

Kurt Ristroph

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EDUCATION

Princeton University – Princeton, NJ

2016 – present

Ph.D. candidate (expected 2021), Department of Chemical and Biological Engineering

Master of Arts in Chemical Engineering

Louisiana State University – Baton Rouge, LA

2012 – 2016

Bachelor of Chemical Engineering, *magna cum laude*, College Honors

Bachelor of Liberal Arts – Classical Civilization

Minors in Chemistry and Latin

RESEARCH EXPERIENCE

NSF GRFP Graduate Researcher

2016 – present

Prud'homme research group

Princeton University

- Combined hydrophobic ion pairing with the Prud'homme group's Flash NanoPrecipitation technology to enable nanoencapsulation of water-soluble charged biologics, including peptides, proteins, and nucleic acids. Demonstrated controlled delivery and retained activity of payloads.
- Formulated a stable, dry nanoparticle powder of the single-dose malaria therapeutic OZ439 with the goal of improving oral bioavailability. Powder has over 10-fold superior dissolution kinetics *in vitro* compared to raw material, is stable for over 6 months, and eliminates fed/fasted food effect.
- Contributed to the engineering design and implementation of an industrial-scale good manufacturing practice Flash NanoPrecipitation line for clinical trial production of antimalarial lumefantrine.
- Technical skills include dynamic light scattering, zeta potential measurement, HPLC, fluorimetry, UV-vis, transmission electron microscopy, thermogravimetric analysis, hydrophobic ion pairing, Flash NanoPrecipitation, lyophilization, spray drying, x-ray powder diffraction, differential scanning calorimetry, and peristaltic/piston/syringe pump operation and maintenance.

Intern

June – August 2018

Drug Product Process Sciences

Moderna Therapeutics, Cambridge, MA

- Studied the effects of chemical and mixing factors relevant to lipid nanoparticle precipitation
- Gave an hour-long, 75-slide seminar detailing results and outlining recommendations for future work at the end of the internship

Undergraduate Researcher

2014 – 2016

Sabliov research group

Louisiana State University

- Developed a first-in-field assay to quantify and model kinetics of polymeric nanoparticle uptake into and biodistribution within soybean plants
- Formulated and characterized proof-of-concept polymeric nanoparticles for improved topical pesticide administration to crops; quantified effect of rainfall on nanoparticle-leaf adhesion

TEACHING EXPERIENCE

Undergraduate research mentor and director

Spring 2016

Prud'homme research group

Princeton University

- Designed and directed senior thesis projects for undergraduates in chemical engineering
- Trained mentees in scientific techniques, laboratory instrumentation, data analysis, and writing
- Met regularly with mentees to design experiments and discuss results
- Senior thesis students:
 - Parador "Joe" Rummaneethorn, graduated spring 2018, thesis 'Protein encapsulation into nanoparticles by hydrophobic ion pairing Flash NanoPrecipitation'
 - Tristan Lim, graduated spring 2018, thesis 'Biodegradable porphyrin nanoparticles for PET imaging applications'
- Junior independent research project students:
 - Brittany Grego, expected graduation spring 2020, junior project 'Predicting particle size from Flash NanoPrecipitation using non-traditional stabilizers'
- Summer students:
 - Tamanna Ananna, graduated spring 2018, summer project 'EUDRAGIT® polymers incorporated into Flash NanoPrecipitation for functional enteric nanoparticles'

Teaching Assistant, Biological Engineering Process Design & Lab

Spring 2016

BE 3340

Louisiana State University

- Led weekly recitation session consisting of a guided review of lecture followed by example problems and assistance with homework and process design
- Wrote and graded weekly homework assignments
- Met individually with students in office hours and corresponded electronically
- Supervised and led the course's three laboratory experiments and ran lab safety orientation

Teaching Assistant

Summers 2013 – 2016

ADVANCE Program for Young Scholars

Duke TIP affiliate for gifted high school students

- Assisted instruction for classes of 15 students: prepared course materials, oversaw classroom, graded homework and exams, and taught class in instructor's absence.
- Led daily hour-long study halls to review material from lecture and assist with homework
- TA for Chemistry (2016), Mythology (2013 and 2015), and Shakespeare (2014) classes
- Program's Head TA in 2016. Coordinated and led team of 14 TAs across several courses

PUBLICATIONS

- C. E. Markwalter, R. F. Pagels, B. K. Wilson, **K. D. Ristroph**, R. K. Prud'homme. Flash NanoPrecipitation for the Encapsulation of Hydrophobic and Hydrophilic Compounds in Polymeric Nanoparticles. *JoVE*. (pending publication), e58757, in press (2018).
- J. Feng, Y. Zhang, S. A. McManus, **K. D. Ristroph**, H. D. Lu, K. Gong, C. White, R. K. Prud'homme, Rapid recovery of clofazimine-loaded nanoparticles with long-term storage stability as anti-cryptosporidium therapy. *ACS Appl. Nano Mater.*, 2018, 1 (5), pp 2184–2194. DOI: 10.1021/acsanm.8b00234
- **K. D. Ristroph**, H. D. Lu, E. L. K. Dobrijevic, J. Feng, S. A. McManus, Y. Zhang, W. D. Mulhearn, H. Ramachandruni, A. Patel, R. K. Prud'homme, Encapsulation of OZ439 into nanoparticles for supersaturated drug release in oral malaria therapy. *ACS Infect. Dis.*, 2018, 4 (6), pp 970–979. DOI: 10.1021/acsinfecdis.7b00278

- H. D. Lu, E. Pearson, **K. D. Ristroph**, G. A. Duncan, L. M. Ensign, J. S. Suk, J. Hanes, R. K. Prud'homme, *Pseudomonas aeruginosa* pyocyanin production reduced by quorum-sensing inhibiting nanocarriers. *Int. J. Pharm.*, 2018. DOI: 10.1016/j.ijpharm.2018.03.058
- H. D. Lu, P. Rummaneethorn, **K. D. Ristroph**, R. K. Prud'homme, Hydrophobic ion pairing of peptide antibiotics for processing into controlled release nanocarrier formulations. *Mol. Pharm.*, 2018, 15 (1), pp 216–225. DOI: 10.1021/acs.molpharmaceut.7b00824
- Y. Zhang, J. Feng, S. A. McManus, H. D. Lu, **K. D. Ristroph**, E. J. Cho, E. L. Dobrijevic, R. K. Prud'homme, Design and solidification of fast-releasing clofazimine nanoparticles for treatment of cryptosporidiosis. *Molecular Pharmaceutics*, 2017, 14 (10), pp 3480–3488. DOI: 10.1021/acs.molpharmaceut.7b00521
- **K. D. Ristroph**, C. E. Astete, E. Bodoki, C. M. Sabliov, Zein nanoparticle uptake by hydroponically grown soybean plants. *Environ. Sci. Technol.*, 2017, 51 (24), pp 14065–14071. DOI: 10.1021/acs.est.7b03923

PATENTS

- **K. D. Ristroph**, N. M. Pinkerton, H. D. Lu, R. K. Prud'homme, Hydrophobic Ion Pairing and Flash NanoPrecipitation for Formation of Controlled Release Nanocarrier Formulations. U.S. Provisional Application 62/581,394 filed December 2017, full international filing November 2018.
- J. Feng, **K. D. Ristroph**, H. D. Lu, Y. Zhang, S. A. McManus, R. F. Pagels, R. K. Prud'homme, Cellulosic Polymer Nanoparticles and Methods of Forming Them. U.S. provisional patent application 62/557,744 filed September 2017, full application filed September 2018.

HONORS AND AWARDS

- **First place (\$500 award), Materials Engineering & Science poster at national AIChE** **2018**
Best poster presentation out of 125 posters in the division
- **Third place (\$5000 award), 13th Annual Princeton Innovation Forum** **2018**
Competition for research with commercial potential; presented antibiotic peptide encapsulation
- **National Science Foundation Graduate Research Fellowship** **2016**
Five-year fellowship that provides three years of funding for doctoral students
- **Ogden Leaders Award (\$5000 grant)** **2014**
Awarded by the LSU Honors College to carry out a self-proposed service project to benefit Louisiana; funded the VOLUMEN Project in 2015
- **Most Outstanding Student** **2013 – 2016**
Awarded annually by the LSU Ogden Honors College to two students in each academic year for outstanding scholarship. Recognized four years.
- **Distinguished Communicator** **2016**
Awarded by LSU's Communication Across the Curriculum Program for completing communication-intensive coursework in visual, written, spoken, and technological modes
- **College Honors** **2016**
From the LSU Honors College for completing their curriculum of honors coursework, seminar courses, and an original research thesis
- **Chancellor's Alumni Scholar** **2012 – 2016**
Presented to the ten most promising undergraduate students entering LSU each year. Full undergraduate scholarship covering tuition, housing, and fees
- **Discover Scholar** **2016**
1 of 12 students recognized by LSU for exemplary undergraduate research

- **Service Award** **2014**
Presented by the LSU Ogden Honors College for over 400 hours of volunteer service work
- **Election to Phi Beta Kappa (2014), Phi Kappa Phi (2013), and Tau Beta Pi (2015) societies**
For scholarship in the humanities, sciences, and engineering
- **Ned Folse (2013) and William M. Clarke (2014) Classics Scholar**
Awarded by the LSU Department of Classics for academic achievement in Latin
- **Chevron (2016), CITGO Petroleum (2015 & 2014), and Edmiston (2013) Scholar in ChE**
From the LSU College of Engineering for academic achievement in chemical engineering
- **Eagle Scout** **2009**

OTHER NOTABLE PUBLICATIONS

- **K. D. Ristroph**, ‘The VOLUMEN Project: Bringing the Library to the Community.’ *Public Libraries* 55 (2) April 2016.
- King, K. ‘Kurt Ristroph aims to connect Baton Rouge youth to libraries.’ (Highlighted as service project director) *225 Magazine*, Feb 2015. <https://bit.ly/2zdzDzf>

LEADERSHIP & SERVICE

Founding Director

2014 – present

The VOLUMEN Project

Citywide service project in Baton Rouge

- Founded and carried out literary service project that granted each of over 40,000 East Baton Rouge Parish students in elementary and middle public, private, and charter schools free access to 55,000 electronic books, homework help, ESL software, and other educational resources
- Coordinated with public library system and school administrators to expand project outreach to every elementary and middle school – about 75 total – in the city
- Promoted project via *TEDxLSU* talk in 2015: bit.ly/2vEDmD9
- Received commendation from the Baton Rouge Public Library Board in 2014

Publications Chair

2017 – present

National Junior Classical League

Nationwide classics youth organization

- Member of 12-person committee that runs the NJCL, an organization of 45,000 high school Latin and Greek students across North America
- Mentor the student Editor in creating four issues of the national magazine the *Torch: U.S.* annually
- Attend planning meetings three times annually to manage the organization’s budget, membership, and trajectory
- Attend and help run the organization’s weeklong national convention each July
- Maintain the NJCL’s social media accounts, including Facebook, Instagram, Twitter, Vimeo, Snapchat, and YouTube

PRESENTATIONS

- **K. D. Ristroph** (speaker and poster presentation), P. Rummaneethorn, R. K. Prud’homme, ‘Formulation of Peptide and Protein Therapeutics into Nanoparticles for Prolonged Activity and Improved Delivery.’ *2018 AIChE Annual Meeting*. Pittsburgh, PA, Nov 2018
- **K. D. Ristroph**, A. Prasad, E. Bodoki, C. E. Astete, A. Bodoki, C. M. Sabliov (speaker) ‘Zein nanoparticles as viable delivery systems for agrochemicals.’ *255th American Chemical Society National Meeting and Exposition*. New Orleans, LA, March 2018

- **K. D. Ristroph** (speaker and poster presentation), R. K. Prud'homme, 'Nanoparticles for Eliminating Superbugs.' *13th Annual Princeton Innovation Forum*. Princeton, NJ, March 2018
- **K. D. Ristroph** (speaker), H. D. Lu, E. L. K. Dobrijevic, S. A. McManus, Y. Zhang, J. Feng, W. D. Mulhearn, H. Ramachandrani, A. Patel, N. Bowers, R. K. Prud'homme, 'Formulation of Stable Nanosuspensions of a Novel Malaria Therapeutic Through Polymer-Directed Precipitation.' *2017 AIChE Annual Meeting*. Minneapolis, MN, Nov 2017
- Y. Zhang (poster presentation), J. Feng, S. A. McManus, H. D. Lu, **K. D. Ristroph**, R. K. Prud'homme, 'Design and Characterization of Fast-Release Clofazimine Nanoparticles to Improve Bioavailability.' *2017 AIChE Annual Meeting*. Minneapolis, MN, Nov 2017
- **K. D. Ristroph** (speaker), H. D. Lu, P. Rummaneethorn, R. K. Prud'homme, 'Increasing the Hydrophobicity of Biologic Active Pharmaceutical Ingredients by Generating Insoluble Salt Forms to Enable Continuous Nanoprecipitation and Encapsulation.' *2017 AIChE Annual Meeting*. Minneapolis, MN, Nov 2017
- **K. D. Ristroph** (speaker), H. D. Lu, E. Pearson, G. A. Duncan, L. M. Ensign, J. S. Suk, J. Hanes, R. K. Prud'homme, 'Modulating *Pseudomonas Aeruginosa* Bacterial Communication with Nanoformulated Signaling Agents' *2017 AIChE Annual Meeting*. Minneapolis, MN, Nov 2017
- Y. Zhang (speaker), J. Feng, S. A. McManus, H. D. Lu, **K. D. Ristroph**, R. K. Prud'homme, 'Size reduction through Flash Nanoprecipitation to Improve Solubility, Dissolution, and Bioavailability of Clofazimine.' *2017 AIChE Annual Meeting*. Minneapolis, MN, Nov 2017
- Y. Zhang (poster presentation), **K. D. Ristroph**, R. K. Prud'homme, 'Co-delivery of Antibiotic and Biofilm Dispersant using Nanoparticles to Control Biofilm Development.' *91st ACS Colloid & Surface Science Symposium*. New York, NY, July 2017
- **K. D. Ristroph** (speaker), H. D. Lu, P. Rummaneethorn, R. K. Prud'homme, 'Modulating Drug Nanocarrier Release Kinetics through Hydrophobic Ion Pairing.' *91st ACS Colloid & Surface Science Symposium*. New York, NY, July 2017
- **K. D. Ristroph** (speaker), H. D. Lu, E. Pearson, G. A. Duncan, L. M. Ensign, J. S. Suk, J. Hanes, R. K. Prud'homme, 'Delivery of Quorum-Sensing Therapeutics across Physiological Barriers to *Pseudomonas aeruginosa* Infections using Nanoparticles' *91st ACS Colloid & Surface Science Symposium*. New York, NY, July 2017
- **K. D. Ristroph** (speaker), H. D. Lu, E. L. K. Dobrijevic, S. A. McManus, Y. Zhang, J. Feng, W. D. Mulhearn, H. Ramachandrani, A. Patel, N. Bowers, R. K. Prud'homme, 'Encapsulation of OZ439 into Nanoparticles for Supersaturated Drug Release in Oral Malaria Therapy' *91st ACS Colloid & Surface Science Symposium*. New York, NY, July 2017
- **K. D. Ristroph** (speaker), H. D. Lu, P. Rummaneethorn, R. K. Prud'homme, 'Salt Form Engineering of Encapsulated Antibiotics for Prolonged Therapeutic Delivery and Activity.' *The 4th Stevens Conference on Bacteria-Material Interactions*. Hoboken, NJ, June 2017
- **K. D. Ristroph** (speaker), C. M. Sabliov, 'Zein nanoparticle interaction with soybean plants.' *LSU 7th Annual Undergraduate Research Conference*. Baton Rouge, LA, Oct 2015.
- **K. D. Ristroph** (speaker) 'The VOLUMEN Project.' *TEDxLSU*. Baton Rouge, LA, Feb 2015