

# RYAN M. DUCHANOIS

## CONTACT

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## ADDRESS

6100 Main St., MS 362  
Houston, TX 77005

## WEBPAGES

[Google Scholar](#)  
[Website](#)

## ACADEMIC APPOINTMENTS

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2023–Present     **Rice Academy Postdoctoral Fellow**  
Rice University  
Department of Chemical and Biomolecular Engineering  
Advisor: Haotian Wang

## EDUCATION

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2017–2022     **Yale University**  
Ph.D. in Chemical & Environmental Engineering  
M.Phil. in Chemical & Environmental Engineering  
M.S. in Chemical & Environmental Engineering  
Advisor: Menachem Elimelech

2016–2017     **University of Cambridge**  
M.Phil. in Engineering for Sustainable Development  
Advisor: Richard Fenner

2012–2016     **University of Arkansas**  
B.S. in Civil Engineering  
Honors, *summa cum laude*  
Advisor: Wen Zhang

## AWARDS AND HONORS

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2023     Finalist, Schmidt Science Fellowship  
2022     Junior Fellow, Rice University Academy of Fellows  
2022     Nanotechnology Enabled Water Treatment (NEWT) Fellow  
2022     North American Membrane Society Student Fellowship  
2020     American Water Works Association Abel Wolman Fellow  
2020     3<sup>rd</sup> 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 <sup>th</sup> 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

## PUBLICATIONS

*First-Author Publications: 5    H-index: 12    Total Citations: 746*

### Published

1. **DuChanois, R.M.**, Cooper, N.J., Lee, B., Patel, S.K., Mazurowski, L., Graedel, T.E., Elimelech, M. "Prospects of Metal Recovery from Wastewater and Brine," *Nature Water*. 2023. *In Press*.
2. Nnorom, N.C., Rogers, T., Jain, A., Alazmi, A., Curi Elias, W., **DuChanois, R.M.**, Flores, K.R., Gardea-Torresdey, J.L., Cokar, M., Elimelech, M., Wong, M.S., Verduzco, R. "Sulfonated Polymer Coating Enhances Selective Removal of Calcium in Membrane Capacitive Deionization," 2022. *Journal of Membrane Science*. 662, 120974. DOI: [10.1016/j.memsci.2022.120974](https://doi.org/10.1016/j.memsci.2022.120974).
3. Heiranian, M., **DuChanois, R.M.**, Ritt, C.L., Violet, C., Elimelech, M. "Molecular Simulations to Elucidate Transport Phenomena in Polymeric Membranes," *Environmental Science & Technology*. 2022. 56 (6), 3313–3323. DOI: [10.1021/acs.est.2c00440](https://doi.org/10.1021/acs.est.2c00440).
4. **DuChanois, R.M.**, Heiranian, M., Yang, J., Porter, C.J., Li, Q., Zhang, X., Verduzco, R., Elimelech, M. "Designing polymeric membranes with coordination chemistry for high-precision ion separations," *Science Advances*. 2022. 8, eabm9436. DOI: [10.1126/sciadv.abm9436](https://doi.org/10.1126/sciadv.abm9436).
5. Porter, C.J., **DuChanois, R.M.**, MacDonald, E., Kilpatrick, S.M., Zhong, M., Elimelech, M. "Tethered electrolyte active-layer membranes," *Journal of Membrane Science*. 2022. 642, 120004. DOI: [10.1016/j.memsci.2021.120004](https://doi.org/10.1016/j.memsci.2021.120004).
6. 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. 641, 119927. DOI: [10.1016/j.memsci.2021.119927](https://doi.org/10.1016/j.memsci.2021.119927).
7. 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. 50, 516-532. DOI: [10.1016/j.mattod.2021.06.013](https://doi.org/10.1016/j.mattod.2021.06.013).
8. **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. 33, 2101312. DOI: [10.1002/adma.202101312](https://doi.org/10.1002/adma.202101312).
9. 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](https://doi.org/10.1038/s41893-020-00619-w).
10. 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](https://doi.org/10.1021/acs.jchemed.0c01194).
11. 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](https://doi.org/10.1038/s41565-020-0713-6).

Featured in [Jerusalem Post](#) and [Yale News](#)

12. 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](#).
13. 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](#).
14. **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](#).
15. **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](#).
16. 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](#).

Featured in [Chemical & Engineering News](#), [Science Daily](#), [Physics World](#), [BBC World Service Radio](#), [National Geographic](#)

## GRANT PROPOSAL EXPERIENCE

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1. *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). September 2021. Principal Investigator: Menachem Elimelech. **Funded**, \$413K. Award No. CBET–2110138. Contributions: Performed 95% of writing, designed all figures, and collected preliminary data.
2. *Copper Recovery from Mining Wastewater with Ion-Selective Electrodialysis*. Concept Paper submitted to National Alliance for Water Innovation (NAWI). June 2021. Principal Investigator: Rafael Verduzco. Contributions: Co-wrote the problem statement and technical approach (~50%).
3. *Selective Ion Transport: from Fundamentals to Functional Materials*. Submitted to Nanotechnology-Enabled Water Treatment Engineering Research Center. March 2021. Principal Investigator: Rafael Verduzco. **Funded**. Contributions: Co-wrote the objectives, problem statement, technical research plan, and expected outcomes (~25%).
4. *Materials and Processes for Selective Removal of Scale-Forming Ions*. Submitted to Nanotechnology-Enabled Water Treatment Engineering Research Center. January 2020. Principal Investigator: Rafael Verduzco. Contributions: Co-wrote the objectives, problem statement, technical research plan, and expected outcomes (~75%).
5. *Sensors for Water Contaminant Detection and Monitoring*. Submitted to National Institute of Health. December 2018. Principal Investigator: Menachem Elimelech. Contributions: Co-wrote the significant, innovation, and approach (~10%).

## INVITED TALKS AND CONFERENCE PRESENTATIONS

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### Oral

1. **DuChanois, R.M.**, Mazurowski, L.A., Elimelech, M. “Engineering Cation-Exchange Membranes with Coordination-Based Selectivity Between Cations,” North American Membrane Society Conference. May 2022. Phoenix, AZ. *Invited (Awards Session)*.
2. **DuChanois, R.M.**, “Designing Polymeric Membranes for High-Precision Ion Separations,” University of Connecticut. March 2022. Storrs, Connecticut. *Invited*.
3. **DuChanois, R.M.**, “Designing Polymeric Membranes for High-Precision Ion Separations,” Imperial College London. February 2022. Virtual. *Invited*.
4. **DuChanois, R.M.**, Heiranian, M., Yang, J., Porter, C.J., Verduzco, R., Elimelech, M. “Facilitated Transport Mechanisms of Ion-Selective Membranes with Fixed Coordination Sites,” American Institute of Chemical Engineers Annual Meeting. November 2021. Boston, MA.
5. 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. “Open-Access Database for Water Purification and Desalination Membranes,” American Institute of Chemical Engineers Annual Meeting. November 2021. Boston, MA.
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.
7. **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.
8. **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.
9. **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.
10. **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.
11. **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

1. **DuChanois, R.M.**, Mazurowski, L.A., Elimelech, M. “Designing Polymeric Membranes with Coordination Chemistry for High-Precision Ion Separations,” North American Membrane Society Conference. May 2022. Phoenix, AZ.
2. **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.
3. **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.
4. **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. **3<sup>rd</sup> place, applications poster competition.**

5. **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.
7. **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.
8. **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.
9. **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.
10. **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.
11. **DuChanois, R.M.**, Zhang, W. “Endocrine Disrupters in Wastewater Streams: A Toxicity Study,” Membrane Applied Science and Technology Conference. October 2015. Fayetteville, AR.

## TEACHING EXPERIENCE

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2022	<b>Guest Lecturer for Membrane Science and Membrane Separation Processes (CENG97014)</b> Imperial College
2020	<b>Co-Instructor for Engineering Our Sustainable Future</b> Yale Pathways to Science Yale University <ul style="list-style-type: none"><li>· Developed a 3-day course about climate science and energy for high school students</li><li>· 8/10 high school students reported “strongly agree” to if they enjoyed the course</li></ul>
2018–2021	<b>Certificate for College Teaching Preparation</b> Yale University <ul style="list-style-type: none"><li>· Completed 40-hour program as training for teaching at the university-level</li></ul>
2018–2019	<b>Teaching Fellow for Environmental Physicochemical Processes (ENAS 642)</b> Yale University <ul style="list-style-type: none"><li>· Student feedback: “Ryan did a great job helping to explain problems and concepts”</li><li>· Student feedback: “Ryan always gave a detailed feedback on the assignment”</li></ul>
2018–2019	<b>Teaching Fellow for Environmental Transport Processes (ENVE 448/ENAS 848)</b> Yale University <ul style="list-style-type: none"><li>· Responsible for teaching students in a small group setting and grading papers</li><li>· 100% of students reported their overall assessment of me was “very good” or “excellent”</li></ul>

## MENTORING EXPERIENCE

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### Graduate Student Research Mentoring

1. Lauren Mazurowski (2021–2022)
  - Awards: 1<sup>st</sup> Place in 2021 NEWT Perfect Pitch Competition
  - Current Affiliation: Ph.D. Student, Yale University
2. Brielle Januszewski (2020–2022)
  - Current Affiliation: Ph.D. Candidate, Yale University

### Undergraduate Student Research Mentoring

1. Jason Yang (2019–2020)
  - Awards: Goldwater Fellowship, National Science Foundation Graduate Research Fellowship
  - Current Affiliation: Ph.D. Student, California Institute of Technology
2. Janvi Trivedi (2018–2020)
  - Current Affiliation: Associate, PDT Partners

## PROFESSIONAL LEADERSHIP AND SERVICE

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### Journal Peer Review

*Nature Water* (1 manuscript)  
*Environmental Science & Technology* (3 manuscripts)  
*Desalination and Water Treatment* (1 manuscript)

### 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  
Engineer in Training (AR 2016)  
American Water Works Association (AWWA)  
American Society of Civil Engineers (ASCE)

### University Service

2021–2022	President NSF Research Center for Nano-Enabled Water Treatment (NEWT)
2019–2021	Vice President NSF Research Center for Nano-Enabled Water Treatment (NEWT)
2017–2022	Graduate Fellowship Affiliate Yale University
2016–2017	Faculty Board Student Representative Engineering Department, University of Cambridge
2014–2016	Student Chapter President American Society of Civil Engineers, University of Arkansas
2014–2015	Student Council Member College of Engineering, University of Arkansas

### Conferences and Symposia

2019–2021 Organizing Member and Panel Coordinator  
Equity in the Job Search Symposium

Yale University  
2017–2018 Recruitment Committee  
Chemical & Environmental Engineering Department  
Yale University

### Outreach

2019–2022 Pathways to Science Volunteer  
Yale University  
2017–2020 STEM Mentor at Yale  
Yale University

## CONSULTING AND PROFESSIONAL PRACTICE

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2021–Present **Open Membrane Database** – Founding Member  
· Founding member of an online database of desalination and water purification membranes  
2019 **Razzberry Inc.** – Consultant  
· Tested the performance of electrochemical sensors and provided a technical report  
2017 **Mott MacDonald** – Consultant  
· Conducted financial analysis of service delivery models in Timor-Leste  
2016 **Garver Water Design Center** – Project Engineer  
· Built a cost estimating tool to improve cost forecasting in engineering projects  
2015 **US Environmental Protection Agency** – Intern  
· Tested and evaluated engineering properties of soils utilized for green roofs  
2014 **University of Virginia** – Research Assistant  
· 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

## MEDIA COVERAGE

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“Tufts researchers create membrane that filters fluoride out of water,” *Tufts Daily*, 2021. ([link](#))  
Membrane Processes, Podcast Episode, University of Pittsburgh, 2021. ([link](#))  
Student Spotlight: Highly selective membrane filtration, *International Filtration News*, 2020. ([link](#))  
“How swimsuit material inspired the ‘holy grail’ of water filtration,” *Yale News*, 2020. ([link](#))  
“Nature provides inspiration for researchers developing selective membranes,” *Jerusalem Post*, 2020. ([link](#))  
“A new way to keep city water clean,” *National Geographic*, 2019. ([link](#))  
*BBC World Service Radio*, 2018. ([link](#))  
“Drink Safely with Biomimetic Technology,” *Nature Nanotechnology*, 2018. ([link](#))  
“Biomimetic coagulant makes water safe to drink,” *Physics World*, 2018. ([link](#))  
“A water treatment breakthrough, inspired by a sea creature,” *Science Daily*, 2018. ([link](#))  
“Sea anemone—inspired particles clean wastewater,” *Chemical & Engineering News*, 2018. ([link](#))  
“Single-Step Water Treatment with a Multi-Functional Biomimetic Nanocoagulant,” *Nature Research Sustainability Community*, 2018. ([link](#))  
Ryan DuChanois, University of Arkansas, 2016. ([link](#))  
“U of A Honors Civil Engineering Student Named Gates Cambridge Scholar,” University of Arkansas, 2016. ([link](#))