Michael D. Cioffi, Ph.D.

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Summary

Skilled research scientist in computational biophysics with expertise in multiscale molecular simulation and structural modeling. Particularly adept at investigating the dynamics of large and complex biomolecular systems through the utilization of coarse-grained models. Eager to secure a challenging and stimulating role where further refinement of computational techniques can be achieved, while simultaneously contributing to advancements in our understanding of biophysical processes. Collaboratively engaged with personnel from computational and experimental groups across disciplines and diverse backgrounds on several research projects. With an extensive research background in viral protein dynamics, I am committed to engaging in cutting-edge research aimed at combating life-threatening diseases.

Positions

Postdoctoral Researcher   **July 2024 – Present**
University of Miami   Coral Gables, FL

Education

Ph.D. | Physics   **August 2018 – July 2024**
Florida International University   Miami, FL

B.Sc. | Physics   **August 2014 – May 2018**
University of Connecticut   Storrs, CT

Key Skills

- Extensive expertise in using both all-atom (AA) and coarse-grained (CG) molecular dynamics (MD) simulations for large biomolecular systems
  - Familiar with enhanced sampling techniques: Umbrella sampling (free energy), AMD, and REMD
- Considerable experience utilizing GPUs and high-performance computing (HPC) facilities for scientific computing and simulations
- Proficient with homology modeling and molecular docking
- Software and programming proficiency:
  - Simulation: GROMACS (extensive), NAMD, AMBER
  - Force fields: Martini (extensive), CHARMM, AMBER
  - Visualization: VMD, PyMOL, ChimeraX,
  - Modeling: AlphaFold, RoseTTAFold, MODELLER
  - Python (8+ years) and Tcl/Tk (3+ years) for data analysis
    - Extensive use of the Pandas, Matplotlib, and NumPy libraries
    - Familiar with basic Monte-Carlo methods and machine learning techniques
- Prior experience with small molecule parameterization using the Martini 3 CG force field for long timescale drug diffusion through lipid membranes

- Adept at designing research projects and writing manuscripts for publication
- Experience collaborating and publishing with multidisciplinary teams
- Strong desire to continue learning the diverse array of techniques used within computational physics, chemistry, and biology

Research Experience

Ebola Virus and Marburg Virus
- Implemented multiscale (all-atom and coarse-grained) molecular dynamics (MD) simulations
- Modeled and simulated several large-scale (750k+ atom) protein and complex lipid bilayer systems
- Created Python scripts, Tcl/Tk scripts, and GROMACS workflows to optimize data processing pipelines for efficient analysis of MD trajectories
- Quantified simulation results with various types of analyses; radial distribution functions, diffusivity/diffusion coefficients, hydrogen bond analysis, principal component analysis, root-mean square-deviations/fluctuations, solvent accessible surface area, etc.
- Investigated molecular level interactions and dynamics, uncovering how protein structure and membrane lipid composition affect oligomeric matrix protein binding and electrostatic interactions, identifying potential target regions for inhibition
- Collaborated with interdisciplinary teams to augment experimental (wet lab) and computational findings
- Presented findings at multiple conferences and seminars, and published in peer-reviewed journals

SARS-CoV-2
- Modeled RNA structures using various pieces of software and performed all-atom MD simulations to examine binding stability
- Determined potential RNA-RNA binding sites between an overly expressed airway long non-coding RNA in patients with COVID-19 and the SARS-CoV-2 spike viral RNA

Publications & Conference Proceedings

Published Research Papers
1. **Cioffi MD**, Sharma T, Motsa BB, Bhattarai N, Gerstman BS, Stahelin RV, Chapagain P. Ebola virus matrix protein VP40 single mutations G198R and G201R significantly enhance plasma membrane localization. *Journal of Physical Chemistry B*. Accepted, August 2024; [doi: 10.1021/acs.jpcb.4c02700]
2. Motsa B, Sharma T, **Cioffi MD**, Chapagain P, Stahelin R. Minor electrostatic changes robustly increase VP40 membrane binding, assembly, and budding of Ebola virus matrix protein derived virus-like particles. *Journal of Biological Chemistry*. 2024;300(5). [doi: 10.1016/j.jbc.2024.107213]
3. **Cioffi MD**, Husby ML, Gerstman BS, Stahelin RV, Chapagain P. Role of phosphatidic acid lipids on plasma membrane association of the Ebola virus matrix protein VP40. *Biochimica et Biophysica Acta* (*BBA*) – *Molecular and Cell Biology of Lipids*. 2024;1869(3). [doi: 10.1016/j.bbalip.2024.159464]
4. Devadoss D, Acharya A, Manevski M, Houserova D, **Cioffi MD**, Pandey K, Nair M, Chapagain P, Mirsaeidi M, Borchert GM, Byrareddy SN, Chand HS. Immunomodulatory

LncRNA on antisense strand of ICAM-1 augments SARS-CoV-2 infection-associated airway mucoinflammatory phenotype. *iScience*. 2022;25(8):104685. [PMCID: PMC9242679]

5. Webb JR, Arroyave V, Laurence D, Revesz S, Bhatta G, Hollingsworth H, Dhalla S, Howard E, **Cioffi M**. The Nature of Micro-Variability in Blazars. *Galaxies*. 2021; 9(4):114. [doi: 10.3390/galaxies9040114]

Published Conference Proceedings

1. Sharma T, **Cioffi M**, Gerstman BS, Stahelin RV, Chapagain P. Investigating the effects of CTD mutations on plasma membrane association of the Marburg virus protein VP40. *Biophysical Journal*. 2024. 123(3):448a.

2. **Cioffi MD**. Role of lipid composition on human plasma membrane interactions with the Ebola virus matrix protein VP40. *Biophysical Journal*. 2023. 122(3):506a-507a.

3. Devadoss D, Acharya A, Manevski M, **Cioffi M**, Pandey K, Nair M, Chapagain P, Byrareddy S, Chand HS. Immunomodulatory LASI lncRNA Regulates Cigarette Smoke Exacerbated SARS-CoV-2 Infectivity in COPD Airway Epithelial Cells. *American Journal of Respiratory and Critical Care Medicine*. 2022;205:A3272.

Selected Presentations

1. [Oral] "Role of Phosphatidic Acid on Ebola Virus Matrix Protein VP40 Interactions with the Human Plasma Membrane"
Cioffi, M.D. *et al. Association of Nepali Physicists in America Conference*, Florida International University, Miami, FL, July 2023.

2. [Poster] "Role of Lipid Composition on Human Plasma Membrane Interactions with the Ebola Virus Matrix Protein VP40"
Cioffi, M.D. *et al. Biophysical Society Meeting*, San Diego, CA, February 2023.

3. [Poster] "The Effects of Single Amino Acid Mutations on Ebola Virus Matrix Protein VP40 and Human Plasma Membrane Interactions"
Cioffi, M.D. *et al. Biomolecular Sciences Institute Symposium*, Florida International University, Miami, FL, May 2023.

Awards

- Graduate and Professional Student Committee (GPSC) Travel Grant, 2023
- College of Arts, Sciences, and Education (CASE) Dean's Office Travel Award, 2023

Teaching Experience

Graduate Teaching Assistant, Florida International University
Department of Physics

PHY 2048L - General Physics Lab 1	(Fall 2019 - Summer 2022, Fall 2023)
PHY 2049L - General Physics Lab 2	(Summer 2019, Summer 2023)
AST 1002L - Descriptive Astronomy Lab	(Fall 2018 - Spring 2019)
AST 2003L - Solar System Astronomy Lab	(Fall 2018 - Spring 2019)