

# ANTHONY P. STRAUB

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## Education

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<b>Ph.D.</b>	<b>Yale University</b> , New Haven, CT Department of Chemical & Environmental Engineering	2017
<b>M.Phil.</b>	<b>Yale University</b> , New Haven, CT Department of Chemical & Environmental Engineering	2015
<b>M.Sc.</b>	<b>Yale University</b> , New Haven, CT Department of Chemical & Environmental Engineering	2014
<b>B.S.</b>	<b>University of Illinois</b> , Urbana-Champaign, IL Department of Civil & Environmental Engineering	2012

## Academic Appointments and Professional Experience

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<b>Assistant Professor</b>	Department of Civil, Environmental, & Architectural Engineering, Environmental Engineering Program University of Colorado Boulder	Aug. 2019 – Present
<b>Swiss National Science Foundation Postdoctoral Research Fellow</b>	Department of Materials Science & Engineering Massachusetts Institute of Technology, Advisor: Prof. Jeffrey Grossman	Nov. 2017 – July 2019
<b>National Science Foundation (NSF) Graduate Research Fellow</b>	Department of Chemical & Environmental Engineering Yale University, Advisor: Prof. Menachem Elimelech	Aug. 2012 – October 2017
<b>Research Intern</b>	Department of Desalination & Water Treatment Ben-Gurion University of the Negev in Israel, Advisor: Prof. Moshe Herzberg	May – Aug. 2011, May – Aug. 2012
<b>Research Assistant</b>	Department of Civil & Environmental Engineering University of Illinois at Urbana-Champaign, Advisor: Prof. Thanh (Helen) Nguyen	Jan. 2010 – May 2012

## Publications

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***H-index: 17, Total citations: 1909***

### Peer-Reviewed Journal Articles (underline indicates Straub graduate students)

- Lee, S.; **Straub, A.P.\*** “Opportunities for high productivity and selectivity desalination via osmotic distillation with improved membrane design.” *Journal of Membrane Science* 611, 118309 (2020)
- Straub, A.P.\***; Asa, E.; Zhang, W.; Nguyen, T.H.; Herzberg, M.\* “In-Situ Graft-Polymerization Modification of Commercial Ultrafiltration Membranes for Long-Term Fouling Resistance in a Pilot-Scale Membrane Bioreactor.” *Chemical Engineering Journal*, 382, 122865 (2020).
- Wang, Z.; Horseman, T.; **Straub, A.P.**; Yip, N.Y.; Li, D.; Elimelech, M.\*; Lin, S.\* “Pathways and Challenges for Efficient Solar-Thermal Desalination.” *Science Advances*, 5, eaax0763 (2019).
- Shaulsky, E.; Karanikola, V.; **Straub, A.P.**; Deshmukh, A.; Zucker, I.; Elimelech, M.\* “Asymmetric Membranes for Membrane Distillation and Thermo-Osmotic Energy Conversion.” *Desalination*, 452, 141-148 (2019).
- Lee, J.\*; **Straub, A.P.**, Elimelech, M. “Vapor-gap membranes for highly selective osmotically driven desalination.” *Journal of Membrane Science* 555, 407-417 (2018).
- Deshmukh, A.; Boo, C.; Karanikola, V.; Lin, S.; **Straub, A.P.**; Tong, T.; Warsinger, D.M.; Elimelech, M.\* “Membrane Distillation at the Water-Energy Nexus: Limits, Opportunities, and Challenges.” *Energy & Environmental Science* 11, 1177-1196 (2018).

7. Rahimi, M.; **Straub, A.P.**; Zhang, F.; Zhu, X.; Elimelech, M.; Gorski, C. A.; Logan, B.E.\* “Emerging Electrochemical and Membrane-Based Systems to Convert Low-Grade Heat to Electricity.” *Energy & Environmental Science* 11, 276-285 (2017).
8. **Straub, A.P.**; Elimelech, M.\* “Energy Efficiency and Performance Limiting Effects in Thermo-Osmotic Energy Conversion from Low-Grade Heat.” *Environmental Science & Technology* 51, 12925-12931 (2017).
9. **Straub, A.P.**; Yip, N.Y.; Lin, S.; Lee, J.; Elimelech, M.\* “Harvesting Low-Grade Heat Energy Using Thermo-Osmotic Vapour Transport Through Nanoporous Membranes.” *Nature Energy* 1, Article Number: 16090 (2016).  
**This publication was covered in several articles:**  
*Nature* | Research Highlight: “Energy: Nanopores Harvest Wasted Heat.” *Nature* 534, 592 (2016).  
*Nature Energy* | News and Views: Phillip, W.A. “Thermal Energy Conversion: Under Pressure.” *Nature Energy* 1, Article Number: 16101 (2016).  
*Press: YaleNews, AIChE ChEnected, SciTechDaily, TechXplore, Wissenschaft Aktuell, and several more*
10. Matthew, L.E.\*; Piedra, L.M.; Wu, C.F.; Kramer-Díaz, A.; Wang, H.; **Straub, A.P.**; Nguyen, T.H. “Social Work and Engineering: Lessons from a Water Filtration Project in Guatemala” *International Social Work* 4, Article Number: 655869 (2016).
11. **Straub, A. P.**; Deshmukh, A.; Elimelech, M.\* “Pressure-Retarded Osmosis for Power Generation from Salinity Gradients: Is It Viable?” *Energy & Environmental Science* 9, 31-48 (2016).
12. Bar-Zeev, E.; Perreault, F.; **Straub, A. P.**; Elimelech, M.\* “Impaired Performance of Pressure-Retarded Osmosis Due to Irreversible Biofouling.” *Environmental Science & Technology* 49, 13050-13058 (2015).
13. **Straub, A. P.**; Osuji, C.O.; Cath, T.Y.; Elimelech, M.\* “Selectivity and Mass Transfer Limitations in Pressure-Retarded Osmosis at High Concentrations and Increased Operating Pressures.” *Environmental Science & Technology* 49, 12551-12559 (2015).
14. **Straub, A. P.**; Lin, S.; Elimelech, M.\* “Module-Scale Analysis of Pressure-Retarded Osmosis: Performance Limitations and Implications for Full-Scale Operation.” *Environmental Science & Technology* 48, 12435-12444 (2014).
15. Lin, S.; **Straub, A. P.**; Elimelech, M.\* “Thermodynamic Limits of Extractable Energy by Pressure-Retarded Osmosis.” *Energy & Environmental Science* 7, 2706-2714 (2014).  
*Press: GWI Water Desalination Report, 21 July 2014, Volume 50, Issue 27*
16. Wang, H.; Narihiro, T.; **Straub, A. P.**; Pugh, C. R.; Tamaki, H.; Moor, J. F.; Bradley, I. M.; Kamagata, Y.; Liu, W.T.; Nguyen, T. H.\* “MS2 Bacteriophage Reduction and Microbial Communities in Biosand Filters.” *Environmental Science & Technology* 48, 6702–6709 (2014).
17. **Straub, A.P.**; Yip, N.Y.; Elimelech, M.\* “Raising the Bar: Increased Hydraulic Pressure Allows Unprecedented High Power Densities in Pressure-Retarded Osmosis.” *Environmental Science & Technology Letters* 1, 55–59 (2014).  
*Press: ACS Chemical & Engineering News*
18. Tirafferi, A.; Yip, N.Y.; **Straub, A.P.**; Romero-Vargas Castrillon, S.; Elimelech, M.\* “A Method for Simultaneous Determination of Transport and Structural Parameters of Forward Osmosis Membranes.” *Journal of Membrane Science* 444, 523–538 (2013).
19. Bradley, I.; **Straub, A.P.**; Maraccini, P.; Markazi, S.; Nguyen, T. H.\* “Iron Oxide Amended Biosand Filters for Virus Removal.” *Water Research* 45, 4501-4510. (2011).
20. Romero, O.C.; **Straub, A.P.**; Kohn, T.; Nguyen, T.H.\* “Role of Temperature and Suwannee River Natural Organic Matter on Inactivation Kinetics of Rotavirus and Bacteriophage MS2 by Solar Irradiation.” *Environmental Science & Technology* 45, 10385-10393 (2011).

**Submitted and Under Review Journal Articles (underline indicates Straub graduate students)**

1. Nguyen, D.T.; Lee, S.; Lee, J.; **Straub, A.P.**\* “Ultra-selective and oxidation-resistant pressure-driven desalination using entrapped nanobubble membranes.” Under review.
2. **Straub, A.P.**\*; Bergman, D.S.; Getachew, B.A.; Leahy, L.; Patel, J.J.; Ferralis, N.; Grossman, J.C.\* “Highly Conductive and Permeable Nanocomposite Ultrafiltration Membranes Using Laser-Reduced Graphene Oxide.” Under Revision.

## Awards and Honors

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<b>Swiss National Science Foundation Postdoc Mobility Fellowship</b> \$76,000 fellowship to support two years of postdoctoral research.	2018
<b>Marie Skłodowska-Curie Individual Fellowship (Declined)</b> \$190,000 fellowship to support two years of postdoctoral research.	2017
<b>National Science Foundation (NSF) Graduate Research Fellowship</b> \$126,000 fellowship to support three years of graduate studies.	2012
<b>ACS Graduate Student Award in Environmental Chemistry</b> Awarded by the American Chemical Society for record of research productivity.	2016
<b>Huddleston and Blum Graduate Fellowship</b> Granted a year of funding for one engineering graduate student at Yale.	2015
<b>Central States Water &amp; Environment Association (CSWEA) Award</b> Awarded to one student per year for academic excellence.	2012
<b>Wilfred F. and Ruth Davison Langelier Scholarship</b> \$4,000 scholarship based on academic performance and extracurricular activities.	2011
<b>Morrill Engineering Program Award</b> Awarded for academic excellence.	2010

## Seminars and Conference Presentations

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1. **Lee, S.; Straub, A.P.\*** “Opportunities for high productivity and selectivity desalination via osmotic distillation with improved membrane design” *North American Membrane Society 2020 Conference*. Virtual meeting. May 21, 2020.
2. **Straub, A.P.**, “Nano-enabled Membrane Materials for Water Treatment and Power Generation” *University of British Columbia*, Vancouver, Canada. Invited Seminar. June 14, 2019.
3. **Straub, A.P.**; Bergsman, D.; Getachew, B.; Leahy, L.; Patel, J.; Ferralis, N.; and Grossman, J.C, “Electrically Conductive and Highly Permeable Nanocomposite Ultrafiltration Membranes Using Laser-Reduced Graphene Oxide” *Association of Environmental Engineering & Science Professors (AEESP) 2019*, Tempe, Arizona. Poster Presentation. May 15, 2019.
4. **Straub, A.P.** “Putting Bubbles to Work: Emerging Applications of Hydrophobic Membrane Materials in Power Generation and Desalination” *Ben-Gurion University of the Negev*, Midreshet Ben-Gurion, Israel. Invited Seminar. February 11, 2019.
5. **Straub, A.P.**, Grossman, J.E. “Functionalized graphene materials for membrane separations” *Gordon Research Conference, Membranes: Materials and Processes*, New London, NH. Poster Presentation. August 13, 2018.
6. **Straub, A.P.**, Elimelech, M. “Energy Efficiency and Performance Limiting Effects in Thermo-Osmotic Energy Conversion from Low-Grade Heat” *Association of Environmental Engineering & Science Professors (AEESP) 2017 Conference*, Ann Arbor, MI. Oral Presentation. June 22, 2017.
7. **Straub, A.P.**, Deshmukh, A., Elimelech, M. “Net Energy Output of Salinity Gradient Power Generation with Pressure-Retarded Osmosis: What Configurations Are Feasible?” *American Chemical Society (ACS) National Conference*, Philadelphia, PA. Oral Presentation. August 24, 2016.  
**Received Best Presentation Award**
8. **Straub, A.P.**, Yip, N.Y., Lin, S., Lee, J., Elimelech, M. “Harvesting Low-Grade Heat Using Thermo-Osmotic Vapor Transport Through Nanoporous Membranes” *Gordon Research Seminar, Membranes: Materials and Processes*, New London, NH. Oral Presentation. July 30, 2016.
9. **Straub, A.P.**, Deshmukh, A., Elimelech, M. “Power Generation from Salinity Gradients by Pressure-Retarded Osmosis: Is It Viable?” *INES Network for Salinity Gradient Energy Webinar*. Oral Presentation. January 25, 2016.
10. **Straub, A.P.**, Lin, S., Elimelech, M. “Power Generation from Salinity Gradients by Pressure-Retarded Osmosis: Is It Viable?” *New England Graduate Student Water Symposium*, Amherst, MA. Oral Presentation. September 12, 2015

11. **Straub, A.P.**, Lin, S., Elimelech, M. “Power Generation from Salinity Gradients by Pressure-Retarded Osmosis: How Much Energy Can We Extract?” *Association of Environmental Engineering & Science Professors (AEESP) 2015 Conference*, New Haven, CT. Oral Presentation. June 15, 2015  
**Received Best Presentation Award**
12. **Straub, A.P.**, Lin, S., Elimelech, M. “Performance Limitations of Pressure-Retarded Osmosis: Experimental Characterization and Module-Scale Analysis” *North American Membrane Society 25<sup>th</sup> Annual Meeting*, Boston, MA. Oral Presentation. June 1, 2015
13. **Straub, A.P.**, Lin, S., Elimelech, M. “Power Generation by Pressure-Retarded Osmosis: How Much Energy Can We Extract?” *International Forward Osmosis Association World Summit*, Lisbon, Portugal. Oral Presentation. September 18-19, 2014.
14. **Straub, A.P.**, Yip, N.Y., Elimelech, M. “Realizing High Power Density in Pressure-Retarded Osmosis with Increased Hydraulic Pressure.” Gordon Research Conference, Membranes: Materials and Processes, New London, NH. Poster Presentation. July 6-11, 2014.
15. **Straub, A.P.**, Lin, S., Yip, N.Y., Elimelech, M. “Limits of Extractable Energy and Power Density in Pressure-Retarded Osmosis.” *INES Network for Salinity Gradient Energy Meeting*, Montreal, Canada. Oral Presentation. June 10, 2014.
16. **Straub, A.P.**, Yip, N.Y., Elimelech, M. “Realizing High Power Density in Pressure-Retarded Osmosis with Increased Hydraulic Pressure.” *North American Membrane Society 24<sup>th</sup> Annual Meeting*, Houston, TX. Oral Presentation. June 4, 2014.
17. **Straub, A.P.**, Yip, N.Y., Elimelech, M. “Realizing High Power Density in Pressure-Retarded Osmosis with Increased Hydraulic Pressure.” *11<sup>th</sup> Annual Robert M. Langer Symposium*, New Haven, CT. Oral Presentation. December 6, 2013.  
**Received Best Presentation Award**
18. Tirafferi, A., Yip, N.Y., **Straub, A.P.**, Romero-Vargas Castrillon, S., Elimelech, M. “Novel Characterization Method for Determination of Transport and Structural Parameters of Forward Osmosis Membranes.” North American Membrane Society 23rd Annual Meeting, Boise, ID. Oral Presentation. June 11, 2013.
19. Bradley, I., **Straub, A.P.**, Sohn, A., Folwarski, P., and Nguyen, T.H. “Iron Amended Biosand Filters for Virus Removal.” WEFTEC 2010 Design Competition, New Orleans, LA. Oral Presentation. October 3, 2010.
20. **Straub, A.P.**, Sohn, A., Bradley, I., and Nguyen, T.H., “Virus Removal in Iron Amended Biosand Filters.” *UIUC Environmental Engineering and Sciences Symposium*, Champaign, IL. Oral Presentation. April 2, 2010

## Teaching

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- Instructor: CVEN 3414 Fundamentals of Environmental Engineering (Boulder)** Aug. 2019 – Present  
Teach 3 credit hour junior-level undergraduate course covering broad topics related to environmental engineering. Enrollment ranges from 60–100 students. Overall course rating: 4.7/6.0. Instructor rating: 5.5/6.0.
- Instructor: CVEN 5464 Environmental Engineering Processes (Boulder)** Aug. 2020 – Present  
Instruct 3 credit hour graduate course covering reactor design and mass transfer. Course is required for all environmental engineering graduate students.
- Teaching Assistant: Environmental Physicochemical Processes (Yale)** Jan. 2016 – May 2017  
Assisted in teaching a graduate level environmental engineering course. Worked with students to review course materials and graded assignments.
- Teaching Assistant: Green Engineering & Sustainable Design (Yale)** Jan. 2014 – May 2014  
Taught Green Engineering and Sustainable Design, an undergraduate and graduate level course. Conceived a design challenge and mentored teams as they addressed the challenge through product design.
- MIT Kaufman Teaching Certificate** Jan. 2019 – May 2019  
Semester-long training program designed at developing skills in teaching and course planning. Includes eight workshops and additional teaching sessions.

## Student Advising

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### Primary Graduate Research Mentor

Elizabeth Hjelvik Ph.D. Student, Materials Science (Jan. 2021 – Present)  
Trisha Nickerson, Co-advised Ph.D. Student, Chemical Engineering (Jan. 2021 – Present)  
Kian Lopez, Ph.D. Student, Environmental Engineering (Aug. 2020 – Present)  
Sangsuk Lee, Ph.D. Student, Environmental Engineering (Aug. 2019 – Present)  
Duong Nguyen, Ph.D. Student, Environmental Engineering (Aug. 2019 – Present)

### Undergraduate Research Mentor

Hannah Cairney, Environmental Engineering (Jan. 2020 – Present)  
Sonrisa Macharia, Environmental Engineering (Sept. 2019 – May 2020)

### Committee Member

Jacob Hutfles, Ph.D. Student, Mechanical Engineering (Oct. 2019 – Dec. 2020)  
Sankar Ravir, Ph.D. Student, Mechanical Engineering (Dec. 2020 – Present)

## Professional Service

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### Reviewer for Scholarly Journals

ACS Applied Materials & Interfaces, Applied Energy, Desalination, Environmental Science & Technology, Environmental Science & Technology Letters, Journal of Chemical Physics, Journal of the Electrochemical Society, Journal of Membrane Science, Nano Letters, Nature Communications, Nature Nanotechnology, Science Advances, Separation & Purification Technology, Sustainable Energy & Fuels

### Professional Memberships

American Chemical Society (ACS), Association of Environmental Engineering & Sciences Professors (AEESP), North American Membrane Society (NAMS)

### Conference Organizing

2020 North American Membrane Society Conference: Session Chair for “Osmotically Driven Processes”  
2019 North American Membrane Society Conference: Session Chair for “Osmotically Driven Processes”

### Press Interviews

Interviewed for and quoted in Scientific American article “[This Battery Runs on the Hidden Power of Estuaries](#)” published on 1 March 2017.

## Professional Service

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### Awarded as PI

“Osmotic membranes with near-perfect selectivity and improved chemical resilience for wastewater reuse” PI: Anthony Straub. Funding Agency: Membrane Science, Engineering and Technology Research Center. Total Award: \$50,000 (no overhead). Award Duration: 1 year (2021)

### Awarded as Co-PI

“Tunable salt rejection membranes for enhanced energetics and high recovery in brackish water desalination” PI: Vasiliki Karanikola (University of Arizona). Co-PIs: Anthony Straub (CU Boulder) and Kerri Hickenbottom (University of Arizona). Funding Agency: U.S. Bureau of Reclamation. Total Award: \$150,000. Award Duration: 1.5 years (2021-2022)