Brandon Kuczenski

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Research Interests

Integrative modeling of the industry-nature boundary

- Distributed data infrastructure for material flow measurements.
- Informatics for decision support in sustainability.
- Toxic substances in and beyond the economy.

Improving the robustness of life cycle sustainability assessment

- Formalization and critical review of product life cycle models.
- Observational basis of process inventory models.
- Semantic consistency in quantitative impact estimations.

Novel data sources for industrial metabolism

- Privacy-preserving methods for competitive collaborators.
- Self-publishing process and flow data.
- Remote sensing of industrial systems.

Education

Carnegie Mellon University, Pittsburgh, PA

2008 **Ph.D.** Mechanical Engineering

2005 **M.S.** Mechanical Engineering

University of California, Berkeley, Berkeley, CA

2001 **B.S.** Mechanical Engineering (High Honors)
Minor in Mathematics

Dissertation Topic: Probing Biological Systems using a Microfluidic Chemical Signal Generator.

Using a custom designed instrument to manipulate laminar flows in microfluidic networks, I investigated spatiotemporal aspects of calcium signaling in murine fibroblast cells. *Advisors: Philip R. LeDuc, William C. Messner*

Professional Experience

2016–present	Associate Researcher, Institute for Social, Behavioral, and Economic Research, UC Santa Barbara. *Chair: Stuart Sweeney*.
2017	Project Associate, LAC Federal, for USDA National Agriculture Library, Knowledge Services Division. *Project Director: Peter Arbuckle*.
2013–2016	Assistant Researcher, Institute for Social, Behavioral, and Economic Research, UC Santa Barbara. *Chair: Stuart Sweeney*.
2008–2013	Postdoctoral Scholar, Department of Environmental Science and Management, UC Santa Barbara. *Advised by Roland Geyer*.
2003–2008	Graduate Student Researcher, Department of Mechanical Engineering, Carnegie Mellon University. *Advised by P.R. LeDuc and W.C. Messner*.
2001–2003	Control Systems Engineer, Kensington Laboratories, Inc., Richmond, CA.
2000	UC Berkeley Engineering Cooperative Education program, Jet Propulsion Laboratory, Pasadena, CA

Teaching Experience

Course Instructor

2016-17	ESM 288 "Energy, Technology, and the Environment"; ESM 595EA / CS 595D PhD Seminar. "Public and private knowledge in Life Cycle Assessment," Co-instructed with Amr El Abbadi
2011-12	ESM 288 "Energy, Technology, and the Environment"; ESM 282 "Industrial Ecology"; ESM 273 "Life Cycle Assessment," Co-instructed with Sangwon Suh

Guest Lecturer

Spring 2013	"Auditing US Energy Use" in ISE 576 Industrial Ecology. *University of Southern California; Course Instructor: Robert Vos*
Winter 2010	"Private Transportation" in ESM 288 Energy, Technology, and the Environment. *Course Instructor: Roland Geyer*

Student Teaching

Spring 2006	Teaching Assistant, 24-262 Stress Analysis. *CMU Mech. Eng.; Course Instructor: Robert Reid*
Spring 2004	Laboratory Assistant, 24-352 Dynamic Systems and Control. *CMU Mech. Eng.; Course Instructor: William C. Messner*
Spring 2001	Undergraduate Student Instructor, Math 1A: Calculus for Scientists and Engineers. *UC Berkeley Mathematics; Course Instructor: Marina Ratner*

Sponsored Projects

2018–2019 *Toward distributed knowledge management for life cycle product system models*. (PI) Cooperative Agreement, Agricultural Research Service, US Department of Agriculture. Agency PI: Peter Arbuckle.

2014–2017 *CyberSEES: Type I: Preserving the privacy of life cycle inventory data in distributed provenance networks* (PI). Co-PI: Amr El Abbadi. NSF Computer and Communication Foundations 1442966.

2015–2016 *Data Poor Fisheries: IT Infrastructure Development* (PI). Project Manager: Jono Wilson, The Nature Conservancy.

2014–2015 *Guidelines for considering life cycle impacts in alternatives analysis.* (Senior Technical Staff). PI: Arturo Keller. California DTSC 13-T3804.

2013–2015 *Used Oil Life Cycle Assessment Online Tool* (PI). CalRecycle DRR13026.

Consulting

2016–2017 Patagonia, Inc. LCA of fossil and bio-based materials; literature review; data collection and analysis.

2016–2017 Alberta Used Oil Management Association / British Columbia Used Oil Management Association. LCA of lubricating oil and related materials management.

2015–2017 World Auto Steel Association. Impacts of material and drivetrain choices on life cycle greenhouse gas emissions. With Roland Geyer.

Publications

Peer-Reviewed Articles

1. **Kuczenski, B.**. (2018) "Disclosure of product sysem models in life cycle assessment: achieving transparency and privacy." *Journal of Industrial Ecology*, advance online publication. doi: 10.1111/jiec.12810.

2. **Kuczenski, B.**, Marvuglia, A., Astudillo, M. F., Ingwersen, W., Satterfield, M. B., Evers, D. P., Koffler, C., Navarrete, T., Amor, B., and Laurin, L. (2018) "LCA capability roadmap—product system model description and revision." *International Journal of Life Cycle Assessment* **23** (8), 1685–92. doi: 10.1007/s11367-018-1446-8.

3. Hertwich, E., Heeren, N., **Kuczenski, B.**, Majeau-Bettez, G., Myers, R. J., Pauliuk, S., Stadler, K., and Lifset, R. (2018) "Nullius in Verba: Advancing Data Transparency in Industrial Ecology." *Journal of Industrial Ecology* **22** (1), 6–17. doi: 10.1111/jiec.12738.

4. **Kuczenski, B.**, Sahin, C., El Abbadi, A. (2017) "Privacy-preserving aggregation in life cycle assessment." *Environment Systems and Decisions* **37** (1), 13–21. doi: 10.1007/s10669-016-9620-7.

5. **Kuczenski, B.**, Davis, C.B., Rivela, B., and Janowicz, K. (2016) "Semantic catalogs for life cycle assessment data." *Journal of Cleaner Production* **137**, 1109–17. doi: 10.1016/j.jclepro.2016.07.216

6. **Kuczenski, B.**. (2015) "Partial ordering of life cycle inventory databases." *International Journal of Life Cycle Assessment* **20**(12), 1673–83. doi: 10.1007/s11367-015-0972-x

7. Geyer, R., **Kuczenski, B.**, Zink, T. and Henderson, A. (2015) "Common Misconceptions about Recycling." *Journal of Industrial Ecology* **20**(5), 1010–17. doi: 10.1111/jiec.12355

8. Geyer, R., **Kuczenski, B.** and Trujillo, M. (2015) "Assessing the Greenhouse Gas Savings Potential of Extended Producer Responsibility for Mattresses and Boxsprings in the United States." *Journal of Industrial Ecology* **20**(4), 917–28. doi: 10.1111/jiec.12313

9. **Kuczenski, B.**, Geyer, R., Zink, T. and Henderson, A. (2014) "Material Flow Analysis of Lubricating Oil Use in California." *Resources, Conservation, and Recycling* **93**: 59–66. doi: 10.1016/j.resconrec.2014.10.001

10. **Kuczenski, B.** and Geyer, R. (2013) "PET bottle reverse logistics: environmental performance of the CRV program." *International Journal of Life Cycle Assessment* **18**(2): 456–71. doi: 10.1007/s11367-012-0495-7

11. **Kuczenski, B.**, Geyer, R. and Boughton, B. (2011) "Tracking Toxicants: toward a life cycle aware risk assessment." *Environmental Science and Technology* **45**(1): 45–50. doi: 10.1021/es101467z.

12. **Kuczenski, B.** and Geyer, R. (2010) "Material flow analysis of polyethylene terephthalate in the US, 1996–2007." *Resources, Conservation and Recycling* **54**(12): 1161–9. doi: 10.1016/j.resconrec.2010.03.013.

13. Kim, Y., **Kuczenski, B.**, LeDuc, P.R. and Messner, W.C. (2009) "Modulation of fluidic resistance and capacitance for long-term, high-speed feedback control of a microfluidic interface." *Lab on a Chip* **9**: 2603–9. doi: 10.1039/b822423d.

14. **Kuczenski, B.**, Ruder, W.C., Messner, W.C. and LeDuc, P.R. (2009) "Probing cellular dynamics with a chemical signal generator." *PLoS One* **4**(3): e4847. doi: 10.1371/journal.pone.0004847.

15. **Kuczenski, B.**, LeDuc, P.R. and Messner, W.C. (2007): "Pressure-driven spatiotemporal control of the laminar flow interface in a microfluidic network." *Lab on a Chip* **7**: 647–9. doi: 10.1039/b617065j

16. **Kuczenski, B.**, LeDuc, P.R. and Messner, W.C. (2005). "A platform for building PIC applications for control and instrumentation." 2005 IEEE American Control Conference. doi: 10.1109/ACC.2005.1470843

Peer-Reviewed Proceedings and Workshop Papers

1. Sahin, C., **Kuczenski, B.**, Egecioglu, O., El Abbadi, A. "Towards practical privacy-preserving life cycle assessment computations." (2017) in: *Seventh ACM Conference on Data and Application Security and Privacy*, CODASPY '17.

2. **Kuczenski, B.**, El Abbadi, A., Sahin, C. "Privacy-preserving aggregation in life cycle assessment." (2016) in: *4rd International Symposium on Sustainable Systems and Technology, ISSST2016*.

3. Janowicz, K., Krisnadhi, A.A., Hu, Y., Suh, S., Weidema, B.P., Rivela, B., Tivander, J., Meyer, D.E., Berg-Cross, G., Hitzler, P., Ingwersen, W., **Kuczenski, B.**, Vardeman, C., Ju, Y. and Cheatham, M. "A Minimal Ontology Pattern for Life Cycle Assessment Data." (2015) in: *Workshop on Ontology and Semantic Web Patterns*, 6th ed., at International Semantic Web Conference, ISWC2015.

4. Yan, B., Hu, Y., **Kuczenski, B.**, Janowicz, K., Ballatore, A., Krisnadhi, A.A., Ju, Y., Hitzler, P., Suh, S. and Ingwersen, W. "An Ontology For Specifying Spatiotemporal Scopes in Life Cycle Assessment." (2015) in: *Diversity++ Workshop* at International Semantic Web Conference, ISWC2015.

5. **Kuczenski, B.** and Beraha, S. "Antelope – a web service for publishing life cycle models and results." (2015) in: *3rd International Symposium on Sustainable Systems and Technology, ISSST2015*. doi: 10.6084/m9.figshare.1510989

6. **Kuczenski, B.**. "Life cycle fragments: computational methods for analyzing and sharing life cycle assessment models." (2014) in: *7th International Congress on Environmental Modelling and Software, iEMSs 2014*.

Book Chapters

1. Li, X., Ortiz, P., **Kuczenski, B.**, Franklin, D. and Chong, F. "Mitigating the environmental impact of smartphones through reuse." in Hu, W. and Kaabouch, N., ed. (2012). *Sustainable ICTs and Management Systems for Green Computing*. IGI Global. doi: 10.4018/978-1-4666-1839-8.ch011

Web Applications

1. **Kuczenski, B.** and Beraha, S. "Used Oil LCA Online Tool." v1.7 (Beta) (2015) Interactive implementation of Geyer et al. (2013). Available at: `http://publictest.calrecycle.ca.gov/lcatoolfrontend`.

Technical Reports

1. Geyer, R., **Kuczenski, B.**, Henderson, A. and Zink, T. (2013) "Life Cycle Assessment of Used Oil Management in California pursuant to Senate Bill 546 (Lowenthal)." Report to the California Department of Resources Recycling and Recovery. Award #DRR10063.

2. **Kuczenski, B.** and Geyer, R. (2012) "The Impact of Extended Producer Responsibility in California on Global Greenhouse Gas Emissions: Plastic Clamshell Container Case Study." Report to the California Department of Resources Recycling and Recovery. Award #IWM09021.

3. Geyer, R. and **Kuczenski, B.** (2012) "The Impact of Extended Producer Responsibility in California on Global Greenhouse Gas Emissions: Mattress Case Study." Report to the California Department of Resources Recycling and Recovery. Award #IWM09021.

4. **Kuczenski, B.** and Geyer, R. (2011) "Objective 1: Life Cycle Assessment of CRV PET Bottles." Report to the California Department of Resources Recycling and Recovery. CRV Market Development Program, Contract #5007-522.

5. **Kuczenski, B.** and Geyer, R. (2011) "Objective 2: Material Flow Analysis of PET." Report to the California Department of Resources Recycling and Recovery. CRV Market Development Program, Contract #5007-522.

6. **Kuczenski, B.** and Geyer, R. (2011) "Life cycle assessment of PET bottles consumed in the state of California." Report to the California Department of Toxic Substances Control. Contract #08-T3630.

7. **Kuczenski, B.** and Geyer, R. (2010) "Safer Product Alternatives Analysis: Methods, models and tools." Report to the California Department of Toxic Substances Control. Contract #08-T3629.

PRESENTATIONS

Invited Talks

1. "What's it worth? Measuring the benefits of used oil recycling." National Used Oil Materials and Antifreeze Advisory Council meeting, Kelowna, BC. August 31, 2017.

2. “Industrial ecology: material flows at the nature-industry boundary.” Roundtable talk, National Center for Ecological Analysis and Synthesis, May 11, 2016.

3. “Distributed Information Management in Industrial Ecology.” Geography Colloquium, UCSB Department of Geography, October 1, 2015.

4. “The Plastic Recycling Ecosystem: Designing for industrial metabolism.” at PolyPack Symposium 2013, San Luis Obispo, CA. May 2, 2013.

Conference Presentations Delivered

1. **Kuczenski, B.**. “Disclosure of product system models in life cycle assessment: achieving transparency and privacy.” International Symposium on Sustainable Systems and Technology, Buffalo, NY. June 26, 2018.

2. **Kuczenski, B.**, Marvuglia, A., Ingwersen, W.W., Satterfield, B., Evers, D.P., Koffler, C., Navarrete, T., Laurin, L. “Inventory model description and revision: Developing an LCA Capability Roadmap” International Society of Industrial Ecology-International Symposium on Sustainable Systems and Technology 2017, Chicago, IL. June 29, 2017.

3. **Kuczenski, B.**. “Toward Distributed Computation and Validation of LCA Results.” Life Cycle Assessment XVI, Charleston, SC. September 29, 2016.

4. **Kuczenski, B.**, El Abbadi, A., Sahin, C. “Privacy-preserving Aggregation in Life Cycle Assessment.” International Symposium on Sustainable Systems and Technology, Phoenix, AZ. May 18, 2016.

5. **Kuczenski, B.**, El Abbadi, A., Sahin, S. and Egecioglu, O. “Partial Disclosure: Balancing confidentiality and transparency in LCA publishing.” Life Cycle Assessment XV, Vancouver, BC. October 8, 2015.

6. **Kuczenski, B.**, Ingwersen, W., Janowicz, K., Hitzler, P., Berg-Cross, G., Vardeman, C., and Suh, S. “Ontology Design Patterns for semantically enriched LCA.” Life Cycle Assessment XV, Vancouver, BC. October 7, 2015.

7. **Kuczenski, B.** and Beraha, S. “A web service for LCA study publication, interaction, and evaluation.” Life Cycle Assessment XV, Vancouver, BC. October 6, 2015.

8. **Kuczenski, B.**, El Abbadi, A., Sahin, S. and Egecioglu, O. “Privacy and Provenance in Environmental Impact Assessment.” International Society of Industrial Ecology, Guildford, UK. July 7, 2015.

9. **Kuczenski, B.** and Beraha, S. “Antelope – a web service for publishing life cycle models and results.” International Symposium on Sustainable Systems and Technology, Dearborn, MI. May 19, 2015.

10. **Kuczenski, B.**. “Life cycle fragments: computational methods for analyzing and sharing life cycle assessment models.” International Congress on Environmental Modelling and Software, San Diego, CA. June 18, 2014.

11. **Kuczenski, B.**, Henderson, A. and Geyer, R. “Empirically driven modeling of combustion emissions for wa ste oil in industrial boilers.” International Symposium on Sustainable Systems and Technology, Oakland, CA. May 20, 2014.

12. **Kuczenski, B.**, Geyer, R., Henderson, A. and Zink, T. "Used Oil Management in California: Coupling Material Flows and LCA." Life Cycle Assessment XII, Tacoma, WA. September 26, 2012.
13. **Kuczenski, B.** and Geyer, R. "Estimating the environmental performance of recycling through material flow analysis." International Society of Industrial Ecology, Berkeley, CA. June 8, 2011.
14. **Kuczenski, B.** and Geyer, R. "Tracking Toxics: Using risk information to characterize intermediate flows in LCA," Life Cycle Assessment X, Portland, OR. November 3, 2010.
15. **Kuczenski, B.** "Life cycle assessment and risk assessment: a fruitful collaboration," Gordon Research Seminar, New London, NH. July 10, 2010.
16. **Kuczenski, B.**and Geyer, R. "LCA and recycling policy – a case study in plastic," Life Cycle Assessment IX, Boston, MA. October 2, 2009.
17. **Kuczenski, B.** and Geyer, R. "PET beverage bottle recycling – an integrated LCA and MFA." First Symposium on Industrial Ecology for Young Professionals, Tempe, AZ. May 17, 2009.
18. **Kuczenski, B.**, Messner, W.C. and LeDuc, P.R. "Probing calcium-regulatory responses of living cells using a chemical signal generator." Biomedical Engineering Society 2008 Annual Meeting, St. Louis, MO. October 2, 2008.
19. **Kuczenski, B.**, Messner, W.C. and LeDuc, P.R. "Precise modulation of chemical concentrations over cellular microdomains: A Chemical Signal Generator." Biophysical Society 2008 Annual Meeting, Long Beach, CA. February 3, 2008.
20. **Kuczenski, B.**, Messner, W.C. and LeDuc, P.R. "Obtaining time series data of cellular behavior by continuously varying chemical stimuli." Biomedical Engineering Society 2005 Annual Meeting, Baltimore, MD. September 30, 2005.
21. **Kuczenski, B.**, Messner, W.C. and LeDuc, P.R. "An Automated System for Controlling the Laminar Flow Interface in a Microfluidic System," ASME 2004 International Mechanical Engineering Congress and Exposition, Irvine, CA. November 16, 2004.

PATENTS

- Kim, Y-T., **Kuczenski, B.**, LeDuc, P. R. and Messner, W. C., "Fluid Pressure Regulator and Related Methods and Systems." U.S. Patent No. 9,170,267 B2. Issued Oct. 27, 2015.

PROFESSIONAL ACTIVITY

Professional Contributions

2017– Member, GLAD Sounding Board, expert advisory panel supporting the United Nations Environment Programme's Global LCA Data Access (GLAD) initiative. Chair: Llorenç Milà i Canals.

2016– Chair, LCA Capabilities Roadmap module: "Product system model description and revision." Discussion group within Society of Environmental Toxicology and Chemistry (SETAC) North America.

2016– Member, International Society for Industrial Ecology (ISIE) Data Transparency Task Force. Chair: Edgar Hertwich.

Student Mentoring

2015–2017	Thesis Committee Member, Julie Xiaoju Chen, Ph.D., Engineering and Public Policy, May 2017. Carnegie Mellon University.
Fall 2015	Undergraduate Project Advisor, "Life Cycle Analysis of Liquid Hydrogen Rocket Propellant." NASA Student Workshop Project. Kevin Montevideo, B.S. Environmental Studies 2016.
Spring 2015	Senior Thesis Advisor, "An Analysis of Compressed Air Energy Storage: Scope in California and Potential Greenhouse Gas Emissions from Residual Methane." Asami Osato, B.S. Environmental Studies 2015.
2012–2013	Group Project Interim Advisor (Spring 2012); External Advisor (thereafter), "Evaluating low carbon fuel options for Patagonia's distribution network." Bren MESM class of 2013.
2009–2010	Group Project External Advisor, "The development of a standard tool to predict the environmental impact of footwear." Bren MESM class of 2010.
2009–2010	Mentoring of high school summer students, UCSB Research Mentoring Program.
Fall 2006	Undergraduate Research Advisor, Jessica Tsang, B.S. Mechanical Engineering, Carnegie Mellon University, class of 2008.

Conferences and Workshops

- International Society for Industrial Ecology-International Symposium on Sustainable Systems and Technology joint conference (ISIE-ISSST), Technical Committee member, 2017.
- International Symposium on Sustainable Systems and Technology (ISSST), Technical Committee member, 2014, 2015, 2016.
- GeoVoCamp on Ontology Design Patterns, Santa Barbara, March 23-25, 2015. Organizing Committee member.
- IEEE International Symposium on Sustainable Systems and Technology (IEEE-ISSST), Technical Committee member, 2011.

Peer Reviewing

Reviewer for:
Environmental Science and Technology
International Journal of Life Cycle Assessment
Sustainable Chemistry and Pharmacy
Journal of Industrial Ecology
Resources, Conservation, and Recycling
Journal of Cleaner Production
Journal of Hazardous Materials
International Journal of Waste Resources
Reviews in Chemical Engineering
Waste Management

Society Memberships

- International Society for Industrial Ecology (2009)
- American Center for Life Cycle Assessment (2012)
- Society for Environmental Toxicology and Chemistry (2015)

HONORS AND AWARDS

2015 Excellence in Review Award, *Resources, Conservation, and Recycling*

2005 Elected to Sigma Xi. *(associate)*

2004 National Science Foundation Graduate Research Fellowship Program, Honorable Mention.

1998 Elected to Tau Beta Pi.

1996–2000 Mary C. and William G. Drake Scholarship for Mechanical Engineering, University of California, Berkeley.

1996–2001 University of California Regents' and Chancellor's Scholar.

COMMUNITY SERVICE

2006–2008 Public Affairs Director, WRCT Pittsburgh 88.3 FM.

Fall 2005 Co-author, Constitution of the Mechanical Engineering Graduate Student Organization at Carnegie Mellon.

Fall 1999 Vice President, CA-α chapter, Tau Beta Pi