# Andrew Tupper | PhD Biochemistry

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## Education

**McMaster University** — **Hamilton, ON (Canada)**
*PhD Biochemistry* — *2015–2020*

**Rensselaer Polytechnic Institute** — **Troy, NY (USA)**
*BS Interdisciplinary Science – summa cum laude* — *2011–2015*

## Technical Skills

### Programming

- Proficient in Rust, Python, C, C++, and Bash
- Basic knowledge of R, HTML, CSS, and javascript
- Parallel: MPI, openMPI, threading, CUDA
- Rust crates: Tokio, Rayon, Serde, Iroh
- Python libs: ApacheBeam, NumPy, Sklearn, PyMC3
- Dedicated to software development best practices: Agile, GitHub, Jira, Test-Driven Developement

### High Performance Computing (HPC)

- HPC admin for UNCW - Center for Marine Science
- Server admin for the USDA - ARS
- SLURM job scheduling and management
- Containers: Docker, Apptainer, quay.io
- Environment: lmod, spack, conda, nextflow
- Automation of usage reports, error monitoring

### Problem Solving

- Development of interdisciplinary knowledge graphs
- Semantic modeling of bioinformatic databases
- Designing of CRISPR-based diagnostic assays
- Novel kmer analysis of population genetic data
- Numerical analysis using Runge-Kutta methods
- Gillespie simulations of chemical kinetics
- Lattice models of NN stochastic processes

### Communication

- Workshop and course instructor for linux and HPC
- Research collaborator with pharmaceutical chemists, physical oceanographers, and Bioinformaticians
- Proficient in scientific writing and presentations
- Author of 8 published papers (4 as first author)
- Mentored 5 graduate and 4 undergraduate students

## Professional Experience

**University of North Carolina at Wilmington - Center for Marine Science** — **Wilmington, NC**
***Research Computing Data Professional*** — *2024–Present*

- HPC Administrator, consultant, instructor for linux seminars and workshops
- Software installation, containerization using Apptainer, developement of novel tools, automation
- Collaboration with researchers spanning pharmaceutical chemistry, physical oceanography, and marine science

**BenchSci** — **Potsdam, NY**
***Bioinformatics Software Engineer (remote)*** — *2022–2024*

- Development of ETL pipelines using Apache beam, Bigquery, and Google cloud infrastructure
- Extraction and analysis of large scale biological and chemical databases
- Knowledge graph modeling of biological and chemical entities

**Horticultural Crops Research Laboratory** — **Corvallis, OR**
***Research Associate with Dr. Niklaus J. Grünwald*** — *2020–2021*

- Development of python software packages for CRISPR-based diagnostic assays
- System administrator for the *'oomy'* compute cluster and web server
- Population genetics of *P. ramorum*, causal agent of sudden oak death

**McMaster University** — **Hamilton, ON (Canada)**
***Graduate Researcher with Dr. Paul G. Higgs*** — *2015–2020*

- Software development of massively parallel programs for high performance computing
- Designing computational models of non-enzymatic and enzymatic RNA replication
- Lipid-catalyzed polymerization of unactivated RNA monomers in the *'Planet Simulator'* - Origins lab

## Professional Experience (continued)

**Rensselaer Polytechnic Institute** **Troy, NY**
***Undergraduate Researcher with Dr. James P. Ferris*** *2012–2014*

- Clay-catalyzed polymerization of activated RNA monomers
- Banin protocol - Quantitative ion exchange of clay minerals
- Data analysis of chemical experiments

## Publications

Foster, Z. S., **Tupper**, A. S., Press, C. M., & Grunwald, N. J. (2023). Krisp: A python package for designing crispr and amplification-based diagnostic assays from whole genome data. *bioRxiv*, 2023–11.

**Tupper**, A. S., & Higgs, P. G. (2021). Rolling-circle and strand-displacement mechanisms for non-enzymatic rna replication at the time of the origin of life. *Journal of Theoretical Biology*, 110822.

Cauret, C. M., Gansauge, M.-T., **Tupper**, A. S., Furman, B. L., Knytl, M., Song, X.-Y., Greenbaum, E., Meyer, M., & Evans, B. J. (2020). Developmental systems drift and the drivers of sex chromosome evolution. *Molecular Biology and Evolution*, *37*(3), 799–810.

**Tupper**, A. S., Pudritz, R. E., & Higgs, P. G. (2019). Can the RNA world still function without cytidine? *Molecular biology and evolution*.

Shah, V., de Bouter, J., *Pauli, Q., **Tupper**, A. S., & Higgs, P. G. (2019). Survival of RNA replicators is much easier in protocells than in surface-based, spatial systems. *Life*, *9*(3), 65.

Pearce, B. K., **Tupper**, A. S., Pudritz, R. E., & Higgs, P. G. (2018). Constraining the time interval for the origin of life on earth. *Astrobiology*, *18*(3), 343–364.

**Tupper**, A. S., & Higgs, P. G. (2017). Error thresholds for RNA replication in the presence of both point mutations and premature termination errors. *Journal of theoretical biology*, *428*, 34–42.

**Tupper**, A., *Shi, K., & Higgs, P. (2017). The role of templating in the emergence of RNA from the prebiotic chemical mixture. *Life*, *7*(4), 41.

***** *mentored undergraduate student*

## Select Conferences

**Gordon Research Conference for the Origins of Life** **Galveston, TX (USA)**
***Poster Presentation*** *2020*
Non-enzymatic Rolling-circle Replication in an RNA World

- Andrew S. Tupper & Paul G. Higgs

**Astrobiology Science Conference (AbSciCon)** **Bellevue, WA (USA)**
***Poster Presentation*** *2019*
Can the RNA World still function without cytidine?

- Andrew S. Tupper, Ralph E. Pudritz & Paul G. Higgs

**Science of Early Life Conference** **Hamilton, ON (Canada)**
***Poster Presentation*** *2018*
Assessing the Plausibility of an AUG Alphabet for RNA Secondary Structure Formation and Replication

- Andrew S. Tupper, Ralph E. Pudritz, & Paul G. Higgs

**Astrobiology Science Conference (AbSciCon)** **Mesa, AZ (USA)**
***Oral Presentation*** *2017*
Error thresholds for RNA replication in the presence of point mutations and premature termination errors

- Andrew S. Tupper & Paul G. Higgs

**Astrobiology Science Conference (AbSciCon)** **Mesa, AZ (USA)**
***Oral Presentation*** – *By Supervisor* *2017*
The role of templating in the emergence of RNA from the prebiotic chemical mixture

- Andrew S. Tupper, Kevin Shi, & Paul G. Higgs