

# Grace Arhin

Biophysics Program  
University of Michigan

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## EDUCATION

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University of Michigan, Ann Arbor, MI, USA *May 2025 (expected)*  
Doctor of Philosophy, Biophysics (GPA: 4.0/4.0)

KNUST, Kumasi, Ghana *May 2019*  
Bachelor of Science, Chemistry (GPA: 3.7/4.0)

## HONORS/AWARDS

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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*

## RESEARCH/WORK EXPERIENCE

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**Graduate Student Research Assistant** *Sep 2020 – present*

University of Michigan, Ann Arbor, MI, USA

Ph.D. Thesis: Understanding non-coding RNA function: A study of structure, dynamics: and small molecule targeting.

Advisors: Sarah C. Keane, Ph.D. and Aaron T. Frank, Ph.D.

- *In silico*, and *in vitro* approaches for the discovery of small molecule ligands targeting micro-RNAs as a therapeutic strategy
- Biophysical characterization of RNA-small molecule interactions to inform molecular design
- Thermal shift assays for characterization of thermal stability of RNA-small molecule complexes
- Evaluating the effects of ‘drugging’ functional sites in target micro-RNAs
- Probing secondary structural dynamics in microRNAs (*let-7f-2*)
- Developing LARMORD-Q: A machine learning predictor that reproduces QM-Derived RNA NMR Chemical Shifts

## Techniques

- **Solution NMR:** <sup>1</sup>H-NMR, STD-NMR, CPMG, WaterLogsy, CPMG, NOESY, TOCSY, HSQC/HMQC, HNN-COSY

- Molecular Modeling: virtual screening, molecular docking, molecular dynamics, machine learning
- Other spectroscopic approaches: CD, fluorescence, UV
- Calorimetry: ITC
- Molecular biology: Cloning, Cell culture, protein expression and purification, RNA transcription and purification, gel electrophoresis, radio/isotopic RNA labeling, RNA chemical probing, qPCR
- Programming: Python, bash scripting and C++

### **Structural and Computational Chemistry Intern**

*Jun 2023 – Aug 2023*

Merck & Company, Rahway Inc. NJ, USA

Research project: To Enable **BioNMR Study of VHL** Mediated Protein Degradation: Backbone Assignments of E3 Ligase VHL-ElonC-ElonB (VCB) Complex

Mentors: Yunpeng Zhou, Ph.D., Daniel Wyss, Ph.D., and David McLaren, Ph.D.

- Isotopic expression and purification of E3 ligase VHL- ElonginC- EloginB (VCB) protein complex
- Biophysical characterization of the VCB protein complex
- Biophysical characterization of VCB-small molecule complex

#### **Techniques:**

- **2D/3D NMR:** HSQC, HNCA, HN(CO)CA, HNCO, HN(CA)CO
- Molecular biology: Protein expression and purification
- Ligand binding: SPR

### **Undergraduate Researcher**

*Sep 2018 – May 2019*

KNUST, Kumasi, Ghana

Undergraduate Thesis: 1,3-dipolar cycloaddition reactions of norbornadiene derivatives with C, N-disubstituted nitrones: A computational Study

Advisors: Richard Tia, Ph.D. and Evans Adei, Ph.D.

### **Summer Intern**

*Jun 2018 – Aug 2018*

Ghana Standards Authority, Accra, Ghana

Job title: Quality control officer

Mentors: Ghana Power Compact Internship and Mentoring Program under the Millennium Development Authority (GCIMP)

## **PUBLICATIONS**

**Arhin G.** and Keane S., Discovery 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 stereo-selectivities 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 CONFERENCES/SYMPOSIUMS/SEMINARS**

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**Arhin G**, Haghpassand 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 7<sup>th</sup> 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)

## **TEACHING AND MENTORING**

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### **Laboratory Mentor**

*Sep 2023 – present*

University of Michigan, Ann Arbor, MI, USA, Biophysics Program, Keanelab

- Mentoring several undergraduate students in laboratory skills development including experimental design and data analysis

### **Graduate Student Instructor**

*Jan 2021 – May 2023*

University of Michigan, Ann Arbor, MI, USA, Biophysics Program

Course directors: Sarah Veatch, Ph.D., Qiong Yang, Ph.D., and Ayalusammy Ramamorthy, Ph.D.

- Introduction to scientific programming: Held office hours to address students' programming needs and graded weekly coding assignments
- Dynamical processes in biophysics: Held office hours to address students' needs and graded weekly assignments
- Theory and methods of biophysical chemistry: graded weekly assignments

### **Teaching Assistant**

*Sep 2019 – Jul 2020*

KNUST, Kumasi, Ghana, Department of Chemistry

- Coordinated departmental weekly seminars.
- Supervised and assessed laboratory work for undergraduate Chemistry and Chemical Engineering students
- Tutored junior and senior year Chemistry students in Physical Chemistry and Computational Chemistry, respectively
- Supervised Chemistry undergraduate research

### **COMMUNITY SERVICE**

Volunteer work at the Aburaso Methodist Hospital

*Jun 2016 – Aug 2016*

Volunteer work at the Komfo Anokye teaching hospital

*Jun 2017 – Aug 2017*

### **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 (NOBCCChE)

**Ambassador**, Millennium Development Authority (MiDA EmPowers)