

# Curriculum Vitae

## Robert L. McGinnis

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Environmental Engineering Program  
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### Education

- 2009 Ph.D. Environmental Engineering, Yale University (expected)  
*Advisor: Menachem Elimelech*
- 2007 M.S. Environmental Engineering, Yale University
- 2002 B.A., Yale University

### Awards

- 2008 ACS Graduate Student Award in Environmental Chemistry
- 2007 Winner, Robert M. Langer Symposium Graduate Student Presentation Competition
- 2006 NSF Graduate Research Fellowship
- 2002 Yale College Dean's Fellowship for Undergraduate Research
- 1997 Exploratory research grant, Lawrence Berkeley National Laboratories

### Research Interests

- **Sustainable Augmentation of Energy and Water Supplies** – using the tools of Engineered Osmosis to increase water and energy availability without requiring significant fossil fuel inputs
- **Development and Characterization of Osmotically Driven Membrane Processes** – introduction of Forward Osmosis (FO) desalination and Osmotic Heat Engine (OHE) power generation technologies; development of process improvements and fundamental characterization studies; investigation of open cycle Pressure Retarded Osmosis power generation methods

- **Novel Membrane Design** – modification of existing polymeric semi-permeable membranes for application to osmotically driven membrane processes; development of novel non-polymeric and hybrid semi-permeable membranes
- **Nanoscale Membrane Sensing** – characterization of membrane transport phenomena; identification of the presence of target contaminants, solutes, or pathogens at very low concentrations in operating membrane separation systems

## Teaching Experience

Spring 2008	Graduate Teaching Fellow, Yale University <b>Chemical Engineering Process Design (CENG 412)</b> <i>Professor: Yehia Khalil</i>
Fall 2007	Graduate Teaching Fellow, Yale University <b>Creativity and New Product Development (ENAS 323)</b> <i>Professor: Henry Bolanos</i>
Spring 2007	Graduate Teaching Fellow, Yale University <b>Mechanical Design (“Robot Wars” MENG 185)</b> <i>Professor: David LaVan</i>
Fall 2006	Graduate Teaching Fellow, Yale University <b>Introduction to Environmental Engineering (ENVE 120)</b> <i>Professor: Jordan Peccia</i>
Spring 2006	Graduate Teaching Fellow, Yale University <b>Chemical Engineering Process Design (CENG 412)</b> <i>Professor: Yehia Khalil</i>

## Research Experience

2007-Present	<b>Graduate researcher</b> , Yale University. <i>Methods of engineered osmosis; novel membrane fabrication methods; nanoscale separation system sensing; FO desalination pilot plant.</i> <u>Funding</u> : NSF Graduate Research Fellowship; WaterCAMPWS
2005-2007	<b>Graduate researcher</b> , Yale University. <i>Forward osmosis (FO) desalination pilot project.</i> <u>Funding</u> : NSF Graduate Research Fellowship; EUWP program (Expeditionary Unit Water Purification); consortium composed of the Office of Naval Research, NAVSEA, US Army TARDEC, US Bureau of Reclamation, and NASA.
2002-2005	<b>Chief Technology Officer</b> , Osmotic Technologies, Inc. (OTI) <b>Research Engineer</b> , Yale University <i>Commercialization of FO desalination and water treatment.</i> <u>Funding</u> : EUWP program (Expeditionary Unit Water Purification); consortium composed of the Office of Naval Research, NAVSEA, US Army TARDEC, US Bureau of Reclamation, and NASA; Research partnership between Yale and OTI.

1999-2002

**Undergraduate researcher**, Yale University

*Forward osmosis desalination and water treatment.*

Funding: Yale College Dean's Fellowship for Undergraduate Research

## **Reviewer for Scholarly Journals**

- *Journal of Environmental Monitoring (Royal Chemical Society)*
- *Desalination*

## **Professional Society Memberships**

- North American Membrane Society
- American Chemical Society
- Association of Environmental Engineering Science Professors (membership in process)

## **Publications**

1. McGinnis, R.L and Elimelech, M. "Global challenges in energy and water supply: The promise of Engineered Osmosis", *Environmental Science & Technology*, submitted.
2. McGinnis, R.L., McCutcheon, J.R. and Elimelech, M. "A Novel Ammonia-Carbon Dioxide Osmotic Heat Engine for Power Generation", *Journal of Membrane Science*, Vol. 305 (2007), pages 13-19.
3. Khalil, Y., Elimelech, M., and McGinnis, R. L. "A Novel, Safe, and Environmentally Friendly Technology for Water Production through Recovery of Rejected Thermal Energy from Nuclear Power Plants", *Nuclear Engineering and Design*. In Press.
4. McGinnis, R. L. and Elimelech, M. "Energy Requirements of Ammonia-Carbon Dioxide Forward Osmosis Desalination", *Desalination*, Vol. 207, 2007, pages 370-382.
5. McCutcheon, J. R., McGinnis, R. L., and Elimelech, M. "The Ammonia-Carbon Dioxide Forward Osmosis Process", *Water Conditioning and Purification*, Vol. 48, #10, Oct. 2006.
6. McCutcheon, J. R., McGinnis, R. L., and Elimelech, M. "Desalination by Ammonia-Carbon Dioxide Forward Osmosis: Influence of Draw and Feed Solution Concentrations on Process Performance", *Journal of Membrane Science*, Vol. 278, July 2006, pages 114-123.
7. McCutcheon, J. R., McGinnis, R. L., and Elimelech, M. "A Novel Ammonia-Carbon Dioxide Forward (Direct) Osmosis Desalination Process", *Desalination*, Vol. 174, 2005, pgs 1-11.

## **Patents**

1. McGinnis, R. L.; McCutcheon, J. R.; Elimelech, M. Ammonia-Carbon Dioxide Osmotic Heat Engine for the Conversion of Low Grade Heat into Electricity. PCT. Pat. Appl., Nov 2006.

2. McGinnis, R. L. Multi-Stage Column Distillation (MSCD) Method for Osmotic Solute Recovery. PCT. Pat. Appl., June 2006.
3. McGinnis, R. L. Method and System for Removing Solutes from a Solution Using Forward Osmosis. PCT. Pat. Appl., Dec 2005.
4. McGinnis, R. L. Modification of Spiral Wound Membranes for Forward Osmosis Use. PCT. Pat. Appl., Oct 2002.
5. McGinnis R. L. Osmotic Desalination Process. PCT. Pat. Appl. WO 02/060825 A2, Feb 2002.
6. McGinnis R. L. Osmotic Desalination Process. U.S. Patent 6,391,205, May 21, 2002.

## **Presentations**

1. McGinnis, R., "Osmotic Heat Engine", oral presentation at the Robert M. Langer Symposium, Yale University, New Haven, CT. December 2007.
2. McGinnis, R., McCutcheon, J., Elimelech, M. "Pilot Scale Demonstration of Ammonia / Carbon Dioxide Forward Osmosis Desalination Process", oral presentation to the EUWP Desalination Program, Las Cruces, NM, September 2007.
3. McGinnis, R., McCutcheon, J., Elimelech, M. "Forward Osmosis Desalination", oral presentation to the employees of Membrane Technology & Research, Menlo Park, CA. August 2007.
4. McGinnis, R., McCutcheon, J., Elimelech, M. "Forward Osmosis Desalination: Current Research and Future Prospects", oral presentation at the American Membrane Technology Association conference, Las Vegas, NV. July 2007.
5. McGinnis, R., Elimelech, M. "Osmotic Heat Engine (Closed Cycle NH<sub>3</sub>/CO<sub>2</sub> PRO)", oral presentation at the ACS Green Chemistry and Engineering conference, Washington, D.C. June, 2007.
6. McGinnis, R., McCutcheon, J., Elimelech, M. "Forward Osmosis Energy Use: Comparisons to RO, MSF, and MED", oral presentation at the North American Membrane Society conference, Orlando, FL. May, 2007.
7. McGinnis, R., McCutcheon, J., Elimelech, M. "Pilot Scale Demonstration of Ammonia / Carbon Dioxide Forward Osmosis Desalination Process", oral presentation to the EUWP Desalination Program, Monterey, CA, January, 2007.
8. McGinnis, R., McCutcheon, J., Elimelech, M. "Pilot Scale Demonstration of Ammonia / Carbon Dioxide Forward Osmosis Desalination Process", oral presentation to the EUWP Desalination Program, Washington, D.C., June, 2006.
9. McGinnis, R., McCutcheon, J., Elimelech, M. "Pilot Scale Demonstration of Ammonia / Carbon Dioxide Forward Osmosis Desalination Process", oral presentation to the EUWP Desalination Program, Long Beach, CA. January, 2006.

10. McGinnis, R., McCutcheon, J., Elimelech, M. "Desalination by Forward Osmosis", oral presentation to the Chief Scientist, BP. London, UK., January, 2006.
11. McGinnis, R., McCutcheon, J., Elimelech, M. "Desalination by a Novel Ammonia - Carbon Dioxide Forward Osmosis Process", oral presentation to the EUWP Desalination Program, Denver, CO. June, 2005.