

# Jay R. Werber

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## Education

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<b>Yale University</b> (New Haven, CT)	2018
Ph.D. in Chemical & Environmental Engineering	
Dissertation: Permeability and selectivity limits of polymeric and biomimetic desalination membranes	
<b>Yale University</b> (New Haven, CT)	2015
Master of Philosophy in Chemical & Environmental Engineering	
Master of Science in Chemical & Environmental Engineering. GPA: 4.00	
<b>Washington University in St. Louis</b> (St. Louis, MO)	2009
Bachelors of Science in Chemical Engineering (Summa Cum Laude), Minor in Biology. GPA: 3.98	

## Academic Appointments and Professional Experience

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<b>Assistant Professor</b>	2021 – Present
Dept. of Chemical Engineering & Applied Chemistry, University of Toronto	
<b>Postdoctoral Research Associate</b>	2018 – 2021
Dept. of Chemistry, University of Minnesota, Adviser: Prof. Marc Hillmyer	
<b>Graduate Student Researcher</b>	2013 – 2018
Dept. of Chemical & Environmental Engineering, Yale University, Adviser: Prof. Menachem Elimelech	
<b>Bioprocess Engineer</b>	2008, 2009 – 2013
Process Research & Development, Genentech, Inc. (South San Francisco, CA)	
<b>Undergraduate Researcher</b> , NSF REU in Tissue Engineering	Summer 2007
Georgia Institute of Technology, Adviser: Prof. Melissa Kemp	
<b>Undergraduate Researcher</b> , NSF REU in Environmental Engineering	Summer 2006
Washington University in St. Louis, Adviser: Prof. Muthanna Al-Dahhan	

## Selected Awards and Fellowships

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Young Membrane Scientist Award, North American Membrane Society	2021
Finalist, Yale 3-Minute Thesis Competition	2018
Abel Wolman Fellowship, American Water Works Association, \$30,000/year award	2017 – 2018
C. Ellen Gontter Award for Best Graduate Student Paper, American Chemical Society, Division of Environmental Chemistry	2017
NSF Graduate Research Fellowship, National Science Foundation, \$126,000 award	2013 – 2017
Recognition Award, Genentech, Inc.	2012
Co-Valedictorian, Washington Univ. School of Engineering	2009
American Institute of Chemical Engineers Academic Excellence Award	2009
Woodward Scholarship, Washington University in St. Louis, \$80,000 award	2005 – 2009

## Peer-Reviewed Publications

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*H-index: 17. Total Google Scholar citations: 3502 (as of 10/20/2021)*

- Werber, J.R.**; Peterson, C.; Van Zee, N.; Hillmyer, M.A. Functionalized Polymersomes from a Polyisoprene–Activated Polyacrylamide Precursor. *Langmuir*. **2021**, 37, 490-498. DOI: [10.1021/acs.langmuir.0c03157](https://doi.org/10.1021/acs.langmuir.0c03157)

2. Hampu, N.; **Werber, J.R.**; Chan, W.Y.; Feinberg, A.M.; Hillmyer, M.A. Next-generation ultrafiltration membranes enabled by block polymers. *ACS Nano*. **2020**, 14, 16446-16471. DOI: [10.1021/acsnano.0c07883](https://doi.org/10.1021/acsnano.0c07883)
3. Ritt, C.L.; **Werber, J.R.**; Wang, M.; Yang, Z.; Zhao, Y.; Kulik, H.J.; Elimelech, M. Ionization behavior of nanoporous polyamide membranes. *Proc. Nat. Acad. Sci. U.S.A.* **2020**, 117, 30191-30200. DOI: [10.1073/pnas.2008421117](https://doi.org/10.1073/pnas.2008421117)
4. Hampu, N.; **Werber, J.R.**; Hillmyer, M.A. Co-casting Highly Selective Dual Layer Membranes with Disordered Block Polymer Selective Layers. *ACS Applied Materials & Interfaces*. **2020**, 12, 45351-45362. DOI: [10.1021/acsami.0c13726](https://doi.org/10.1021/acsami.0c13726)
5. Porter, C.J.; **Werber, J.R.**; Zhong, M.; Wilson, C.J.; Elimelech, M. Pathways and Challenges for Biomimetic Desalination Membranes with Sub-Nanometer Channels. *ACS Nano*. **2020**, 14, 10894-10916. DOI: [10.1021/acsnano.0c05753](https://doi.org/10.1021/acsnano.0c05753)
6. Wang, Y.; Lee, J.; **Werber, J.R.**; Elimelech, M. Capillary-driven desalination in a synthetic mangrove. *Science Advances*. **2020**, 6, eaax5253. (Featured in the [Guardian](#) and [Yale News](#)). DOI: [10.1126/sciadv.aax5253](https://doi.org/10.1126/sciadv.aax5253)
7. Porter, C.J.; **Werber, J.R.**; Ritt, C.L.; Guan, Y.; Zhong, M.; Elimelech, M. Controlled grafting of polymer brush layers from porous cellulosic membranes. *Journal of Membrane Science*. **2020**, 596, 117719. DOI: [10.1016/j.memsci.2019.117719](https://doi.org/10.1016/j.memsci.2019.117719)
8. Ritt, C.L.\*; **Werber, J.R.\***; Deshmukh, A.; Elimelech, M. Monte Carlo simulations of framework defects in layered two-dimensional nanomaterial desalination membranes: Implications for permeability and selectivity. *Environ. Sci. Technol.* **2019**, 53, 6214-6224. DOI: [10.1021/acs.est.8b06880](https://doi.org/10.1021/acs.est.8b06880)
9. **Werber, J.R.**; Porter, C.J.; Elimelech, M. A path to ultra-selectivity: Support layer properties to maximize performance of biomimetic desalination membranes. *Environ. Sci. Technol.* **2018**, 52, 10737-10747. DOI: [10.1021/acs.est.8b03426](https://doi.org/10.1021/acs.est.8b03426)
10. Davenport, D.M.; Deshmukh, A.; **Werber, J.R.**; Elimelech, M. High pressure reverse osmosis for energy-efficient hypersaline brine desalination: current status, design considerations, and research needs. *Environ. Sci. Technol. Lett.* **2018**, 5, 467-475. DOI: [10.1021/acs.estlett.8b00274](https://doi.org/10.1021/acs.estlett.8b00274)
11. **Werber, J.R.**; Elimelech, M. Permselectivity limits of biomimetic desalination membranes. *Science Advances*. **2018**, 4, eaar8266. DOI: [10.1126/sciadv.aar8266](https://doi.org/10.1126/sciadv.aar8266)
12. Mauter, M.S.; Zucker, I.; Perreault, F.; **Werber, J.R.**; Kim, J.H.; Elimelech, M., The role of nanotechnology in tackling global water challenges. *Nature Sustainability*. **2018**, 1, 166-175. DOI: [10.1038/s41893-018-0046-8](https://doi.org/10.1038/s41893-018-0046-8)
13. Lu, X.\*; Feng, X.\*; **Werber, J.R.**; Chu, C.; Zucker, I.; Kim, J.H.; Osuji, C.O.; Elimelech, M. Enhanced antimicrobial activity through the controlled alignment of graphene nanosheets. *Proc. Natl. Acad. Sci. U.S.A.* **2017**, 201710996. DOI: [10.1073/pnas.1710996114](https://doi.org/10.1073/pnas.1710996114)
14. Zucker, I.; **Werber, J.R.**; Fishman, Z.S.; Hashmi, S.M.; Gabinet, U.; Lu, X.; Osuji, C.O.; Pfefferle, L.D.; Elimelech, M. Loss of phospholipid membrane integrity induced by two-dimensional nanomaterials. *Environ. Sci. Technol. Lett.* **2017**, 4, 404-409. DOI: [10.1021/acs.estlett.7b00358](https://doi.org/10.1021/acs.estlett.7b00358)
15. **Werber, J.R.**; Bull, S.K.; Elimelech, M. Acyl-chloride quenching following interfacial polymerization to modulate permeability and surface charge of desalination membranes. *Journal of Membrane Science* **2017**, 535, 357-364. DOI: [10.1016/j.memsci.2017.04.041](https://doi.org/10.1016/j.memsci.2017.04.041)
16. Chen, D.\*; **Werber, J.R.\***; Zhao, X.; Elimelech, M. A facile method to quantify the carboxyl group areal density in the active layer of polyamide thin-film composite membranes. *Journal of Membrane Science* **2017**, 534, 100-108. DOI: [10.1016/j.memsci.2017.04.001](https://doi.org/10.1016/j.memsci.2017.04.001)
17. **Werber, J.R.\***; Deshmukh, A.\*; Elimelech, M. Can batch or semi-batch processes save energy in reverse-osmosis desalination? *Desalination* **2017**, 402, 109-122. DOI: [10.1016/j.desal.2016.09.028](https://doi.org/10.1016/j.desal.2016.09.028)

18. **Werber, J.R.**; Deshmukh, A.; Elimelech, M. The critical need for increased selectivity, not increased water permeability, for desalination membranes. *Environ. Sci. Technol. Lett.* **2016**, 3, 112-120. DOI: [10.1021/acs.estlett.6b00050](https://doi.org/10.1021/acs.estlett.6b00050)
19. **Werber, J.R.**; Osuji, C.O.; Elimelech, M. Materials for next-generation desalination and water purification membranes. *Nature Reviews Materials* **2016**, 1, 16018. DOI: [10.1038/natrevmats.2016.18](https://doi.org/10.1038/natrevmats.2016.18)
20. Shaffer, D.L.\*; **Werber, J.R.\***; Jaramillo, H.; Lin, S.; Elimelech, M. Forward osmosis: Where are we now? *Desalination* **2015**, 356, 271–284. DOI: [10.1016/j.desal.2014.10.031](https://doi.org/10.1016/j.desal.2014.10.031)
21. Mo, W.; Soh, L.; **Werber, J.R.**; Elimelech, M.; Zimmerman, J.B. Application of membrane dewatering for algal biofuel. *Algal Research* **2015**, 11, 1-12. DOI: [10.1016/j.algal.2015.05.018](https://doi.org/10.1016/j.algal.2015.05.018)
22. **Werber, J.R.**; Wang, Y.J.; Milligan, M.; Li, X.; Ji, J.A. Analysis of 2,2'-azobis (2-amidinopropane) dihydrochloride degradation and hydrolysis in aqueous solutions. *Journal of Pharmaceutical Sciences* **2011**, 100, 3307–3315. DOI: [10.1002/jps.22578](https://doi.org/10.1002/jps.22578)
23. Mueller, S.G.; **Werber, J.R.**; Al-Dahhan, M.H.; Dudukovic, M.P. Using a fiber-optic probe for the measurement of volumetric expansion of liquids. *Ind. Eng. Chem. Res.* **2007**, 46, 4330–4334. DOI: [10.1021/ie061630y](https://doi.org/10.1021/ie061630y)

\*equal contribution

## Patents

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Hillmyer, M., **Werber, J.R.** “Solvent-free extractive separation.” Patent application. U.S. Application No. 17/003538 (Mar 2021)

Mahajan, E.; Kothary, K.; So, J.; **Werber, J.** “Method for chromatography reuse.” Full patent application. U.S. Application No. 14/479,092 (Sep 2014)

## Invited Presentations

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1. **Werber, J.R.** “Heterogeneous Ionization Behavior of Polyamide Thin-Film Composite Membranes for Reverse Osmosis and Nanofiltration.” North American Membrane Society, Estes Park, CO., August 2021
2. **Werber, J.R.** “Block-Polymer Membranes and Membrane-Like Capsules for Aqueous Separations.” Materials Research Society (Virtual). Symposium on Advances in Membrane and Water Treatment Materials for Sustainable Environmental Remediation. April 2021
3. **Werber, J.R.** “Structural and Transport Behavior of Polymeric and Biomimetic Membranes for Reverse-Osmosis Desalination.” Western University, Dept. of Chemical and Biological Engineering. February 2021
4. **Werber, J.R.** “Polymersomes, Biomimetic Membranes, and Desalination.” McMaster University, Dept. of Chemical Engineering. April 2020
5. **Werber, J.R.** “Polymersomes, Biomimetic Membranes, and Desalination.” University of Toronto, Dept. of Chemical Engineering & Applied Chemistry. April 2020
6. **Werber, J.R.** “Selectivity Limits of Biomimetic Desalination Membranes: Insights from Polymersome Permeability Measurements.” University of Wisconsin, Dept. of Chemical and Biological Engineering. February 2020
7. **Werber, J.R.** “Selectivity Limits of Biomimetic Desalination Membranes: Insights from Polymersome Permeability Measurements.” University of Pittsburgh, Dept. of Civil and Environmental Engineering. January 2020
8. **Werber, J.R.** “Selectivity Limits of Biomimetic Desalination Membranes: Insights from Polymersome Permeability Measurements.” University of Delaware, Dept. of Chemical and Biomolecular Engineering. January 2020
9. **Werber, J.R.** “Selectivity Limits of Biomimetic Desalination Membranes: Insights from Polymersome Permeability Measurements.” Princeton University, Dept. of Chemical and Biological Engineering. January 2020

## Teaching Experience

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- Teaching Assistant**, Fluid Mechanics (Yale MENG 361) Fall 2014  
Held well-attended office hours for undergraduates in Chemical and Mechanical Engineering (70 students total). Graded problem sets and tests.
- Volunteer Teacher**, Citizen Schools California Fall 2010  
Co-designed and co-taught a weekly after-school class for 6<sup>th</sup>–8<sup>th</sup> graders on open-ended engineering design, focusing on hands-on projects and working in teams.
- Course Director**, EN120 Freshman Engineering Seminar (Washington Univ.) 2006 – 2007  
Worked with the Assistant Dean of Engineering, five student Course Directors and thirty student Course Assistants to design, organize and lead a one-credit, weekly freshman engineering seminar (~150 students per year). Combined team-based project work with lessons introducing the engineering disciplines.

## Research Mentorship Experience

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- Adam Hyatt (Fall 2019 – Spring 2020): UMN undergraduate in Mat. Sci.; fabricated porous polymer materials
- Chitra Xiong (Summer 2019): Local high school student through ACS SEED; fabricated porous polymer materials
- Cody Ritt (Fall 2017 – Spring 2018): Yale Ph.D. student; modeled transport through graphene oxide framework membranes. Also, assessed surface charge behavior of polymeric membranes.
- Nicholas Hampu (Fall 2018 – Spring 2020): UMN Ph.D. student. Synthesized high-performance mesoporous block polymer membranes.
- Cassandra Porter (Fall 2016 – Spring 2018): Yale Ph.D. student; fabricated polymer brush membranes.
- Ding Chen (Spring – Winter 2016): Visiting Ph.D. student from Tsinghua Univ.; helped develop technique to quantify carboxyl group densities in desalination membranes.
- William Stark (Summer 2016): Local high school student through Yale Summer Science Research Institute; studied forward osmosis membranes; now pursuing a B.S. in engineering at Univ. of Hartford.
- Sarah K. Bull (Spring 2015 – Spring 2016): Yale undergraduate in ChE; studied solvent quenching of thin-film composite membranes; now pursuing a Ph.D. in ChE at Univ. Colorado at Boulder.

## Professional Service and Volunteer Experience

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Member of American Chemical Society (ACS) Division of Environmental Chemistry, American Water Works Association (AWWA), American Institute of Chemical Engineers (AIChE), Association of Environmental Engineering & Science Professors (AEESP), International Desalination Association (IDA), and American Membrane Technology Association (AMTA)

Peer reviewer for the *Journal of Membrane Science*, *Science Advances*, *Macromolecules*, *Environmental Science & Technology*, *ACS Applied Materials & Interfaces*, and *Water Research*

- Organizing Committee Member**, Yale Symposium on Gender Equity in the STEM Job Search 2017
- Communications Assistant**, AEESP 2015 Conference Organizing Committee 2014 – 2015
- Mentor**, New Haven Science Fair 2013 – 2015
- Hiring Committee Member**, Genentech Process Development Rotational Program 2012 – 2013  
Worked on a cross-functional team seeking to recruit, interview, and hire top applicants.
- Co-President**, Genentech Bicycle Club 2012 – 2013
- Big Brother**, Big Brothers Big Sisters of the Bay Area 2011 – 2013
- President**, Feed St. Louis (Washington Univ.) 2006 – 2007  
Managed one of the school's largest community service organizations, which was dedicated to feeding

those in need while mitigating food waste. Organized a merger with a similar organization, eventually leading to the group becoming a chapter of the Campus Kitchens Project.