BIOGRAPHICAL SKETCH

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NAME: Herbine, Karl

eRA COMMONS USER NAME (credential, e.g., agency login): KRH021

POSITION TITLE: Graduate Student

EDUCATION/TRAINING *(Begin with baccalaureate or other initial professional education, such as nursing, include postdoctoral training and residency training if applicable. Add/delete rows as necessary.)*

INSTITUTION AND LOCATION	DEGREE *(if applicable)*	Start Date MM/YYYY	Completion Date MM/YYYY	FIELD OF STUDY
Temple University	BA	08/2008	12/2016	Biochemistry
University of Pennsylvania	--	02/2017	06/2019	Immunology
Thomas Jefferson University	PhD	07/2019	TBD	Biochemistry & Molecular Pharmacology

A. Personal Statement

My long term research interests focus on the implementation of solving the structures of macromolecules to develop a comprehensive understanding on how protein complexes execute specific biological functions and how defects in molecular machines can contribute to human disease. My academic training and research experience to date have provided me with an excellent background in biochemistry and structural biology. As an undergraduate at Temple University, I had the opportunity to conduct research in two notable labs. I first started research under the mentorship of Dr. Weidong Yang on studying ribosomal subunit processing, mRNA export, and HIV-1 Rev response elements. During my final year of my undergraduate studies, I participated in an Undergraduate Research Program (URP) under the mentorship of Dr. Vincent Voelz on using molecular dynamic simulations to study the folding mechanisms of two protein domains of streptococcal G protein that are similar in sequence but have separate folding and functions. Prior to my graduate training, I joined the lab of Dr. De'Broski Herbert as a research technician where I had many independent research projects in molecular biology and immunology. This research experience resulted in 4 publications, 2 of which I shared co-authorship, and an invitation to present my research at the 22nd Annual Woods Hole Immunoparasitology (WHIP) conference. For my graduate training at Thomas Jefferson University, I have moved back into the fields of structural biology and biochemistry by studying the underlying molecular mechanisms of transcription initiation and processive elongation in human mitochondria under the mentorship of Dr. Dmitry Temiakov. Dr. Temiakov specializes in biochemistry and is well known in the field of mtDNA transcription and replication. For my current thesis project, I am currently working on solving the structures of mtDNA transcription initiation complex intermediates using Cryoelectron microscopy in order to elucidate a step-wise mechanism of transcription initiation in human mitochondria. The field of CryoEM is rapidly growing and requires near perfect sample preparation in order to achieve high-resolution structures. During my graduate studies, I plan on obtaining multiple high-resolution structures of the human mitochondrial transcription complex. Overall, I feel that the resources provided by the National Center for CryoEM Access and Training (NCCAT) will serve as in integral part of my graduate studies and will help me complete my long-term goals.

B. Positions, Scientific Appointments and Honors

Positions and Employment

2015 – 2016 Lab Assistant, Temple University
2016 – 2017 Undergraduate Research Assistant, Temple University
2017 – 2019 Research Technician, University of Pennsylvania

Other Experience and Professional Memberships

2012 Member, Temple Ambler Health Organization
2016 Participant, Undergraduate Research Program

Honors

2015 Dean's list
2016 Dean's list, Distinction in Major

C. Contribution to Science

1. **Undergraduate Research (1):** In the laboratory of Dr. Weidong Yang, I Studied the effects of CRISPR/Cas9 mediated gene knockout of critical genes that chaperone the export of mRNA and pre-ribosomal RNA through the Nuclear Pore Complex in HeLa cell lines. The project involved FRET and SPEED microscopy to analyze single molecule trajectory data to resolve export pathways and efficiencies. My contributions to this work were included in a submitted manuscript to PNAS and most recently the Journal of Molecular Biology.

2. **Undergraduate Research (2):** I was part of an undergraduate research project in the laboratory of Dr. Vincent Voelz at Temple University. Dr. Voelz's laboratory specializes in applying statistical mechanical models in MDS to better understand the fine microscopic details underlying the mechanisms of protein structure, function, and folding. My research done in the Voelz lab consisted of analyzing large trajectory data of Protein G from Streptococcal bacteria using Python and the UNIX Command Line to see the effects of amino acid substitutions on secondary protein structure and free energy contributions of residues to the overall structure.

3. **Post-Undergraduate Research**: my most recent and comprehensive research experience was as a research technician in the Herbert Lab of Mucosal Immunology at the University of Pennsylvania. I was involved in many independent and collaborative projects, but my main project was on studying the immunological consequences of mice that lacked IL-33 specifically in conventional Dendritic Cells (cDCs) that were subjected to gastrointestinal parasites. Unexpectedly, our data showed that loss of cDC-derivedIL-33 augmented worm clearance and Type 2 cytokine production, indispensable for host immunity, despite IL-33 being a potent inducer of Type 2 cytokine production. The revealing of this unexpected role for IL-33 in dendritic cells in developing an immune response.
    a. Zullo KM, Douglas B, Maloney NM, Ji Y, Wei Y, Herbine K, Cohen R, Pastore C, Cramer Z, Wang X, Wei W, Somsouk M, Hung LY, Lengner C, Kohanski MH, Cohen NA, Herbert DR. LINGO3 regulates mucosal tissue regeneration and promotes TFF2 dependent recovery from colitis. Scand J Gastroenterol. 2021 Jul;56(7):791-805. doi: 10.1080/00365521.2021.1917650. Epub 2021 May 3. PMID: 33941035; PMCID: PMC8647134.
    b. Hung LY, Tanaka Y, Herbine K, Pastore C, Singh B, Ferguson A, Vora N, Douglas B, Zullo K, Behrens EM, Li Hui Tan T, Kohanski MA, Bryce P, Lin C, Kambayashi T, Reed DR, Brown BL, Cohen NA, Herbert DR. Cellular context of IL-33 expression dictates impact on anti-helminth immunity. Sci Immunol. 2020 Nov 13;5(53):eabc6259. doi: 10.1126/sciimmunol.abc6259. PMID: 33188058; PMCID: PMC8257082.
    c. Belle NM, Ji Y, Herbine K, Wei Y, Park J, Zullo K, Hung LY, Srivatsa S, Young T, Oniskey T, Pastore C, Nieves W, Somsouk M, Herbert DR. TFF3 interacts with LINGO2 to regulate EGFR activation for protection against colitis and gastrointestinal helminths. Nat Commun. 2019 Sep 27;10(1):4408. doi: 10.1038/s41467-019-12315-1. PMID: 31562318; PMCID: PMC6764942.
    d. Hung LY, Johnson JL, Ji Y, Christian DA, Herbine KR, Pastore CF, Herbert DR. Cell-Intrinsic Wnt4 Influences Conventional Dendritic Cell Fate Determination to Suppress Type 2 Immunity. J Immunol. 2019 Jul 15;203(2):511-519. doi: 10.4049/jimmunol.1900363. Epub 2019 Jun 7. PMID: 31175162; PMCID: PMC6615948.
4. **Graduate Research**: My ongoing PhD thesis research is focused on studying the underlying molecular mechanisms of transcription initiation and processive elongation in human mitochondria through

structural and biochemical techniques. The results from my research will help us understand how defects in mitochondrial transcription machinery can lead to human diseases. I am currently utilizing cryo-electron microscopy to determine the complex intermediates of the transcription complex as it progresses from imitation to elongation.

D. Additional Information: Research Support and/or Scholastic Performance

Scholastic Performance

YEAR	COURSE TITLE	GRADE
	TEMPLE UNIVERSITY	
2012	General Chemistry	B
2012	General Chemistry II	B
2013	Introduction to Biology	B
2013	Introduction to Biology II	B
2013	Organic Chemistry	B
2014	Organic Chemistry II	B
2014	Inorganic Chemistry	A
2014	Biochemistry I	B
2014	Precalculus	A
2015	Genetics	B
2015	Biochemistry II	A
2015	Calculus I	A
2015	Classical Physics I	A
2015	Calculus II	A
2015	General Physics II	A
2015	Cell Structure and Function	B
2015	Molecular Biology	A
2015	Analytical Chemistry	A
2015	Calculus III	B
2016	Research Techniques/Senior Project	B
2016	Virology	B
2016	Cell & Molecular Neuroscience	A
2016	Physical Chemistry of Biomolecules	A
2016	Structural Bioinformatics	A
2016	Thermodynamics & Kinetic Theory	A
	THOMAS JEFFERSON UNIVERSITY	
2019 - Current	Seminar in Biochemistry	S
2019	Foundation in Biomedical Sciences	A
2020	Genetic Information Transfer	B
2020	Seminar in Biochemistry	S
2020	Macromolecular Structure	A
2020	Macromolecular Function	A
2020	Applied Statistics in Neuroscience	A
2020	Research Ethics	S
2020	Cell Signaling	A
2021	Planning & Writing Research Grants	S
2021	General Pharmacology	A