

# Joshua T. Atkinson, Ph.D. | Curriculum Vitae

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## Education

2019	Ph.D., Systems, Synthetic, and Physical Biology <i>Thesis: 'Controlling bioenergetic systems using protein design and synthetic biology'</i>	Rice University
2012	B.S., Microbiology with minor in Asian Studies	University of Michigan

## Positions

2022-Present	Visiting NSF Postdoctoral Fellow with Lars Peter Nielsen	Aarhus University
2020-Present	NSF Postdoctoral Fellow with Moh El-Naggar	University of Southern California
2019-20	Postdoctoral Assoc. with Jonathan Silberg	Rice University
2018-19	Vaughn Graduate Fellow with Jonathan Silberg	Rice University
2017-18	DoE SCGSR Fellow with Caroline Ajo-Franklin	Lawrence Berkeley National Lab
2014-18	NSF Graduate Fellow with Jonathan Silberg	Rice University
2011-13	Lab Technician in Vaccine and Antimicrobial R&D	NanoBio Corporation
2009-11	Undergraduate Researcher with Paul Dunlap	University of Michigan

## Funding Obtained

2020-24	NSF Postdoctoral Research Fellowship in Biology – 'Integrative Research Investigating the Rules of Life'
2020	Gordon and Betty Moore Foundation Fellow of the Life Sciences Research Foundation, <i>Declined</i>
2018-19	Lodieska Stockbridge Vaughn Fellowship
2017-18	DOE Office of Science Graduate Research (SCGSR) Fellowship
2014-17	NSF Graduate Research Fellowship
2014	NASA Space Technology Research Fellowship, <i>Declined</i>

## Honors & Awards

2022	'Best Poster' – Bioelectrochemical Society 2022 Meeting
2020	'Editor's Choice Article' – <i>Protein Eng. Des. Sel.</i> 32(11) 489-501 (2019)
2018	'Best Talk' – Int. Soc. of Microbial Electrochemistry and Technology N. American 2018 Meeting

## Peer-reviewed Publications

(\* Equal contributions. Undergraduate authors)

### 2022

16. **J.T. Atkinson\***, L. Su\*, X. Zhang, G.N. Bennett, J.J. Silberg, C.M. Ajo-Franklin. Real-time environmental monitoring of contaminants using living electronic sensors *Nature* in press doi: 10.1038/s41586-022-05356-y (2022) [*bioRxiv* doi:10.1101/2021.06.04.447163]
15. **J.T. Atkinson**, M.S. Chavez, C.M. Niman, M.Y. El-Naggar. Living Electronics: A catalog of engineered living electronic components. *Microb. Biotechnol.* in press (2022)
14. F. Zhao, M.S. Chavez, K.L. Naughton, C.M. Niman, **J.T. Atkinson**, J.A. Gralnick, M.Y. El-Naggar, J.Q. Boedicker. Light-Induced Patterning of Electroactive Bacterial Biofilms. *ACS Synth. Biol.* 11(7):2327–2338 (2022)
13. I. Campbell, **J.T. Atkinson**, M.D. Carpenter, D. Myerscough, L. Su, C.M. Ajo-Franklin, J.S. Silberg. Determinants of multiheme cytochrome extracellular electron transfer uncovered by systematic peptide insertion *Biochemistry* 61(13):1337–1350 (2022)
12. C. Tseng, F. Liu, X. Zhang, P. Huang, I. Campbell, Y. Li, **J.T. Atkinson**, T. Terlier, C.M. Ajo-Franklin, J.S. Silberg, R. Verduzco. Solution-Deposited and Patternable Conductive Polymer Thin Film Electrodes for Microbial Bioelectronics. *Adv. Mater.* 34(13):e2109442 (2022)

## 2020

11. I.J. Campbell, D. Kahanda, **J.T. Atkinson**, **O.N. Sparks**, **J. Kim**, C.P. Tseng, R. Verduzco, G.N. Bennett, J.J. Silberg. Recombination of 2Fe-2S ferredoxins reveals differences in the inheritance of thermostability and midpoint potential. *ACS Synth. Biol.* 9(12):3245-3253 (2020)
10. E.M. Fulk, D. Huh, **J.T. Atkinson**, **M. Lie**, C.A. Masiello, J.J. Silberg. A split methyl halide transferase AND gate that reports by synthesizing an indicator gas. *ACS Synth. Biol.* 9(11):3104-3113 (2020)
9. I.J. Campbell, J.L. Olmos, W. Xu, D. Kahanda, **J.T. Atkinson**, **O.N. Sparks**, M.D. Miller, G.N. Phillips, G.N. Bennett, J.J. Silberg. *Prochlorococcus* phage ferredoxin: structural characterization and interactions with cyanobacterial sulfite reductases. *J. Biol. Chem.* 295(31):10610-10623 (2020)
8. B.Y. Wu, **J.T. Atkinson**, D. Kahanda, G.N. Bennett, and J.J. Silberg. Combinatorial design of chemical-dependent protein switches for controlling intracellular electron transfer. *AIChE J.* e16796. (2020)

## 2019

7. **J.T. Atkinson**, A.J. Jones, V. Nanda, and J.J. Silberg. Protein tolerance to random circular permutation correlates with thermostability and local energetics of residue-residue contacts. *Protein Eng. Des. Sel.* 32(11):489-501 (2019) – *Editor's Choice Article*
6. **J.T. Atkinson**, I.J. Campbell, S.C. Bonitatibus, S.J. Elliot, G.N. Bennett, and J.J. Silberg, Metalloprotein switches that display chemical-dependent electron transfer, *Nat. Chem. Bio.* 15(2):189-195. (2019)

## 2018

5. **J.T. Atkinson\***, A.J. Jones\*, Q. Zhou, and J.J. Silberg. Circular permutation profiling by deep sequencing libraries created using transposon mutagenesis. *Nucleic Acids Res.* 46(13):e76. (2018)

## 2016

4. **J.T. Atkinson**, I. J. Campbell, G.N. Bennett, and J.J. Silberg. Cellular assays for ferredoxins: a strategy to understand electron flow through protein carriers that link metabolic pathways. *Biochemistry.* 55(51):7047-7064. (2016)
3. A.M. Jones, M.M. Mehta, E.E. Thomas, **J.T. Atkinson**, **T.H. Segall-Shapiro**, S. Liu, and J. J. Silberg. The structure of a thermophilic kinase shapes fitness upon random circular permutation. *ACS Synth Biol.* 5(5):415-425. (2016)

## 2015

2. D.W. Howell, S.P. Tsai, K. Churion, J. Patterson, C. Abbey, **J.T. Atkinson**, D. Porterpan, Y.H. You, K.E. Meissner, K.J. Bayless, and S.E. Bondos. Identification of multiple dityrosine bonds in materials composed of the *Drosophila* protein Ultrabithorax. *Adv. Funct. Mater.* 25(37):5988-98. (2015)

## 2011

1. Urbanczyk, H., Y. Ogura, T.A. Hendry, A.L. Gould, N. Kiwaki, **J.T. Atkinson**, T. Hayashi, and P.V. Dunlap. Genome Sequence of *Photobacterium mandapamensis* svers.1.1., bioluminescent symbiont of the cardinalfish *Siphamia versicolor*. *J Bacteriol.* 193(12):3144-5. (2011)

## Book Chapters and Articles

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### 2019

3. **J.T. Atkinson**. Life simplified: recompiling a bacterial genome for synonymous codon compression. *Synthetic Biology.* 4:1. (2019)
2. **J.T. Atkinson**, B.Y. Wu, L. Segatori, and J.J. Silberg. Overcoming component limitations in synthetic biology through transposon-mediated protein engineering. Ch. 15 *Methods in Enzymology.* 621:191-212. (2019)

### 2016

1. A.M. Jones, **J.T. Atkinson**, and J. J. Silberg. PERMutation Using Transposase Engineering (PERMUTE): a simple approach for constructing circularly permuted protein libraries. Ch.19 *Methods in Molecular Biology.* 1498:295-308. (2017)

## Patents

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- J.J. Silberg, **J.T. Atkinson**, I.J. Campbell, and G.N. Bennett. Regulating electron flow using split proteins, US 11,407,792 B2. *United States Patent and Trademark Office.* (9 Aug. 2022)

## Invited Talks

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- J.T. Atkinson.** (2022) Using synthetic biology & protein engineering to build living electronics (Synthetic Biology Young Speaker Series (SynBYSS), Global Virtual Seminar)

- J.T. Atkinson**, L. Su, X. Zhang, G.N. Bennett, C. Ajo-Franklin, and Silberg, J.J. (2021) Real-time environmental monitoring of contaminants using living electronic sensors (Society for Industrial Microbiology and Biotechnology 71<sup>st</sup> Annual Meeting, Austin, TX, USA)
- J.T. Atkinson**, A.M. Jones, V. Nanda, and Silberg, J.J. (2020) Protein tolerance to random circular permutation correlates with thermostability and local energetics of residue-residue contacts (PEDS Protein Engineering and Design Webinar) – PEDS Editor’s Choice Article
- J.T. Atkinson**, L. Su, G.N. Bennett, C. Ajo-Franklin, and Silberg, J.J. (2020) Using engineered protein switches to control extracellular electron transfer in *Escherichia coli*. (Engineering Biology Research Consortium – Cell-Material Interface Virtual Seminar)
- J.T. Atkinson**, L. Su, I.J. Campbell, G.N. Bennett, C. Ajo-Franklin, and Silberg, J.J. (2019) Creating living bioelectronic sensors using ferredoxin-dependent electron transport chains (Rice SynBio Hangout, Houston, TX, USA)

## Selected Talks

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- J.T. Atkinson**, L. Su, X. Zhang, G.N. Bennett, C. Ajo-Franklin, and Silberg, J.J. (2022) Real-time bioelectronic sensing of environmental contaminants (Bioelectrochemical Society 2022, Antwerp, BE)
- J.T. Atkinson**, L. Su, X. Zhang, G.N. Bennett, C. Ajo-Franklin, and Silberg, J.J. (2021) Real-time bioelectronic sensing of environmental contaminants (North America-International Society of Microbial Electrochemistry and Technology, Los Angeles, CA, USA)
- J.T. Atkinson**, L. Su, I.J. Campbell, G.N. Bennett, C. Ajo-Franklin, and Silberg, J.J. (2018) Creating living bioelectronic sensors using ferredoxin-dependent electron transport chains (North America-International Society of Microbial Electrochemistry and Technology, Minneapolis, MN, USA) – *Awarded ‘Best Talk’*

## Conference Presentations

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- J.T. Atkinson**, M. Chavez, F. Zhao, J. Boedicker, M.Y. El-Naggar (2022) Controlling the conductivity of light-patterned biofilms (Engineering Biology Research Consortium Annual Meeting 2022, Berkeley, CA)
- J.T. Atkinson**, M. Chavez, F. Zhao, J. Boedicker, M.Y. El-Naggar (2022) Controlling the conductivity of light-patterned biofilms (Bioelectrochemical Society 2022, Antwerp, BE) – *Awarded ‘Best Poster’*
- J.T. Atkinson**, M. Chavez, F. Zhao, J. Boedicker, M.Y. El-Naggar (2021) Controlling the conductivity of light-patterned biofilms (North America-International Society of Microbial Electrochemistry and Technology, Los Angeles, CA, USA)
- J.T. Atkinson**, M.Y. El-Naggar (2021) Synthetic cable bacteria – programming multicellular electronically coupled metabolism (Electromicrobiology 2021, Aarhus, DK)
- J.T. Atkinson**, L. Su, I.J. Campbell, G.N. Bennett, C. Ajo-Franklin, and Silberg, J.J. (2019) Creating living bioelectronic sensors using ferredoxin-dependent electron transport chains (1<sup>st</sup> Bioelectronics Gordon Research Conference, Andover, NH, USA)
- J.T. Atkinson**, L. Su, I.J. Campbell, G.N. Bennett, C. Ajo-Franklin, and Silberg, J.J. (2018) Creating living bioelectronic sensors using ferredoxin-dependent electron transport chains (DeLange Bioelectronics, Houston, TX, USA)
- J.T. Atkinson**, L. Su, I.J. Campbell, G.N. Bennett, C. Ajo-Franklin, and Silberg, J.J. (2018) Creating living bioelectronic sensors using ferredoxin-dependent electron transport chains (Synthetic Biology: Engineering, Evolution & Design, Scottsdale, AZ, USA)
- J.T. Atkinson**, I.J. Campbell, G.N. Bennett, and Silberg, J.J. (2018) Design of an allosteric 2Fe-2S ferredoxin switch that displays chemical-dependent electron transfer (39<sup>th</sup> Steenbock Symposium, Madison, WI, USA)
- J.T. Atkinson**, I.J. Campbell, G.N. Bennett, and Silberg, J.J. (2017) Chemical-Responsive Protein Electron Carriers To Control Electron Flow (2<sup>nd</sup> Annual Asilomar Bioelectronics Conference, Pacific Grove, CA, USA)
- J.T. Atkinson**, I.J. Campbell, J. Torres, G.N. Bennett, and Silberg, J.J. (2017) Controlling Energy Flow in Bacteria Using Engineered Ligand-Responsive Protein Electron Carriers (Molecular Foundry User Meeting, Lawrence Berkeley National Lab, Berkeley, CA, USA)
- J.T. Atkinson**, I.J. Campbell, J. Torres, G.N. Bennett, and Silberg, J.J. (2017) Controlling Energy Flow in Bacteria Using Engineered Ligand-Responsive Protein Electron Carriers (Synthetic Biology: Engineering, Evolution & Design, Vancouver, BC, CAN)
- J.T. Atkinson**, I.J. Campbell, J. Torres, G.N. Bennett, and Silberg, J.J. (2017) Controlling energy flow in bacteria using engineered protein electron carriers (25<sup>th</sup> Texas Protein Folders and Function Meeting, Cleveland, TX, USA)

- J.T. Atkinson**, I.J. Campbell, G.N. Bennett, and Silberg, J.J. (2016) Tuning the electron transfer activity of a 2Fe2S ferredoxin using homologous recombination and an *Escherichia coli* selection (24<sup>th</sup> Texas Protein Folders and Function Meeting, Cleveland, TX, USA)
- J.T. Atkinson**, I.J. Campbell, J. Torres, G.N. Bennett, and Silberg, J.J. (2016) Tuning the electron transfer activity of a 2Fe2S ferredoxin using homologous recombination and an *Escherichia coli* selection (Synthetic Biology: Engineering, Evolution & Design, Chicago, IL, USA)
- J.T. Atkinson**, I.J. Campbell, J. Torres, G.N. Bennett, and Silberg, J.J. (2016) Rational design of split ferredoxins that function as electron transfer AND gates in *Escherichia coli* (4<sup>th</sup> Penn State Bioinorganic Workshop, State College, PA, USA)
- J.T. Atkinson**, I.J. Campbell, J. Torres, G.N. Bennett, and Silberg, J.J. (2016) Two-fragment ferredoxins that function as electron transfer AND gates (72<sup>nd</sup> Annual ACS Southwest Regional Meeting, Galveston, TX, USA)
- J.T. Atkinson**, M. Lie, G.N. Bennett and J.J. Silberg (2014) Using Laboratory Evolution to Discover Ferredoxins that Transduce Electrons from Fd-NADPH Oxidoreductase to Sulfite Reductase (24<sup>th</sup> Annual Keck Research Conference, Houston, TX, USA)

## Teaching Experiences

2016	Rice University	BIOC 352: "Physical Chemistry for Biosciences" (guest lecturer)
2016	Rice University	"Systems, Synthetic, & Physical Biology Bootcamp" (course designer)
2015	Rice University	SSPB 503: "Synthetic Biology" (teaching assistant)
2014	Rice University	"Systems, Synthetic, & Physical Biology Bootcamp" (course designer)

## Mentoring Experiences

2022	Supervised and mentored 1 Master's student from the Aarhus U. Molecular Biology and Genetics department and 1 visiting Erasmus intern from Offenburg U.	
2022	Founding Postdoctoral Advisor of the USC iGEM team training >20 undergraduate students in molecular and synthetic biology	
2022	Mentored 1 undergraduate student from the USC Physics department in independent research in the El-Naggar Lab	
2021	Trained 1 Ph.D. student rotating through El-Naggar lab from the USC Molecular and Cellular Biology graduate program (1 joined the El-Naggar lab)	
2015-19	Trained 9 Ph.D. students rotating through Silberg lab from the Rice U. Systems, Synthetic, and Physical Biology and Biochemistry & Cell Biology graduate programs (4 joined the Silberg lab)	
2014-19	Mentored 7 undergraduate students in independent research in the Silberg lab resulting in 6 poster presentations for campus wide undergraduate poster contests, 2 poster presentations at the Beckman Scholars Conference, and 4 co-authored peer reviewed papers ( <u>underlined</u> above)	
2015-16	Founding Graduate Advisor of the Rice iGEM team training 15 undergraduate students in 2016 and 13 undergraduate students in 2015 in molecular and synthetic biology and organizing the first transcontinental iGEM team by forming a joint team with 18 undergraduate students from Hong Kong University of Science and Technology (HKUST) in 2015	

## Outreach Activities

2021	Judge	1st Global Open Genetic Engineering Competition (GOGEC)
2021	Judge	1st International Directed Evolution Competition (iDEC)
2021	H.S. Student Mentor	Bridge Undergraduate Science Program Jr., University of Southern California
2021	Judge	Microbiology - Senior Division, California Science and Engineering Fair
2020-21	Community Designer	International Directed Evolution Competition (iDEC)
2019-21	H.S. Team Mentor	BioBuilderClub Team for Westborough High School - Westborough, MA (Virtual)
2019	Poster Judge	Rice BioSciences Research Symposium and Retreat
2018	Poster Judge	Rice Institute of Biosciences and Bioengineering Undergraduate Poster Symposium
2017	Oral Presenter	"How to find a NSF REU Summer Research Experience",

		San Jacinto Community College
2016	Presentation Judge	Gulf Coast Consortia Undergraduate Symposium
2016	Oral Presenter	“How to find a NSF REU Summer Research Experience”, San Jacinto Community College
2015	Poster Judge	Rice Undergraduate Research Symposium
2015	Poster Judge	Rice - Duncan College Undergraduate Research Symposium
2014	H.S. Student Mentor	Institute of Biosciences & Bioengineering Summer Academy, Rice University
2014	Judge	Biochemistry/Microbiology, Science Engineering Fair of Houston

## Community Activities

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2022	Mentor Chair	EBRC Mentorship for Undergraduate and Master Students (EMUMS) Program
2022	Education Working Group Liaison	Engineering Biology Research Consortium (EBRC) – Student and Postdoctoral Association (SPA) Board
2022	External Reviewer	Air Force Office of Scientific Research
2021-22	Ad hoc Reviewer	Cell Systems
2021-22	Ad hoc Reviewer	Frontiers in Microbiology
2021	Conference Organizer	International Society of Microbial Electrochemistry and Technology (ISMET) - North American Meeting 2021
2020	Ad hoc Reviewer	Journal of Molecular Biology
2017-19	Social Chair	Systems, Synthetic, and Physical Biology Graduate Student Association
2014	Recruitment Chair	Systems, Synthetic, and Physical Biology Graduate Program

## Professional Societies

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2022	Bioelectrochemical Society
2021-22	Engineering Biology Research Consortium (EBRC) – Student and Postdoctoral Association (SPA)
2018-22	International Society of Microbial Electrochemistry and Technology
2014-22	American Society of Microbiologists

## Workshops

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2022	NSF Using the Rules of Life – Achieving a Sustainable Future Workshop
2016	4th Penn State Bioinorganic Workshop

## Collaborators

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Andreas Schramm (Aarhus U.), Pernille Klarskov Pedersen (Aarhus U.), Thomas Boesen (Aarhus U.), Anne Jones (Arizona State University), James Boedicker (U. of Southern California), Jeff Gralnick (U. Minnesota), Caroline Ajo-Franklin (Lawrence Berkeley National Lab/Rice U.), George N. Bennett (Rice U.), Vikas Nanda (Rutgers U.), Rafael Verduzco (Rice U.), Sean J. Elliot (Boston U.), Sarah E. Bondos (Texas A&M)