

EDUCATION

University of Illinois at Urbana-Champaign, Ph.D. in Civil and Environmental Engineering
(Expected Graduation: May 2023)

University of Illinois at Urbana-Champaign, M.S in Civil and Environmental Engineering

Georgia Institute of Technology, B.S. Chemical Engineering with an emphasis in Biotechnology

RESEARCH INTERESTS

Topics: Computer-Aided Process Engineering; Techno-Economic Analysis; Life Cycle Assessment; Biofuels and Bioproducts; Software Development; Machine Learning.

Description: I create and leverage tools to design, simulate, and perform techno-economic analysis and life cycle assessment of biorefineries. Using automated biorefinery models, I perform rigorous uncertainty and sensitivity analyses to navigate trade-offs and charter development roadmaps for emerging and conceptual technologies.

SKILLS

Computer: Python, Julia, MATLAB, Excel, Aspen plus, SuperPro Designer, and DWSIM

Languages: Native Spanish and English, Chinese as a second language

RESEARCH EXPERIENCE

NSF Graduate Student Fellow, Research Assistant	<p>Guest Group Lab, University of Illinois at Urbana-Champaign, Urbana-Champaign, Illinois (Since Aug 2017)</p> <p>Developed the Biorefinery Simulation and Techno-Economic Analysis Modules (BioSTEAM) software and performed uncertainty and sensitivity analyses of early-stage technologies for the sustainable production of biofuels and bioproducts.</p>
Exchange Research Assistant	<p>Kang Group Lab, National University of Singapore, Singapore (Aug 2019 – May 2020)</p> <p>Collaborative research on data-driven metabolic pathway optimization through machine learning.</p>
Summer Intern	<p>Fort Johnson Summer Undergraduate Research Program, Grice Marine Laboratory, College of Charleston, Charleston, South Carolina (Summer 2015)</p> <p>Studied the production of hydrogen and acetate from microbial electrosynthesis and how enzymes may functionalize an electrode.</p>
Undergraduate Research Assistant	<p>Reddi Group Lab, Institute for Bioengineering and Bioscience, Georgia Institute of Technology, Atlanta, Georgia (Aug 2014 – May 2015)</p> <p>Transformed <i>S. cerevisiae</i> and created Glr1 knock out strains. Glr1 catalyzes glutathione reduction. Reduced glutathione has been found to decrease heme availability <i>in vitro</i>. Measured cytosolic heme availability of various mutants <i>in vivo</i> through a fluorescent heme biosensor.</p>

RESEARCH EXPERIENCE (CONTINUED)

- Research Exchange Student** Ishikawa Group Lab, Laboratory of Organic and Polymeric Materials, Tokyo Institute of Technology, Tokyo, Japan (Spring 2014)
Used light microscopy, scanning electron microscopy, and Matlab to study the iridescence of jeweled beetles including *C. Gloriosa*, *C. Roelofsi* and *E. Caerulea*.
- Summer Intern** National Eye Institute Laboratory of Retinal Cell Molecular Biology, National Institutes of Health, Bethesda, MD (Summer 2013)
Characterized the visual function, morphology, and Rpe65 protein expression of RPE65 mutant mice including P25L Knock-In/Knock-In mice and P25L Knock-In/Knock-Out mice by taking histology pictures, performing Optical Coherence Tomography and Electroretinographs, and running Rpe65 Western Blots.

TEACHING EXPERIENCE

- Guest Lecture** Course: Bioenergy Technology (CHBE 478), University of Illinois at Urbana-Champaign, Urbana-Champaign, Illinois (Nov 4, 2021)
Developed and delivered a lecture to chemical engineering students on the importance of techno-economic analysis and an overview of the methodology, from process modeling to cashflow analysis.
- BioSTEAM Office Hours** Participants: Researchers and engineers at the U.S. Center for Advanced Bioenergy and Bioproduct Innovations (CABBI), the U.S. Center for Bioenergy Innovation (CBI), the Brazilian Bioethanol Science and Technology Laboratory (CTBE), and the EV Biotech company based in the Netherlands. (Since Aug 2021)
Held monthly meetings to encourage external collaboration and accelerate the adoption of the BioSTEAM software. In every meeting, I showcase new features, answer how-to questions, and explain the chemical engineering principles behind the algorithms of unit operations.
- Teaching Assistant** Course: Environmental Engineering (CEE 330), University of Illinois at Urbana-Champaign, Urbana-Champaign, Illinois (Jan 2019 – May 2019)
Held weekly office hours, facilitated in-class activities, helped proctor exams.
- Python Workshops** Participants: Laboratory groups at the Center for Advanced Bioenergy and Bioproduct Innovations (CABBI), University of Illinois at Urbana-Champaign, Urbana-Champaign, Illinois (Sep 2018 – Nov 2018)
Held bi-weekly introductory workshops on Python. Topics include Python data classes, importing, and object-oriented programming.

MENTORSHIP EXPERIENCE

- Internship Program Planning Committee Member** Program: Research in Sustainable Bioenergy (RISE), University of Illinois at Urbana-Champaign, Urbana-Champaign, Illinois (Since Oct 2021)
Contributed to the program structure and recruitment planning for the Research in Sustainable Bioenergy (RISE) program, which targets underrepresented students interested in bioenergy research. I also plan on mentoring an intern for this program in Summer 2022.

ENTREPRENEURSHIP EXPERIENCE

I-CORPS Summer Fellow Program: I-Corps Summer Fellows Customer Discovery program, delivered by the University of Toledo in partnership with the National GEM Consortium (July 2021)

Participated in a short course on customer discovery. Completed 20 interviews to potential BioSTEAM users, including university professors and researchers, researchers at the national renewable energy laboratory (NREL), and engineers at Bayer AG and EV Biotech. Presented my findings on the demand for developing proprietary products that would give BioSTEAM more utility.

PUBLICATIONS

Yan, Q., T.B. Jacobson, S. Hubbard, W.T. Cordell, R.E. Oleniczak, Z. Yea, F.V. Gambacorta, **Y.R. Cortés-Peña**, S.S. Bhagwat, J.S. Guest, D. Amador-Noguez, and B.F. Pfleger, "Metabolic engineering of *Yarrowia lipolytica* to produce 1,2-diacyl-3-acetyl triacylglycerol," *In preparation*.

Lee, J.W., N. Kuanyshev, L. Sun, Y.B. Cho, S.S. Bhagwat, Y.-G. Lee, Y. Li, **Y.R. Cortés-Peña**, J.S. Guest, and Y.-S. Jin, "Rewiring metabolism to construct a yeast strain capable of producing 2,3-butanediol without ethanol and glycerol production," *In preparation*.

Cortés-Peña, Y.R., C.V. Kurambhatti, K. Eilts, V. Singh, J.S. Guest, "Techno-Economic and Life Cycle Implications of Integrating Cellulosic Ethanol Production and Seasonal Oilsorghum Processing at an Oilcane Biorefinery," *In preparation* for submittal to *GCB Bioenergy*.

Stewart, D., **Y.R. Cortés-Peña**, Y. Li, R. Shi, A. Stillwell, and J.S. Guest, "Incorporation of Locality-Specific Financial Factors and Life Cycle Inventories in BioSTEAM," *In preparation*.

Yang, P., X. Cai, Y.-Y. Lee, M. Khanna, **Y.R. Cortes-Pena**, J.S. Guest, J. Kent, and T. Hudiburg, "An Agent-Based Modeling Tool Supporting Communication within the Bioenergy and Bio-Product Community for Cellulosic Bio-Economy Development," *In preparation*.

Bhagwat, S.S., Y. Li, **Y.R. Cortés-Peña**, E.C. Brace, T.A. Martin, H. Zhao, J.S. Guest, "Sustainable Production of Acrylic Acid via 3-Hydroxypropionic Acid from Lignocellulosic Biomass," *ACS Sustainable Chemistry & Engineering*, **9** (49), pp. 16659–16669 (2021).

Li, Y., S.S. Bhagwat, **Y.R. Cortés-Peña**, *et al.*, "Sustainable Lactic Acid Production from Lignocellulosic Biomass," *ACS Sustainable Chemistry & Engineering*, **9** (3), pp. 1341–1351 (2021).

McClelland, D.J., B.-X. Wang, W.T. Cordell, **Y.R. Cortes-Peña**, E.B. Gilcher, L. Zhang, J.S. Guest, B.F. Pfleger, G.W. Huber and J.A. Dumesic, "Renewable linear alpha-olefins by base-catalyzed dehydration of biologically-derived fatty alcohols," *Green Chemistry*, **23** (12), pp. 4338–4354 (2021).

Zhou, K., W. Ng, **Y.R. Cortés-Peña**, and X. Wang, "Increasing metabolic pathway flux by using machine learning models," *Current Opinion in Biotechnology*, **66**, pp. 179–185 (2020).

Cortés-Peña, Y.R., "Thermosteam: BioSTEAM's Premier Thermodynamic Engine," *Journal of Open Source Software*, **5** (56), p. 2814 (2020).

Cortes-Peña, Y.R., D. Kumar, V. Singh, and J.S. Guest, "BioSTEAM: A Fast and Flexible Platform for the Design, Simulation, and Techno-Economic Analysis of Biorefineries under Uncertainty," *ACS Sustainable Chemistry & Engineering*, **8** (8), pp. 3302–3310 (2020).

PUBLICATIONS (CONTINUED)

Li, Y., S. Yu, T. Duncan, Y. Li, P. Liu, E. Gene, **Y.R. Cortes-Pena**, H. Qian, L. Dong, T.M. Redmond, "Mouse model of human *RPE65* P25L hypomorph resembles wild type under normal light rearing but is fully resistant to acute light damage," *Human Molecular Genetics*, **24** (15), pp. 4417–4428 (2015).

AWARDS & HONORS

- 2018 National Science Foundation (NSF) Graduate Research Fellowship Program (GRFP) Fellowship
- 2017 GEM University Associate Fellow
- 2017 UIUC Support for Under-Represented Groups in Engineering (SURGE) Fellowship Program
- 2014 Japan Student Services Organization Scholarship
- 2013 General Electric/League of United Latin American Citizens Scholarship
- 2011 Congressional Hispanic Caucus Institute Scholarship
- 2011 Georgia HOPE/Zell Miller foundation Scholarship

PRESENTATIONS & POSTERS (*presenter underlined*)

Stewart, D., **Y.R. Cortés-Peña**, Y. Li, R. Shi, A. Stillwell, and J.S. Guest, "Incorporation of Locality-Specific Financial Factors and Life Cycle Inventories in BioSTEAM," *CABBI Retreat*. Presentation. July 2021

Yang, P., X. Cai, Y.-Y. Lee, M. Khanna, **Y.R. Cortes-Pena**, J.S. Guest, J. Kent, and T. Hudiburg, "An Agent-Based Modeling Tool Supporting Communication within the Bioenergy and Bio-Product Community for Cellulosic Bio-Economy Development," *CABBI Retreat*. Presentation. July 2021

Cortes-Pena, Y.R., J. Guest. "Enabling the Design, Simulation, and Techno-Economic Analysis of Agile Biorefineries in BioSTEAM," *AIChE 2020 Bioenergy Sustainability Conference*. Presentation. Nov. 2020.

Cortes-Pena, Y.R., J. Guest. "Expediting Design, Simulation and Techno-Economic Analysis Through BioSTEAM," *ACS Fall 2020 Virtual Meeting & Expo*. Presentation. Aug. 2020.

Shi, R., **Y.R. Cortés-Peña**, J. Guest. "Integrating Life Cycle Assessment and Process Design for Prioritization of Biofuels and Bioproducts Production," *AIChE Annual Meeting*. Presentation. Aug. 2019

Cortes-Pena Y.R., D. Kumar, V. Singh, J. Guest. "Development of BioSTEAM: The Open-Source Bioprocess Simulation and Technoeconomic Analysis Modules in Python," *AIChE Systems and Process Design Symposium*. Poster. Oct. 2018.

Cortes-Pena Y.R., D. Kumar, V. Singh, J. Guest. "A Process Simulation Environment on Python for Automated Preliminary Techno-Economic Analysis". *CABBI Colloquium*. Poster. July. 2018.

Cortes-Pena Y.R., H. May, "Microbial Electrosynthesis: Functionalizing an electrode through extracellular enzymes". *Fort Johnson REU Research Symposium*. Presentation. Aug. 2015.

Cortes-Pena Y.R., K. Ishikawa, M. Kamimura, "Structural Origin of the Iridescent Properties of Jeweled Beetles". *Young Scientist Exchange Program Research Symposium*. Presentation. Aug. 2014.

PRESENTATIONS & POSTERS (CONTINUED)

Cortes-Pena Y.R., T.M. Redmond, Y. Li, "Functional Characterization of Rpe65 P25L Knock In Mice". *National Institutes of Health Intern Poster Exposition*. Poster. Aug. 2013.

Cortes-Pena Y.R., A. Roher, T. Kokjohn, "Validation of the antimicrobial activity of the β -Amyloid peptides". *Banner Research Institute Intern Symposium*. Presentation. Aug. 2012.

Cortes-Pena Y.R., D. Birt, X. Zhang, "Cytotoxicity in Echinacea Extracts". *Iowa State University Intern Symposium*. Presentation and Poster. July 2010.