Joseph C. Kreitz

75 Ames St • Cambridge, MA 02142
jkreitz@broadinstitute.org
Google Scholar

EDUCATION

Massachusetts Institute of Technology, *Cambridge, MA* 2018-present
- PhD Candidate, Biological Engineering (expected graduation: ~April 2024)
- Topic: Therapeutic delivery with engineered phage-like injection systems

Duke University, *Durham, NC* 2014-2018
- B.S., Biology, High Distinction, *cum laude*
- Topic: Antimicrobial therapy with rationally-designed phage cocktails

RESEARCH EXPERIENCE

Graduate Research Assistant (Advisor: Prof. Feng Zhang) June 2019-present
Broad Institute of MIT and Harvard
- Developed a novel protein delivery strategy based on contractile injection systems (CISs)
- Demonstrated CISs can kill cancer cells, deliver gene editors into human cells, or target mice

Rotation Student (Advisor: Prof. Timothy Lu) Aug 2018-June 2019
Department of Biological Engineering, MIT
- Developed a method for retargeting phages against novel bacterial hosts

NSF REU Fellow (Advisor: Prof. Ryland Young) May-Aug 2016
Center for Phage Technology, Texas A&M University
- Isolated 5 therapeutic phages for a national project to treat a patient with bacteremia

Undergraduate Research Assistant (Advisor: Prof. Lingchong You) May 2015-Aug 2018
Department of Biomedical Engineering, Duke University
- Developed a method for optimizing phage cocktails based on phage synergy/antagonism

PUBLICATIONS & PATENTS

1. **Kreitz, J.**, Yang, V., Lash, B., Macrae, R.K., Zhang, F. Modular delivery by contractile injection systems. *Manuscript in preparation*.
2. Friedrich, M.J., **Kreitz, J.**, Macrae, R.K., Zhang, F. Specific peptide vaccination with a bacterial injection system. *Manuscript in preparation*.
3. **Kreitz, J.**, Friedrich, M.J., Guru, A., Lash, B., Saito, M., Macrae, R.K., Zhang, F. (2023) Programmable protein delivery with a bacterial contractile injection system. ***Nature*** 616, 357–364.
    - Featured in *Nature* Podcast, McGovern Institute, *Scientific American*, *Freethink*, *GEN*, and others
4. Zhang, F., **Kreitz, J**. Cell-type-specific targeting contractile injection system. US patent no. 63/310,327 (2023).
5. **Kreitz, J**., You, L. Interaction network optimization improves the antimicrobial efficacy of phage cocktails. Duke University, Thesis for Degree in Biology (2018).

AWARDS & HONORS

2020 Yang-Tan Graduate Fellowship, *Massachusetts Institute of Technology*
2018 Presidential Graduate Fellowship, *Massachusetts Institute of Technology*
2018 Graduation with High Distinction, *Duke University* (top 10% of undergraduate theses)
2017 Finalist, Best Poster Award, *NC ASM Annual Meeting* (top 5 posters of 70)
2017 Dean's Summer Research Fellowship, *Duke University*
2016 NSF REU Fellowship in Biochemistry, *Texas A&M University*
2015 Howard Hughes Research Fellowship, *HHMI/Duke University*
2014 National AP Scholar, *The College Board*
2013 Eagle Scout, *Boy Scouts of America*
2013 General Member, *Mensa*

SELECTED PRESENTATIONS

2023 "Programmable protein delivery with a bacterial contractile injection system". *Genome Engineering Symposium*, Harvard Medical School, Boston, MA. (Invited Talk)
2023 "Programmable protein delivery with a bacterial contractile injection system". *Broad Institute Retreat*, Boston, MA. (Invited Talk)
2023 "Programmable therapeutic delivery with a bacterial nano-syringe." *KCA Novel Technologies Symposium*, Sydney, Australia. (Invited Keynote Talk)
2023 "Programmable protein delivery with a bacterial injection system." *Mammalian Synthetic Biology Workshop (mSBW)*, San Jose, CA. (Talk)
2022 "Protein delivery with a bacterial contractile injection system". *Yang-Tan Centers Retreat*, Cambridge, MA. (Talk)
2022 "Protein delivery with a bacterial contractile injection system". *MIT Biochemistry and Toxicology Seminar*, Cambridge, MA. (Talk)
2018 "Interaction network optimization improves the antimicrobial efficacy of phage cocktails." *ACC Meeting of the Minds*, Boston, MA. (Poster)
2017 "Interaction network optimization improves the antimicrobial efficacy of phage cocktails." *NC ASM Annual Meeting*, Raleigh, NC. (Poster)
2016 "Hunting for phage against pandrug-resistant *Acinetobacter baumannii* clinical isolates." *Biochemistry REU Research Symposium*, College Station, TX (Talk)
2015 "Characterization of bacterial conjugation *in vivo* using *C. elegans*." *Howard Hughes Research Fellowship Symposium*, Durham, NC. (Poster)
2015 "Detecting Antibiotic Resistance with dCas9." *iGEM regional conference*, College Park, MD. (Talk).

TEACHING EXPERIENCE & OUTREACH

2023-present Research mentor for an undergraduate student in the Zhang laboratory
2024 Judge, 2024 Boston Public Schools Citywide STEM Fair
2023 Featured speaker, Biotech Engineering Exploration Challenge for High schools
- Led a discussion for an initiative aimed at informing Boston-area high schoolers about local work in biotechnology

2019-2020 Teaching assistant, *20.109 Laboratory Fundamentals in Biological Engineering*, MIT
- Taught undergraduates laboratory techniques in molecular biology

REFERENCES

Professor Feng Zhang, PhD
(Relationship: PhD Advisor)
James and Patricia Poitras Professor in Neuroscience, MIT
Departments of Brain and Cognitive Sciences and Biological Engineering, MIT
Core Member, Broad Institute of MIT and Harvard
Investigator, McGovern Institute for Brain Research, MIT
Investigator, Howard Hughes Medical Institute
Cambridge, MA, USA
zhang@broadinstitute.org

Professor Timothy Lu, PhD
(Relationship: PhD Rotation Advisor)
Associate Professor of Electrical Engineering and Computer Science and Biological Engineering, MIT
Associate Member, Broad Institute of MIT and Harvard
Core Member, MIT Synthetic Biology Center
Cambridge, MA, USA
timlu@mit.edu

Professor Martin Pilhofer, PhD
(Expert in CIS biology; commented on Kreitz et al. 2023)
Deputy Head of Institute of Molecular Biology and Biophysics
Professor of Cryo-Electron Microscopy, ETH Zürich
Zürich, Switzerland
pilhofer@biol.ethz.ch