

**Samantha A.
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Ph.D. candidate passionate about water/sustainability technology, space, and using art and video to foster interest in science. Seeking research opportunities in the fields of fluid mechanics, physiochemical separation processes, water treatment, and self-assembly.

RESEARCH INTERESTS

- ◇ New technologies for **water treatment** and **desalination**
- ◇ Organic and inorganic **crystallization** and self-assembly
- ◇ Recovery of chemical products and energy from **waste streams**
- ◇ Effect of **fluid flow** on chemical kinetics, especially at interfaces and boundary layers

EDUCATION

Ph.D. Mechanical Engineering, Massachusetts Institute of Technology (MIT)	Expected 2019
Thesis: Interfacial crystallization for environmental engineering	GPA: 4.6/5.0
M.S. Chemical Engineering, Rensselaer Polytechnic Institute (RPI)	2015
Thesis: Effect of shear and structure on amyloid fibrillation	GPA: 3.9/4.0
B.S. Environmental Engineering, University of Nevada, Reno (UNR)	2013
Summa Cum Laude	GPA: 4.0/4.0

RESEARCH EXPERIENCE

- Ionic Materials, Woburn MA** **Jan 2018**
Project: Investigated the possibility of using a solid-state electrolyte as an ion exchange membrane for **electrochemical desalination** via theoretical and experimental methods
Related Skills: Electrochemistry, membrane preparation, economic analysis, consulting
- Varanasi Research Group, MIT** **Sep 2015-Current**
Projects: Anti-scaling surface technology for desalination and oil/gas, relating substrate properties to **crystal** nucleation, surface engineering to recover struvite from **wastewater**, reducing **biofouling** on membranes, assembly of crystalline **patterns** from evaporating drops
Related Skills: Surface functionalization, nanoengineering, lithography, clean room fabrication, optical microscopy, Scanning Electron Microscopy (SEM), video editing, water chemistry, experiment design/construction, X-ray Spectroscopy (XPS)
- Hirsa Research Group, RPI** **Nov 2013-Aug 2015**
Project: Effect of Taylor-Couette shear on protein degradation and amyloid formation, protein adsorption at hydrophobic interfaces, design of a microgravity drop experiment
Related Skills: Protein crystallization, atomic force microscopy, circular dichroism, spectrophotometry, **microgravity fluids** engineering, machining and experiment design, fluid mechanics and solutions of Navier-Stokes, surface shear viscometry
- Environmental Chemistry Group, Leuphana Universität Lüneburg** **May 2013-July 2013**
Project: Material analysis for sustainable hygroscopic thermal batteries
Related Skills: thermogravimetric analysis (TGA), literature review, crystal structure-property relations, international collaboration
- Kolodziej Research Group, UNR** **May 2011-May 2013**
Project: Environmental transport of hormones from livestock run-off to surface water
Related Skills: LCMS and GCMS, equilibrium partitioning analysis, absorption/desorption kinetics, environmental fate and transport, microbial reduction of pollutants, redox chemistry, liquid-liquid extraction, water chemistry

AWARDED GRANTS

Martin Sustainability Fellowship, Author, Advised by Kripa Varanasi	2018
Proposal: Interfacial Engineering for Struvite Recovery from Wastewater	
Award Value: \$78,000	
NSF GRFP, Author, Advised by Amir Hirsa and Kripa Varanasi	2015
Proposal: Relating Crystallization Kinetics and Hydrophobic Interfaces	
Award Value: \$138,000 over 3 years	
NASA Flight Opportunities, Co-Author, PI: Amir Hirsa	2015
Proposal: Droplet Pinning in Microgravity	
Award Amount: \$79,000	
NSF EPSCOR Summer Research Grant, Author, Advised by Edward Kolodziej	2011
Proposal: Determination of a Sorption Mechanism for 17 β Trenbolone to Humic Acids	
Award Amount: \$5,500	

PUBLICATIONS

- ◇ **McBride, S.A.,** Dash, S., Khan, S., Varanasi, K.K. Crystallization of Spirals from Drops. Submitted to *Nature Communications*, summer **2018**.
- ◇ Zea, L., Nisar, Z., Rubin, P., Cortesao, M., Luo, J., **McBride, S.A.,** Moeller, R., Klaus, D., Mueller, D., Varanasi, K.K., Muecklich, F., Stodieck, L. Design of a spaceflight biofilm experiment. *Acta Astronautica*, **2018**.
- ◇ **McBride, S.A.,** Dash, S., Varanasi, K.K. Evaporative Crystallization in Drops on Superhydrophobic and Liquid Impregnated Surfaces. *Langmuir*, accepted April **2018**. Selected for Cover Artwork (October 2018 issue).
- ◇ Balarj, V.S., Zeng, P.C.H., Sanford, S.P., **McBride, S.A.,** Raghunadandan, A., Lopez, J.M., Hirsa, A.H. Surface Shear Viscosity as a Macroscopic Probe of Amyloid Fibril Formation at a Fluid Interface. *Soft Matter*, **2017**.
- ◇ Gulati, S., Raghunandan, A., Rasheed, F., **McBride, S.A.** Hirsa, A.H. Ring-Sheared Drop (RSD): Microgravity Module for Containerless Flow Studies. *Microgravity Science and Technology*, **2016**.
- ◇ **McBride, S.A.,** Sanford, S.P., Lopez, J.M., Hirsa, A. Shear-Induced Amyloid Fibrillization: the role of Inertia. *Soft Matter*, **2016**.
- ◇ **McBride, S.A.,** Tilger, C., Sanford, S., Tessier, P., Hirsa, A. Comparison of Human and Bovine Insulin Fibrillization under Uniform Shear. *Journal of Physical Chemistry B*, **2015**.
- ◇ Cole, E.A., **McBride, S.A.,** Marchand, E.A., Kolodziej, E.P. Rates and Product Identification for Trenbolone Acetate Metabolite Biotransformation under Aerobic Conditions. *Environmental Toxicology and Chemistry*, **2015**.

CONTRIBUTED PRESENTATIONS

- ◇ **McBride, S.A.,** Dash, S., Khan, S., Varanasi, K.K. Spirals from Drops. 256th American Chemical Society National Meeting, **Aug 2018**.
- ◇ **McBride, S.A.,** Munoz-Abujder, R.R.R., Putman, E., Bhaskar, R., Lopez-Camara, C.F., Helmig, J. A Space Science Curriculum to Initiate Student Interest in STEM. International Space Station Research and Development Conference, **July 2018**.
- ◇ **McBride, S.A.,** Dash, S., Khan, S., Varanasi, K.K. Crystalline desiccation patterns and film break up from evaporation drops on superhydrophobic oxide surfaces. American Physical Society Division of Fluid Mechanics 70th Annual Conference, **Nov 2017**.

- ◇ **McBride, S.A.**, Varanasi, K.K. Influence of Gravitational Orientation and Convection on Desiccation Patterns. American Society for Gravitational and Space Research 33rd Annual Meeting, **Oct 2017**.
- ◇ **McBride, S.A.**, Dash, S., Khan, S., Varanasi, K.K. Interfacial Engineering for Suppressing Scale Formation. The Materials Society: Energy Materials 2017, **March 2017**.
- ◇ **McBride, S.A.**, Dash, S., Varanasi, K.K. Crystal Deposition Patterns from Evaporating Sessile Drops on Superhydrophobic and Liquid Impregnated Surfaces. American Physical Society Division of Fluid Mechanics 69th Annual Conference, **Nov 2016**.
- ◇ **McBride, S.A.**, Sanford, S.P., Lopez, J., Hirsra, A. Probing the Biophysics behind Flow-Induced Amyloid Crystallization. American Physical Society Division of Fluid Mechanics 68th Annual Conference, **Nov 2015**.
- ◇ **McBride, S.A.** Water Separations: Challenges Separating Water in Space. American Society for Gravitational and Space Research 31st Annual Meeting, **Oct 2015**.
- ◇ **McBride, S.A.**, Tilger, C., Sanford, S., Hirsra, A. Effect of Hydrophobic Residues on Interfacial Fibrillization Kinetics. Poster, Biophysical Society 59th Annual Meeting, **Feb 2015**.
- ◇ **McBride, S.A.**, Tilger, C., Hirsra, A., Lopez, J. Self-assembly of protein fibrils in stable circular Couette flow. American Physical Society Division of Fluid Mechanics 67th Annual Conference, **Nov 2014**.
- ◇ **McBride, S.A.**, Tilger, C., Lopez, J., Hirsra, A. Ring Sheared Drop Experiment for the Study of Amyloid Fibrils in Microgravity. 30th American Society for Gravitational and Space Research 30th Annual Meeting, **Oct 2014**.
- ◇ **McBride, S.A.**, Tilger, C., Lopez, J., Hirsra, A. Development of Ring Shear Apparatus for Study of Amyloid formation in microgravity. Poster, International Space Station Research and Development Conference, **June 2013**.
- ◇ **McBride, S.A.** Open-Cycle Desalination. Paper and Presentation compiled for ASCE mid-pacific international Water Research competition. Awarded second place. **April 2013**
- ◇ **McBride, S.A.**, Kolodziej, E.P. Determination of Sorption Mechanisms for 17 β -Trenbolone. Poster. Nevada Water Environment Association Annual Conference, **April 2012**.

INVITED PRESENTATIONS and PANELS

- ◇ Panelist and Moderator for Student Space Researcher Panel, International Space Station Research and Development Conference, **July 2018**.
- ◇ Presented on panel titled "Exciting the Next Generation of Scientists and Engineers through the International Space Station," International Space Development Conference, **May 2017**.
- ◇ Water Engineering in Space and on Earth. Presented as part of a panel on capitol hill titled "Scientists Bringing International Space Station Research Down to Earth," **April 2016**.
- ◇ Meet the Scientists. Panel presentation for high school students, at the American Society for Gravitational and Space Research, **Oct 2015**.
- ◇ Treating Water Using Household Items and Limited Resources. Presentation to RPI student Body, hosted by Engineers for a Sustainable World, **Oct 2014**.

TEACHING EXPERIENCE

Instructor, MIT High School Summer Program

2018

Course: Microgravity and Space Science

Duties: Designed curriculum translating recent developments in microgravity science to a middle school level which incorporated videos, hands-on activities, and interactive questions. Presented to audience of 6-12th grade students during a two-hour lecture.

- Participant, MIT Kaufman Teaching Certificate Program** 2018
Program: The KTCP is designed to instruct future faculty in designing and facilitating university courses. Assignments included writing a syllabus, constructing effective problem sets and exams, and researching/understanding modern theories on teaching/learning.
- Seminar Lecturer, Nordakademie University of Applied Sciences** 2016
Course: Environmental Business
Duties: Prepared and presented two-day seminar course regarding the business/economic aspects of environmental science and engineering. Awarded honorarium by the University, and received 97% positive feedback from student evaluations.
- Teaching Assistant, University of Nevada, Reno** 2012
Course: Environmental Quality Analysis
Duties: Assisted in curriculum development and organization of laboratory schedule, managed and prepared experiments, equipment, and chemicals, guided students in nutrient and contaminant analysis experiments.
- Fluid Mechanics Tutor, University of Nevada, Reno** 2012
Duties: Prepared example problem sets related to course homework, presented the problems and solutions in a weekly classroom setting.

LEADERSHIP

- Student President, American Society for Gravitational and Space Research** 2015-2018
 Led a team of 25 other students in a national club dedicated to microgravity research. Organized two science advocacy trips to D.C., presented at a congressional panel and educational panels, organized outreach activities at local schools, science fairs, and conferences; built a website for student group, wrote chapter by-laws, organized fundraising efforts resulting in the largest club budget to date, and organized/emceed conference events and astronaut presentations.
- MIT Water Club Vice President** 2017-2018
 Organized monthly seminar series on topics related to water research, organized and served as panel moderator for MIT's 2017 Water Summit on water/agriculture nexus, volunteered at Water Innovation Prize events, helped organize the 2018 MIT Water Night which had 200+ attendees, and served as a judge for the 2018 Junior Stockholm Water Competition.
- Troy Sponsor-a-Scholar Program Mentor** 2014-2015
 Participated in a program that helps low income students with strong academic records stay on track, met with student mentee once a week to discuss homework and college plans.
- Engineers for a Sustainable World at RPI** 2014-2015
 Assisted undergraduate leaders in fundraising, presented during monthly meetings, and helped design a solar charger for a village in Haiti.
- Water Treatment Team Captain at UNR** 2011-2013
 Organized teams of students to compete in the Water Treatment Competition at the Annual Mid-Pacific Regional ASCE Student Conference, developed various water quality protocols to rapidly characterize and modify a sample's pH, conductivity, metal content, and nutrient content. Wrote technical reports for the 2012 and 2013 competitions; Report placed 2nd out of 14 participating schools in 2012 and 3rd of 11 schools in 2013.
- ASCE Student Body Secretary at UNR** 2012-2013
 Promoted and arranged 12+ guest speaker events, industrial tours, and student meetings. Wrote the student branch annual report that resulted in the chapter's first Certificate of Commendation from the national committee, recorded meeting minutes and organized schedules.

AWARDS and HONORS

◇ Martin Sustainability Fellow	2018
◇ NSF Graduate Fellow	2015
◇ ASGSR Travel Award	2014 & 2015
◇ Rensselaer Graduate Fellowship (<i>one of 15 from 4000 applicants</i>)	2013
◇ Tau Beta Pi National Fellowship (<i>Deuchler Fellow No. 33</i>)	2013
◇ ASCE Water Research Competition 2nd place (<i>Open Cycle Desalination</i>)	2013
◇ ASCE College of Engineering Outstanding Service Award	2012 & 2013
◇ NSF EPSCoR Summer Research Grant	2012
◇ Coulter Foundation Engineering Scholarship	2011
◇ Millennium Scholarship	2009

PROGRAMS, LANGUAGES, and LAB EQUIPMENT

Programs: AutoCAD, MATLAB, Excel, HTML design

Programming: MATLAB, FORTRAN

Languages: English (native), Advanced German

Microscopy: Optical, atomic force (AFM), scanning electron (SEM)

Fabrication: Photolithography, Reactive Ion Etch (RIE), basic cleanroom protocols, Laser cutting, Vertical mill and other machining

Analysis: Liquid/gas chromatography tandem mass spectroscopy (GCMS, LCMS), gravimetric analysis (TGA), Circular dichroism (CD), X-ray Diffraction (XRD), X-ray Spectroscopy (XPS), colorimetric spectroscopy for water analysis

PROFFESIONAL MEMBERSHIPS

- ◇ American Chemical Society
- ◇ American Society for Gravitational and Space Research (ASGSR)
- ◇ American Physical Society, Division of Fluid Dynamics
- ◇ Water Environment Federation
- ◇ Tau Beta Pi Engineering Honor Society