Krista G. Freeman, PhD

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PROFESSIONAL APPOINTMENTS

Research Associate, University of Pittsburgh — September 2022 - Present
Department of Biological Sciences, Advisor: Dr. Graham Hatfull

Postdoctoral Research Associate, University of Pittsburgh — September 2017 - August 2022
Department of Biological Sciences, Advisor: Dr. Graham Hatfull

EDUCATION

Carnegie Mellon University, Department of Physics, Pittsburgh, PA — August 2017
Doctor of Philosophy, Physics
Thesis: "Viral DNA Packaging and Ejection Controlled by Capsid Stability"
Advisor: Dr. Alex Evilevitch

Carnegie Mellon University, Department of Physics, Pittsburgh, PA — May 2014
Master of Science, Physics

Cleveland State University, Department of Physics, Cleveland, OH — December 2011
Bachelor of Science with University Honors, Physics Major and Mathematics Minor
University Valedictorian

GRANTS AND RESEARCH FELLOWSHIPS

National Institutes of Health MOSAIC K99/R00 Pathways to Independence Award 2023-2028
Proposal: "Improving phage-based medicine with immunoengineering"
PI: Dr. Krista Freeman
Funding amount: $946,972

National Science Foundation Integrative Activities in Physics June 2017
Proposal: "Support for the 2017 Canadian-American-Mexican Graduate Student Physics Conference"
PI: Dr. Amy Flatten, Director of the American Physical Society's Office of International Affairs
Co-PI: Krista Freeman
Funding amount: $39,937.00

Michael and Dorothy Stein Memorial Fund Fellowship May - August 2017
Award funded my final four months of doctoral research.

National Science Foundation Graduate Research Fellowship August 2013 - August 2016
Proposal: "Mapping the energy and kinetics of viral genome ejection: A study of the physical-chemical pathway of viral infection"

John and Marilyn Hall First-Year Fast Track Research Fellowship July 2012 - August 2013
Carnegie Mellon University Physics Department

National Science Foundation Research Experience for Undergraduates (REU) Award 2009
Department of Polymer Science, University of Akron

Pending proposals:
National Institutes of Health NIAID New Innovators Award DP2 2023
Proposal: "Mapping and Manipulating Mycobacteriophage Immunogenicity"
Impact score: Not discussed.

PEER-REVIEWED PUBLICATIONS (* indicates equal contribution)

K. Freeman, A. Robotham, O. Parks, L. Abad, D. Jacobs-Sera, M. Lauer, J. Podgorski, Y. Zhang, J. Williams, S. White, J. Kelly, G. Hatfull, W. Pope. Virion glycosylation influences mycobacteriophage immune recognition. *Cell Host & Microbe*, 2023, 31, 1-16.

J. Podgorski, **K. Freeman**, S. Gosselin, A. Huet, J. Conway, M. Bird, J. Grecco, S. Patel, D. Jacobs-Sera, G. Hatfull, J. Gogarten, J. Ravantti, S. White. A Structural Dendrogram of the Actinobacteriophage Major Capsid Proteins Provides Important Structural Insights into the Evolution of Capsid Stability. *Structure*, 2023, 31 (3), 282-294.

R. Dedrick, B. Smith, M. Cristinziano, **K. Freeman**, D. Jacobs-Sera, Y. Belessis, A. W. Brown, K. Cohen, R. Davidson, D. van Duin, A. Gainey, C. Berastegui Garcia, C. R. R. George, G. Haidar, W. Ip, J. Iredell, A. Khatami, J. Little, K. Malmivaara, B. McMullan, D. Michalik, A. Moscatelli, J. Nick, M. Tupayachi Ortiz, H. Polenakovik, P. Robinson, M. Skurnik, D. Solomon, J. Soothill, H. Spencer, P. Wark, A. Worth, R. Schooley, C. Benson, G. Hatfull. Phage Therapy of Mycobacterium Infections: Compassionate-use of Phages in Twenty Patients with Drug-Resistant Mycobacterial Disease. *Clinical Infectious Diseases*, 2023, 76 (1), 103.

J. Little*, R. Dedrick*, **K. Freeman**, M. Cristinziano, B. Smith, C. Benson, T. Jhaveri, L. Baden, D. Solomon, G. Hatfull. Bacteriophage Treatment of Disseminated Cutaneous Mycobacterium chelonae Infection. *Nature Communications*, 2022, 13 (1), 2313.

J. Nick, R. Dedrick, A. Gray, E. Vladar, B. Smith, **K. Freeman**, K. Malcolm, L. Epperson, N. Hasan, J. Hendrix, K. Callahan, K. Walton, B. Vestal, E. Wheeler, N. Rysavy, K. Poch, S. Caceres, V. Lovell, K. Hisert, V. Calado de Moura, D. Chatterjee, P. De, A. Amin, N. Weakly, S. Martiniano, D. Lynch, C. Daley, M. Strong, F. Jia, G. Hatfull, R. Davidson. Host and Pathogen Response to Bacteriophage Engineered Against Mycobacterium abscessus Lung Infection. *Cell*, 2022, 185 (11), 1860.

R. Dedrick*, **K. Freeman***, J. Nguyen*, A. Bahadirli-Talbott, M. Cardin, M. Cristinziano, B. Smith, S. Jeong, E. Ignatius, C. T. Lin, K. Cohen, G. Hatfull. Nebulized bacteriophage in a patient with refractory Mycobacterium abscessus lung disease. *Open Forum Infectious Diseases*, 2022, 9 (7), 1.

K. Freeman, K. Wetzel, Y. Zhang, K. Zack, D. Jacobs-Sera, S. Walters, D. Barbeau, A. McElroy, J. Williams, G. Hatfull. A mycobacteriophage-based vaccine platform: SARS-CoV-2 antigen expression and display. *Microorganisms*, 2021, 9 (12), 2414.

R. Dedrick*, **K. Freeman***, J. Nguyen*, A. Bahadirli-Talbott, B. Smith, A. Wu, A. Ong, C. T. Lin, L. Ruppel, N. Parrish, G. Hatfull, K. Cohen. Potent antibody-mediated neutralization limits bacteriophage treatment of a pulmonary Mycobacterium abscessus infection. *Nature Medicine*, 2021, 27 (8), 1357-1361.

K. Wetzel, C. Guerrero-Bustamante, R. Dedrick, C.-C. Ko, **K. Freeman**, H. Aull, A. Divens, J. Rock, K. Zack, G. Hatfull. CRISPY-BRED and CRISPY-BRIP: Efficient bacteriophage engineering. *Scientific Reports*, 2021, 11 (1), 6796.

K. Freeman, J. Huffman, F. Homa, A. Evilevitch. UL25 capsid binding facilitates mechanical maturation of the Herpesvirus capsid and allows retention of pressurized DNA. *Journal of Virology*, 2021, 95 (20), e00755-21.

K. Freeman, J. Adamczyk, K. Streletzky. Effect of synthesis temperature on size, structure, and volume phase transition of polysaccharide microgels. *Macromolecules*, 2020, 53 (21), 9244-9253.

K. Freeman, M. Behrens, K. Streletzky, U. Olsson, A. Evilevitch. Portal stability controls dynamics of DNA ejection from phage. *Journal of Physical Chemistry B*, 2016, 120 (26), 6421-6429.

A. Ghoorchian, K. Vandemark, **K. Freeman**, S. Kambow, N. Holland, K. Streletzky. Size and shape characterization of thermoreversible micelles of three-armed star elastin-like polypeptides. *Journal of Physical Chemistry B*, 2013, 117 (29), 8865-8874.

HONORS AND AWARDS

DEI Travel Award 2022
2022 Gordon Research Conference for Immunoengineering (Ventura, CA)

Inductee, Sigma Pi Sigma Physics Honors Society 2018
Cleveland State University's Chapter of Sigma Pi Sigma

Distinguished Alumni Award 2016
Cleveland State University's Mandel Honors College

USA delegate to the 2015 Lindau Nobel Laureate Meeting 2015
Funded by National Science Foundation

"25 under 35" Award 2015
Saint Joseph Academy

University Valedictorian 2011
Cleveland State University

1st Place Poster Award 2011
Cleveland State University Graduate Student Interdisciplinary Research Conference

1st Place Outstanding Research Award 2011
Department of Physics, Cleveland State University

Outstanding Senior Award 2011
Department of Physics, Cleveland State University

Outstanding Poster Award 2009
Women in Physics WoPhy09 Conference (University of Nebraska-Lincoln)

Honors Scholarship 2007 - 2011
Cleveland State University

Music Talent Scholarship 2007 - 2011
Cleveland State University

SELECTED PRESENTATIONS (full list available upon request)

2023 Viruses of Microbes Meeting (Tbilisi, Georgia) July 2023
Virion glycosylation influences mycobacteriophage immune recognition (**poster**)

University of Miami Biology of Viruses course (virtual) October 2022
Mycobacteriophage immunogenicity, from antimicrobials to vaccines (**invited talk**)

Gordon Research Conference for Immunoengineering (Ventura, CA) July 2022
Immunoengineering bacteriophages may improve their use as antimicrobials and vaccines (poster)

Drexel Immune Modulation & Engineering Symposium (virtual) December 2021
A mycobacteriophage-based vaccine platform: SARS-CoV-2 antigen expression and display (poster)

HHMI SEA Faculty Meeting, Featured Research Session (virtual) June 2021
BaDAS and DEaDAS: Lessons learned on phage display vaccines (**invited talk**)

Pittsburgh Bacterial Meeting (Pittsburgh, PA) March 2020
Into the vast unknown: Structure-function relationships in uncharacterized bacteriophage proteins (poster)

Cleveland State University's Soft Matter REU program (Cleveland, OH) June 2019
DNA cannons or complex gene machines? A physicist's journey toward understanding viruses (**invited talk**)

National Institute for Standards and Technologies (Gaithersburg, MD) June 2017
Scattering techniques to study double-stranded DNA viruses (**invited talk**, low-q seminar series)

The Ohio State University (Columbus, OH) May 2017
Powered by pressure: Viral DNA ejection (**invited talk**, Division of Pharmaceutics seminar series)

Argonne National Laboratory (Lemont, IL) March 2017
Portal stability controls DNA ejection dynamics from phage (**invited talk**, Small Angle Scattering Special Interest Group seminar series)

TEACHING EXPERIENCES AND PEDAGOGICAL TRAINING

Postdoctoral Teaching Assistant January 2018 - December 2019
University of Pittsburgh
I worked with Dr. Andrew VanDemark to develop and teach a biochemistry laboratory course built around my postdoctoral project focused the structural and functional characterization of mycobacteriophage genes.

Future Faculty Program September 2013 - September 2017
Eberly Center for Teaching Excellence and Educational Innovation, Carnegie Mellon University
I completed this voluntary program designed to help graduate students develop their teaching skills and document their teaching related professional development activities.

Teaching Assistant May 2016 - August 2017
Carnegie Mellon University
I was the TA for junior- and senior-level “Intermediate Optics Laboratory”, where I presented laboratory theory and procedures, supervised lab sessions, and graded lab reports. I also led daily recitation sessions and group tutoring (typically attended by 10-20 students) for "Physics II for Physics and Engineering Majors” and the “Summer Academy for Math and Science.”

Guest Lecturer November 2016
Carnegie Mellon University
I prepared and presented two lectures on Fresnel Diffraction for “Intermediate Optics”, a course for junior and senior physics majors.

Teaching Assistant and Tutor May 2008 - July 2012
Cleveland State University
I presented laboratory theory and procedures, supervised lab sessions, and graded lab reports for five different physics laboratory courses. I also tutored students in all introductory-level physics courses, explaining physics concepts one-on-one to encourage understanding.

MENTORING

Honors Thesis Advisor August 2020 - May 2021
Along with Graham Hatfull and Debbie Jacobs-Sera, I advised Michael Lauer on his undergraduate honors thesis, which described a structural and functional characterization of a novel phage-encoded anti-mycobacterial peptide.

Research Mentor May 2018 - Present
I have co-mentored a diverse group of 2 graduate students, 3 research technicians, and 16 undergraduate researchers at the University of Pittsburgh. Of these, one is now in medical school (Drexel University), three are in PhD programs (New York University, Carnegie Mellon University, Drexel University), and one is in an MS program (University of Pittsburgh).

LEADERSHIP ROLES

Chair, CAM2017 Conference 2016 - 2017

I planned the 2017 Canadian-American-Mexican Graduate Student Physics Conference, a well-received international graduate student physics conference, hosted in Washington, D.C.

Elected Chair, American Physical Society's Forum on Graduate Student Affairs 2015 - 2017
Throughout the 3-year chair track, I orchestrated national professional development opportunities, organized invited sessions at national physics conferences, and chaired meetings of the forum.

President, CSU Chapter of the Society of Physics Students 2008 - 2011
I organized student presentations, professional seminars, and social events, doubled event attendance and earned for the chapter the 2010 & 2011 outstanding chapter awards.

PROFESSIONAL SERVICE

Member of the Committee on Diversity, Inclusion and Equity (CODIE) April 2022 - Present
I am a member of the University of Pittsburgh Department of Biological Science's CODIE, where I currently serve on the subcommittee steering the department's bridge and graduate programs.

Peer Reviewer for Clinical Microbiology and Infection November 2022
Reviewed manuscript reporting pharmacokinetics, biodistribution, and immune responses after single or repeated doses of bacteriophages in rats and monkeys.

SCIENTIFIC OUTREACH

Lab visit for Taylor Allderdice High School students October 2022
Hosted ten high school student visitors in the Hatfull Lab to talk about phages, bad bacteria, and research at the university level.

STEAM Saturday at Homewood Community Engagement Center April 2022
Led Hatfull Lab members in preparing an event for middle school students in the PittEnrich program. We developed an interactive, gamified lesson on good and bad "bugs" of all kind.

SciTech Festival at the Carnegie Science Center November 2019
Welcomed middle-schoolers to a table exhibit to learn about phage therapy and make a paper phage magnet.

SciTech Festival at the Carnegie Science Center November 2018
Organized an interactive exhibit to teach middle school kids about virus structure by making origami phages.

Volunteer with Carnegie Mellon University outreach groups 2012 - 2016
I helped with various outreach events like the on-campus "Moving 4th Into Science" and "Girls Rock Science!" at the Carnegie Science Center.

Physics Fridays Outreach Coordinator 2011 - 2017
I founded and helped garner funding for this K-8 physics outreach program for public school students. I still participate occasionally, when opportunity allows!

MEDIA

- Forbes article highlights our 2022 case series in Clinical Infectious Diseases: https://www.forbes.com/sites/judystone/2022/06/30/more-promising-phage-news-using-bacteria-killing-viruses-to-treat-antibiotic-resistant-infections/
- Forbes article highlights our 2022 phage therapy case published in Cell: https://www.forbes.com/sites/judystone/2022/05/15/bacteria-killing-viruses-are-successful-in-treating-antibiotic-resistant-infections
- Podcast "This Week in Microbiology" reviews our Nature Medicine 2021 paper and introduces first authors: https://www.microbe.tv/twim/twun-247/
- APS News review of CAM2017, the international conference I chaired: https://www.aps.org/publications/apsnews/201710/international.cfm
- CMU news story sharing my experience at the 2015 Lindau Nobel Laureates Meeting: https://www.cmu.edu/mcs/news-events/2017/0525-lindau-meeting.html
- APS News article I wrote to invite applicants to the CAM2017 conference: https://www.aps.org/publications/apsnews/201702/international.cfm

- Video interview for Cleveland State University Distinguished Alumni Award: https://www.youtube.com/watch?v=9on52y7uvio
- Interviewed for Cleveland State University's Engaged blog: http://clevelandstate.tumblr.com/post/115786050472/for-nsf-graduate-research-fellow-krista-freeman
- Spotlighted during the National Science Foundation's 2015 celebration of Women's History Month: http://nationalsciencefoundation.tumblr.com/post/113444681399/working-in-the-space-between-disciplines

PROFESSIONAL SOCIETY MEMBERSHIPS

American Physical Society 2009 - Present
Society of Physics Students 2009 - Present
Sigma Pi Sigma Physics Honors Society 2018 - Present