AUSTIN J. SZUMINSKY

6209 Willow Street, Finleyville, PA 15332
Tel: +1 (412) 877-2862 Email: austin_szuminsky@brown.edu

EDUCATION

Brown University, Providence, RI
Master of Science, Physics, GPA: 4.0, May 2024

University of Pittsburgh, Pittsburgh, PA
Bachelor of Science, Major: Molecular Biology – Cell & Developmental Biology Specialization | Minor: Chemistry, 2022

Community College of Allegheny County, Pittsburgh, PA
Associate of Science, Major: Computer Information Systems, GPA: 3.79, 2018

RESEARCH EXPERIENCE

Brown University, Department of Physics, Providence, RI
Graduate Research – Statistical Mechanics, 2022
Advisor: Dr. J. Michael Kosterlitz (*Nobel laureate, 2016*)

- Application of regularity structures and related notions to models describing an evolving biological system
- Non-equilibrium statistical mechanics, nonlinear stochastic partial differential equations, dynamics of complex systems, Riemannian geometry and statistical physics

University of Pittsburgh School of Medicine, Department of Pediatrics, John G. Rangos Sr. Research Center - UPMC Children's Hospital of Pittsburgh, Pittsburgh, PA
Undergraduate Research, 2021
Faculty Mentor: Dr. Jerry Vockley | Faculty Co-sponsor: Dr. Jeffrey Brodsky

- Formulation and coordination of research experiments under the direction of Dr. Vockley and Dr. Eduardo Vieira Neto
- Characterization of mutations in the HADHA (α-subunit) and HADHB (β-subunit) genes of mitochondrial trifunctional protein (TFP) and the physiological effects of changes in cardiolipin synthesis and on mitochondrial bioenergetics in TFP/LCHAD deficient cells; structural model generation; PCR-RFLP genotype confirmation and maintenance of TFP deficient mice colony for hepatocyte studies
- Analysis of mitochondrial bioenergetics for TFP deficient fibroblasts as measured by a Seahorse XFe96 extracellular flux analyzer
- Assessment of the accumulation of mitochondrial reactive oxygen species (ROS) and efficacy of synthetic tetrapeptide treatment for the common long-chain 3-hydroxyacyl-CoA dehydrogenase (LCHAD) mutation (c.1528G>C;p.Glu510Gln) that affects monolysocardiolipin acyltransferase (MLCLAT) activity; development of a microplate assay to quantify ROS

University of Pittsburgh, Department of Physics and Astronomy, Pittsburgh, PA
Undergraduate Research, 2021
Faculty Mentor: Dr. Sergey Frolov

- Development and evaluation of electrical conductivity and the gate effect at liquid helium temperature in nanowire devices under the direction of Dr. Sergey Frolov
- Implementation of nanowire device models leveraging the Kwant Python package for analysis of quantum transport simulations and tight-binding calculations
- Initiation of optical lithography and metal film evaporation; optical and scanning electron microscopy; placement of nanowires on substrate and the design of electrical contacts

Magee-Womens Research Institute & Foundation, Pittsburgh, PA
Undergraduate Research, 2021
Faculty Mentor: Dr. Jerry Schatten | Faculty Co-sponsor: Dr. Deborah Chapman

- Conception and realization of research experiments under the direction of Dr. Schatten and Dr. Calvin Simerly
- Utilization of fluorescent microscopy for data analysis of antibody probes against centrosomal and spindle proteins
- Execution of the culture of mouse embryonic fibroblasts and pulmonary lung mucoepidermoid carcinoma cells, cell fixation, and immunocytochemistry techniques; confocal microscopy

University of Pittsburgh, Department of Biological Sciences, Pittsburgh, PA
Undergraduate Research, 2019
Faculty Mentor: Dr. Miler Lee

- Designed and coordinated research experiments under the direction of Dr. Lee
- Analyzed ChIP-Seq data for putative enhancers within transposable elements in the zebrafish genome
- Leveraged CRISPRscan gRNA scoring algorithm to identify the subset of gRNAs that target the greatest number of transposable elements; computationally an NP-hard problem

PUBLICATION(S) AND MANUSCRIPTS

E. Vieira Neto, M. Wang, **A.J. Szuminsky**, L. Ferraro, E. Koppes, Y. Wang, C. Van't Land, A. Mohsen, T.S. Anthonymuthu, V. Kagan, H. Bayır, and J. Vockley. "Mitochondrial bioenergetics and cardiolipin remodeling abnormalities in mitochondrial trifunctional protein deficiency."

Submitted: March 2023, *Cell Reports*

TEACHING EXPERIENCE

Brown University, Providence, RI
Graduate Teaching Assistant / Grader - Basic Physics B, 2023
Faculty Mentor: Dr. Matthias Kuehne
- Grading of homework assignments
- Response to student inquiries over university email

Brown University, Providence, RI
Graduate Teaching Assistant / Grader - Analytical Mechanics, 2022
Faculty Mentor: Dr. Ulrich Heintz
- Grading of homework assignments
- Response to student inquiries over university email

University of Pittsburgh, Pittsburgh, PA
Undergraduate Teaching Assistant - Genetics, 2021
Faculty Mentor: Dr. Gerard Campbell
- Assistance in the instruction of genetics to undergraduate students
- Execution of weekly study group sessions/office hours for student questions; preparation for corresponding material; response to student inquiries over university email
- Facilitation and support of recitation section instruction; attendance to course organizational meetings

University of Pittsburgh, Pittsburgh, PA
Undergraduate Teaching Assistant - Introduction to Physics 2, 2021
Faculty Mentor: Dr. W. Vincent Liu
- Assistance in the instruction of physics to undergraduate students
- Provision of administrative support during instructor lectures; examination proctor
- Execution of 3 hours of study group sessions/office hours weekly for student questions in accordance with departmental UTA training; preparation for material delivery; response to student inquires over university email and the Physics and Astronomy Discord Server

GRADUATE COURSES

APMA 2200: Nonlinear Dynamical Systems
PHYS 2300: Quantum Theory of Fields (QFT 2)
PHYS 2020: Mathematical Methods of Engineers and Physicists
PHYS 2050: Quantum Mechanics
15-651: Algorithm Design and Analysis
- Carnegie Mellon University

PHYS 2565: Non-Relativistic Quantum Mechanics I
PHYS 3274: Computational Methods
- University of Pittsburgh

INTERNSHIPS AND HACKATHONS

- **HackPrinceton Fall 2021**, Virtual/Hybrid (Princeton, New Jersey)
- **McGill Physics Hackathon 2021**, Virtual (Montréal, QC Canada)
- **NIH Summer Internship Program (SIP) Codeathon**, Virtual (Bethesda, Maryland)
  Team Writer - Hackathon, 2021
  Team Lead: Dr. Steve Tsang – NIAID Office of Data Science and Emerging Technologies
  Team Project: Improving Software FAIRness and Reproducibility with Automated Containerization of GitHub Repositories
- **Summer Research Internship Program (SRIP)**, Pittsburgh, PA
  Internship - University of Pittsburgh School of Medicine, Department of Pediatrics, 2021
  Faculty Mentor – Genetics: Dr. Jerry Vockley
    - Examination of HADHA gene (TFP α-subunit) mutations and analysis of the putative monolysocardiolipin acyltransferase active site responsible for mature cardiolipin synthesis
    - Identification of treatment concentrations of the synthetic tetrapeptide elamipretide (SS-31) effective for the reduction of ROS in TFP deficient fibroblasts

NIH SPONSORED ADVANCED TRAINING COURSES

- **Frontiers in Stem Cells in Cancer (FriSC^2)**, Pittsburgh, PA
  Course/Lecture Series – Pittsburgh Development Center, 2021
- **Frontiers in Addiction Research and Pregnancy (FrARP)**, Virtual (Pittsburgh, PA)
  Course/Lecture Series – Pittsburgh Development Center, 2021

PRESENTATIONS

- **8th Annual Meeting of the International Network for Fatty Acid Oxidation Research and Management**, Pittsburgh, PA
  Efficacy of treatment concentration for the cardiolipin-binding peptide elamipretide in LCHAD/TFP deficient fibroblasts for the reduction of mitochondrial reactive oxygen species (ROS). **Szuminsky, A.J**., Vieira Neto, E., and Vockley, J. October 2021.
- **2021 Summer Research Intern Poster Day, University of Pittsburgh School of Medicine**, Pittsburgh, PA
  Elamipretide (SS-31) as an effective treatment for the reduction of mitochondrial reactive oxygen species (ROS) in LCHAD/TFP deficient fibroblasts. **Szuminsky, A.J**., Vieira Neto, E., and Vockley, J. July 2021.

DISTINCTIONS

Phi Theta Kappa Honor Society
Eagle Scout, Boy Scouts of America
American Legion Silver Citizenship Medal
5.0 star Uber passenger rating (pre-pandemic)

ADDITIONAL LABORATORY SKILLS

Flow Cytometry	Gibson Assembly	UV spectroscopy
Western Blot	Restriction digest	Interpretation of NMR and IR spectra
SDS Page	Motif enrichment analysis	Organic synthesis
Generation of reporter constructs	RNA-Seq principal component analysis and heatmaps	Thin-layer chromatography

TECHNICAL COMPUTER SKILLS AND SOFTWARE

Languages: Lisp, C++, Java, R, Python, MIPS/Assembly, XML, CSS, HTML, TeX/LaTeX
Operating Systems: Windows, Ubuntu, Unix
Database: MS SQL Server, MySQL, SQLite
General Software Tools: Unix shell, Emacs, MS Visual Studio, NetBeans, Eclipse, Git, MS Office, GraphPad, GIMP
Bioinformatics Tools: HISAT2, BEDTools, SAMtools, featureCounts, PyMOL, CLC Main Workbench, ApE, Fiji, NIS-Elements
GitHub Profile: SzuminskyAJ

RELEVANT COURSEWORK

Molecular Biology	Molecular Genetics Laboratory	Database Systems
Cell Biology	Genetics	Computer Organization and Assembly Language
Cell and Developmental Biology Seminar	Macromolecular Structure and Function	Discrete Structures for CS
Developmental Biology	Metabolic Pathways and Regulation	Applied Statistical Methods
Developmental Biology Laboratory	Organic Chemistry 2	Quantum Physics at Nanoscale
Computational Biology	Organic Laboratory	