Kofi S.S. Christie, Ph.D.

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EDUCATION

Vanderbilt University, Nashville, Tennessee, USA — May 2016 – May 2020
PhD in Environmental Engineering
Advisor: Shihong Lin, PhD
Thesis: *Membrane Distillation for Brine Treatment: Energy Efficiency and Mineral Scaling*

Vanderbilt University, Nashville, Tennessee, USA — Aug 2014 – May 2016
MS in Environmental Engineering

Morehouse College, Atlanta, Georgia, USA — Aug 2011 – May 2014
BS in Physics (cum laude)

PROFESSIONAL EXPERIENCE

Louisiana State University, Baton Rouge, Louisiana, USA — Aug 2022 – Present
Assistant Professor – Department of Civil and Environmental Engineering

Princeton University, Princeton, New Jersey, USA
Postdoctoral Research Fellow – Water and Energy Technologies Lab — Aug 2020 – Aug 2022
Co-Advisors: Z. Jason Ren, PhD (Environmental Engineering) and Rodney Priestley, PhD (Chemical Engineering)

- Developed novel polymer membrane design approaches for greenhouse gas mitigation and resource recovery from wastewater
- Investigated the role of stimuli-responsive materials in water treatment applications
- Tested and analyzed the thermal properties of solar-active hydrogels

C-Salt, Nashville, Tennessee, USA — Jan 2020 – Aug 2021
Co-founder

- Founded industrial wastewater technology company for high-salinity wastewater management
- Secured $50k investment for strategic market analysis and intellectual property procurement
- Forged partnerships with small-scale (10-15 MW) cogen power plant for pilot-scale testing

Vanderbilt University, Nashville, Tennessee, USA — Aug 2014 – May 2020
Graduate Research Assistant – Water, Interfaces, Systems, and Engineering Lab
Advisor: Shihong Lin, PhD

- Developed a new understanding of the impact of polarization, species solubility, and membrane wettability on mineral scaling in membrane distillation
- Developed new intuitive metrics for energy efficiency analysis of membrane distillation
- Investigated a novel in-situ membrane monitoring scheme for membrane distillation via electrical impedance spectroscopy
- Analyzed fouling mechanisms of proteins and organic compounds in ultrafiltration and microfiltration

- Designed and constructed a capacitive deionization suite for the optimization of carbon-based materials in electrochemical desalination

Stanford University, Palo Alto, California, USA May 2013 – Aug 2013
Undergraduate Research Assistant – Environmental Microbiology Lab
Advisor: Julian Damashek, PhD
- Nutrient (N, P, K) analysis and nitrification rate analysis of wastewater effluent

Morehouse College, Atlanta, Georgia, USA Oct 2012 – Aug 2014
Undergraduate Research Assistant – Micro Optics Research and Engineering Lab
Advisors: Willie Rockward, PhD and Thomas Searles, PhD
- Optical device fabrication using low-cost materials
- Development of nanosatellite deployment mechanism for zero-gravity environments

Kyoto University, Kyoto, Japan May 2012 – Aug 2012
Undergraduate Research Assistant – Solid State Spectroscopy Lab
Advisor: Takashi Arikawa, PhD
- Gold nanoparticle analysis for biomedical applications and radiation therapy

PUBLICATIONS

[1] Xu, X., Guillomaitre, N., **Christie, K.S.S.**, Bay, R.K., Bizmark, N., Louf, J., Datta, S.S., Ren, Z.J., Priestley, R.D. (2022). Biomimetic Loofah-Shaped hydrogel with rapid response for solar-driven clean water purification. In preparation.

[2] **Christie, K.S.S.**, McGaughey, A., McBride, S., Xu, X., Stone, H., Priestley, R.D., Ren, Z.J. (2022). Membrane distillation crystallization for sustainable carbon utilization and storage. In preparation.

[3] Xu, X., Bizmark, N., **Christie, K.S.S.**, Datta, S., Ren, Z.J., & Priestley, R.D. (2022). Thermo-responsive polymers for water treatment and collection. *Macromolecules*, *55*(6), 1894-1909. https://doi.org/10.1021/acs.macromol.1c01502

[4] **Christie, K.S.S.**, Horseman, T., Wang, R., Su, C., Tong. T., & Lin, S. (2022). Gypsum scaling in membrane distillation: impacts of temperature and vapor flux. *Desalination*, 525, 115499. https://doi.org/10.1016/j.desal.2021.115499

[5] Horseman, T., Yin, Y., **Christie, K.S.S.**, Wang, Z., Tong, T., & Lin, S. (2021). Wetting, Scaling, and Fouling in Membrane Distillation: State-of-the-Art Insights on Fundamental Mechanisms and Mitigation Strategies. *ACS ES&T Engineering*, *1*(1), 117–140. https://doi.org/10.1021/acsestengg.0c00025

[6] Tang, M., **Christie, K.S.S.**, Hou, D., Ding, C., Jia, X., & Wang, J. (2021). Fabrication of a novel underwater-superoleophobic/hydrophobic composite membrane for robust anti-oil-fouling membrane distillation by the facile breath figures templating method. *Journal of Membrane Science*, *617*, 118666. https://doi.org/10.1016/j.memsci.2020.118666

[7] **Christie, K.S.S.**, Horseman, T., & Lin, S. (2020). Energy efficiency of membrane distillation: Simplified analysis, heat recovery, and the use of waste-heat. *Environment International*, *138*, 105588. https://doi.org/10.1016/j.envint.2020.105588

[8] ***Christie, K.S.S.**, *Yin, Y., Lin, S., & Tong, T. (2020). Distinct Behaviors between Gypsum and Silica Scaling in Membrane Distillation. *Environmental Science and Technology*, *54*(1), 568–576. https://doi.org/10.1021/acs.est.9b06023

[9] Hou, D., **Christie, K.S.S.**, Wang, K., Tang, M., Wang, D., & Wang, J. (2020). Biomimetic superhydrophobic membrane for membrane distillation with robust wetting and fouling resistance. *Journal of Membrane Science*, *599*, 117708. https://doi.org/10.1016/j.memsci.2019.117708

[10] Su, C., Horseman, T., Cao, H., **Christie, K.S.S.**, Li, Y., & Lin, S. (2019). Robust Superhydrophobic Membrane for Membrane Distillation with Excellent Scaling Resistance. *Environmental Science & Technology*. *53* (20), 11801-11809. https://doi.org/10.1021/acs.est.9b04362

[11] Horseman, T., Su, C., **Christie, K.S.S.**, & Lin, S. (2019). Highly effective scaling mitigation in membrane distillation using a superhydrophobic membrane with gas purging. *Environmental Science and Technology Letters*, *6*(7), 423–429. https://doi.org/10.1021/acs.estlett.9b00354

CERTIFICATES

Engineer in Training (EIT), New Jersey – Environmental Engineering Mar 2021

TECHNICAL EXPERIENCE

Graduate Coursework

Chemical Engineering

- Polymer Science and Engineering
- Transport Phenomena
- Advanced Chemical Engineering Thermodynamics
- Electrochemistry: Theory and Analysis
- Mathematical Methods for Chemical Engineers
- Molecular Aspects of Chemical Engineering
- Nanoscale Science and Engineering

Environmental Engineering

- Environmental Separations Processes
- Biological Unit Processes
- Environmental Assessments
- Environmental Chemistry
- Hydrology
- Surface Water Quality Monitoring

Technical Skills

Laboratory

- Polymer film fabrication (NIPS, electrospinning)
- Microscopic analysis (optical, SEM)
- Elemental characterization (XRD, EDX, FTIR)
- Interfacial analysis (goniometry, zeta potential, surface tension)
- Electrochemical analysis (CV, EIS)
- Material strength analysis (stress/strain, modulus)

Computer

- AutoCAD
- Matlab
- PHREEQC
- EC-Lab
- OriginPro
- ImageJ
- Microsoft Office

AWARDS, FELLOWSHIPS, AND DISTINCTIONS

DuPont Growth Opportunities Leading in Diversity Program	2021
Dow Building Engineering & Science Talent Symposium	2021
Princeton Presidential Postdoctoral Research Fellowship	2020
National Science Foundation Innovation Corps Grant	2020
National Science Foundation Graduate Research Fellowship	2015
IBM-Vanderbilt Graduate Student Fellowship	2014
United Negro College Fund Jack H. Skirball Scholarship	2013
Society of Physics Students Quadrennial Conference Poster Award	2012
Morehouse Academic Scholarship	2011

PRESENTATIONS

[1] **Christie, K.S.S.**, Sustainable Membrane-Based Carbon Mineralization (Poster). Association of Environmental Engineering & Science Professors Research and Education Conference, June 28, 2022

[2] **Christie, K.S.S.**, Thomas Horseman, Ruoyu Wang, Chunlei Su, Tiezheng Tong, and Shihong Lin, Gypsum scaling in direct contact membrane distillation: elucidating the impacts of temperature and flux (Poster). 31st North American Membrane Society Annual Meeting, May 14, 2022

[3] **Christie, K.S.S.**, Sustainable Membrane-Based Carbon Mineralization (Oral). American Chemical Society Spring 2022 Conference, March 20, 2022

[4] **Christie, K.S.S.**, Membrane distillation for high salinity brine management: Scaling and energy efficiency (Oral). Carnegie Mellon University, Department of Civil and Environmental Engineering Seminar, March 16, 2021

[5] **Christie, K.S.S.**, Membrane Distillation for Brine Treatment and Resource Recovery (Oral). North Carolina State University, Department of Environmental Science and Engineering Seminar, March 3, 2022

[6] **Christie, K.S.S.**, Membrane Distillation for Brine Treatment and Resource Recovery (Oral). California Institute of Technology, Department of Civil, Construction, and Environmental Engineering - Environmental, Water Resources, and Coastal Engineering Seminar, February 4, 2022

[7] **Christie, K.S.S.**, Membrane Distillation for Brine Treatment and Resource Recovery (Oral). North Carolina State University, Department of Civil, Construction, and Environmental Engineering - Environmental, Water Resources, and Coastal Engineering Seminar, February 4, 2022

[8] **Christie, K.S.S.**, Membrane distillation for high salinity brine management: Scaling and energy efficiency (Oral). Louisiana State University, Department of Civil and Environmental Engineering Seminar, February 3, 2021

[9] **Christie, K.S.S.**, Sustainable Membrane-Based Carbon Mineralization (Oral). Princeton University, Department of Civil and Environmental Engineering Brown Bag Seminar, January 14, 2022

[10] **Christie, K.S.S.**, Sustainable Membrane-Based Carbon Mineralization (Oral). University of Southern California, Department of Civil and Environmental Engineering Seminar, December 2, 2021

[11] **Christie, K.S.S.**, Sustainable Membrane-Based Carbon Mineralization (Poster). Andlinger Center for Energy and the Environment – Annual Meeting, October 27, 2021

[12] **Christie, K.S.S.**, Membrane Technology for a Water-Optimized Tomorrow (Oral). DuPont, GOLD Seminar, NOBCChE Conference, September 17, 2021

[13] **Christie, K.S.S.**, Polymer Membranes for High-Salinity Wastewater Treatment (Oral). Dow, BEST Symposium, August 2, 2021

[14] **Christie, K.S.S.**, Ren, Z.J., Resource recovery from wastewater using membrane crystallization (Oral). Princeton University, Department of Civil and Environmental Engineering Brown Bag Seminar, March 26, 2021

[15] **Christie, K.S.S.**, How to apply for and succeed in grad school (Panelist). Vanderbilt University, GEM Grad Lab, October 17, 2020

[16] **Christie, K.S.S.**, Horseman, T., Koutsoulas, Y., C-Salt: Sink or Swim? Final Report (Oral). National Science Foundation Innovation Corps, Winter Cohort, February 24, 2020

[17] **Christie, K.S.S.**, Tipping the Scale: High Salinity Water Treatment. Vanderbilt University, Department of Civil and Environmental Engineering 3-Minute Thesis Competition, March 22, 2019

[18] **Christie, K.S.S.**, Lin, S., Gypsum Scaling in Membrane Distillation: The Interplay between Flux and Temperature (Poster). North American Membrane Society (NAMS) 27th Annual Meeting, June 9-13, 2018

TEACHING AND MENTORSHIP

Vanderbilt Programs for Talented Youth, Nashville, Tennessee, USA — Jan 2021 – Jun 2021
Course Instructor — Jan 2019 – Apr 2019
- Environmental Engineering: Sustainability from the Sun to the Sea (grades 9-12) — Nov 2017 – Dec 2017
- The Water-Energy Nexus: Engineering Solutions (grades 7-9)
- Reading and Writing in Engineering (grades 5-7)

Austin Peay State University, Clarksville, Tennessee, USA — Apr 2017
Guest Lecturer
- Geology (undergraduate)

School for Science and Math at Vanderbilt, Nashville, Tennessee, USA — Dec 2016 – Dec 2017
Graduate Student Mentor
- Flow-powered UV Disinfection System (one-on-one mentorship with grade 11 student)

Vanderbilt Programs for Talented Youth, Nashville, Tennessee, USA — July 2016 – Jun 2016
Teaching Assistant — July 2017 – Jun 2017
- Nanotechnology and Engineering (grades 9-12)

Vanderbilt University, Nashville, Tennessee, USA — Aug 2014 – May 2015
Teaching Assistant — Aug 2018 – May 2019
- Civil Engineering Senior Design (undergraduate)
- Intro to Civil Engineering Lab (undergraduate)

Morehouse Summer Science Academy, Atlanta, GA, USA — May 2014 – Jun 2014
Teaching Assistant
- Nuclear, Materials Science, and Space Science (grades 5-8)

PROFESSIONAL AFFILIATIONS

Water Environment Federation (WEF)
Association of Environmental Engineering and Science Professors (AEESP)
American Chemical Society (ACS)
National Organization of Black Chemists and Chemical Engineers (NOBCChE)
North American Membrane Society (NAMS)
National Society of Black Engineers (NSBE)

REVIEWER SERVICE

ACS ES&T Engineering
Environmental Science & Technology
Environmental Science: Water Research and Technology
Journal of Cleaner Production