Sarah E. Maurer, Ph.D.
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Educational Background:

PhD. Chemistry and Biochemistry, June 2010; University of California, Santa Cruz (UCSC) with David Deamer

B.S. Biochemistry, December 2004, Minor: Biology. Indiana University of Pennsylvania (IUP), Indiana PA

Professional Experience:

2020-current: Department Chair, Central Connecticut State University (CCSU), Department of Chemistry and Biochemistry, New Britain, CT

2022-Current: Professor; 2018-2022: Associate Professor, 2013-2018: Assistant Professor

2019-2020: Visiting Researcher (Sabbatical – Loren Williams Lab), Georgia Institute of Technology, Department of Chemistry and Biochemistry, Atlanta, GA

2012-2013: Postdoctoral Researcher, University of Akron, Polymer Sciences, Akron, OH with Nita Sahai

2011-2012: Postdoctoral researcher, University of Southern Denmark, Dept. of Physics and Chemistry, Odense, Denmark with Steen Rasmussen

2005: Post-baccalaureate researcher, Los Alamos National Laboratory, Biosciences , Los Alamos, NM

Dedication to Diversity and Inclusion

2022 NASA SMD Bridge program workshop; working with NASA organizers to build a program to help increase racial/ethnic diversity in STEM fields

2021 ACS Workshop “Leading Inclusively”; Building strategies for professional development of “diversity, inclusion, equity, and respect”

2021-2022 CSU-AAUP Research Grant, *“The Role of Race, Gender, and Preparation on Student Learning in General Chemistry”* $5150 with Tom Burkholder; Exploring how different demographics perceive their success in intro chemistry courses through interview based assessment.

2013-2017; TRIO College Experience Program, Chemistry Module; Helping high school students in underrepresented groups experience courses at CCSU in the summer.

2017-2018 “Culturally Relevant Teaching Strategies” CCSU community learning group; Developing teaching strategies to reach underrepresented groups through readings and monthly discussion sessions.

2013-2015; Chemistry with STRIVE. STRIVE is an after-school program for 6^{th} grade girls at risk for teen pregnancy. Dr. Maurer would take activities and talk with the students about science and chemistry.

Awards and Honors

2018 Dean’s Outstanding Research Award, School of Engineering, Science & Technology

2010 Eliot-Kimbach award for Outstanding Research in the Origins of Life, GRC Origins of Life

Publications

Lago I, Black L, Wilfinger M, **Maurer SE**. Synthesis and Characterization of Amino Acid Decyl Esters as Early Membranes for the Origins of Life. *Membranes.* **2022**, *12*, 858.

Foster K, Hillman B, Rajaei V, Seng K, **Maurer SE**. Evolution of Realistic Organic Mixtures for the Origins of Life through Wet-Dry Cycling. *Sci* **2022**, *4*.

Vincent LN, Colón-Santos S, Cleaves II HJ, Baum DA, **Maurer SE** "The Prebiotic Kitchen: A Guide to Composing Prebiotic Soup Recipes to Test Origins of Life Hypotheses" *Life,* **2021,**

Smith HH, Hyde AS, Simkus DN, Libby E, **Maurer SE**, Graham HV, Kempes CP, Sherwood Lollar B, Chou L, Ellington AD, Fricke GM, Girguis PR, Grefenstette NM, Pozarycki CI, House CH, Johnson SS "The Grayness of the Origin of Life" *Life*, **2021,** *11*(6), 498.

Thompson B, Burt K, Lingard K, Lee, A, **Maurer SE** "Partitioning of amino acids and proteins into decanol using phase transfer agents towards understanding life in non-polar liquids" *Scientific Reports*, **2019,** *9*(1) 17750.

Maurer SE, Tølbøl Sørensen K, Iqbal Z, Nicholas J, Quirion K, Gioia M, Monnard PA, Hanczyc MM. "Vesicle Self-Assembly of Monoalkyl Amphiphiles under the Effects of High Ionic Strength, Extreme pH, and High Temperature Environments" *Langmuir* **2018**, *34* (50), 15560–15568.

Maurer SE "The Impact of Salts on Single Chain Amphiphile Membranes and Implications for the Location of the Origin of Life". *Life* **2017**, *7*.

Wamberg MC, Pedersen PL, Löffler PG, Albertsen AN, **Maurer SE,** Nielsen KA, Monnard PA. "Synthesis of Lipophilic Guanine N-9 Derivatives: Membrane Anchoring of Nucleobases Tailored to Fatty Acid Vesicles." *Bioconjug. Chem.* **2017**, *28*, 1893–1905.

Maurer SE & Nguyen G. Prebiotic Vesicle Formation and the Necessity of Salts. *Origins of Life and Evolution of Biospheres*. **2016,** 46, 215-222.

Andersen AA, **Maurer SE**, Monnard PA. "Transmission of photo-catalytic function in a self-replicating chemical system: in situ amphiphile production over two protocell generations." *Chemical Communications* **2014**, 50, 8989.

Cape JL, Edson JB, Spencer LP, DeClue MS, Ziock HJ, **Maurer SE,** Rasmussen S, Monnard PA, Boncella JM, "Phototriggered DNA phosphoramidate ligation in a tandem 5′-amine deprotection/3′-imidazole activated phosphate coupling reaction" *Bioconjugate Chemistry* **2012,** 23(10), 2014-2019.

Maurer SE and Monnard PA. "Primitive membrane formation and function and its role in emergent properties" *Entropy* **2011**, 13(2), 466-484.

Maurer SE, DeClue M, Albertsen A, Dörr M, Ziock HJ, Rasmussen S, Boncella J, Monnard PA. "Interactions between catalyst and structures and their implications for a protocell model" *ChemPhysChem* **2011**, 12(4), 828-835.

Maurer SE & Monnard, PA "Integration of primitive metabolic information and structural protocell components under simulated early Earth conditions" *Astrobiology: Physical Origin, Biological Evolution, and Spatial Distribution* Ed. Hegedus and Csorrka, Nova, **2010**.

Maurer SE, Deamer DW, Boncella JM, Monnard PA. "Chemical evolution of amphiphiles: glycerol monoacyl derivatives stabilize plausible prebiotic membranes" *Astrobiology* **2009**, 9(10), 979-987.

DeClue MS, Monnard PA, Bailey JA, **Maurer SE**, Collis GE, Ziock HJ, Rasmussen S, Boncella JM. "Nucleobase Mediated, Photocatalytic Vesicle Formation from Ester Precursor Molecules" *JACS* **2009**, 131(3), 931-933.

List of external grants awarded between Fall 2013 and Fall 2021

Total awarded: $1,019,550

2023-2025 Molecular Foundations of Biotechnology – National Science Foundation "*Accelerating the Discovery of Novel Liposome Formations with Origins-of-Life Insights, Laboratory Automation, and Machine Learning"* in collaboration with Joshua Schrier, Fordham University $553,131 out of $1,074,218

2022-2023 Heising-Simons Foundation "Enceladus Plume Chemistry: From Lab to Telescope"

$55,000

2020 Connecticut Space Grant Faculty/Student Summer Research "*Development of Heterogenous Abiotic Mixtures and Analysis of Their Potential for Chemical Evolution" $14,000*

2019 National Science Foundation (NSF), in collaboration with Loren Williams, GeorgiaTech "*Collaborative Research, Research Opportunity Award (ROA): Interaction of RNA with phase separated systems to challenge the necessity of water for biopolymer function*" $49,000

2017-2019 NASA Exobiology, "*Energy Transduction and Carbon-Fixation by Membrane-Bound Polycyclic Aromatic Hydrocarbons as an Early Photosynthetic Model*" $201,775

2017 Connecticut Space Grant Faculty/Student Summer Research "*The effect of Membranes on the Polymerization of Amino Acids Under Early Earth Conditions*" $13,000 with Brayden Malley and Rubin Rocha

2017-19 (NSF), "*Collaborative Research: Life Out of Water - Possibility of Evolution in Non-Aqueous Environments"* $133,644

List of Internal grants awarded between Fall 2013 and Fall 2022

Total awarded: $56,172

2022-2023 CSU-AAUP Research Grant *"Reduction of Pyruvate by NAD+ in protocells to inform the formation of metabolisms for the origins of life"* $5000.

2021-2022 CSU-AAUP Research Grant "*Condensation of amino acids and alcohols to form primitive cell membranes for the origins of life*" $4640

2021-2022 CSU-AAUP Research Grant "*The Role of Race, Gender, and Preparation on Student Learning in General Chemistry*" $5150 with Thomas Burkholder

2021-2022 SEST Research Grant "*Investigating Archaeal Membranes as Primitive Cells and Their Evolutionary Significance: A Collaborative Investigation of Knockout Archaea and Their Membrane Composition"* with Jessica Smith (BMS) $8000

2020-2021 CSU-AAUP Research Grant, *"Characterization of heterogenous prebiotic mixtures for the origins of life using FTIR and NMR"*, $4978

2019-2020 CSU-AAUP Research Grant, *"In vitro selection and characterization of hydrophobic RNA",* $3500.

2018 Faculty International Travel Grant from the Center for International Education, "Travel to Life3E: Astrobiology Conference in Quy Nonh, Vietnam" $2000.

2017-18 CSU-AAUP Research Grant, "*Co-evolution of membranes and biopolymers: Improved stability of membranes in the presence of simple biomolecules*" $4947

2016-2017; Faculty-Student Grant, "*Insights into pre-Darwinian evolution through competition and survival between artificial cells*, with Taylor Zaniewski, $500

2016-2017; Faculty-Student Grant, "*Prevention of UV degradation of amino acids using membrane bound absorbers"* with Ruth Bowman and Mi Phan *$650*

2016-17; CSU-AAUP Research Grant, "*Membrane-Assisted Polymerization of Amino Acids*" $4721

2015-16; Faculty-Student Grant, "*The Role of Membrane-Incorporated PAHs on UV-Induced CPD Formation*", with Agata Orlinski (M.S.), $500

2015-16; Faculty-Student Grant "*Fur Secreted Lipid Characterization of RUF vs. Wild type Mus musculus Genotypes*", with Ruth Bowman and Miles Petchler, $703

2015-16; CSU-AAUP Research, "*Reduction of UV Damage to DNA using Membrane-Bound Polycyclic Aromatic Hydrocarbons*", $4896

2014-15; Curriculum Development Grant, "*Development of State-of-the-Art Biochemistry Laboratory Curriculum for Undergraduate Training*", $1600

2014-15; Internal Faculty-Student Grant, *"Analysis of Lipid Membrane Content in Dynamic Environments*", with Leanne Aakjar and Amanda Chamberland, $600

2014-15; CSU-AAUP Research, "*Environmental selection of membrane composition to model chemical evolution on early Earth*", $3787

Invited Presentations

"Amino acid decyl esters as membrane forming amphiphiles for abiogenesis" University of Washington, Astrobiology Seminar Series, 2022.

Keynote: "Prebiotic Self-Assembly and Selection processes for the Origins of Biology" 2021 International Society for the Study of the Origins of Life Meeting, Virtual.

"Protocells from the Prebiotic Soup: Formation and Function" RPI Astrobiology Seminar Series, Fall 2021.

"Simple Hydrophobic Aggregates as Robust Photosynthetic Reaction Centers on Early Earth" GRC: Origins of Life, Galveston TX, 2020.

"First Aggregation, Then Life" Breakthrough Discuss, UC Berkley, 2019.

"The ability of simple membranes to harvest light-energy: proton gradient generation and CO2 reduction" Life3E: Search for Life, ICISE Quy Nhon, Vietnam 2019.

"Formation and characterization of protocells for the origins of life" Biological Chemistry Seminar, Wesleyan University, 2018.

"Prebiotic vesicle formation and the necessity of salts" Late breaking discussion, GRC: Origins of Life, Galveston TX 2016.

"Learning risk taking as a young female scientist" SciX, Providence, RI. 2015.

"Structures on the Edge of Stability" The Israel Society for Astrobiology and the Study of the Origin of Life, Rehovot, Israel 2011.

"The Role of Amphiphile Structures in Self-replicating Chemical Systems" FAS Center for Systems Biology, Harvard University, Boston 2010.

Other Presentations (Presenter listed first, CCSU student denoted with *)

"Vesicle Formation Under Ocean-Like Conditions from Prebiotically Plausible Amphiphiles" Astrobiology Science Conference, Mesa, AZ, 2017.

"Can meteorite aromatics mitigate UV-induced DNA damage" Agata Orlinski*, Sarah E. Maurer. Origins of Life Gordon Research Conference, Galveston, TX, 2016. Poster session.

"Bilayer self-assembly from single-chain amphiphiles during the origins of life" Sarah E. Maurer, National Meeting of the American Chemical Society, Denver, CO, 2015.

"Determination of aggregation equilibrium of fatty acid vesicles using gas chromatography with flame ionization detection" Leanne Aakjar*, Sarah E. Maurer, National Meeting of the American Chemical Society, Denver, CO, 2015.

"Analysis of lipid membrane content in dynamic environments" Amanda Chamberland*, Leanne Aakjar*, Sarah E. Maurer, National Meeting of the American Chemical Society, Denver, CO, 2015.

"Effect of salt concentration on protocell development" Provenzano KP*, Sarah E Maurer, National Meeting of the American Chemical Society, Dallas, TX 2014.

"Analysis of application of interpolation techniques to ultraviolet-visible spectroscopy of critical vesicle concentration" Gunarso Nguyen*, Sarah E. Maurer, National Meeting of the American Chemical Society, Denver, CO, 2015.

"Protocell Morphology During Growth and Division" Oral presentation, Systems Chemistry III, Heraklion, Greece, 2011.

"Why The Flint Protocell Is Unique" Oral presentation, Artificial Life XII: Odense, Denmark 2010.

Professional Service

- 2020-current Review Board Member, *Membranes*
- 2022 Scientific organizing committee member, Astrobiology Science Conference, Atlanta GA
- 2020-current Elected Councilor International Society for the Study of the Origins of Life
- 2018-2022 Steering Committee member: Research Coordination Network for the Origins of Life, National Science Foundation, $500,000 grant; Co-chair in development of a Massive Open Online Course (MOOC) for the Origins of Life
- 2019-2021; Origins of Life MOOC using Complexity Explorer through the Santa Fe Institute to design and implement a free online 7-week course.
- 2019 Conference organization: Astrobiology Science Conference (AbSciCon) Session Convener
- Peer review: Reviewer for NASA grant applications (2017-2018, 2020); Reviewer for Natural Sciences and Engineering Research Council of Canada Fellowship program (2017); Astrobiology Journal (2015-2017); Origins of life and Evolution of the Biosphere Journal (2014-2017); Other Journals by request (PNAS, ChemPhysChem, Cells, eLife)
- Advocating women in science: Participation at the National Meeting of Applied Spectroscopy (SciX in Providence, RI, September 17-24, 2015) in on "Careers and Diversity in Analytical Science Discussion Panel"

Master's Theses advised:

2016, Agata Orlinski, "A Prebiotic Method Toward Mitigation of UVB-Induced DNA Damage, Analyzed Through CPD Quantitation"

University and Departmental Service

- 2022-2024 University Sabbatical Leave Committee Member
- 2022 Organizer for the SEST Education Journal Club
- 2020-current Chairperson of the Council of Academic Chairs
- 2018 Grants Review Committee CSU-AAUP Research Grant Competition; reviewed grants from sister schools; made ultimate funding decisions based on reviewer feedback
- Search committee member for the Dean of the School of Engineering Science and Technology (2018)
- University Research and Creative Achievement Program (URCAP) Coordinator (2017-2019)
- URCAP Judging Organizer (2016-17)
- Library liaison (2013-2017)
- Information Technology Committee (2015-2017)
- Website manager and SEST calendar manager (2013-current), see chemistry.ccsu.edu
- Chemistry Club advisor (2014- current)
- Student and Public Relations committee (2014-2020)
- Instrument and long-range planning committee (2013-2015)
- Search committee member for Department Faculty (2014, 2016, 2021)