

Joshua A. Mancini, Ph.D.
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RESEARCH INTERESTS

Using rational and computational design combined with directed evolution techniques to build light and redox active *de novo* enzymes with a main focus on artificial biliproteins, heme, metal cluster, and photosynthetic antenna centers.

A critical part of this work is interfacing *de novo* proteins with natural cofactor maturation and attachment systems, specifically in *E. coli*, cyanobacteria, and mammalian cells.

EDUCATION

- 2011-2017 **University of Pennsylvania, Philadelphia, PA**
Ph.D. in Biochemistry and Molecular Biophysics, *Mar 2017*
Dissertation: Engineering designed proteins for light capture, energy transfer, and emissive sensing *in vivo*, Advisor: P. Leslie Dutton, Ph.D.
GPA: 3.62
- 2003-2007 **Wittenberg University, Springfield, OH**
Bachelor of Science in Biochemistry and Molecular Biology, *May 2007*
Summa cum Laude GPA: 3.84

RESEARCH EXPERIENCE

NASA Astrobiology Postdoctoral Fellow, Rutgers University, New Brunswick, NJ Aug 2018- Present
Designing proteinaceous catalytic components that could be used for sustaining primitive life.

Postdoctoral Associate, Princeton University, Princeton, NJ Aug 2017- August 2018
Building *de novo* proteomes and characterizing for enzymatic activity

Doctoral Thesis University of Pennsylvania, Philadelphia, PA *Sep 2011 – Mar 2017*

Engineering biogenesis of man-made light- and redox-active protein maquettes

1. Interfaced maquettes with cytochrome *c* maturation machinery *in vivo* for development of a no-assembly-required man-made soluble electron transporter.
2. *In vivo* expression of manmade biliproteins (bilimaquettes) for the use of light harvesting components in manmade photochemical systems and emissive sensing.

Staff Scientist, Chantest Inc., Garfield Heights, Ohio July 2011 – Aug 2011

1. Performed electrophysiology studies to find drugs for the Cystic Fibrosis Foundation that correct the trafficking and functionality of the mutated CFTR channel.
2. Performed single cell current recordings using automated and manual patch clamping for FDA preclinical safety testing.

PUBLICATIONS

Peer Reviewed Publications

1. Lishchuk, A., Kodali, G., **Mancini, J. A.**, Broadbent, M., Darroch, B., Mass, O. A., et al. (2018). A synthetic biological quantum optical system. *Nanoscale*, *10*(27), 13064–13073.
2. **Mancini, J. A.**, Sheehan, M., Kodali, G., Chow, B. Y., Bryant, D. A., Dutton, P. L., & Moser, C. C. (2018). De novo synthetic biliprotein design, assembly and excitation energy transfer. *Journal of the Royal Society Interface*, *15*(141)
3. **Mancini, J. A.**, Kodali, G., Jiang, J., Reddy, K. R., Lindsey, J. S., Bryant, D. A., Dutton, P. L., & Moser, C. C. (2017). Multi-step excitation energy transfer engineered in genetic fusions of natural and synthetic light-harvesting proteins. *Journal of the Royal Society Interface*, *14*(127)
4. **Mancini, J. A.***, Kodali, G.*, Solomon, L. A., Episova, T. V., Roach, N., Hobbs, C. J., et al. (2017). Design and engineering of water-soluble light-harvesting protein maquettes. *Chemical Science*, *8*(1), 316–324. *Authors contributed equally
5. Anderson, J. L. R., Armstrong, C. T., Kodali, G., Lichtenstein, B. R., Watkins, D. W., **Mancini, J. A.**, et al. (2014). Constructing a man-made c-type cytochrome maquette in vivo : electron transfer, oxygen transport and conversion to a photoactive light harvesting maquette. *Chemical Science*, *5*(2), 507–514.
6. Bruce R Lichtenstein, Tammer A Farid, Goutham Kodali, Lee A Solomon, J L Ross Anderson, Molly M Sheehan, Nathan M Ennist, Bryan A Fry, Sarah E Chobot, Chris Bialas, **Joshua A Mancini**, Craig T Armstrong, Zhenyu Zhao, Tatiana V Esipova, David Snell, Sergei A Vinogradov, Bohdana M Discher, Christopher C Moser, and P Leslie Dutton. **Engineering oxidoreductases: maquette proteins designed from scratch.** *Biochem. Soc. Trans.* **40**, 561–566 (2012).

Manuscripts in Review

1. Molly M Sheehan*, **Joshua A Mancini***, Michael S Magarachi, Ivan A Kuznetsov, Pimkhan Hannanta-Anan, Goutham Kodali, Christopher C Moser, P Leslie Dutton, and Brian Y Chow. **Mammalian cell-expressible de novo fluorescent proteins.** *Nat. Chem. Biol.*
*Authors contributed equally

Book Chapters

Ennist, N. M., **Mancini, J. A.**, Auman, D. B., Bialas, C., Iwanicki, M. J., Esipova, T. V., et al. (2017). Maquette Strategy for Creation of Light- and Redox-Active Proteins. In *Photosynthesis and Bioenergetics* (pp. 1–33). WORLD SCIENTIFIC.
http://doi.org/10.1142/9789813230309_0001

Moser, C. C., Ennist, N. M., **Mancini, J. A.**, & Dutton, P. L. (2017). Chapter 1: Making Maquette Models of Bioenergetic Structures. In *Mechanisms of Primary Energy Transduction in Biology* (pp. 1–24). Ed. Wikström, Marten: Royal Society of Chemistry.
<http://doi.org/10.1039/9781788010405-00001>

PATENTS

Chow, B. Y., Dutton, P. L., Moser, C. C., Discher, B. M., Sheehan, M. M., **Mancini, J. A.**, Ennist, N. M., Kodali G.: Artificial proteins and compositions and methods thereof. U.S. Patent Application No.: 62/250,812 & 62/251,171, International Application No.:PCT/US2016/060677 submitted November 4, 2016. Published November 11, 2017

HONORS AND AWARDS

Phi Beta Kappa National Honor Society member	2007
Gamma Sigma Alpha National Honor Society Member	2006
Wittenberg's Deans List	2003-2007
The ACS Merck Index Achievement Award in Organic Chemistry	2005
Won the West Tech Alumni Association Incorporation Scholarship	2004

RELATED COURSES

Cell Biology, Macromolecular Biophysics I and II, Current Biochemical Topics, Bio-inorganic Chemistry, Macromolecular Crystallography, Protein Folding, Thermodynamics, Computational Biology, Principles of Mechano-enzymes, Molecular biophysics or Ion Channels, Biochemistry I and II, Molecular Biology, Organic Chemistry I and II, Microbiology, Physical Chemistry, Analytical Chemistry, Waves and Mechanics, Introductory Electromagnetism, Optics, Special Relativity and Applications

TEACHING EXPERIENCE

Lecturer, Department of Chemistry Princeton University, NJ Jan 2018- Present

- Helped teach the graduate course: Principles of Macromolecular Structure: Protein Folding, Structure and Design

The Math Workshop of Wittenberg University, Springfield, OH Aug 2005- May 2007

- Tutor chemistry and math to college and high school students 12 hours a week
- Level I Tutor Training Certification set forth by standards established by the College Reading and Learning Association

RESEARCH SKILLS

Biochemistry and Molecular Biology techniques

- Protein design, cloning, mutagenesis, transformation, over-expression and purification of proteins from *E. coli* and *Synechococcus* and *Synechocystis*.
- Primary human cell culture aseptic technique without the use of antibiotics in cell media.
- Experience in handling light sensitive, oxygen sensitive and temperature sensitive proteins.
- Protein Purification & separation techniques: Size exclusion chromatography, Affinity chromatography, Ion exchange chromatography, gel electrophoresis, dialysis, ultra centrifugation and HPLC.
- X-ray crystallography

Spectroscopy techniques

- UV/Vis absorption and Fluorescence spectroscopy
- Circular dichroism spectroscopy
- MALDI (Matrix Assisted Laser Desorption Spectrometry)

Industry Specific Training

- Good Laboratory Practice (GLP) training
- Electrophysiology Equipment worked with: fast patch machine, manual patch rigs, various micro manipulators and amplifiers, Ussing chambers

Software knowledge

Operating systems

- Windows, MacOS

Data analysis, programming, and Presentation Software

- JUMP statistical analysis program, Labscribe, Clampex, Origin, Excel, Power Point, Illustrator, Pymol, PhotochemCAD, Mathematica

ORGANIZED CONFERENCES

- Organized an international conference, 2014 Johnson foundation Britton Chance Research Discussions, April 22, 2014, University of Pennsylvania, Philadelphia. Scientists from University of Pennsylvania, USA, University of Wallongong, Australia and University of Otago attended this conference.

PRESENTATIONS AND ABSTRACTS

- Absence of a role for fungal associates in germination of North American Dandelions, *Taraxacum officinale*. **Mancini, J.**, Yoder, J. and Collier, M., Bardgett, M., Maye A. 2006. *The Ohio Journal of Science*, 106: 32
- Constructing a man-made, oxygen binding *c*-type cytochrome maquette *in vivo*. Ross Anderson, Craig T Armstrong, Goutham Kodali, Bruce Lichtenstein, Daniel W Watkins, **Joshua Mancini**, Aimee L Boyle, Tammer Farid, Matthew P Crump, Christopher Moser, P. Leslie Dutton. Protein engineering: new approaches and applications. A joint Biochemical Society / Protein Society conference, 10—12 April 2013, University of Chester, UK
- Single designed protein platform with multiple functionalities: Oxidoreductase, oxygen transport, light harvesting, and light activated electron transfer. Kodali, Goutham; Farid, Tammer A.; Solomon, Lee A.; Lichtenstein, Bruce R.; Anderson, J. L. R.; Mass, Olga A.; Esipova, Tatiana V.; Patole, Samson; Sheehan, Molly M.; Ennist, Nathan M.; Fry, Bryan A.; Bialas, Christopher P.; **Mancini, Joshua A.**; Zhao, Zhenyu; Vinogradov, Sergei A.; Hunter, C. N.; Lindsey, Jonathan S.; Discher, Bohdana M.; Moser, Christopher C.; Dutton, P. L., Abstracts of Papers, 244th ACS National Meeting & Exposition, Philadelphia, PA, United States, August 19-23, 2012
- Design and engineering of protein platforms for multiple functions. Goutham Kodali, Lee A. Solomon, Michael T. Englander, Bruce R. Lichtenstein, Tammer A. Farid, Molly M. Sheehan, Nathan M. Ennist, Bryan A. Fry, Christopher P. Bialas, **Joshua A. Mancini**, Zhenyu Zhao, Jessica A. Siedlecki, Bohdana M. Discher, Christopher C. Moser, P. Leslie Dutton. Abstracts of Papers, Biophysical Society 57th Annual Meeting, Philadelphia, PA, United states, February 2-6, 2013.
- Light harvesting and light activatable protein maquettes designed from scratch. **Joshua A. Mancini**, Goutham Kodali, Lee A. Solomon, Nicholas Roach, J.L. Ross Anderson, Tatiana V. Esipova, Sergei A. Vinogradov, Pawel Wagner, Bohdana M. Discher, David L. Officer, Christopher C. Moser, P. Leslie Dutton. Abstracts of Papers, Biophysical Society 57th Annual Meeting, Philadelphia, PA, United states, February 2-6, 2013.
- Engineering light harvesting maquettes both *in vitro* and *in vivo* [PARC]. **Joshua A. Mancini**, Goutham Kodali, Lee A. Solomon, Nicholas Roach, J. L. Ross Anderson, Aparna Nagarajan, Jinjie Yu, Tatiana V. Esipova, Sergei A. Vinogradov, Pawel Wagner, Olga A. Mass, Jonathan S. Lindsey, Bohdana M. Discher, David L. Officer, Himadri B. Pakrasi, Christopher C. Moser, P. Leslie Dutton. SCIENCE FOR OUR NATION'S ENERGY FUTURE: 2013 EFRC PI

MEETING, US Department of Energy, Office of Science, Washington D.C., United states, July 18-19, 2013

- Design and engineering of man-made protein maquettes for diverse functions. Goutham Kodali, Lee A Solomon, Michael T Englander, Bruce R Lichtenstein, Tammer A Farid, J L Ross Anderson, Molly M Sheehan, Nathan M Ennist, Bryan A Fry, Chris Bialas, **Joshua A Mancini**, Zhenyu Zhao, Bohdana M Discher, Christopher C Moser, P Leslie Dutton, Abstracts of Papers, 247th ACS National Meeting & Exposition, Dallas, TX, United States, March 16-20, 2014.
- Using bilin maquettes as light harvesters. **Joshua A Mancini**, 2014 Johnson Foundation Britton Chance Research Discussions, April 22, 2014, University of Pennsylvania, Philadelphia
- Toward the biogenesis of manmade oxidoreductases working in cells. P Leslie Dutton, Goutham Kodali, **Joshua A Mancini**, Nathan M Ennist, Steve Stayrook, Zhenyu Zhao, Michael Englander, Molly M Sheehan, Bryan A Fry, Chris Bialas, Tatiana V Esipovo, Sergei A Vinogradov, Geetha Goparaju, Daniel W Watkins, Craig T Armstrong, J L Ross Anderson, Bohdana M Discher, and Christopher C Moser. *Biochim. Biophys. Acta-Bioenerg.* 2014 vol. Supplement (1837) pp. e9-e10.

INVITED TALKS

- Maquettes and Maquette/Biliprotein biohybrids for light harvesting and energy transfer *in vitro* and *in vivo*. PARC Photosynthetic Antenna Research Center, June 24, 2015, Washington University, St. Louis
- Maquette antenna design: man-made protein infrastructure for novel *in vivo* photochemical pathways. PARC Photosynthetic Antenna Research Center, June 22, 2016, Washington University, St. Louis
- “Man-made protein antennas produced and assembled *in vivo*: A starting point for novel cellular photochemical pathways” 2016 George W. Raiziss 33rd Annual Retreat (Upenn), Pocono Mountains, Pa

OUTREACH

iPraxis

2012-2013

Belmont Charter School Philadelphia, PA
Middle School Science Mentor
Mentored small groups of disadvantaged students,
Assisted in science fair projects, helped groups
compete school and city-wide science fairs

Upward Bound at University of Pennsylvania

2013-2014

Philadelphia, PA
Science Instructor
Organized and ran laboratory sessions where students
explored enzyme kinetics and starch metabolism

EXTRACURRICULAR ACTIVITIES

Certified Advanced SCUBA Diver	2005-present
Sculptor, presented work in local galleries and shows	2007- present
Volunteered at Mercy Hospital cataloging slides and blocks in Histology lab	Fall 2006
Lambda Chi Alpha fraternity Risk Manager	2005- 2006
Wittenberg University Biochemistry and Molecular Biology Club President and Treasurer	2005- 2007