

## Curriculum Vitae - Buz Barstow

Assistant Professor  
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 Department of Biological and Environmental Engineering  
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 Faculty Position Appointment Dates: January 2<sup>nd</sup> 2018 to present

### A. Education and Training

INSTITUTION AND LOCATION	DEGREE (if applicable)	YEAR(s)	FIELD OF STUDY
Imperial College, London, United Kingdom	MSci, 1 <sup>st</sup> Class	1997-2001	Physics
Cornell University	Ph.D.	2001-2009	Applied Physics
Harvard Medical School	Postdoc	2009-2014	Synthetic Biology

### B. Positions and Honors

ACTIVITY/ OCCUPATION	BEGINNING DATE	ENDING DATE	FIELD	INSTITUTION/COMPANY	SUPERVISOR/ EMPLOYER
Undergraduate Researcher	07/2000	09/2000	Quantum Optics	Quantum Optics and Laser Science Group, Imperial College, London, UK	Dr. Jon Marangos
Undergraduate Researcher	10/2000	07/2001	Quantum Optics and Plasma Physics	Quantum Optics and Laser Science Group, Imperial College, London, UK	Dr. Roland Smith
Undergraduate Researcher and Technician	04/2001	08/2001	Biotechnology Instrumentation Development	DeltaDOT Ltd, Imperial College London, UK	Dr. John Hassard
Teaching Assistant	08/2001	05/2002	Mathematical Physics	Applied and Engineering Physics, Cornell University	Prof. Bruce Kusse
Graduate Research Assistant	05/2002	08/2003	Particle Accelerator Development	Laboratory for Elementary-Particle Physics, Cornell University	Prof. Hasan Padamsee and Prof. Sol M. Gruner
Graduate Research Assistant	08/2003	04/2009	Biophysics	Laboratory of Atomic and Solid State Physics, Cornell University	Prof. Sol M. Gruner
Postdoctoral Research Fellow	04/2009	06/2014	Synthetic Biology	Harvard Medical School	Prof. Pamela A. Silver
Research Associate	07/2014	12/2017	Synthetic Biology	Princeton University	
Assistant Professor	01/2018	Present	Synthetic Biology	Cornell University	

### C. Academic and Professional Honors

- Cornell Atkinson Center for Sustainability Senior Faculty Fellow, 2024-present.
- Carl Sagan Institute Faculty Fellow, 2021-present.
- Cornell Atkinson Center for Sustainability Faculty Fellow, 2019-2023.
- Burroughs-Wellcome Fund Career Award at the Scientific Interface, “*Evolving the limits of metabolism and in vivo catalysis*”, 2012-present.
- Finalist for the Gregorio Weber International Prize in Biological Fluorescence, 2011.
- NIH Ruth L. Kirschstein National Research Service Award (F32GM089028), “*Evolution of biological hydrogen production*”, 2010-2013.
- William Nichols Findley Exceptional Research Award, Cornell University, 2009.
- Travel grant for “Fourth Generation Light Sources I: X-Ray Laser”, US Particle Accelerator School hosted by Indiana University, Baton Rouge, LA, January 6-17, 2003.

### D. Publications

An up to date list of publications can be found at [barstow.bee.cornell.edu/publications](http://barstow.bee.cornell.edu/publications). My ORCID is 0000-0003-2218-6152.

#### Journal Articles

42. J.B. Balta, M.E. Holycross, B. Barstow, E. Gazel, “Co-generation of NaREE(MoO<sub>4</sub>)<sub>2</sub> and REEPO<sub>4</sub> in multiple habits by solid-flux crystal growth”, *In Submission at International Journal of Minerals, Metallurgy and Materials* (2024).
41. M.G Alaman-Zarate, B.J. Rady, C.A. Evans, B. Pian, D. Greetham, S. Marecos, M.J. Dickman, A.L. Lovering, B. Barstow, S. Mesnage, “Unusual 1-3 peptidoglycan cross-links in Acetobacteriaceae are made by L,D-transpeptidases with a catalytic domain distantly related to YkuD domains”, *Journal of Biological Chemistry* (2023). doi:10.1016/j.jbc.2023.105494.
32. C. Anderson, S. Medin, J. Adair, B. Demopoulos, L. Elmelech, E. Eneli, C. Kuelbs, J. Lee, T.J. Sheppard, D. Şinar, Z. Thurston, M. Xu, K. Zhang, B. Barstow, “Constraints on Lanthanide Separation by Selective Biosorption”, *In Review at iScience* (2023). doi:10.1101/2023.10.18.562985.
31. S. Medin, A. Dressel, D.A. Specht, T.J. Sheppard, M.E. Holycross, M.C. Reid, E. Gazel, M. Wu, B. Barstow, “Multiple Rounds of *in vivo* Random Mutagenesis and Selection in *Vibrio natriegens* Result in Substantial Increases in REE Binding Capacity”, *ACS Synthetic Biology* (2023). doi:10.1021/acssynbio.3c00484.
30. D.A. Specht, T.J. Sheppard, F. Kennedy, S. Li, G. Gadikota, B. Barstow, “Efficient Natural Plasmid Transformation of *Vibrio natriegens* Enables Zero-capital Molecular Biology”, *PNAS Nexus* (2023). doi:10.1093/pnasnexus/pgad444.
29. Z.A. Pollard, M. Karod, A.M. Schmitz, B. Pian, B. Barstow, J.L. Goldfarb, “Stable and Reusable ZnO Precursor Enhances Reactive Oxygen Species to Remove Emerging Pollutants from Water”, *Chemical Engineering Journal* (2023). doi:10.1016/j.cej.2023.147499.
28. B. Fu, X. Mao, Y. Park, Z. Zhao, T. Yan, W. Jung, D.H. Francis, W. Li, B. Pian, F. Salimijazi, M. Suri, T. Hanrath, B. Barstow, P. Chen, “Single-cell multimodal imaging uncovers energy conversion pathways in biohybrids”, *Nature Chemistry* (2023). doi:10.1038/s41557-023-01285-z.
27. T.J. Sheppard, D.A. Specht, B. Barstow, “Efficiency Estimates for Electromicrobial Production of Branched Chain Hydrocarbons”, *iScience* (2024). doi:10.1016/j.isci.2023.108773.
26. A.M. Schmitz, B.D. Pian, S. Marecos, M. Wu, M.E. Holycross, E. Gazel, M.C. Reid, B. Barstow, “High Efficiency Rare Earth Element Biomining with Systems Biology Guided Engineering of *Gluconobacter oxydans*”, *In Review at Communications Biology* (2023). doi:10.1101/2023.02.09.527855.

25. S. Medin, A.M. Schmitz, B.D. Pian, M.C. Reid, M.E. Holycross, E. Gazel, M. Wu, B. Barstow, “Genomic Characterization of Rare Earth Binding by *Shewanella oneidensis*”, *Scientific Reports* (2023). doi:10.1101/2022.10.31.514631.
24. T.J. Sheppard, D.A. Specht, B. Barstow, “Upper Limit Efficiency Estimates for Electromicrobial Production of Drop-In Jet Fuels”. *Bioelectrochemistry* (2023). doi:10.1016/j.bioelechem.2023.108506.
23. S. Marecos, A. Dressel, L. Gaul, L. Li, K. Satish, I. Tjokorda, J. Zheng, B. Barstow, “Practical and Thermodynamic Constraints on Electromicrobially-Accelerated CO<sub>2</sub> Mineralization”. *iScience* (2022). doi:10.1016/j.isci.2022.104769.
22. L. Wise, K. Randolph, S. Marecos, E. Nshimyumukiza, M. Hassan, J. Strouse, B. Barstow, “Constraints on the Efficiency of Electromicrobial Protein Production”. *Frontiers in Bioengineering and Biotechnology* (2022). doi:10.3389/fbioe.2022.820384.
21. A.M. Schmitz, B. Pian, S. Medin, M. Reid, M. Wu, E. Gazel and B. Barstow, “Generation of a *Gluconobacter oxydans* knockout collection for improved extraction of rare earth elements”, *Nature Communications* (2021). doi:10.1038/s41467-021-27047-4.
20. A. Rowe, F. Salimijazi, L. Trutschel, J. Sackett, O. Adesina, I. Anzai, L. Kugelmass, M. Baym, B. Barstow, “Identification of a Pathway for Electron Uptake in *Shewanella oneidensis*”, *Communications Biology* (2021). doi:10.1038/s42003-021-02454-x.
19. F. Salimijazi, J. Kim, A.M. Schmitz, R. Grenville, A. Bocarsly, B. Barstow, “Constraints on the Efficiency of Electromicrobial Production”, *Joule* 4:1-30 (2020). doi:10.1016/j.joule.2020.08.010.  
Perspective: G. Fan and A.L. Furst, “How Far Can Electromicrobial Production Go?” *Joule* 4:2079–2081 (2020). doi:10.1016/j.joule.2020.09.012.
18. F. Salimijazi, E.A. Parra, B. Barstow, “Electrical Energy Storage with Engineered Biological Systems”, *Journal of Biological Engineering* 13:38 (2019). doi:10.1186/s13036-019-0162-7.
17. I.A. Anzai, L. Shaket, O. Adesina, M. Baym, B. Barstow, “Knockout Sudoku, a method for rapidly curating gene disruption collections”, *Nature Protocols* 12, 2110–2137 (2017). doi:10.1038/nprot.2017.073.
16. O. Adesina, I.A. Anzai, J.L. Avalos, B. Barstow, “Embracing Biological Solutions to the Sustainable Energy Challenge”, *Chem* 2:20–51 (2017). doi:10.1016/j.chempr.2016.12.009.
15. M. Baym, L. Shaket, I.A. Anzai, O. Adesina, B. Barstow, “Rapid Construction of a Whole-genome Transposon Insertion Collection for *Shewanella oneidensis* by Knockout Sudoku”, *Nature Communications* 7, 13270 (2016). doi:10.1038/ncomms13270.
14. B. Barstow, “Molecular Mechanisms for the Biological Storage of Renewable Energy”, *Advanced Science, Engineering and Medicine* 7(12):1066-1081, 2015. doi:10.1166/ asem.2015.1813.
13. N. Ando\* and B. Barstow\*, “High hydrostatic pressure effects on proteins: Fluorescence studies”, *Encyclopedia of Analytical Chemistry*, eds R.A. Meyers, John Wiley, Chichester (2011). doi:10.1002/9780470027318.a9246.  
\*equal attribution, invited review
12. B. Barstow, C.M. Agapakis, P.M. Boyle, G. Grandl, P.A. Silver and E.H. Wintermute, “A Synthetic System Links FeFe-hydrogenases to Essential *E. coli* Sulfur Metabolism”, *Journal of Biological Engineering*, 5(1), 7 (2011). doi:10.1186/1754-1611-5-7.
11. B. Barstow, N. Ando, C.U. Kim and S.M. Gruner, “Coupling of Pressure-Induced Structural Shifts to Spectral Changes in a Yellow Fluorescent Protein”, *Biophysical Journal* 97:1719-27 (2009). doi:10.1016/j.bpj.2009.06.039.
10. C.U. Kim, B. Barstow, M.W. Tate and S.M. Gruner, “Evidence for Liquid Water During the High-density to Low-density Amorphous Ice Transition”, *PNAS* 106:4596-4600 (2009). doi:10.1073/pnas.0812481106.

9. N. Ando, B. Barstow, A. Field, W.A. Baase, B.W. Matthews, and S.M. Gruner, "Structural and Thermodynamic Characterization of T4 Lysozyme Mutants and the Contribution of Internal Cavities to Pressure Denaturation", *Biochemistry* 47:11097-11109 (2008). doi:10.1021/bi801287m.
8. B. Barstow, N. Ando, C.U. Kim and S.M. Gruner, "Alteration of Citrine Structure by Hydrostatic Pressure Explains the Accompanying Spectral Shift", *PNAS* 105:13362-13366 (2008). doi:10.1073/pnas.0802252105.  
Awarded 2009 William Nichols Findley Exceptional Research Award, Cornell University.
7. H. Padamsee, B. Barstow, I. Bazarov, S. Belomestnykh, M. Liepe, V. Medjidzade, R.L. Geng, V. Shemelin, C. Sinclair, K. Smolenski, M. Tigner and V. Vescherevich, "An Overview of the Cryomodule for the Cornell ERL Injector", Proceedings of the European Particle Accelerator Conference, July 5-9, 2004, p. 491. <http://buzbarstow.org/resources/Padamsee2004.PDF>.
6. B. Barstow, M. Liepe and H. Padamsee, "Engineering a Light Source for the Future", Proceedings of the 11th International Workshop on Superconducting Radio Frequency (SRF 2003), September 8-12, 2003. <http://buzbarstow.org/resources/Barstow2003.pdf>.
5. H. Padamsee, B. Barstow, I. Bazarov, S. Belomestnykh, M. Liepe, R.L. Geng, V. Shemelin, C. Sinclair, K. Smolenski, M. Tigner and V. Veserevich, "Overview of the Cornell ERL Injector Cryomodule", Proceedings of the 11th International Workshop on Superconducting Radio Frequency (SRF 2003), September 8-12, 2003. <http://buzbarstow.org/resources/Padamsee2003.pdf>.
4. H. Padamsee, B. Barstow, et al., "An Overview of SRF Activities at Cornell's Laboratory of Elementary Particle Physics", Proceedings of the 11th International Workshop on Superconducting Radio Frequency (SRF 2003), September 8-12, 2003.
3. M. Liepe, B. Barstow and H. Padamsee, "First Studies for a Low Temperature Higher- Order-Absorber for the Cornell ERL Prototype", Proceedings of the 2003 Particle Accelerator Conference, May 12-16, 2003. IEEE (2003), Vol. 2, 1320-1322. <http://buzbarstow.org/resources/Liepe2003.PDF>
2. H. Padamsee, B. Barstow, I. Bazarov, S. Belomestnykh, M. Liepe, R.L. Geng, V. Shemelin, C. Sinclair, K. Smolenski, M. Tigner and V. Veserevich, "Overview of the Cornell ERL Injector Cryomodule", *Proceedings of the 2003 Particle Accelerator Conference*, 2003, pp. 1317-1319 Vol.2, doi:10.1109/PAC.2003.1289691.
1. G.H. Hoffstaetter, B. Barstow, I.V. Bazarov, S. Belomestnykh, D. Bilderback, S.M. Gruner, M. Liepe, H. Padamsee, D. Sagan, V. Shemelin, C. Sinclair, R. Talman, M. Tigner, V. Veshcherevich, G.A. Krafft and L. Merminga, "The Cornell ERL Prototype Project", Proceedings of the 2003 Particle Accelerator Conference, May 12-16, 2003. IEEE (2003), Vol. 1, 192-194. <http://buzbarstow.org/resources/Hoffstaetter2003.pdf>

## Patents

5. B. Barstow, S. Marecos, "Non-acid Mediated Mechanisms of Bioleaching". Cornell invention disclosure 10484 (2023).
4. B. Barstow, A. Dressel, S. Medin, M. Wu, "Evolved Strains of *Vibrio natriegens* with Enhanced Total Biosorption and Selectivity for Heavy Rare Earths". US provisional application 63/598,883 (2023).
3. B. Barstow, S. Medin, B. Pian, A.M. Schmitz, "Systems and Methods for Separating Rare Earth Elements with Engineered Microorganisms". US provisional application 63/405,353 (2022).
2. B. Barstow, E. Gazel, S. Medin, B. Pian, A.M. Schmitz, M. Wu, "Systems and Methods for Extracting Rare Earth Elements with Engineered Microorganisms". US provisional application 63/152,798 (2021).
1. B. Barstow, M. Baym, L. Shaket, I.A. Anzai, and O. Adesina, "Method for isolating DNA molecules by generating a progenitor collection catalog". US Patent [US11053493B2](#) (2021)

## E. Invited Talks

- Boston University, Bioinformatics Program, Spring 2024.
- Cornell University, Microbiology Department, Spring 2024.
- Air Force Research Lab Discover, Dayton, OH, October 24<sup>th</sup> 2023 (cancelled due to Federal Government shutdown).
- AgBiome, Research Triangle Park, NC, June 19<sup>th</sup> 2023.
- University of Edinburgh, School of Physics and Astronomy, May 12<sup>th</sup> 2023.
- University of Edinburgh, School of Physics and Astronomy, April 6<sup>th</sup> 2023.
- University of Surrey, Department of Microbial Sciences, April 5<sup>th</sup> 2023.
- Imperial College, Department of Life Sciences, April 4<sup>th</sup>, 2023.
- University of Sheffield, Department of Biosciences, April 3<sup>rd</sup> 2023.
- Cambridge University, Department of Chemistry, March 27<sup>th</sup> 2023.
- AI-powered Biology Workshop, San Francisco, CA, 2023.
- Hicks Memorial Lecture, Westbury, NY, 2023.
- Cornell CALS Advisory Council, Ithaca, NY, 2023.
- 2030 Project Roundtable, Ithaca, NY, 2022.
- Society for Industrial Microbiology, San Francisco, CA, 2023.
- Cornell Chemical Biology Interface Symposium, 2022.
- BES2022, Antwerp, Belgium, 2022.
- ICAMD2021, Jeju Island, South Korea, 2021.
- NA-ISMET 2021, University of Southern California, 2021.
- University of Rochester Department of Biology, 2020.
- UT Southwestern Green Center, September 2020.
- MIT A+B Applied Energy conference, August 2020.

## F. Service

- CALS 2050 Roadmap panel, 2022.
- Reviewer for Cornell Energy Systems Institute postdoctoral fellowship, 2021
- Guest editor for special issue of *iScience* on electrode-microbe interface, 2021.
- Cornell Delegate to UN Climate Conference, COP26, Glasgow, United Kingdom, 2021.
- Biological and Environmental Engineering Diversity, Equity, and Inclusion Committee, 2020 - present (chair from 2023 - present).
- Organizing committee for MIT A+B Applied Energy Conference, 2020 - present.
- Guest editor for MIT A+B special edition of *Applied Energy*, 2020 - present.
- Guest Editor for special edition of *iScience* on biological-inorganic interface, 2021.
- Biological and Environmental Engineering faculty search committees, 2018 - present.
- Faculty Senator for Biological and Environmental Engineering, 2018 - present.
- Journal Reviewer for *PNAS*, *mBio*, *Biophysical Journal*, *Genome Research*, *Metabolic Engineering*, *Nature Catalysis*, *Nature Communications*, *Joule*, and *JACS*.

## H. Selected Media

- *Low-cost microbe can speed biological discovery*  
An article in the [Cornell Chronicle](#) on David Specht and TJ Sheppard's work on engineering natural competence (DNA uptake) into *Vibrio natriegens*.
- *Little bacterium may make big impact on rare-earth processing*  
An article in the [Cornell Chronicle](#) on Sean Medin and Stacie Dressel's work on engineering *Vibrio natriegens* for selective rare earth biosorption.
- *Microbial miners take on rare-earth metals*  
A technology feature in [Nature](#) on rare earth biomining.
- *Bacteria could be the key to a safer, greener way of processing rare-earth metals*  
An interview on [NPR's Marketplace Tech](#) on rare earth separations using engineered microbes.
- *Imaging Shows How Inorganic-Microbe Hybrids Use Light to Turn Carbon Dioxide into Bioplastic*  
An article covering work by Peng Chen in Cornell Chemistry (and us) on how *Ralstonia eutropha* converts CO<sub>2</sub> and electricity to bioplastic on the [DOE Office of Science](#).
- *Researchers Commercialize Rare-earth Tech with I-Corps Help.*  
An article about how Barstow Lab Alum Alexa Schmitz and grad student Sean Medin commercialized rare earth biomining tech developed in our lab on the [Cornell Chronicle](#).
- *Imaging Shows How Solar-Powered Microbes Turn CO<sub>2</sub> Into Bioplastic*  
An article covering work by Peng Chen in Cornell Chemistry (and us) on how *Ralstonia eutropha* converts CO<sub>2</sub> and electricity to bioplastic on the [Cornell Chronicle](#).
- *NY Lt. Gov. Tour Highlights Sustainability, Equity*  
An article covering the recent visit to our lab by Lt. Governor Antonio Delgado to our lab by the [Cornell Chronicle](#).
- *Entrepreneurs Find Home as Activate Fellows at Praxis Center*  
An article covering Alexa's Activate fellowship, and starting REEgen at the Cornell Praxis Center by the [Cornell Chronicle](#).
- *Rising Women Innovator Awards*  
Here's a great piece on Alexa's Rising Women Innovator award from Cornell Tech Licensing by the [Cornell Chronicle](#). And here's a link to a video about it on [YouTube](#).
- *Engineering Bacteria to Extract Rare Earths*  
Here's a great piece on our rare earth element bio-mining work by the [Institute of Materials, Minerals, and Mining](#).
- *Cornell Engineers Are Pioneering a Novel Method for Mining Metals That Are Key to Unlocking a Sustainable Future*  
Here's a great piece on our rare earth element bio-mining work by Chris Dawson that originally appeared in [Cornell Engineering Magazine](#).
- *Using Microbes, Scientists Aim to Extract Rare-Earth Elements*  
Here's a story in the Chronicle about an award we received from ARPA-E for rare earth element bio-mining in the [Cornell Chronicle](#).
- *Engineers Go Microbial to Store Energy, Sequester CO<sub>2</sub>*  
Here's another piece written by Blaine Friedlander on Farshid's theory of electromicrobial production that appeared in the [Cornell Chronicle](#).

- *Interdisciplinary Team Gets \$2M Grant for Bioenergy Conversion*  
Here's a story about an award we received (in collaboration with Peng Chen in Cornell Chemistry, who's the lead professor) in the [Cornell Chronicle](#).
- *Wiring Up Bacteria to the Grid*  
We're quoted by Carl Zimmer from the [New York Times](#).
- *Engineered Bacteria Could Be Missing Link in Energy Storage*  
Here's a piece written by Krishna Ramanujan on Farshid's review of some of the fundamentals of using microbes to store electricity electromicrobial production that appeared in the [Cornell Chronicle](#).
- *Princeton Researchers Propose Biological Solutions to Sustainable Energy Problems*  
You can find more about the challenges of sustainable energy and proposed solutions in our review article in [Chem](#) and in a Q&A piece written by Princeton Chemistry's science writer, Tien Nguyen, on the [Princeton Chemistry website](#).
- *Sudoku Strategy Democratizes Powerful Tool for Genetics Research*  
You can find out more about Knockout Sudoku in a great popular piece written by Princeton Chemistry's science writer, Tien Nguyen, on the [Princeton Chemistry website](#).