Benjamin John Davis

Associate Professor of Chemical Engineering • The Cooper Union for the Advancement of Science and Art
7 East 7th Street • Building 41CS Rm 419 • New York, NY 10003 • Website: faculty.cooper.edu/bdavis
Telephone: (212) 353-4374 • Cell: (310) 666-9459 • E-mail: benjamin.j.davis@gmail.com

Education

Ph.D. in Chemical and Biomolecular Engineering June 2009
University of California at Los Angeles (Los Angeles, CA)
Ph.D. Thesis title: *"Global Optimization Techniques for Chemical Process Network Synthesis"*

B.S. in Chemical and Biomolecular Engineering May 2002
Cornell University (Ithaca, NY)

Professional Experience

Associate Professor 2016 – present
The Cooper Union for the Advancement of Science and Art (New York, NY)
Teaching undergraduate and graduate courses, supervising and advising students, leading committees and councils, assisting in institutional planning and oversight.

Assistant Professor 2009 – 2015
The Cooper Union for the Advancement of Science and Art (New York, NY)

Teaching Experience

Assistant and Associate Professor 2009 – present
The Cooper Union for the Advancement of Science and Art (New York, NY)
- ChE 221 Energy and Material Balances (2018)
- ChE 162/371/372 Chemical Engineering Laboratory I and II (2013, 2016, 2017)
- ChE 161.2/382 Process Evaluation and Chemical Systems Design II (2011-2016)
- ChE / EID 488 Convex Optimization Techniques (2010-present)
- ChE 421 Advanced Chemical Reaction Engineering (2010-present)
- ChE 151/352 Process Simulation and Mathematical Techniques for ChEs (2010-present)
- ChE 142/351 Separation Process Principles (2009-2016)
- ChE / EID 447 Sustainability and Pollution Prevention (2009-present)

Teaching Assistant - Pollution Prevention Spring 2005, 2006, 2007, 2008
University of California at Los Angeles (Los Angeles, CA)

Teaching Assistant - Process Economics and Analysis Winter 2005, 2006, 2007, 2008
University of California at Los Angeles (Los Angeles, CA)

Teaching Assistant - Cryogenics and Low-Temperature Processes Fall 2004, 2005, 2006
University of California at Los Angeles (Los Angeles, CA)

Teaching Assistant - Computer-Aided Chemical Process Design Spring 2004, 2007
University of California at Los Angeles (Los Angeles, CA)

Teaching Assistant - Introduction to Chemical Engineering Fall 2003
University of California at Los Angeles (Los Angeles, CA)

Journal Publications

Davis, B. J. "Time on Task as an Assessment Tool for Student Learning." *Chemical Engineering Education* (in preparation).

Davis, B. J., Nakagaki, N., Manousiouthakis, V. I. "Performance Targets for Batch Wastewater Treatment Operations." *Industrial & Engineering Chemistry Research* (in preparation).

Stevenson, J. M., Davis, B. J. "Fuzzy Sustainability Assessment of Mass Transit via Fuzzy Systems." *Columbia Undergraduate Science Journal* (submitted).

Phillis, Y. A., Davis, B. J. "Assessment of Corporate Sustainability via Fuzzy Logic." *Journal of Intelligent and Robotic Systems* 55 (1) p. 3 – 20, 2009.

Davis, B. J., Taylor, L. A., Manousiouthakis, V. I. "Identification of the Attainable Region for Batch Reactor Networks." *Industrial & Engineering Chemistry Research* 47 (10) p. 3388 – 3400, 2008.

Proceedings Publications

Jeong, C.; Davis, B. J. "Economic and Environmental Evaluation of Olive Mill Wastewater Treatment Methods for a Self-Supplied American Olive Oil Mill." *Proceedings Environmental Division*, AIChE Annual Meeting, Minneapolis, Minnesota, November 2017.

O'Neill, K.; Davis, B. J. "Economic and Environmental Assessment of Methane to Ethylene Via Oxidative Coupling." *Proceedings Topical Conference: Innovations of Green Process Engineering for Sustainable Energy and Environment*, AIChE Annual Meeting, San Francisco, California, November 2016.

Davis, B. J. "Time on Task as an Assessment Tool for Student Learning." *Proceedings Education Division*, AIChE Annual Meeting, Minneapolis, Minnesota, October 2011.

Davis, B. J. "Chemical Engineering in the 8th Grade Classroom." *Proceedings Education Division*, AIChE Annual Meeting, Nashville, Tennessee, November 2009.

Davis, B. J.; Berens, B.; Manousiouthakis, V. I. "Dynamic Operation of a 1.2 kW PEM Fuel Cell." *Proceedings Computing and Systems Technology Division*, p. 6616-6619, AIChE Annual Meeting, Cincinnati, Ohio, November 2005.

Davis, B. J.; Manousiouthakis, V. I. "Application of Primal-Dual Iteration to the Solution of Process Network Synthesis Problems." *Proceedings Computing and Systems Technology Division*, p. 6874-6878, AIChE Annual Meeting, Cincinnati, Ohio, November 2005.

Presentations

O'Neill, K.; Davis, B. J. "Economic and Environmental Evaluation of Olive Mill Wastewater Treatment Methods for a Self-Supplied American Olive Oil Mill." Presented at the AIChE Annual Meeting, paper 521b, Minneapolis, Minnesota, November 2017.

O'Neill, K.; Davis, B. J. "Economic and Environmental Assessment of Methane to Ethylene Via Oxidative Coupling." Presented at the AIChE Annual Meeting, paper 70a, San Francisco, California, November 2016.

Bayles, T. et al. "Getting Started in Engineering Education Research" (invited panelist) Presented at the AIChE Annual Meeting, paper 412, Atlanta, Georgia, November 2014.

Lepek et al. "The Teaching of Transport Phenomena and Related Courses: Survey Results" Presented at the AIChE Annual Meeting, paper 372786, Atlanta, Georgia, November 2014.

Anderson, T. J. et al. "Electives in the Undergraduate Chemical Engineering Curriculum" Presented at the AIChE Annual Meeting, paper 574a, San Francisco, California, November 2013.

Huh, H. and Davis, B. J. "Gas to Olefins: Sustainable Development of Shale Gas?" Presented at the AIChE Annual Meeting, paper 764e, San Francisco, California, November 2013.

Davis, B. J. "Time on Task as an Assessment Tool for Student Learning." Presented at the AIChE Annual Meeting, paper 372h, Minneapolis, Minnesota, October 2011.

Davis, B. J. "What is Chemical Engineering?" Presented at Stuyvesant High School to junior and senior Physics research students, room 815, New York, New York, May 2011.

Davis, B. J. "Project-Based Learning for Sustainability and Life-Cycle Assessment." Presented at the AIChE Annual Meeting, paper 405d, Salt Lake City, Utah, November 2010.

Davis, B. J. "Chemical Engineering in the 8th Grade Classroom." Presented at the AIChE Annual Meeting, paper 32c, Nashville, Tennessee, November 2009.

Davis, B. J.; Phillis, Y. A. "Fuzzy Assessment of Corporate Sustainability." Presented at the AIChE Annual Meeting, paper 713c, Philadelphia, Pennsylvania, November 2008.

Manousiouthakis, V. I.; Davis, B. J. "Performance Targets for Batch Wastewater Treatment Operations." Presented at the AIChE Annual Meeting, paper 86b, Philadelphia, Pennsylvania, November 2008.

Davis, B. J.; Manousiouthakis, V. I. "Optimization of Hydrogen Liquefaction Networks." Presented at the AIChE Annual Meeting, paper 296b, Salt Lake City, Utah, November 2007.

Davis, B. J.; Manousiouthakis, V. I. "Automatic Construction of Globally Optimal Power Cycle Networks." Presented at the AIChE Annual Meeting, paper 176d, Salt Lake City, Utah, November 2007.

Davis, B. J.; Manousiouthakis, V. I. "Attainable Region Construction for Reactor Networks Exhibiting Limit Cycles." Presented at the AIChE Annual Meeting, paper 460g, San Francisco, California, November 2006.

Davis, B. J.; Manousiouthakis, V. I. "Faster Methods for Solving Large Quadratic Programs." Presented at the AIChE Annual Meeting, paper 617e, San Francisco, California, November 2006.

Davis, B. J.; Manousiouthakis, V. I. "Dynamic Operation of a 1.2 kW PEM Fuel Cell." Presented at the AIChE Annual Meeting, paper 314d, Cincinnati, Ohio, November 2005.

Davis, B. J.; Manousiouthakis, V. I. "Application of Primal-Dual Iteration to the Solution of Process Network Synthesis Problems." Presented at the AIChE Annual Meeting, paper 445e, Cincinnati, Ohio, November 2005.

Davis, B. J.; Manousiouthakis, V. I. "PEM Fuel Cell Network Optimization." Presented at the AIChE Annual Meeting, paper 26c, Austin, Texas, November 2004.

Davis, B. J.; Manousiouthakis, V. I. "Modeling of a Single Non-Isothermal Fuel Cell Stack." Presented at the AIChE Annual Meeting, paper 514d, Austin, Texas, November 2004.

Research Interests

- Pollution prevention in chemical and energy generation processes
- Sustainable chemical and bioproduct process design
- Performance targets for batch processes and wastewater treatment
- Economics of CO_2 production and sequestration
- Engineering education (economics, evaluation, and assessment)
- Life-cycle and sustainability assessment
- Convex optimization theory (algorithms, vector space methods, applications to networks)
- Numerical methods and scientific computing in Python and Matlab

Theses Supervised

- Chae Jeong, ME '18, The Cooper Union – masters thesis on "Economic and Environmental Evaluation of Olive Mill Wastewater Treatment Methods for a Self-Supplied American Olive Oil Mill" (Fall 2016 – present)
- Kenneth O'Neill, ME '18, The Cooper Union – masters thesis on "Oxidative Coupling of Methane on Nanowire Catalysts: Synthesis of a Separation Train for OCM Reactor Effluent" (Fall 2016 – present)
- Norris Nakagaki, ME '14, The Cooper Union – masters thesis on "Optimizing Batch and Fed-Batch 4-Chlorophenol Treatment Processes" (Fall 2012 – Spring 2014)
- Jung Choi, ME '13, The Cooper Union – masters thesis on "Green Chemical Engineering: Case studies on achieving sustainability in chemical process design" (Fall 2011 – Spring 2013)
- Heejae Huh, ME '13, The Cooper Union – masters thesis on "Sustainable Development of Shale Gas and Gas-to-Propylene" (Fall 2011 – Spring 2013)
- James Lee, ME '13, The Cooper Union – masters thesis on "Local Astaxanthin: The design and economics of a small-scale microalgal facility to produce a natural dietary supplement for an urban market" (Fall 2010 – Spring 2013)

Independent Study Projects Supervised

- Sun Kim '18, The Cooper Union – independent study project on heat integration and minimum utility costs for an OCM plant (Fall 2016 – present)
- Kenneth O'Neill '16, The Cooper Union – independent study project on process design for oxidative coupling of methane (Fall 2015 – Spring 2016)

- Henry Kasen '14, The Cooper Union – independent study project on identifying optimal games for three or more players (Summer 2012 – Fall 2012)
- Roy Kim '12, The Cooper Union – independent study project on the environmental impacts of ethylene carbonate production as a step in making polycarbonate (Summer 2011 – Fall 2011)
- Yosef Treitman '11 and James Baker '11, The Cooper Union – independent study project on developing an integer programming algorithm for Cooper Union scheduling (Spring 2011)
- Philip Wong '11, The Cooper Union – independent study project on a life-cycle assessment for bamboo v. aluminum v. steel bicycles (Fall 2010)
- Edwin Deleon '11, The Cooper Union – independent study project on modeling a chemical reactor for biomass pyrolysis for renewable energy generation (Spring 2010)
- James Stevenson '11, The Cooper Union – independent study project on assessment of the environmental and social impacts of urban mass transit systems in the U.S. (Fall 2009, Spring 2010, and Fall 2010)

Outreach and Other Activities

Regular panelist "What is Chemical Engineering Night." presented at The Cooper Union for the Advancement of Science and Art to AIChE Student Chapter (2010-present)

Regular partner with East Side Community High School, on "Water Quality and Treatment: Thinking Like an Engineer" and chemistry student evaluation (2010-present)

Petrocelli, F. P. et al. "Outreach in Action: Properties of CO_2." Helped lead 47 high school students in hands-on activity on CO_2 at AIChE Annual Meeting in San Francisco, CA (November 2013)

Led Cooper Union Summer Research Internship Program on "Engineering Polymers: How Plastics are Made" (2011, 2013)

Petrocelli, F. P. et al. "Let it Flow: Chocolate Viscosity." Helped lead 5 high school (9^{th} and 10^{th} grade) students in hands-on activity on chocolate and economically optimal pipe size for its transport at AIChE Annual Meeting in Pittsburgh, PA (October 2012)

Professional, Committee and Leadership Experience

The Cooper Union for the Advancement of Science and Art (New York, NY) **Committee Member**, Academic Standards Committee	September 2016 – present
Association of Energy Engineers, Cooper Union Student Chapter **Faculty Advisor and Chapter Mentor**	June 2016 – present
The Cooper Union for the Advancement of Science and Art (New York, NY) **Chair**, Working Group on Standard 5 for MSCHE accreditation	April 2016 – April 2017
American Institute of Chemical Engineers, Education Division **2nd Vice-Chair** (elected position)	September 2015 – present
American Institute of Chemical Engineers Annual Meeting (San Francisco, CA) **Co-chair**, "Issues and Challenges in Teaching Chemical Process Design" and "Survey Results and Best Practices: Electives"	November 2013

The Cooper Union for the Advancement of Science and Art (New York, NY) **Chair**, "Working Group", Academic Opportunities Sub-committee	October 2013 – January 2014
The Cooper Union for the Advancement of Science and Art (New York, NY) **Committee Member**, Institutional Review Board (IRB)	January 2013 – present
The Cooper Union for the Advancement of Science and Art (New York, NY) **Chair**, Planning and Assessment Council (member since April 2011)	October 2012 – present
American Institute of Chemical Engineers Annual Meeting (Pittsburgh, PA) **Co-chair**, "Best Practices in Senior Design Courses by Adjuncts" and "Faculty and Best Papers From CEE and the ASEE Proceedings"	October 2012
The Cooper Union for the Advancement of Science and Art (New York, NY) **Committee Member and Chair**, Ad Hoc Communications Committee	August 2012 – November 2012
American Institute of Chemical Engineers, Education Division **Committee Member and Chair**, K-12 Committee	May 2012 – January 2017
American Institute of Chemical Engineers Annual Meeting (Minneapolis, MN) **Co-chair**, "Critical Thinking in the Chemical Engineering Curriculum" and "Fundamentals of Biomass Utilization"	October 2011
American Institute of Chemical Engineers, Education Division **Secretary / Treasurer** (elected position)	September 2011 – September 2015
American Institute of Chemical Engineers Annual Meeting (Salt Lake City, UT) **Co-chair**, "Incorporating Green Eng. and Sustainability Into the Curriculum"	November 2010
American Institute of Chemical Engineers Annual Meeting (Nashville, TN) **Co-chair**, "Dynamics, Design and Control of Sustainable Processes and Technologies and Associated Waste Management Principles"	November 2009

Honors and Awards

Elected to the "Student's List" by Cooper Union Engineering Student Council	Fall 2011

Fellowships and Grants

University of California at Los Angeles / Culver City Middle School **UCLA SEE-LA GK-12 Teaching Fellowship**	2008 – 2009
American Institute of Chemical Engineers **2008 CAST Graduate Travel Grant**	November 2008

Professional Affiliations

American Institute of Chemical Engineers – Member (2004-2016), Senior Member (2017-present)