Philipp Ross, Ph.D.

HHMI Postdoctoral Scientist • Mendoza Lab • University of Chicago
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Research Summary

Biochemist with proven expertise in characterizing macromolecular structure and function relevant to human immunity including MHCs, KIRs, TCRs, antibodies, nanobodies, and Fabs. Extensive experience with recombinant protein expression, x-ray crystallography, and flow cytometry and proficiency with yeast-display mediated screening, protein engineering, and high-throughput cellular assays using functional readouts. Actively seeking positions that allow me to apply my expertise, contribute to cutting-edge projects, and work with and develop emerging technologies.

Education

University of Chicago, Ph.D. with Biochemistry Emphasis in Genetics, Genomics, & Systems Biology
University of Chicago, M.Sc. in Genetics, Genomics, & Systems Biology
Oct. 2016 - Mar. 2023
Laboratory of Erin J. Adams, Department of Biochemistry and Molecular Biology
Dissertation Title: “Structural and Cellular Properties of Archaic and Non-Classical HLA Molecules”
Committee Members: Carole Ober, Allan D. Drummond, Bana Jabri, Vincent J. Lynch

Bachelors of Science in Bioengineering
Cum laude | Binghamton University, Binghamton, NY USA
Sep. 2008 - May 2013

Research

HHMI Postdoctoral scientist
2023 - Present

Protein Engineering, University of Chicago
Advisor: Dr. Juan L. Mendoza
As a postdoctoral scientist, I use yeast display-based protein engineering methods to both study and enhance cytokine signaling pathways with the goal of developing better immunotherapeutics

Graduate student
2017 - 2023

Molecular Immunology, University of Chicago
Advisor: Dr. Erin J. Adams
As a graduate student, I used cellular, biochemical, and structural methods to understand how archaic and non-classical MHCs present peptides and interact with innate and adaptive immune cells in humans.

Computational biologist
2013 - 2016

Computational Biology, Pennsylvania State University
Advisor: Dr. Manuel Llinás
As a technician, I designed and utilized bioinformatic workflows to understand pre- and post-transcriptional regulation in the deadliest human infecting species of the parasite that causes malaria, *Plasmodium falciparum*.

Undergraduate researcher 2012 - 2013	**Mathematical Modeling,** Binghamton University **Advisor:** Dr. Hiroki Sayama As an undergraduate student, I designed a computational simulation and graphical user interface looking at the socioeconomic consequences of the widespread adoption of 3D printers implemented in Mathematica and Python.

Funding, Fellowships, & Scholarships

2021 - 2026	**R01 Grant Award Recognition,** Contributor **PI:** Dr. Erin Adams **Project Title:** Molecular and functional investigation of the role of HLA-F in immune regulation
2020 - 2021	**R21 Grant Award Recognition,** Contributor **PI:** Dr. Erin Adams **Project Title:** Molecular characterization of the functional isoforms of HLA-F in human health and cancer
2020	**Not Awarded, F31 Predoctoral Fellowship** Score: 32 Percentile: 23 **Title:** Molecular mechanisms of HLA-F recognition at the maternal-fetal interface
2019	**Not Awarded, R.C. Lewontin Early Award** **Title:** HLA-F, a non-classical MHC, in immunity, reproduction, and human evolution
2018	**Honorable Mention, NSF GRFP** **Title:** HLA-F, a non-classical MHC, in immunity, reproduction, and human evolution
2009 - 2010	**SMART Grant,** Binghamton University
2008	**Kathleen Mallory Memorial Scholarship,** Earl L. Vandermeulen High School

Awards & Honors

2013	**Graduated Cum Laude**, Bachelors of Science in Bioengineering, Binghamton University
2013	**Member,** Tau Beta Pi Engineering Honor Society

Submitted manuscripts

Philipp Ross†, Hugo Hilton†, Jane Lodwick, Tomasz Slezak, Lisbeth A. Guethlein, Curtis P. McMurtrey, Alex S. Han, Morten Nielsen, Daniel Yong, Kristof T. Nolan, Charles L. Dulberger William H. Hildebrand, Minglei Zhao, Anthony Kossiakoff, Peter Parham, Erin J. Adams "*Molecular characterization of the archaic HLA-B*73:01 allele reveals presentation of a unique peptidome and skewed engagement by KIR2DL2.*"
Under Review at JBC https://www.biorxiv.org/content/10.1101/2024.11.25.625330v1

Manuscripts in Preparation

Kristof Nolan†, **Philipp Ross†**, Tomasz Slezak, Jane Lodwick, Jason Krawic, Curtis McMurtrey, Samuel Weng, Allen Huff, William Hildebrand, Anthony Kossiakoff, Erin J. Adams "*HLA-F is predominantly peptide-loaded on the surface of cells and may present KIR-permissive peptides.*"

Journal Publications

Lia Chappell, **Philipp Ross**, Lindsey Orchard, Timothy J Russell, Thomas D Otto, Matthew Berriman, Julian C Rayner, Manuel Llinás "*Refining the transcriptome of the human malaria parasite Plasmodium falciparum using amplification-free RNA-seq*" **BMC Genomics** 2020 https://doi.org/10.1186/s12864-020-06787-5

Munir Akkaya, Abhisheka Bansal, Patrick W Sheehan, Mirna Pena, Alvaro Molina-Cruz, Lindsey M Orchard, Clare K Cimperman, Chen-Feng Qi, **Philipp Ross**, Takele Yazew, Daniel Sturdevant, Sarah L Anzick, Girija Thiruvengadam, Thomas Dan Otto, Oliver Billker, Manuel Llinás, Louis H Miller, Susan K Pierce "*A single-nucleotide polymorphism in a Plasmodium berghei ApiAP2 transcription factor alters the development of host immunity*" **Science Advances** 2020 https://doi.org/10.1126/sciadv.aaw6957

Joana Mendonca Santos, **Philipp Ross***, Gabrielle Josling*, Preeti Joshi, Lindsey Orchard, Tracey Campbell, Ariel Schieler, Ileana M Cristea, Manuel Llinás "*Red blood cell invasion by the malaria parasite is coordinated by the PfAP2-I transcription factor*" **Cell Host & Microbe** 2017 https://doi.org/10.1016/j.chom.2017.05.006

Shiri Eshar, Lindsey Altenhofen, Alona Rabner, **Philipp Ross**, Yair Fastman, Yael Mandel-Gutfreund, Rotem Karni, Manuel Llinás, Ron Dzikowski "*PfSR1 controls alternative splicing and steady-state RNA levels in Plasmodium falciparum through preferential recognition of specific RNA motifs*" **Molecular microbiology** 2015 https://doi.org/10.1111/mmi.13007

Amber Ferger, Wai Lau, **Philipp Ross**, Wyman Zhao, Hiroki Sayama, Steen Rasmussen "*Impact of Personal Fabrication Technology on Social Structure and Wealth Distribution: An Agent-Based Simulation Study*" **MIT Press** 2013

Conferences & Seminars

Poster "*Correlating Binding Affinity and Signaling Strength in the JAK/STAT Pathway*" HHMI Science Meeting (Feb. 2025)

Virtual Talk, "*Molecular mechanisms of HLA-F recognition at the maternal-fetal interface*" Maternal/Fetal Interface Seminar Series (Oct. 2020)

Poster "*The unique peptidome and structure of the archaic HLA-B allele, HLA-B*73:01*" UChicago Molecular Biosciences Retreat (Oct. 2019)

Talk "*HLA-F, a non-classical MHC, in immunity, reproduction, and human evolution*" UChicago Molecular Biosciences Retreat (Oct. 2019)

Service

2024 - Presemt	**Career Mentor**, Nucleate Dojo - supporting undergraduate biotech talent
2023	**Judge (Remote),** International Genetically Engineered Machine (iGEM)
2023 - Present	**Primary Wet Lab Supervisor,** UChicago iGEM (GeneHackers)
2020 - 2022	**Graduate Student Advisor,** UChicago iGEM (GeneHackers)
2019 - 2021	**Graduate Program Student Representative**, Deans Council, University of Chicago
2017 - 2019	**Science Connections Volunteer,** Museum of Science and Industry
2017 - Present	**Resident Scientist,** Skype a Scientist (http://www.skypeascientist.com)
2017	**Judge,** Spring Symposium & Student Research Conference in STEM
2010 - 2011	**President,** Binghamton Bioengineering Club, Binghamton University

Teaching & Mentorship

2023 - Present **Postdoctoral Supervisor**

Mentees: Zhijie Chen and Shima Shabani

As a postdoctoral associate in the Mendoza lab, I mentor the graduate students on a daily basis and provide feedback of various kinds including experimental, professional, and more broadly scientific.

2023 **Primary Wet Lab Supervisor**

Mentees: Sneha Agarwal, Tommy Walsh, and Clara Deimling

I directly mentored three undergraduates with minimal wet lab experience during the summer of 2023 in order to generate data for the wet lab component of our 2023 iGEM project, Green Levothyroxine Optimised with Transaminases (Glow), for which we received a Gold Medal.

2019 - 2021 **Undergraduate mentor**

Mentee: Daniel Yong

I mentored and worked with Daniel to structurally characterize a rare MHC molecule known as HLA-B*73:01, a project which will lead to a co-author publication.

2019 **T.A. - Evolution of Biological Molecules**

Instructors: Dr. Joe Thornton & Dr. Allan Drummond
University of Chicago

2017 **T.A. - Genetic Analysis of Model Organisms**

Instructors: Dr. Doug Bishop, Dr. Jocelyn Malamy, & Dr. Edwin (Chip) Ferguson
University of Chicago

Preprint Peer Reviews

Aging represses lung tumorigenesis and alters tumor suppression
Reviewed by: **Philipp Ross** and Juan L. Mendoza
10.5281/zenodo.12747023

Indels allow antiviral proteins to evolve functional novelty inaccessible by missense mutations
Reviewed by: **Philipp Ross**, William Grubbe, and Juan L. Mendoza
10.5281/zenodo.11644732

Cryo-EM structure and biochemical analysis of human chemokine receptor CCR8
Reviewed by: **Philipp Ross**, William Grubbe, and Juan L. Mendoza
10.5281/zenodo.11644389

Virion morphology and on-virus spike protein structures of diverse SARS-CoV-2 variants
Reviewed by: James Fraser, Luisa Vasconcelos, Liyi Cheng, Samantha Lish, S. Chan Baek, Lang Ding, Alexandra Probst, Naiya Phillips, William Grubbe, Youchen Guan, and **Philipp Ross**
10.5281/zenodo.10779310