John P. Marken

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Education and Academic Positions

Resnick Sustainability Institute Postdoctoral Scholar
California Institute of Technology, USA (June 2023 – Present)
Advisor: Bruce A. Hay

Ph.D. in Bioengineering
California Institute of Technology, USA (Aug 2017 – May 2023)
Advisor: Richard M. Murray
Thesis: *Experimental and theoretical frameworks for enabling environmental synthetic biology*

B.S. in Applied Mathematics
College of William and Mary, USA (Aug 2013 – Aug 2017)

Awards and Recognitions

National Science Foundation Graduate Research Fellowship (2019)
National award given to 2000 undergraduates and graduates

Barry M. Goldwater Scholarship (2015)
National award given to 260 undergraduates in STEM fields

Graduate Student Council Teaching Award (2019-2020)
Awarded to two teaching assistants across all graduate-level courses at Caltech

Student Committee for Undergraduate BBE Advancement Teaching Award (2020-2021)
Awarded to one teaching assistant across all Biology and Bioengineering courses at Caltech

Peer-reviewed Publications (* denotes co-first author, † denotes corresponding author)

1. Synthetic microbiology in sustainability applications
   Ethan M. Jones*, **John P. Marken***, Pamela A. Silver† (2024), *Nature Reviews Microbiology*
2. Addressable and adaptable intercellular communication via DNA messaging
   John P. Marken†, Richard M. Murray (2023), *Nature Communications*
3. Comparative analysis of three studies measuring fluorescence from engineered bacterial constructs
   Jacob Beal†, Geoff S. Baldwin, Natalie G. Farny, Markus Gershater, Traci Haddock-Angelli, Russell Buckley-Taylor, Ari Dwijayanti, Daisuke Kiga, Meagan Lizarazo, **John P. Marken**, Kim de Mora, Randy Rettberg, Vishal Sanchania, Vinoo Selvarajah, Abigail Sison, Marko Storch, Christopher T. Workman, iGEM Interlab Study Contributors (2021), *Plos One*
4. Robust estimation of bacterial cell count from optical density
   Jacob Beal†, Natalie G. Farny, Traci Haddock-Angelli, Vinoo Selvarajah, Geoff S. Baldwin, Russell Buckley-Taylor, Markus Gershater, Daisuke Kiga, **John P. Marken**, Vishal Sanchania, Abigail Sison, Christopher T. Workman, iGEM Interlab Study Contributors (2020), *Communications Biology*
5. Fluorescent calcium imaging and subsequent in situ hybridization for neuronal precursor characterization in *Xenopus laevis*
   Eileen F. Ablondi, Sudip Paudel, Morgan Sehdev, **John P. Marken**, Andrew D. Halleran, Atiqur Rahman, Peter Kemper, Margaret S. Saha† (2020), *Journal of Visualized Experiments*
6. Calcium activity dynamics correlate with neuronal phenotype at a single cell level and in a threshold-dependent manner

Sudip Paudel, Eileen F. Ablondi, Morgan Sehdev, **John P. Marken**, Andrew D. Halleran, Atiqur Rahman, Peter Kemper, Margaret S. Saha† (2019), *International Journal of Molecular Sciences*

7. The genetic insulator RiboJ increases expression of insulated genes
   Kalen P. Clifton*, Ethan M. Jones*, Sudip Paudel, **John P. Marken**, Callan E. Monette, Andrew D. Halleran, Lidia Epp, Margaret S. Saha† (2018), *Journal of Biological Engineering*
8. A Markovian entropy measure for the analysis of calcium activity time series
   John P. Marken*, Andrew D. Halleran*, Atiqur Rahman, Laura Odorizzi, Michael C. LeFew, Caroline A. Golino, Peter Kemper, Margaret S. Saha† (2016), *Plos One*

White Papers

1. Policy recommendations for the regulation of engineered microbes for environmental release
   John P. Marken, Mary E. Maxon, Richard M. Murray (2024),
   Linde Center for Science, Society, and Policy

Funding Acquisition

Center for Environmental Microbial Interactions Pilot Grant: *Exploring environmental virulence gene removal using a non-transgenic plasmid curing strategy*

$10,000. PI: Bruce Hay

Co-conceived the project, co-wrote the proposal (Oct 2024 – Sep 2025)

Resnick Sustainability Institute Impact Grant: *Engineering a technology platform for monitoring gene expression dynamics within soil microbes in the undisturbed rhizosphere*

$1,760,000. PIs: Bruce Hay, Gözde Demirer, Elliot Meyerowitz, Niles Pierce

Conceived the project, organized the team, co-wrote the proposal (Sep 2022 – Sep 2025)

Resnick Sustainability Institute Explorer Grant: *Developing the nematode Steinernema hermaphroditum as a delivery vector for engineered microbes in the soil*

$120,000. PIs: Paul Sternberg, Richard Murray

Conceived the project, organized the team, co-wrote the proposal (June 2021 – June 2023)

Resnick Sustainability Institute Explorer Grant: *An open synthetic biology toolkit for engineering reliable genetic circuits in microbes in soil*

$100,000. PI: Richard Murray

Conceived the project, wrote the proposal (June 2020 – June 2022)

Teaching Experience

Caltech

Design Principles of Genetic Circuits (Spring 2020, 2021, 2022)

Teaching Assistant. Course teaches mathematical analysis and design principles of genetic circuits to graduate and advanced undergraduate students.

Starting 2022, became a coauthor of the in-progress online textbook for the course with instructors Michael Elowitz and Justin Bois.

William & Mary

Readings in Synthetic Biology (Spring 2016, 2017)

Co-designed and co-taught the course. Teaches fundamental concepts of synthetic biology and teaches how to read the primary literature to first-year undergraduates.

Freshman Honors Biology Lab (Fall 2016 – Spring 2017)

Teaching Assistant. Introduces first-year undergraduate students to laboratory techniques via a year-long guided research project.

Cellular Biophysics and Modeling (Fall 2015, 2016)

Teaching Assistant. Teaches mathematical and biological concepts underlying neuroscience to undergraduates.

Programming & Data Analysis for Biology (Summer 2016)

Co-designed and co-taught the one-week course for incoming undergraduates from underrepresented backgrounds.

Service and Mentorship

The Spirit of Asilomar and the Future of Biotechnology Conference (Feb 2025)

Member of steering committee. 4-day international workshop on 50th anniversary of 1975 Asilomar Meeting on Biotechnology.

LCSSP Workshop: Pathways towards the safe and effective deployment of engineered microbial technologies (Feb 2024)

Conceived and co-organized a 2-day workshop bringing together 35 federal regulators, industry representatives, and academics to identify and address the challenges associated with the regulation of genetically engineered microbial products intended for environmental release.

Resnick Sustainability Institute Seminars (June 2020 – June 2023)

Organized and co-organized various seminar series for the Resnick Sustainability Institute focusing on synthetic biology, the rhizosphere, and agriculture.

iGEM Measurement Committee (Nov 2017 – Nov 2018)

Designed and implemented a Measurement Hub to collect resources for teams on the official iGEM website. Contributed to the design and execution of the 2018 iGEM Interlab Study.

Undergraduate research mentor (Summer 2018 – Spring 2022)

Formally mentored 2 undergraduate research students while a graduate student at Caltech.

Student Advisor, William & Mary iGEM Team (Summer 2017)

Also participated as a member of the 2015 and 2016 William & Mary iGEM Teams.

Invited Manuscript Reviewer

For journals: *ACS Synthetic Biology*, *Nature Communications*

Invited Presentations

Rice University Systems, Synthetic, and Physical Biology Seminar

A novel mathematical framework for the holistic analysis of biomolecular reaction system behavior (Jan 2025)

National Academies' Board on Life Sciences: Fall Meeting

Genetically Engineered Microbes: Future Challenges and Opportunities (Oct 2024)

SynBioBeta: The Global Synthetic Biology Conference

Seeking Regulatory Approval for GEMs: Building up the Science Base for Informed Decision-Making (May 2024)

Banff International Research Station Workshop: Emerging mathematical challenges in synthetic biological network design

Reaction order analysis reveals global polyhedral constraints on the behavior of biomolecular reaction systems (Aug 2023)

Other Conference Presentations

[Talk] International Conference for Biomolecular Engineering (Jan 2025)
[Poster] Synthetic Biology: Engineering, Evolution, & Design (SEED) (May 2023)
[Poster] Winter q-Bio (Feb 2020)
[Poster] Summer q-Bio (Aug 2019)
[Poster] Society for Developmental Biology (Aug 2016)