

RYAN M. DUCHANOIS

EDUCATION

2017–Present	Yale University New Haven, CT, USA Ph.D. Candidate in Chemical & Environmental Engineering M.Phil. in Chemical & Environmental Engineering M.S. in Chemical & Environmental Engineering	Exp. Graduation: Fall 2022
2016–2017	University of Cambridge Darwin College, Cambridge, UK M.Phil. in Engineering for Sustainable Development	
2012–2016	University of Arkansas Fayetteville, AR, USA B.S. in Civil Engineering, Honors, <i>summa cum laude</i>	

RESEARCH EXPERIENCE

Ph.D. Researcher NSF Graduate Research Fellow Yale University (Advisor: Menachem Elimelech)	Aug. 2017–Present
<ul style="list-style-type: none">· Engineering membranes for water purification, resource recovery, and energy conversion applications· Developing sub-nm porous membranes that selectively transport an ion using host-guest chemistry	
Master's Student Gates Cambridge Scholar University of Cambridge (Advisor: Richard Fenner)	Sept. 2016–Aug. 2017
<ul style="list-style-type: none">· Conducted statistical analyses on nationally representative data sets in Stata to identify factors inhibiting continuity of water sources in low and middle-income countries	
Undergraduate Honors Researcher University of Arkansas (Advisor: Wen Zhang)	Sept. 2014–May 2016
<ul style="list-style-type: none">· Used <i>in vitro</i> assays to determine toxicity of endocrine-disrupting compounds in wastewater effluents	
Research Intern US EPA Greater Research Opportunity (GRO) Fellow US EPA Office of Research and Development, Corvallis, OR (Advisor: Paul Mayer)	June 2015–Aug 2015
<ul style="list-style-type: none">· Tested and evaluated engineering properties of soils utilized for green roofs	
Research Assistant NSF Research Experience for Undergraduates (REU) University of Virginia, Limpopo, South Africa (Advisor: James Smith)	June 2014–Aug. 2014
<ul style="list-style-type: none">· Tested efficacy of silver-impregnated ceramic tablets and filters in villages in South Africa· Piloted focus group research in villages for the maintenance and use of each technology	

AWARDS AND HONORS

2020	American Water Works Association Abel Wolman Fellow
2020	3 rd Place, Applications Poster Competition, North American Membrane Society Conference
2019	American Water Works Association Scholarship, Connecticut Chapter
2017	Water Conservators Best M.Phil. Dissertation Prize
2017	Yale University Sheffield Fellowship
2016	National Science Foundation Graduate Research Fellowship
2016	Gates Cambridge Scholarship
2016	University of Arkansas College of Engineering Outstanding Senior (Valedictorian)
2016	University of Arkansas Class of 2016 Razorback Classic (Top 8 of Graduating Class)
2016	University of Arkansas Civil Engineering Outstanding Senior
2015	University of Arkansas Class of 2016 Senior of Significance

2015	University of Arkansas College of Engineering Presidential Scholar
2014	Environmental Protection Agency Greater Research Opportunity Fellowship
2014	Chi Epsilon, Civil Engineering Honor Society, 57 th Chapter
2014	University of Arkansas Civil Engineering Outstanding Sophomore
2014	National Science Foundation Research Experience for Undergraduates Scholar
2012	University of Arkansas Chancellor's Scholarship
2012	Arkansas Governor's Distinguished Scholarship

TEACHING AND MENTORING EXPERIENCE

Teaching

- Co-Instructor** | Engineering Our Sustainable Future, Yale Pathways to Science July 2020–July 2020
 · Developed and taught a 3-day course about climate science and renewable energy for 15 high school students
- Teaching Fellow** | Environmental Engineering, Yale University Aug. 2018–May 2020
 · Responsible for teaching students in a small group setting and grading papers of two graduate-level courses
 · 100% of students reported their overall assessment of me was “very good” or “excellent”
- Certificate for College Teaching Preparation** | Yale University Aug. 2018–Present
 · Completed 40-hour teaching program geared to train effective teachers at the university-level

Graduate Research Mentoring

- [2] Lauren Mazurowski (Aug. 2021–Present)
 · Project: “Precise Ion Separations in Electrodialysis Using Multilayered Polymer Membranes”
 · Affiliation: Ph.D. Student, Yale University
- [1] Brielle Januszewski (Aug. 2020–Present)
 · Project: “Monovalent Ion Recovery Using Polyelectrolyte Multilayer Nanofiltration Membranes”
 · Affiliation: Ph.D. Student, Yale University

Undergraduate Research Mentoring

- [2] Jason Yang (Feb. 2019–Jan. 2020)
 · Project: “Highly Precise Ion Separations with Polymeric Membranes via Host–Guest Chemistry”
 · Awards: Goldwater Fellowship, National Science Foundation Graduate Research Fellowship
 · Affiliation: Ph.D. Student, California Institute of Technology
- [1] Janvi Trivedi (Aug. 2018–May 2020)
 · Project: “Controlling Pore Structure of Polyelectrolyte Multilayer Nanofiltration Membranes by Tuning Polyelectrolyte–Salt Interactions”
 · Affiliation: Associate, PDT Partners

PROFESSIONAL LEADERSHIP AND SERVICE

Professional Societies and Licensure

- Association of Environmental Engineering & Science Professors (AEESP)
- North American Membrane Society (NAMS)
- American Chemical Society (ACS)
- American Membrane Technology Association (AMTA)
- Order of the Engineer
- American Institute of Chemical Engineers (AIChE)
- Chi-Epsilon Civil Engineering Honor Society
- American Society of Civil Engineers (ASCE)
- Engineer in Training (AR 2016)
- American Water Works Association (AWWA)

- Membrane Technology Research Committee Member July 2020–Present
- American Society of Civil Engineers
- University of Arkansas Student Chapter President Apr. 2014–May 2016

University Service

- Vice President | NSF Research Center for Nano-Enabled Water Treatment (NEWT) July 2019–Present
- Supervises a leadership committee that organizes 5 outreach and professional development events per year
- Graduate Fellowship Affiliate | Yale University Oct. 2017–Present
- Supporting Yale undergraduates in preparing for interviews for nationally-competitive awards
- Faculty Board Student Representative | Univ. of Cambridge Engineering Department Nov. 2016–Aug. 2017
- Student Council Member | Univ. of Arkansas College of Engineering Aug. 2014–May 2015

Conferences and Symposiums

- Organizing Member and Panel Coordinator | Equity in the Job Search Symposium Jan. 2019–Present
- Spearheads an annual panel on mentorship relationships across racial & gender lines (100–200 attendees)
- Environmental Engineering Recruitment Committee | Yale University Dec. 2017–Mar. 2018
- Organized recruitment weekend for prospective Ph.D. students in the department

Outreach

- Volunteer | Yale Pathways to Science Mar. 2019–Present
- Hosting events for middle and high school students to learn about water treatment and renewable energy
- Mentor | STEM Mentors at Yale Oct. 2017–Present
- Assisting local high school students in preparing college applications in STEM fields

CONSULTING AND PROFESSIONAL PRACTICE

- Razzberry Inc.** | New Haven, CT, USA Aug. 2019–Dec. 2019
- Tested the performance of electrochemical sensors and provided a technical report to a venture capital firm
- Mott MacDonald** | Cambridge, UK Jan. 2017–May 2017
- Conducted financial analysis of service delivery models in Timor-Leste and orally presented results to client
- Garver Water Design Center** | Fayetteville, AR, USA May 2016–Aug. 2016
- Built a cost estimating tool to improve speed and accuracy of cost forecasting in engineering projects

GRANT PROPOSAL EXPERIENCE

Lead Author | *Selective Transport of Divalent Cations in Polymeric Membranes Using Host-Guest Chemistry*. Submitted to National Science Foundation (NSF) and US-Israel Binational Science Foundation (BSF). November 2020. Principal Investigator: Menachem Elimelech. Funded.

Contributor | *Materials and Processes for Selective Removal of Scale-Forming Ions*. Submitted to Nanotechnology-Enabled Water Treatment Engineering Research Center. March 2020. Principal Investigator: Rafael Verduzco.

Contributor | *Sensors for Water Contaminant Detection and Monitoring*. Submitted to National Institute of Health. December 2018. Principal Investigator: Menachem Elimelech.

PUBLICATIONS

H-index: 7 Total Citations: 220

Published

- [10] Zuo, K., Wang, K., **DuChanois, R.M.**, Fang, Q., Deemer, E.V., Huang, X., Abdallah, I., Xin, R., Walker, W.S., Lou, J., Elimelech, M., Huang, X., Li, Q. “Selective membranes in water and wastewater treatment: Role of advanced materials,” *Materials Today*. **2021**. *In press*. DOI: 10.1016/j.mattod.2021.06.013

- [9] **DuChanois, R.M.**, Porter, C.J., Violet, C., Verduzco, R., Elimelech, M. “Membrane Materials for Selective Ion Separations at the Water-Energy Nexus,” *Advanced Materials*. **2021**. 2101312. DOI: 10.1002/adma.202101312
- [8] Yao, Y., Zhang, P., Jiang, C., **DuChanois, R.M.**, Zhang, X., Elimelech, M. “High performance polyester reverse osmosis desalination membrane with chlorine resistance,” *Nature Sustainability*. **2021**. 4, 138-146. DOI: 10.1038/s41893-020-00619-w
- [7] Wang, L., Violet, C., **DuChanois, R.M.**, Elimelech, M. “Derivation of the Theoretical Minimum Energy of Separation of Desalination Processes,” *Journal of Chemical Education*. **2020**. 97 (12), 4361-4369. DOI: 10.1021/acs.jchemed.0c01194
- [6] Epsztein, R., **DuChanois, R.M.**, Ritt, C.L., Noy, A., Elimelech, M. “Towards single-species selectivity of membranes with sub-nanometre pores,” *Nature Nanotechnology*. **2020**. 15, 426-436. DOI: 10.1038/s41565-020-0713-6
- [5] Sigurðardóttir, S.B., **DuChanois, R.M.**, Epsztein, R., Pinelo, M., Elimelech, M. “Energy barriers to anion transport in nanofiltration membranes: Role of intra-pore diffusion,” *Journal of Membrane Science*. **2020**. 603, 117921. DOI: 10.1016/j.memsci.2020.117921
- [4] Bollman, M., DeSantis, G., **DuChanois, R.M.**, Etten-Bohm, M., Olszyk, D., Lambrinos, J., Mayer, P. “Optimizing hydrologic performance of green roof media,” *Ecological Engineering*. **2019**. 140, 105589. DOI: 10.1016/j.ecoleng.2019.105589
- [3] **DuChanois, R.M.**, Liddle, L., Fenner, R., Jeuland, M., Evans, B., Cumming, O., Zaman, R. U., Mujica-Pereira, A.V., Ross, I., Gribble, M.O., Brown, J. “Factors Associated with Continuous Water Services for the Rural Populations of Bangladesh, Pakistan, Ethiopia, and Mozambique,” *Environmental Science & Technology*. **2019**, 53 (8), 4355-4363. DOI: 10.1021/acs.est.8b07173
- [2] **DuChanois, R.M.**, Epsztein, R., Trivedi, J.A., Elimelech, M., “Controlling pore structure of polyelectrolyte multilayer nanofiltration membranes by tuning polyelectrolyte–salt interactions,” *Journal of Membrane Science*. **2019**, 581, 413-420. DOI: 10.1016/j.memsci.2019.03.077
- [1] Liu, J., Cheng, S., Cao, N., Geng, C., He, C., Shi, Q., Xu, C., Ni, J., **DuChanois, R.M.**, Elimelech, M., Zhao, H. “Actinia-like multifunctional nanocoagulant for single-step removal of water contaminants,” *Nature Nanotechnology*. **2019**, 14 (1), 64-71. DOI: 10.1038/s41565-018-0307-8

Submitted/Under review/In press

- [3] Ritt, C.L., Stassin, T., Davenport, D.M., **DuChanois, R.M.**, Nulens, I., Yang, Z., Segev-Mark, N., Ben-Zvi, A., Elimelech, M., Tang, C.Y., Ramon, G.Z., Vankelecom, I.F.J., Verbeke, R. “The Open Membrane Database: synthesis–structure–performance relationships of reverse osmosis membranes,” *Journal of Membrane Science*. **2021**. *Under review*.
- [2] Porter, C.J., **DuChanois, R.M.**, MacDonald, E., Kilpatrick, S.M., Zhong, M., Elimelech, M. “Tethered electrolyte active-layer membranes,” *Journal of Membrane Science*. **2021**. *Under review*.
- [1] **DuChanois, R.M.**, Heiranian, M., Yang, J., Porter, C.J., Zhang, X., Verduzco, R., Elimelech, M. “Highly precise ion separations with polymeric membranes via host-guest chemistry,” **2021**. *In preparation*.

SEMINARS AND CONFERENCE PRESENTATIONS

Oral

- [6] **DuChanois, R.M.**, Heiranian, M., Yang, J., Porter, C.J., Verduzco, R., Elimelech, M. “Ion-selective membranes for resource recovery: Utilizing facilitated transport,” *American Chemical Society Meeting*. August 2021. Virtual.
- [5] **DuChanois, R.M.**, Heiranian, M., Yang, J., Porter, C.J., Verduzco, R., Elimelech, M. “Highly Precise Ion Separations via Polymeric Membranes with Host–Guest Chemistry,” *North American Membrane Society Conference*. August 2021. Estes Park, CO.

- [4] **DuChanois, R.M.**, Epsztein, R., Trivedi, J.A., Elimelech, M. “Controlling Pore Structure of Polyelectrolyte Multilayer Nanofiltration Membranes by Tuning Polyelectrolyte–Salt Interactions,” *Northeast Graduate Student Water Symposium*. September 2018. Amherst, MA.
- [3] **DuChanois, R.M.**, Liddle, L., Fenner, R., Jeuland, M., Evans, B., Cumming, O., Zaman, R.U., Mujica-Pereira, A.V., Ross, I., Gribble, M.O., Brown, J. “Factors Associated with Continuous Water Services for the Rural Populations of Bangladesh, Pakistan, Ethiopia, and Mozambique,” *Engineering for Sustainable Development Dissertation Conference*. July 2017 and 2018. Cambridge, UK.
- [2] **DuChanois, R.M.**, Smith, J. “Evaluation of Ceramic Water Filter and MadiDrop Point-of-Use Water Treatment Technologies in South Africa,” *Recent Developments in Science, Engineering, and Technology*. October 2015. Delhi, India.
- [1] **DuChanois, R.M.**, Zhang, W. “Endocrine Disruptors in Wastewater Streams: A Toxicity Study,” *Arkansas Water Works and Water Environment Association Conference*. May 2015. Hot Springs, AR.

Poster

- [10] **DuChanois, R.M.**, Heiranian, M., Yang, J., Porter, C.J., Verduzco, R., Elimelech, M. “Facilitated Transport Mechanisms for Resource Recovery with Ion-Selective Polymeric Membranes,” *Nanotechnology-Enabled Water Treatment Annual Meeting*. May 2021. Virtual.
- [9] **DuChanois, R.M.**, Yang, J., Porter, C.J., Verduzco, R., Elimelech, M. “Selective Ion Transport Through Polyelectrolyte Multilayer Membranes Using Host–Guest Chemistry,” *Nanotechnology-Enabled Water Treatment Industry/Practitioner Advisory Board Meeting*. October 2020. Virtual.
- [8] **DuChanois, R.M.**, Sigurðardóttir, S.B., Epsztein, R., Pinelo, M., Elimelech, M. “Controlling Pore Structure of Polyelectrolyte Multilayer Nanofiltration Membranes for Selective Ion Removal,” *North American Membrane Society Conference*. May 2020. Virtual. **3rd place, applications poster competition.**
- [7] **DuChanois, R.M.**, Sigurðardóttir, S.B., Yang, J., Epsztein, R., Verduzco, R., Elimelech, M. “Tuning Polyelectrolyte Multilayer Nanofiltration Membranes for Selective Ion Transport,” *Nanotechnology-Enabled Water Treatment Annual Meeting*. May 2020. Virtual.
- [6] **DuChanois, R.M.**, Epsztein, R., Trivedi, J.A., Elimelech, M. “Controlling Pore Structure of Polyelectrolyte Multilayer Nanofiltration Membranes by Tuning Polyelectrolyte–Salt Interactions,” *Environmental Nanotechnology Gordon Research Seminar and Conference*. June 2019. Newry, ME.
- [5] **DuChanois, R.M.**, Cheng, W., Epsztein, R., Trivedi, J., Verduzco, R., Elimelech, M. “Tuning Polyelectrolyte Multilayer Nanofiltration Membranes for Selective Removal of Divalent Cations,” *Nanotechnology-Enabled Water Treatment Annual Meeting*. May 2019. Rice University. Houston, TX.
- [4] **DuChanois, R.M.**, Liddle, L., Fenner, R., Jeuland, M.A., Evans, B., Cumming, O., Zaman, R.U., Mujica-Pereira, A.V., Ross, I., Gribble, M., Brown, J. “Identifying Factors Associated with Continuous Water Services for the Rural Populations of Bangladesh, Pakistan, Ethiopia, and Mozambique,” *Water and Health Conference: Where Science Meets Policy*. October 2018. University of North Carolina Chapel Hill. Chapel Hill, NC.
- [3] **DuChanois, R.M.**, Epsztein, R., Elimelech, M. “Controlling Pore Structure of Polyelectrolyte Multilayer Nanofiltration Membranes by Tuning Polyelectrolyte–Salt Interactions,” *Nanotechnology-Enabled Water Treatment Industry/Practitioner Advisory Board Meeting*. October 2018. Yale University. New Haven, CT.
- [2] **DuChanois, R.M.**, Epsztein, R., Trivedi, J.A., Elimelech, M. “Controlling Pore Structure of Polyelectrolyte Multilayer Nanofiltration Membranes by Tuning Polyelectrolyte–Salt Interactions,” *Membranes: Materials and Processes Gordon Research Seminar and Conference*. August 2018. New London, NH.
- [1] **DuChanois, R.M.**, Zhang, W. “Endocrine Disruptors in Wastewater Streams: A Toxicity Study,” *Membrane Applied Science and Technology Conference*. October 2015. Fayetteville, AR.

MEDIA COVERAGE

[Membrane Processes](#), Podcast Episode, University of Pittsburgh, 2021

[Student Spotlight: Highly selective membrane filtration](#), *International Filtration News*, 2020
[How swimsuit material inspired the ‘holy grail’ of water filtration](#), *Yale News*, 2020
[Nature provides inspiration for researchers developing selective membranes](#), *Jerusalem Post*, 2020
[A new way to keep city water clean](#), *National Geographic*, 2019
BBC World Service Radio, 2018
[Drink Safely with Biomimetic Technology](#), *Nature Nanotechnology*, 2018
[Biomimetic Coagulant makes water safe to drink](#), *Physics World*, 2018
[A water treatment breakthrough, inspired by a sea creature](#), *Science Daily*, 2018
[Sea anemone—inspired particles clean wastewater](#), *Chemical & Engineering News*, 2018
[Single-Step Water Treatment with a Multi-Functional Biomimetic Nanocoagulant](#), *Nature Research Sustainability Community*, 2018
[Ryan DuChanois](#), University of Arkansas, 2016
[U of A Honors Civil Engineering Student Named Gates Cambridge Scholar](#), University of Arkansas, 2016