Tyler P. Roche, Ph.D.
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Curriculum Vitae

(901) 212-2862

EDUCATION

2022 **Doctor of Philosophy,** Chemistry and Biochemistry — Atlanta, GA
Georgia Institute of Technology

2012 **Bachelor of Arts,** Molecular Biology — Claremont, CA
Pomona College

AWARDS, FELLOWSHIPS, AND HONORS

2021 **Georgia Tech Astrobiology Fellowship**
Georgia Institute of Technology—College of Sciences Sutherland Dean's Chair

2018 **William Emerson Outstanding Second Year Seminar Award**
Georgia Institute of Technology—School of Chemistry & Biochemistry

2017–2021 **President's Fellowship**
Georgia Institute of Technology

2012–2014 **Provost's Ph.D. Fellowship**
University of Southern California

RESEARCH EXPERIENCE

2017–2022 **Graduate Research Assistant,** Georgia Institute of Technology — Atlanta, GA
Investigated the chemical origins of life, specifically the reaction of noncanonical nucleic acid bases with sugars to form proto-RNA molecules in early earth conditions, resulting in two publications and several conference presentations. Responsible for experimental design, execution, and analysis, report authorship, and collaboration management including among senior scientists & mentoring an undergraduate researcher.

2012–2014 **Graduate Research Assistant,** University of Southern California — Los Angeles, CA
Worked to cultivate archaeoglobus fulgidus *in anaerobic systems, including use of an anaerobic glove box, oxygen-free media preparation, and microscopic analysis.*

2011–2012 **Undergraduate Researcher,** Pomona College — Claremont, CA
Investigated protein modification and its role in development in Drosophila melanogaster*, specifically targeting an N-terminal modification to the cellular trafficking protein GDI. Utilized molecular cloning techniques to design primers for, clone, and express modified GDI followed by cellular localization studies.*

2010 **Research Intern,** Saban Research Institute — Los Angeles, CA
Investigated the effects of amniotic fluid stem cells on induced lung fibrosis in murine model organisms, including organ harvesting, sectioning, and microscopic analysis, and resulting in a publication.

COMMUNICATION EXPERIENCE

2022–2023 **Visiting Assistant Professor,** Trinity University — San Antonio, TX
Taught both lecture (Biochemistry I) and laboratory (Biochemistry Lab, Advanced Chemical Principles) courses in an undergraduate-focused liberal arts institution. Responsible for ongoing development of flipped-classroom methodology, updating assessments, and holding office hours for additional student learning.

2021–2022 **Astrobiology Fellow,** Georgia Institute of Technology — Atlanta, GA
Developed and begin implementation of an undergraduate minor in Astrobiology modeled from the successful graduate certificate in astrobiology. Contributed to the hypothesis browser knowledge repository for astrobiology and origin-of-life science communication.

2021–2022 **Biochemistry I Co-Teacher,** Georgia Institute of Technology — Atlanta, GA
Developed and delivered two lectures as part of Tech to Teaching Certificate Capstone, incorporating teaching strategies and lesson plan ideas developed throughout Tech to Teaching coursework.

2017–2018, 2021 **Teaching Assistant,** Georgia Institute of Technology — Atlanta, GA
Biochemistry: Facilitated a hybrid learning environment using both in-person and virtual communication. Responsible for assessment preparation and remote office hours, as well as two in-person lectures.
Quantitative Analysis: Managed laboratory section of undergraduate chemistry students. Responsibilities included lesson prep, laboratory safety, time management, and procedural assistance.

TECHNICAL EXPERIENCE

2015–2017 **Technical Expert**, Apple Store — San Diego, CA

Resolved both software and hardware issues on mobile devices, including physical repair and software troubleshooting. Responsible for managing customer expectations and setting and holding one-on-one appointments with customers in a fast-paced environment.

LEADERSHIP EXPERIENCE

2021–2022 **Secretary, ExplOrigins Executive Board,** Georgia Institute of Technology — Atlanta, GA

Maintained Georgia Tech Astrobiology website, active organization roster, and meeting minutes. Coordinated multiple events including socials, public talks, and the annual ExplOrigins Colloquium.

2020–2022 **Chair, Gordon Research Seminar (GRS): Origins of Life**

Responsible for obtaining funding, setting the conference details, and maintaining conference plan information for future implementation despite late-term cancellation due to COVID-19 pandemic.

2019 **External Organizer, Astrobiology Graduate Conference** — Salt Lake City, UT

Organized and managed the Proposal Writing Retreat, overseeing the schedule and hosting 25+ students. Responsibilities included logistics of food, lodging, and retreat scheduling, and applicant team assignments.

OUTREACH EXPERIENCE

2017–2020 **Member, Center for Chemical Evolution**, Georgia Institute of Technology — Atlanta, GA

Aided in the creation and implementation of both science demonstrations and media activities in the fields of astrobiology and STEAM, including events at local schools, science festivals, and outreach events.

PROFESSIONAL MEMBERSHIPS

2021–Present Origin of Life Early Career Network—*https://oolen.org/*

SCIENTIFIC POSTERS AND PRESENTATIONS

1. **T. P. Roche,** P. J. Nedumpurath, D. M. Fialho, G. B. Schuster, N. V. Hud. Prebiotic Reactivity of Noncanonical Nucleobases. ExplOrigins Colloquium (2022), Georgia Tech, Atlanta, GA (Poster)
2. **T. P. Roche,** D. M. Fialho, C. Menor Salván, R. Krishnamurthy, G. B. Schuster, N. V. Hud. Robust Ribonucleosides: A Pathway to Ribose from Simple Sugars via Ketose Intermediates. AbGradCon (2021) Virtual, (https://www.youtube.com/watch?v=fVZaOfYDK7Q)
3. **T. P. Roche,** D. M. Fialho, C. Menor Salván, R. Krishnamurthy, G. B. Schuster, N. V. Hud. Ketoses: The Key to Prebiotic Nucleoside Formation? Prebiotic Chemistry and Early Earth Environments Seminar Series (2021), Virtual (https://www.youtube.com/watch?v=xwOHUG1WSDc)
4. **T. P. Roche**, D. M. Fialho, C. Menor-Salván, R. Krishnamurthy, G. B. Schuster, N. V. Hud. Origins of Life: What Role did Sugars Play? ExplOrigins Colloquium (2021), Georgia Tech, Atlanta, GA (Poster)
5. **T. P. Roche**, D. M. Fialho, G. B. Schuster, N. V. Hud. Prebiotic Relevance of Ketose Sugars to the Origin of Aldose Nucleosides. American Chemical Society Spring Meeting (2020), Virtual (Digital Slide Presentation)
6. **T. P. Roche**, D. M. Fialho, G. B. Schuster, R. Krishnamurthy, N. V. Hud. Robust Ribonucleosides: A Pathway to Ribose from Simple Sugars via Ketose Intermediates. Gordon Research Conference: Origins of Life (2020), Galveston, TX (Poster, also presented at ExplOrigins Colloquium 2020)
7. **T. P. Roche**, D. M. Fialho, G. B. Schuster, R. Krishnamurthy, N. V. Hud. Prebiotic Relevance of Ketose Sugars to the Origin of Aldose Nucleosides. Astrobiology Science Conference (2019), Bellevue, WA (Oral Presentation)
8. **T. P. Roche**, D. M. Fialho, G. B. Schuster, R. Krishnamurthy, N. V. Hud. Sugars and the Origin of Life: Unlocking Ribose with Ketose Sugars. ExplOrigins Colloquium (2019), Georgia Tech, Atlanta, GA (Poster)
9. **T. P. Roche**, D. M. Fialho, R. Krishnamurthy, N. V. Hud. The Condensation of a Model Proto-RNA Nucleobase with Ribulose: A Prebiotic Pathway to RNA. Astrobiology Graduate Conference (2018), Georgia Tech, Atlanta, GA (Poster, updated from below)
10. **T. P. Roche**, D. M. Fialho, R. Krishnamurthy, N. V. Hud. The Condensation of a Model Proto-RNA Nucleobase with Ribulose: A Prebiotic Pathway to RNA. Georgia Tech Astrobiology Colloquium (2018), Atlanta, GA (Poster)

PUBLICATIONS

1. **T. P. Roche,** D. M. Fialho, P. J. Nedumpurath, B. N. Lindgren, S. Mangalath, G. B. Schuster, N. V. Hud. Prebiotic Reactivity of Noncanonical Nucleosides. *In prep*.
2. L. E. Rodriguez, T. Altair, N. Y. Hermis, T. Z. Jia, **T. P. Roche**, L. H. Steller, J. M. Weber. Chapter 4: A Geological and Chemical Context for the Origins of Life on Early Earth, in Astrobiology Primer 3.0 special issue, edited by M. Schaible, N. Szeinbaum, and G. Tan. *Astrobiology*. *In review*.
3. **T. P. Roche,** D. M. Fialho, C. Menor-Salván, R. Krishnamurthy, G. B. Schuster, N. V. Hud. A Plausible Path to Nucleosides: Ribosides and Related Aldosides are Generated from Ribulose, Fructose, and Similar Abiotic Precursors. *Chem. Eur. J.* 2023, 29, e202203036.
4. D. M. Fialho, **T. P. Roche**, N. V. Hud. Prebiotic Syntheses of Noncanonical Nucleosides and Nucleotides. *Chem. Rev.* **120**, 4806–4830 (2020).
5. O. Garcia, G. Carraro, G. Turcatel, M. Hall, S. Sedrakyan, **T. Roche**, S. Buckley, B. Driscoll, L. Perin, D. Warburton. Amniotic fluid stem cells inhibit the progression of bleomycin-induced pulmonary fibrosis via CCL2 modulation in bronchoalveolar lavage. *PLOS ONE* **8**(8): e71679 (2013).