kyle R., **Bredeweg, Erin L.**, Baker, Scott E. "Regulation of Nitrogen Metabolism by GATA Zinc Finger Transcription Factors in *Yarrowia lipolytica*". *mSphere*. 2017:2(1). DOI:10.1128/mSphere.00038-17
17. **Erin L. Bredeweg**, Kyle R. Pomraning, Ziyu Dai, Jens Nielsen, Eduard J. Kerkhoven, Scott E. Baker. "A genetic toolbox for *Yarrowia lipolytica*" *Biotechnology for Biofuels*. 2017:10(2). DOI: 10.1186/s13068-016-0687-7
18. Rigzin Dekhang, Cheng Wu, Kristina M. Smith, Teresa M. Lamb, Matthew Peterson, **Erin L. Bredeweg**, Oneida Ibarra, Jillian M. Emerson, Nirmala Karunarathna, Anna Lyubetskaya, Elham Azizi, Jennifer M. Hurley, Jay C. Dunlap, James E. Galagan, Michael Freitag, Matthew S. Sachs, Deborah Bell-Pedersen. "The *Neurospora* Transcription Factor ADV-1 Transduces Light Signals and Temporal Information to Control Rhythmic Expression of Genes Involved in Cell Fusion" *G3*, 2017. 7(1): p. 129-142. doi: 10.1534/g3.116.034298.
19. Miia R. Makela, **Erin L. Bredeweg**, Jon K. Magnuson, Scott E. Baker, Ronald P. De Vries, Kristina Hilden. "Fungal Ligninolytic Enzymes and Their Applications," *Microbiol Spectrum* 4(6):FUNK-0017-2016. Ed. Joseph Heitman, Barbara J. Howlett, Eva Holtgrewe Stukenbrock, doi:10.1128/microbiolspec.FUNK-0017-2016
20. Scott E. Baker and **Erin L. Bredeweg**. "Comparative Genomics, Sequencing and Fast Forward Genetics in *Aspergillus* and *Penicillium*." *Aspergillus and Penicillium in the Post-genomic Era*. Ed. Ronald P de Vries, Isabelle Benoit Gelber, and Mikael Rordam Andersen. Norfolk, UK: Caister Academic Press, 2016. p17-26. doi.org/10.21775/9781910190395.02
21. Pomraning KR, Kim YM, Nicora CD, Chu, RK, **Bredeweg EL**, Purvine SO, Hu D, Metz TO, Baker SE. Multi-omics analysis reveals regulators of the response to nitrogen limitation in *Yarrowia lipolytica*. *BMC Genomics*. 2016:17(138).
22. Pomraning KR, Wei S, Karagiosis SA, Kim YM, Dohnalkova AC, Arey BW, **Bredeweg EL**, Orr G, Metz TO, Baker SE. Comprehensive Metabolomic, Lipidomic and Microscopic Profiling of *Yarrowia lipolytica* during Lipid Accumulation Identifies Targets for Increased Lipogenesis. *PLoS One*. 2015: 10(4).
23. Tao Geng, **Erin L. Bredeweg**, Craig J. Szymanski, Bingwen Liu, Scott E. Baker, Galya Orr, James E. Evans, Ryan T. Kelly. "Compartmentalized microchannel array for high-throughput analysis of single cell polarized growth and dynamics". *Scientific Reports* 2015:5, doi: 10.1038/srep16111.
24. Cheng Wu, Fei Yang, Kristina M. Smith, Matthew Peterson, Rigzin Dekhang, Ying Zhang, Jeremy Zucker, **Erin L. Bredeweg**, Chandrashekar Mallappa, Xiaoying Zhou, Anna Lyubetskaya, Jeffrey P Townsend, James E Galagan, Michael Freitag, Jay C. Dunlap, Deborah Bell-Pedersen, Matthew S. Sachs. "Genome-Wide Characterization of Light-Regulated Genes in *Neurospora crassa*." *G3*, 2014. 4(9): p. 1731-45.
25. Meritxell Riquelme, **Erin L. Bredeweg**, Olga Callejas-Negrete, Robert W. Roberson, Sarah Ludwig, Alejandro Beltrán-Aguilar, Stephan Seiler, Michael Freitag. "The *Neurospora crassa* exocyst complex tethers Spitzenkörper macrovesicles to the apical plasma membrane. *Molecular Biology of the Cell*, 2014. 25(8): p. 1312-26.
26. Kristina M. Smith, Pallavi A. Phatale, **Erin L. Bredeweg**, Lanelle R. Connolly, Kyle R. Pomraning, Michael Freitag. *Epigenetics of filamentous fungi in Epigenetic Regulation and Epigenomics*. *Encyclopedia of Molecular Biology and Molecular Medicine*. Wiley-Blackwell. 2012.
27. Pomraning, Kyle R., Smith, Kristina M., **Bredeweg, Erin L.**, Connolly, Lanelle R., Phatale, Pallavi A., Freitag, Michael. "Library Preparation and Data Analysis Packages for Rapid Genome Sequencing." In: Nancy P. Keller and Geoffrey Turner (eds.), *Fungal Secondary Metabolism: Methods and Protocols*, *Methods in Molecular Biology*, vol. 944, Springer Science and Business Media, LLC. 2012. p. 1-22.
28. Kristina M. Smith, Gencer Sancar, Rigzin Dekhang, Christopher M. Sullivan, Shaojie Li, Andrew G. Tag, Cigdem Sancar, **Erin L. Bredeweg**, Henry D. Priest, Ryan F. McCormick, Terry L. Thomas, James C. Carrington, Jason E. Stajich, Deborah Bell-Pedersen, Michael Brunner, and Michael Freitag. *Transcription Factors in Light and Circadian Clock Signaling Networks Revealed by Genomewide Mapping of Direct Targets for Neurospora White Collar Complex*. *Eukaryotic Cell*, 2010. 9(10): p. 1549-56.

29. Chappell, P.E., Goodall, C. P., Tonsfeldt, K. J., White, R. S., **Bredeweg, E.** and Latham, K. L. Modulation of Gonadotrophin-Releasing Hormone Secretion by an Endogenous Circadian Clock. *Journal of Neuroendocrinology*, 2009. 21(4): p. 339-345.

### Manuscripts in Preparation

- Erin L. Bredeweg**, Kyle R. Pomraning, Kristina M. Smith, Rigzin Dekhang, Fei Yang, Jillian M. Emerson, Jay C. Dunlap, Deborah Bell-Pedersen, Matthew S. Sachs and Michael Freitag. "Two Fatty Acid Regulators in *Neurospora crassa*." (in preparation for "G3")
- Erin L. Bredeweg**, Eva Ottum, Maggie Jones, Kyle R. Pomraning, Scott E. Baker. "A mutant allele in the *Yarrowia lipolytica* Hap4 ortholog, *red*, accumulates protoporphyrin XI" (in preparation)
- Rodrigo Gonçalves, **Erin L. Bredeweg**, Michael Freitag and Maria-Celia Bertolini. "Characterization of genomic targets for the *Neurospora crassa* hypothetical transcription factor NCU04390 by ChIP-seq." (in preparation)

### Skills and Techniques

**Cell Biology:** Growth and maintenance of fungal and bacterial cultures, fruiting and conidiation, antibiotic resistance titration, crossing assays and genetic analysis, phenotyping assay design, isotopic metabolite labeling, mutagenesis, endogenous gene tagging; **Molecular Biology:** diagnostic, routine and overlap PCR amplification and optimization, Gibson assembly, traditional cloning and restriction analysis, site directed mutagenesis, ChIP immunoprecipitation, agarose and SDS-page electrophoresis, western blotting, northern blotting, Southern blotting, dot blotting, protein purification, cell fractionation, confocal microscopy, TEM sample preparation, cryotome operation, tissue immunocytochemistry, sequencing library preparation and optimization, bacterial and fungal transformation, and genetic engineering; **Computational Analysis:** perl and command line programming and file manipulation, bioinformatics, promoter analysis, HTS sequencing analysis including mapping, genome assembly, and differential expression analysis.

### Presentations

EMSL Learn webinar: 3D Live Imaging	January 2024
SIMB Annual meeting (Washington, D.C.)	2019
Cofactor balance in <i>Yarrowia lipolytica</i> (talk)	
SIMB Annual meeting (Chicago, IL)	2018
Itaconic acid production in <i>Yarrowia lipolytica</i> : tools and metabolism (talk)	
SIMB Annual Meeting (Denver, CO)	2017
Genetic and cell biological tools in <i>Yarrowia lipolytica</i> (poster)	
Postdoctoral Research Symposium (Richland, WA)	2016
Molecular genetic tools and live cell imaging in fungi (talk)	
Fungal Genetics Conference (Asilomar, CA)	2015
A nitrogen transceptor in the oleaginous yeast <i>Yarrowia lipolytica</i> (poster)	
NRCS Lunch and Learn (Portland, OR)	2014
Agricultural Applications of Cell Biology and Genomics (talk)	
CGRB Fall Conference (Corvallis, OR)	2013
Two Fatty Acid Regulators in <i>Neurospora crassa</i> (poster)	
Biology Graduate Student Symposium (Newport, OR)	2013
Control and Function of Two Fatty Acid Metabolism Regulators in <i>Neurospora crassa</i> : FAR-1 and FAR-2 (talk)	
Fungal Genetics Conference (Asilomar, CA)	2013
Two Fatty Acid Regulators in <i>Neurospora crassa</i> (poster)	
CGRB Fall Conference (Corvallis, OR)	2012
Two Fatty Acid Regulators in <i>Neurospora crassa</i> (poster)	
Oregon Neurospora Symposium (Eugene, OR)	2012
Two Fatty Acid Regulators in <i>Neurospora crassa</i> (talk)	
Neurospora Conference (Asilomar, CA)	2012
Characterization of two Fatty Acid Regulator transcription factors in <i>Neurospora crassa</i> (poster)	
Fungal Genetics Conference (Asilomar, CA)	2011
Genome-wide analysis of binding sites for a transcription factor involved in fatty	

acid metabolism, FAR-1 (poster)	
CGRB Fall Conference (Corvallis, OR)	2010
Genome-wide SIN-3 occupancy under osmotic stress assayed by ChIP-sequencing in <i>Neurospora crassa</i> (poster)	
Neurospora Conference (Asilomar, CA)	2010
Genome-wide SIN-3 occupancy under osmotic stress assayed by ChIP-sequencing in <i>Neurospora crassa</i> (poster)	

**Professional Development**

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Institutional Biosafety Committee rDNA subject matter expert	2021-present
Participation in Synthetic Biology/Predictive Phenomics journal club	2018-present
SIMB annual meeting-convenor (transfer due to no virtual attendance)	2021
“Metabolic Engineering and New Tools for Non-Model Organisms”	
NSF review panel (CBET)	2021
Scientists and Engineers Development Program (SEDP)	class of 2020
Completion of R course, (PNNL internal) from Allison Thompson	March-April 2020
KBase Fungal Biochemistry Curation Jamboree	December 2019
Participant in Pilot Mentor program as a mentee (mentor: Katrina Waters)	2019
Grant authoring Seminar Series (PNNL)	2019
ACS-NORM (Richland) convener	2018
“Synthetic Biology”	
Breakthrough Science & Technology Workshop, recorder	2017
Teaching methods for college level educators (course)	2013
Success in the College Classroom	
CGRB short courses	2013
Intro to Unix/Linux, Unix Pipelines and Regular Expressions for Biological Data Analysis	

**Primary References**

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[REDACTED]	[REDACTED]	[REDACTED]	[REDACTED]
[REDACTED]	[REDACTED]	[REDACTED]	[REDACTED]
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Richland, Washington  
 United States of America  
 3/16/2024

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