

Grace Arhin

(313)-5055-498
garhin@umich.edu

EDUCATION

UNIVERSITY OF MICHIGAN, ANN ARBOR
Ph.D., Biophysics

Ann Arbor, MI
May 2025 (expected)

KWAME NKRUMAH UNIVERSITY OF SCIENCE AND TECHNOLOGY
B.S., Chemistry

Kumasi, Ghana
May 2019

SKILLS

Spectroscopy: 1D/2D/3D Nuclear magnetic resonance (NMR), Circular dichroism (CD), Ultraviolet-visible (UV-Vis), fluorescence

Calorimetry: Isothermal titration (ITC), Differential scanning (DSC)

Molecular biology: Cloning, Cell culture, Protein expression and purification, RNA transcription and purification, Gel electrophoresis, Radio & isotopic RNA labeling, RNA chemical probing, qPCR

Chromatographic techniques: Size exclusion (SEC), Ion exchange (IEX), Affinity based methods

Molecular Modeling: Molecular docking, Virtual screening, Molecular dynamics, Machine Learning

Programming: Python, Bash scripting and C++

RESEARCH/WORK EXPERIENCE

UNIVERSITY OF MICHIGAN

Ann Arbor, MI
2020 - Present

Graduate Student Research/Teaching Assistant

Structural Characterization of Regulatory RNAs

- Demonstrated for the first time using unassigned NMR chemical shifts to model ncRNA secondary structure
- Assigned NMR chemical shifts of RNA oligonucleotides to expand chemical shift databases
- Developed LARMORD-Q: A machine learning predictor that reproduces QM-derived RNA NMR chemical shifts
- Demonstrated structural dynamics within microRNA let-7f-2 using NMR, chemical probing, and molecular modeling

Small Molecule Lead Discovery and Optimization

- Developed an integrative structure guided ligand discovery pipeline identifying small molecule ligands targeting functional RNAs
- Collaborated on the *in-silico* discovery of splicing inhibitors of a group-II RNA intron
- Screened and identified new compounds targeting two novel RNA targets: NPSL2 and oncogenic precursor microRNA-31 (pre-miR-31)
- Characterized NPSL2-ligand/pre-miR-31-ligand complexes to inform molecular design
- Biophysical characterization of NPSL2-ligand/pre-miR-31-ligand complexes

Protein Purification and Biochemical Assays

- Purified FLAG tagged Dicer protein from Expi293 cells using an affinity-based protein purification method
- Expressed and purified TRBP protein using IMAC and SEC to enable complexation with Dicer
- Performing Dicer-TRBP cleavage assays to evaluate the functional relevance to targeting microRNAs

Teaching and Mentoring

- Instructed several graduate/undergraduate level courses such as Introduction to programming, Theory and methods in biophysics and Dynamical processes in biophysics
- Mentored several undergraduate students in laboratory skill development

MERCK RESEARCH LABORATORIES

Kenilworth, NJ

Structural and Computational Chemistry Intern

Jun 2023 – Aug 2023

Protein Expression/Purification and Structural Characterization

- Isotopically labeled, expressed, and purified a VHL-elonginB-elonginC (VCB) protein complex in three steps using IMAC, IEX and SEC to obtain >90% complex purity for NMR studies

- Collected and partially assigned the backbone HSQC-NMR spectra of the VCB protein complex to enable bioNMR study of targeted protein degradation (TPD)

KWAME NKRUMAH UNIVERSITY OF SCIENCE AND TECHNOLOGY

Kumasi, Ghana

Undergraduate Researcher

2018 – 2019

Molecular Modelling

- Published two manuscripts on the computational study of the reaction mechanisms of nitrones with norbornadienes

PUBLICATIONS

- Arhin G.** and Keane S., Discovery and characterization of drug-like molecules targeting a regulatory element in the human oncomiR-1 miRNA (Manuscript under preparation)
- Fedorova O, **Arhin G**, Pyle AM, Frank AT. In Silico Discovery of Group II Intron RNA Splicing Inhibitors. *ACS Chemical Biology*. 2023 Aug 21;18(9):1968-75
- Moudgal N, **Arhin G**, Frank AT. Using Unassigned NMR Chemical Shifts to Model RNA Secondary Structure. *The Journal of Physical Chemistry A*. 2022 Apr 26;126(17):2739-45
- Liu Y, Kotar A, Hodges TL, ..., **Arhin G**, ..., Johnson BA, Keane SC. A. NMR chemical shift assignments of RNA oligonucleotides to expand the RNA chemical shift database. *Biomolecular NMR Assignments*. 2021 Oct;15(2):479-90
- Opoku E, **Arhin G**, Pipim GB, Adams AH, Tia R, Adei E. Site-, enantio- and stereoselectivities of the 1, 3-dipolar cycloaddition reactions of oxanorbornadiene with C, N disubstituted nitrones and dimethyl nitrilimines: a DFT mechanistic study. *Theoretical Chemistry Accounts*. 2020 Jan;139:1-5
- Arhin G**, Adams AH, Opoku E, Tia R, Adei E. 1, 3-Dipolar cycloaddition reactions of selected 1, 3-dipoles with 7-isopropylidenenorbornadiene and follow-up thermolytic cleavage: a computational study. *Journal of Molecular Graphics and Modelling*. 2019 Nov 1;92:267-79

SELECTED COFERENCES/SYMPOSIA

- Arhin G**, Haghpasand L, Keane SC. Identification, and characterization of small molecule ligands targeting oncogenic pre-miR-31, Chicago Area NMR Discussion Group meeting, Oct. 2024 (poster)
- Arhin G**, Keane SC. Discovery of ligands for a regulatory element in the OncomiR-1 miRNA: A combined STD-NMR and molecular modeling approach, *UM Biophysics seminar series*, Nov 2023 (oral)
- Arhin G**, Keane SC. Alternate conformations of pre-let-7f-2 miRNA affects Dicer cleavage efficiency, *UM Center for RNA Biomedicine's 7th Annual Symposium*, Mar 2023 (poster)
- Arhin G**, Frank AT. LAMORD-Q: A machine learning predictor that reproduces QM-derived RNA chemical shifts for structural studies, *Pfizer Biotech Connect Symposium*, Apr 2022 (oral)
- Arhin G**, Tia R, Adei E. 1,3-Dipolar cycloaddition reactions of C, N-disubstituted nitrones with 7-isopropylidenenorbornadiene: A Computational Study, *Ghana science association seminar*, Apr 2019 (poster)

HONORS/AWARDS

- Rackham Predoctoral Fellowship award, University of Michigan, Ann Arbor, USA **2024**
- Rackham Research grant, University of Michigan, Ann Arbor, USA **2024**
- Best poster presenter award, Chicago Area NMR Discussion Group Meeting **2024**
- Best Graduating Student, Department of Chemistry, KNUST, Kumasi, Ghana **2019**

PROFESSIONAL AFFILIATIONS

- Marketing Chair**, Graduate Society of Black Engineers, and Scientist (GSBES)
- Member**, National Organization for the Professional Advancement of Black Chemists and Chemical Engineers (NOBCCHE)
- Ambassador**, Millennium Development Authority (MiDA EmPowers)